



Derwent World Patents Index

EPI Manual Codes Part 2

Edition 24



DERWENT WORLD PATENTS INDEX (DWPI)

EPI MANUAL CODES
(PART 2)

Edition 24

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U11: Semiconductor Materials and Processes

U11 covers processing, packaging, assembly, testing and handling of the devices in U12 to U14, but note that aspects of manufacture specific to certain devices can be found in U12 and U14, under codes for LEDs, lasers, solar cells, thick film and hybrid circuits. Liquid crystal layer manufacture is included in U14-K01A1. Chip carrier, multilayer substrate circuit board and chip-on-substrate technologies are coded under integrated circuit packaging in U11-D01A, and hybrid circuits in U14-H03 and U14-H04.

U11-A

Materials

See U11-B03, U11-C01J, U12-B03C, U12-E01 and X12-D01C for chemical details of produced crystals, structures and organic semiconductors.

U11-A01

Semiconductor materials, dopants

Includes preparation of semiconductor material from precursors, refining and purification, new semiconductor material. For solar cell material see also appropriate code in U12-A02A2.

U11-A01A [1992]

Silicon

Silane, fluoride, chloride

U11-A01A1 [1997]

Porous silicon

(U11-A01A)

LED

U11-A01B [1992]

AIII-BV compounds

Includes complex ternary and quaternary compounds.
Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride, arsinogalanes

U11-A01C [1992]

AII-BVI compounds

Includes complex ternary and quaternary compounds.
Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-A01D [1992]

Group IV elements and their compounds (except elemental silicon)

Silicon carbide, diamond, germanium

U11-A01F [1992]

Organic semiconductor materials

U11-A01M [1992]

Dopants

U11-A01X [1992]

Other semiconductor materials

Includes materials not covered by U11-A01A to U11-A01F codes, e.g. AIV-BVI group, AI-BIII-CVI group, AII-BIV-CV group semiconductors.

Lead sulphide, lead telluride, chalcopyrite compounds, copper indium sulphide, copper gallium selenide, chalcogenide compounds, zinc tin arsenide, cadmium germanium arsenide

U11-A02

Piezoelectric, electrostrictive, magnetostrictive materials

Materials for transducers are also coded in V06-V. Includes electrets of organic materials which exhibit piezoelectric and pyroelectric properties. Also includes Ferroelectric materials

Lead, titanate, zirconate, titanium, zirconium, bismuth, permalloy, lead scandium tantalate, polyvinyl fluoride, polyvinyl chloride, polyacrylonitrile

U11-A03

Liquid crystal, electrochromic materials

U11-A03A [1992]

Liquid crystal material, compounds, additives

See also V07-K10A.

Chiral, ester, phenyl, smectic, cholesteric, nematic, twisted nematic, cyano, hydroxy, mesogenic, polymer dispersed LC, PDLC, polymer network LC, halo-acetylene derivatives, phenyldioxanes, ferroelectric LC

U11-A03C [1992]

Electrochromic materials

For details regarding electrochromic display (structures, circuits) see U14-K02 codes.

U11-A04

Magnetic materials

Magnetic materials in general are coded in V02-A.
Iron, garnet, alloy, oxide

U11-A05

Thick and thin film materials

Includes conductive pastes and inks, thick film resistive compositions (see also V01-A02C1). For general thick film aspects see U14-H02.

Vehicle, solvent, frit, powder, paste

U11-A05A [1987]

Screen print solders

Gold, silver, glass frit inks

U11-A05B [1987]

Substrate materials

Includes novel composite material, new materials for multilayer ceramic substrate (see also U14-H03B1), materials for other hybrid circuit substrate (see also U14-H03C). For general integrated circuit substrate see also U11-D01A.

U11-A06 [1983]

Resists for semiconductor device manufacture

(U11-A09)

Includes photosensitivity increasing substances. See V04-R01A for resists used in PCB manufacture. Apparatus for coating, processing photoresist are covered by U11-C04A1 codes.

Photolithography, photosensitive, positive, negative

U11-A06A [1992]

Organic resist for semiconductor device manufacture

Quinonediazides, phenol resin

U11-A06B [1992]

Inorganic resist

Germanium selenide, amorphous silicon

U11-A07 [1983]

Encapsulants, sealants

(U11-A09)

See V04-S01A for compounds used to encapsulate complete modules, circuit boards etc.

Resin, epoxy, coating, powder, cure, harden, glass, polythylene terephthalate

U11-A08 [1992]

Insulating, conductive materials

U11-A08A [1992]

Insulating materials for dielectric layer

Includes preparation of material from precursors, any other aspect relating to layer structure or deposition being covered by the appropriate codes U11-C05A or U11-C05B.

U11-A08A1 [1992]

Organic insulating material for semiconductor manufacture

(U11-A05A)

Polyquinoxalines, polyquinoxalones, polybenzoxazoles, polyimide crosslinking agents

U11-A08A2 [1992]

Inorganic insulating material for semiconductor manufacture

(U11-C05B5, U11-C05B7)

Prior to 1992, coded in U11-A09 and/or U11-C05B5, or U11-C05B6, or U11-C05B7.

U11-A08B [1992]

Conductive materials for semiconductor manufacture

(U11-A09, U11-D03A1, U11-D03B)

Includes metals, alloys for e.g. electrodes, wires, interconnections, lead frames. See also appropriate code in U11-D to identify use of respective metal or alloy, e.g. U11-D03A1 for beam leads, U11-D03B for interconnections, electrodes.

U11-A08B1 [2005]

Organic conductive materials for semiconductor manufacture

U11-A08B2 [2005]

Inorganic conductive materials for semiconductor manufacture

(U11-A09, U11-D03A1, U11-D03B)

U11-A09

Other materials for semiconductor manufacture

Includes resins not used as encapsulants or sealants.

Adhesives

U11-A10 [1992]

Abrasives, polishers, cleaners, etchants used in semiconductor manufacture

(U11-A09)

Includes materials used in mechanical and/or chemical treatment. Resist strippers are also coded here. See also U11-C06A1, U11-C07A1, or U11-C07B as appropriate.

U11-A11 [1992]

Developers for microlithography

(U11-A09, U11-C04A1)

U11-A12 [1997]

Gases for semiconductor technology

(U11-A09)

For reactive processing gases see also U11-A13.

Argon, nitrogen, helium, ozone

U11-A13 [2005]

Precursors for deposition process in semiconductor manufacture

(U11-A09)

Includes reactive gases, liquid and solid precursors.

U11-A14 [2006]

Nano-structural materials

Use in conjunction with other U11-A codes to indicate type of material. For conductive nano-structural materials in general, see also X12 codes.

U11-A15 [1992]

Electroluminescent materials

(U11-A09, U14-J)

Also includes other novel luminescent materials used in semiconductor devices, e.g. phosphors, photoluminescent and fluorescent materials. See U14-J codes for electroluminescent devices and displays (structure, circuits, manufacture).

U11-A15A [2002]

Inorganic electroluminescent materials

U11-A15B [2002]

Organic electroluminescent materials

Includes polymeric and organometallic complexes.

U11-A16 [2007]

Immersion lithography fluid

See U11-C04K codes for immersion lithography apparatus and method.

U11-B

Bulk crystal growth

Includes methods of growing monocrystals of silicon, germanium and other homogeneous materials except those covered by subclass U11-B03 below. See U11-C01J1 for epitaxy and U11-C01H for liquid phase deposition on substrate.

Single crystal, monocrystalline, polycrystalline

U11-B01 [1983]

Pulling from melt crystal growth for semiconductor manufacture

Includes Czochralski method.

CZ pull, boules, liquid encapsulated Czochralski, LEC

U11-B02 [1987]

Zone refining, other

U11-B02A [1992]

Zone refining crystal growth for semiconductor manufacture

Includes floating zone method.

Zone melting

U11-B02B [1997]

Crystal growth from melt in crucible

(U11-B02X)

Bridgman

U11-B02C [2002]

Spherical crystal growth methods

Includes e.g. droplet method. For spherical ICs see U13-D06.

U11-B02X [1992]

Other crystal growth methods for semiconductor manufacture

Includes vertical, horizontal gradient freeze method, floating fluidised bed method. For ribbon techniques, edge defined film growth, see U11-B04.

U11-B03 [1987]

Characterised by crystal material and crystallographic orientation

Includes chemical techniques rather than apparatus details. This code is usually used in conjunction with other codes, whenever crystallographic structure is emphasised.

Oriented films

U11-B03A [1992]

Bulk crystal growth of AIII-BV compounds

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride

U11-B03B [1992]

Bulk crystal growth of AII-BVI compounds

Includes complex ternary and quaternary compounds.

Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-B03C [1992]

Bulk crystal growth of AIV elements and their compounds

Excludes elemental silicon.

Carbon, germanium, silicon carbide

U11-B03X [1992]

Bulk crystal growth of other semiconductor compounds

Includes bulk growth of elemental silicon crystal, or bulk growth of any other semiconductor material not mentioned in U11-B05 section.

U11-B04 [1987]

Ribbon techniques, pulling/casting from melt for semiconductor device manufacture

Includes edge-defined film-fed crystal growth process, forming dendritic web e.g. for photovoltaic applications.

EFG, monocrystal, polycrystal

U11-B05 [2002]

Apparatus details for crystal growth

U11-B05A [2002]

Crucibles, crystal holders

U11-B05B [2002]

Crystal pulling mechanisms

Includes pulling-rods, pull-seeds etc.

U11-B05C [2002]

Heating/cooling arrangements for growth vessel, crucible

U11-C

Substrate processing for semiconductor device manufacture

In U11-C, each sub-group (-C01, -C02, -C03 etc.) covers a distinct category of processing e.g. deposition, doping, heat treatment etc. and is further divided to indicate techniques used for a particular device or technology, such as FET or gallium arsenide. For example, electrode manufacture for gallium arsenide devices is coded in U11-C05E(-1 or -2) and U11-C05F3; in another example, forming smoothing insulating layer over interconnection structure is coded in U11-C05B9 and U11-C05D1. Aspects regarding processing apparatus are covered by U11-C09 codes.

U11-C01

Deposition of active materials (e.g. semiconductors)

U11-C01A to U11-C01H are applied for deposition using specified apparatus, with details about apparatus covered by U11-C09 codes. U11-C01J codes are used to indicate details of substrates or the nature of deposited active layers. Note that U11-C01J1 is used only when epitaxy is emphasised as an important aspect of the invention. For methods which imply epitaxial deposition e.g. molecular beam epitaxy, liquid phase epitaxy, U11-C01J1 is not used.

U11-C01A

Physical deposition of semiconductor layer

U11-C01A1 [1987]

Thermal evaporation for deposition of semiconductor layer

Arc evaporation, thermal vacuum evaporation using e.g. resistive heating, or inductive (RF) heating.

U11-C01A2 [1987]

Molecular beam, atomic beam, ion beam deposition of semiconductor layer

Includes cluster ion beam deposition. For reactive ion beam deposition see U11-C01B.

MBE

U11-C01A3 [1997]

Sputtering deposition of semiconductor layer (U11-C01A9)

Includes deposition by glow/RF discharge, magnetron sputtering. Prior to 1997 sputtering was covered in U11-C01A9.

U11-C01A9 [1987]

Other methods of physical deposition

Includes also laser ablation.

U11-C01B

Chemical vapour deposition of semiconductor layer

For apparatus see U11-C09B and in case of plasma enhanced CVD and electron cyclotron resonance CVD, U11-C09C. Also includes reactive ion beam deposition and seeded crystallisation deposition techniques. Prior to 199201 for PECVD see U11-C01A9 and U11-C01B. Also cover Vapour phase epitaxy (VPE).

CVD, low pressure, LPCVD, PECVD, photochemical, PhCVD, atmospheric pressure, APCVD, ECRCVD, hot filament, HFCVD, metal-organic, MOCVD, organometallic, OMCVD

U11-C01B1 [1987]

Beam/mask assisted CVD of semiconductor layer

Using beam/mask defining areas of localised reactive deposition.

Laser assisted, LACVD

U11-C01C [1987]

Large surface area deposition

E.g. physical or chemical vapour deposition for solar cells (see also U12-A02A3), semiconductor memories arrays (see also U11-C18B5).

Roll to roll, continuously moving web, continuous belt

U11-C01D [1987]

Other methods of deposition of semiconductor layer

(U11-C01X)

U11-C01F [1992]

Langmuir Blodgett method

(U11-C01D)

Mono-molecular films

U11-C01H [1992]

Liquid phase deposition of semiconductor layer

(U11-C01D)

Includes sliding or sloping position liquid phase epitaxy, electrophoresis, atomised films, conversion of insulating layer (e.g. oxide) into semiconductor by immersion into solution.

LPE

U11-C01J [1987]

Nature/structure/material/composition of active layers

When method of deposition is specified, U11-C01J codes are used in conjunction with codes above (-C01A,-C01B, etc.).

U11-C01J1 [1987]

Epitaxial growth of semiconductor layer

Only used when epitaxy is emphasised as essential for method of deposition or structure described. For epitaxy by seeded crystallisation see also U11-C01B and U11-C01J8. This code is **not** used for methods of deposition which imply epitaxy e.g. molecular beam epitaxy, liquid phase epitaxy.

Single crystal layer, atomic layer epitaxy, ALE

U11-C01J2 [1987]

Semiconductor amorphous/polycrystalline film

Includes specific crystalline form e.g. HSG, spherical grain.

Thin film

U11-C01J3 [1987]

Deposition of semiconductor layers other than silicon

U11-C01J3A [1992]

Deposition of AIII-BV compound layer

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride

U11-C01J3B [1992]

Deposition of AII-BVI compound layer

Includes complex ternary and quaternary compounds.

Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-C01J4 [1987]

Deposition of other inorganic semiconductor material layers

U11-C01J4A [1997]

Deposition of group IV element/compound layer

(U11-C01J4)

Silicon carbide, diamond, germanium

U11-C01J5 [1987]

Polymer, organic film structures

Macromolecular

U11-C01J6 [1987]

Heterojunction, superlattice structures, quantum wells, wires, boxes manufacture

U11-C01J6A [2006]

Strained layers and their manufacture

Manufacture of strained layers to enhance material properties such as charge-carrier mobility. For device with strained layer structure see also U12-E01B1A.

Strained silicon, strained-layer super lattice, strained layer, relaxed layer, SLS

U11-C01J7* [1987-1996]

Other active layers, electroluminescent, ferroelectric

*This code is now discontinued, but remains searchable and valid for records from 1987 to 1996. Includes layers e.g. for bubble memories, SAW devices. For electroluminescent layer deposition see also U14-J01. For ferroelectric layer deposition e.g. for capacitor manufacture, see U11-C05G1B and U11-C05B codes.

U11-C01J8 [1987]

Characterised by substrate details

E.g. for solar cells, thin films, rugged, trenched substrate, three-dimensional structures with layers built up to include isolation regions. Includes deposition with lattice adaptation on substrate being crystalline insulating material or semiconductor material, also deposition on substrate with particular geometry e.g. grooves, holes. For selective, lateral epitaxy by seeded crystallisation see also U11-C01B and U11-C01J1. Covers also separation of epitaxial device layers (see also U11-C01J1) from substrates on which they are grown (see also U11-C04D1).

Sandwich wafer

U11-C01J8A [1997]

Substrate bonding

(U11-C01X)

Covers bonding of semiconductor layers to insulation or semiconductor substrate, forming protection film on back of wafer to prevent autodoping, (previously coded in U11-C01X). For silicon on insulator structures see also U11-C08A6.

SOI

U11-C01J8B [1997]

Preventing lattice mismatch

(U11-C01J8)

Includes forming buffer layer for lattice compatibility.

U11-C01X

Other aspects of deposition

Covers deposition using vibrating substrate, e.g. in liquid phase deposition (see also U11-C01H), etc.

U11-C02

Doping for semiconductor device manufacture

For introducing impurities (dopant) during growth or deposition of material, U11-C02 should be used in conjunction with appropriate codes in U11-B or U11-C. Codes in this sub-class should be used in conjunction which each other. For example, ion implantation of gallium arsenide layers for MESFET using beams oriented at a certain angle is coded in U11-C02B2, U11-C02J1A and U11-C02J6 (if structure of device is novel, or in order to identify type of device, U12 codes will be also used).

U11-C02A

Diffusion, apparatus and associated techniques

U11-C02A1 [1987]

Diffusion apparatus

Electrical aspects of diffusion furnaces are also covered by X25-C codes.

U11-C02A2 [1987]

Diffusion techniques, dopant layer structures

Used only if special conditions for dopant diffusion or structures are emphasised, e.g. using masks for edge diffusion or under slanted angle. Includes diffusion from solid or gaseous phase dopant source in contact with semiconductor surface.

U11-C02B

Ion implantation, apparatus and associated techniques

Ion injection, ion bombardment

U11-C02B1 [1987]

Ion implantation apparatus

For novel aspects of ion beam apparatus. see also V05-F05A7C.

Ion source, ion beam generator, focussing, deflection, control, processing chamber

U11-C02B2 [1987]

Ion implantation techniques

Used only if special ion implantation conditions are emphasised, e.g. using masks, implantation at certain angle between ion beam and surface plane or crystal planes (to avoid channelling), etc.

Recoil implantation

U11-C02J

Doping aspects relating to substrate, structures, layers, devices being processed

U11-C02J1	[1987]
Doping non-silicon semiconductor substrate	
U11-C02J1A	[1992]
Doping AIII-BV compounds	
Includes complex ternary and quaternary compounds <i>Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride</i>	
U11-C02J1B	[1992]
Doping AII-BVI compounds	
Includes complex ternary and quaternary compounds. <i>Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide</i>	
U11-C02J1C	[1992]
Doping AIV elements and their compounds	
<i>Germanium, diamond, silicon carbide</i>	
U11-C02J1X	[1992]
Doping other semiconductor materials	
U11-C02J2	[1987]
Doping heterojunction structures	
U11-C02J3	[1987]
Doping non-semiconductor layers, insulators, polymers	
Includes e.g. implanting wiring surface prior to patterning in order to prevent formation of hillocks (see also U11-C05D3, U11-D03B2). <i>Macromolecular</i>	
U11-C02J4	[1987]
Other techniques and apparatus	
Includes doping aspects using wave or particle treatment. Includes alloying of doping materials with semiconductor body. <i>Radiation-enhanced diffusion</i>	
U11-C02J5	[1987]
Doping for bipolar device manufacture	
Includes doping of electrode regions, formation of buried layers. <i>Shallow junction</i>	
U11-C02J6	[1987]
Doping for FET manufacture	
Includes doping of electrode regions e.g. using gate electrode as mask for forming source and drain. <i>Channel stop implants, LDD</i>	

U11-C02J7	[1987]
Doping for other semiconductor device manufacture	
<i>Capacitor, LED, solar cells</i>	
U11-C02X*	[1988-1996]
Other doping	
*This code is now discontinued, but remains searchable and valid for records from 1988 to 1996. See U11-C02J4 from 1997 for alloying aspects.	
U11-C03	
Heat, electrical, radiation treatment of semiconductor body; Apparatus	
Codes from U11-C03B to U11-C03D, representing various treatment techniques, are used in conjunction with U11-C03J1 to U11-C03J3 codes for structures, and/or U11-C03J8 codes for specific materials.	
U11-C03A	[1987]
Heat, radiation, furnace treatment	
Includes temperature control systems and apparatus for semiconductor manufacture, or substrate in vacuum processing apparatus, e.g. sputtering, CVD or etching apparatus (see also appropriate codes in U11-C09). Electrical aspects of furnaces are covered by X25-C codes. <i>Heater, temp, control, IR, lamp</i>	
U11-C03B	[1987]
Electron/ion beam treatment of semiconductor	
For apparatus, see also V05-F05A codes.	
U11-C03C	[1987]
Other type of treatment of semiconductor	
<i>Plasma, hydrogen plasma, electrical pulse, mechanical pulse</i>	
U11-C03D	[1992]
Laser treatment of semiconductor	
(U11-C03C)	
U11-C03E	[1997]
Radiation treatment of semiconductor	
(U11-C03B, U11-C03C)	
Includes bombardment with wave or particle radiation. <i>Radioactive pulse</i>	
U11-C03J	[1987]
Nature of process/techniques, structure/material being treated	

U11-C03J1	[1987]
Recrystallising semiconductor layer (H01L-021/324)	
U11-C03J2	[1987]
Annealing, defect control, gettering of semiconductor	
U11-C03J2A	[1992]
Annealing semiconductor layer <i>Rapid thermal annealing, RTA</i>	
U11-C03J2B	[1992]
Gettering, defect control of semiconductor Includes introducing internal imperfections, strained layers and methods for external gettering e.g. honing, sandblasting, backside damage. Covers also deep level dopants for lifetime carrier control, killer dopant (see also U11-C02 codes where doping techniques or structures are novel). <i>Intrinsic gettering, bulk micro defects</i>	
U11-C03J3	[1987]
Blanket treatment of semiconductor E.g. forming punch through implants to reduce short-channel effects in submicron CMOS (see also U11-C02B2, U11-C02J6).	
U11-C03J4	[1987]
Heat/radiation treatment for very large surface area E.g. for solar cell.	
U11-C03J5	[1987]
Beam treatment of localised areas on surface	
U11-C03J6	[1987]
Semiconductor heat/radiation treatment using masks, structures on substrate	
U11-C03J7	[1987]
Producing localised depth profile, and other structures by semiconductor treatment Includes e.g. potential barrier diffusion region below deep contact diffusion to suppress software errors produced by radiation (see also appropriate U11-C02 codes and U14-A11), inhibiting dopant diffusion in semiconductor (e.g. silicon) by using preamorphising agent (e.g. germanium) to create shallow junction with lateral containment (see also U11-C02 codes).	
U11-C03J8	[1992]
Heat/radiation treatment of non-silicon semiconductor material	

U11-C03J8A	[1992]
Heat/radiation treating AIII-BV compounds Includes complex ternary and quaternary compounds. <i>Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride</i>	
U11-C03J8B	[1992]
Heat/radiation treating AII-BVI compounds Includes complex ternary and quaternary compounds. <i>Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury sulphide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide</i>	
U11-C03J8C	[1992]
Heat/radiation treating AIV elements and their compounds <i>Diamond, silicon carbide</i>	
U11-C03J8X	[1992]
Heat/radiation treating of other semiconductor materials	
U11-C04	
Lithography (photo-, beam-, etc.), masks, techniques, exposure and alignment The following codes are no longer applied but remain valid for records prior to 199201: U11-C04A2, U11-C04A3, U11-C04A4, U11-C04A5, U11-C04C1.	
U11-C04A	[1983]
Resist processing, mask manufacture and inspection, and exposure control in microlithography (G03F-007)	
U11-C04A1	[1987]
Cleaning, rinsing, spin coating, developing, inspection for microlithography From 1992 all cleaning processes not related to microlithography are covered by U11-C06A1B.	
U11-C04A1A	[1992]
Wafer preparation for resist coating Includes cleaning, rinsing, drying, baking, priming or silylating.	
U11-C04A1B	[1992]
Wafer coating with resist for microlithography Includes forming 'charge-up' preventing layer on top of resist. <i>Spin coating</i>	

U11-C04A1C	[1992]
Developing, resist stripping (wet process) for microlithography	
For developer materials see U11-A11.	
U11-C04A1D	[1992]
Plasma oxidising or ashing for microlithography	
Includes resist selective removal by e.g. laser, ion beam. For apparatus, see U11-C09C.	
U11-C04A1E	[1992]
Testing, measurement and inspection of mask for microlithography	
For inspection of lithographic layers see also U11-F01B code. For all other measurement, testing or inspection for microlithography see also U11-F01 and S02/S03 codes as appropriate.	
U11-C04A1F	[2005]
Resist processing	
Includes all post wafer coating processes to prepare resist on wafer for lithographic exposure. <i>Hard bake, soft bake, surface treatment, hydrophilization, solvent evaporation</i>	
U11-C04A1H	[1997]
Anti-reflective layers for microlithography	
See also U11-C04E1.	
U11-C04A2*	[1987-1991]
Optical masks	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U11-C04E2. <i>Shielding layer</i>	
U11-C04A3*	[1987-1991]
X-ray masks	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U11-C04H2.	
U11-C04A4*	[1987-1991]
Other masks	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. Includes masks e.g. for sputter apparatus. From 1992 see U11-C04F2, U11-C04G2.	

U11-C04A5*	[1987-1991]
Electron/particle beam apparatus	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U11-C04F1 for electron beam apparatus, and U11-C04G1 for ion beam apparatus.	
U11-C04A6	[1987]
Control of exposure apparatus	
From 1992 this code is used in conjunction with U11-C04E1 for control of optical exposure light source (e.g. laser, lamp), or with U11-C04F1 for control of electron beam apparatus, or with U11-C04G1 for control of ion beam apparatus, or with U11-C04H1 for control of X-ray apparatus.	
U11-C04A7	[2005]
Other lithographic aspects for microlithography	
Includes e.g. biological process. For Micro- and Nano imprint lithography from 2005 see U11-C04J codes.	
U11-C04B	[1983]
Alignment	
U11-C04B1	[1987]
Producing alignment marks on substrate, mask and mark details	
U11-C04B2	[1987]
Mark detection and position control signal generation in microlithography	
See also S02-A03 codes for optical systems, in particular S02-A10D2 for checking of alignment. <i>Optical recognition, through-the-lens, TTL</i>	
U11-C04B3	[1987]
Alignment for beam equipment in microlithography	
(H01L-021/027, G03F-007/20)	
U11-C04C	[1983]
Exposure for microlithography	
U11-C04C1*	[1987-1991]
Exposure source details	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U11-C04 (-E1,-F1,-G1,-H1) codes, as appropriate for type of exposure source used in lithographic process.	

U11-C04C2 [1987]

Focussing control for exposure apparatus

This code is used in conjunction with other U11-C04 (-E1,-F1,-G1,-H1) codes, depending on type of exposure source used, e.g. lens focussing in laser microlithographic system is coded in U11-C04C2 and U11-C04E1.

Optical system adjustment, lens positioning

U11-C04C3 [1987]

Vertical alignment and tilt control for exposure apparatus

Through-the-lens, TTL

U11-C04C4 [2002]

Reticle and stage drive mechanisms

This code is used in conjunction with other U11-C04 (-E1,-F1,-G1,-H1) codes, depending on type of exposure source used.

Step-and-repeat, wafer stepper scan.

U11-C04C5 [2005]

Vibration control and compensation for microlithography

Includes e.g. reaction frames, balance mass, and mounts.

U11-C04D [1987]

Masking techniques for microlithography

Relates to lithographic structures on semiconductor or active layer. Until 200701 includes e.g. lift-off, sequences of masking and etching techniques to produce patterned structures on integrated circuit, and masking techniques used in non-microlithographic steps of semiconductor manufacture. From 200701 see U11-C06C for all non-microlithographic masking, along with other relevant codes, e.g. U11-C05D3 for masking techniques applied to interconnection manufacture, U11-C07D1 for masks used in etching fine details, U11-C18D and U14-K01A1C for masks used in optical filter manufacture. for LCD, etc.

Pattern transfer, Dissolving mask

U11-C04D1 [1987]

Conformal masks, lift-off techniques for microlithography

U11-C04D2 [1987]

Non-mask fine line width production for microlithography

Includes e.g. use of holograms, diffraction grating, phase segregation of metals.

Two beam interference exposure

U11-C04E [1992]

Photolithography for semiconductor manufacture

U11-C04E1 [1992]

Apparatus and method for photolithography

(U11-C04C, U11-C04C1)

Includes exposure using optical and non-ionising ultraviolet radiation (for exposure using ionising ultraviolet radiation e.g. EUV see U11-C04H codes). For control and focusing aspects see also U11-C04A6 and U11-C04C2 respectively. Includes e.g. exposing peripheral portion of wafer.

Laser, UV, lamp, stepper, light source, projection, dummy wafer

U11-C04E1A [2005]

Optical elements and systems for photolithography

Includes individual lenses and mirrors as well as multiple lens/mirror systems, and other non-electrical optical elements for beam focus.

U11-C04E2 [1992]

Optical masks for photolithography

(U11-C04C2)

Includes mask repair, pellicle protection, case holders for masks (see also U11-F02), mask inspection.

Phase shifting, photomask, reticle

U11-C04F [1992]

Electron beam lithography for semiconductor manufacture

U11-C04F1 [1992]

Apparatus and method for electron beam lithography

(U11-C05A5, U11-C04C, U11-C04A6)

For control and focusing aspects see also U11-C04A6 and U11-C04C2 respectively. Includes methods of avoiding 'charge up' of resist. See V05-F codes for novel details of apparatus and methods of apparatus monitoring, operation and control.

Beam modulation, electrodes

U11-C04F2 [1992]

Masks for electron beam lithography

(U11-C04A4)

Also see V05-F codes for novel electron beam lithography masks.

Stencil mask

U11-C04G [1992]

Ion beam lithography for semiconductor manufacture

U11-C04G1	[1992]
Apparatus and method for ion beam lithography	
For control and focusing aspects see also U11-C04A6 and U11-C04C2 respectively. See V05-F codes for novel details of apparatus and methods of apparatus monitoring, operation and control.	
U11-C04G2	[1992]
Masks for ion beam lithography	
(U11-C04A4)	
Also see V05-F codes for novel ion beam lithography masks.	
<i>Stencil mask</i>	
U11-C04H	[1992]
X-ray lithography for semiconductor manufacture	
<i>Roentgen</i>	
U11-C04H1	[1992]
Apparatus and method for X-ray lithography	
(U11-C04C, U11-C04C1)	
Includes exposure using X-ray, soft X-ray and ionising ultraviolet radiation (for exposure using non-ionising ultraviolet radiation e.g. DUV see U11-C04E codes). For control and confinement aspects see also U11-C04A6 and U11-C04C2 respectively. See V05-E and V05-F codes for novel details of apparatus and methods of monitoring, operation and control.	
<i>Extreme ultraviolet, EUV</i>	
U11-C04H2	[1992]
X-ray masks	
(U11-C04A3)	
Also see V05-E08 codes and V05-F codes for novel X-ray, soft X-ray and EUV lithography masks.	
U11-C04J	[2005]
Imprint lithography for semiconductor manufacture	
Includes use of stamps and presses to form pattern.	
<i>Soft lithography</i>	
U11-C04J1	[2005]
Stamp design and manufacture	
U11-C04J2	[2005]
Process methods and control	

U11-C04K	[2005]
Immersion Lithography	
Includes all apparatus and methods for exposure through a liquid. See other U11-C04 codes for type of exposure source used. For immersion fluid composition see U11-A16.	
U11-C04K1	[2007]
Fluid management apparatus	
Includes all apparatus associated with handling, processing and delivering fluids for immersion lithography.	
U11-C04K2	[2007]
Fluid management methods	
Includes all methods and processes for fluid manipulation, including measurement and monitoring aspects (see also appropriate S02 and S03 codes)	
U11-C05	
Layer formation	
Includes insulating, passivating and conductive layers.	
U11-C05A	
Organic insulating layer formation	
Prior to 1992 this code included new materials as well as methods and structures related to organic insulating layer. From 1992 see U11-A08A1 for new materials. See also other relevant codes, e.g. U11-C05B9 when organic layer is used for planarising interconnection structures, U14-H03A1 or U14-H03A4B4 when used for packaging mountings or multichip interconnect.	
U11-C05A1	[1987]
Combined with organic materials	
U11-C05B	
Inorganic insulating layer deposition	
U11-C05B1 to U11-C05B4 are used where apparatus and associated techniques are emphasised (see also U11-C09 codes for apparatus details); U11-C05B5 to U11-C05B8 are used for type of deposited material and substrate; e.g. CVD of a silicon dioxide layer on gallium arsenide substrate is coded in U11-C05B2, U11-C05B7 and U11-C05B8. For novel materials see U11-A08A2.	
U11-C05B1	[1983]
Chemical reaction of semiconductor substrate for insulating layer formation	
E.g. oxide, nitride.	
<i>Oxidation, thermal oxidation, anodic oxidation, nitridation</i>	

U11-C05B2 [1987]

Insulating layer deposition using physical/chemical vapour apparatus

For apparatus details see also U11-C09 codes.

U11-C05B3 [1987]

Localised deposition of insulating layer

Includes e.g. deposition using beam induced CVD or masks.

U11-C05B4 [1987]

Modifying materials deposited on substrate (metallic oxides)

Includes e.g. oxidation of metallic layer (e.g. forming alumina film by oxidation of aluminium layer).

U11-C05B5 [1987]

Deposited inorganic nitrogen containing insulating layers

Includes all nitrides of silicon and silicon oxide using methods in U11-C05B1, U11-C05B2 or U11-C05B3. Silicate glasses and silicon oxides without nitride content are covered by U11-C05B7.

U11-C05B6 [1987]

Chemically altered deposited layers

Alumina layer, metal nitrides, metal oxides, hafnium oxide

U11-C05B7 [1987]

Chemically altered semiconductor material and other nitrogen free dielectric layers

Includes all silicate glasses and silicon oxides without nitride content. Includes also fluoride type dielectric layers. It also covers deposition of ferroelectric film e.g. for capacitor dielectrics.

Phospho-silicate glass, PSG, BPSG, spin on glass, SOG, calcium fluoride, barium strontium fluoride, calcium strontium fluoride, silicon dioxide

U11-C05B8 [1987]

Non-silicon semiconductor substrate for insulating layer deposition

U11-C05B8A [1992]

AIII-BV compound substrate for insulating layer deposition

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride

U11-C05B8B [1992]

AII-BVI compound substrate for insulating layer deposition

Includes complex ternary and quaternary compounds.

Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-C05B8C [1992]

AIV element/compound substrate for insulating layer deposition

Silicon carbide, diamond

U11-C05B8X [1992]

Other non-silicon substrate for insulating layer deposition

U11-C05B9 [1987]

Characterised by sequence of steps to produce insulating layer structure, shape

Includes e.g. dielectric layer applied over interconnection structure (see also U11-C05D1), planarisation layers, passivation films, patterning, etching dielectric layers with metallic interconnection aspects (see also other relevant codes e.g. U11-C05D1, U11-C05D3). Also covers layers to prevent soft errors (inside device, rather than package adaptations). Includes post-treatment of insulating layers.

U11-C05B9A [1997]

Planarisation/protection

(U11-C05B9)

Includes e.g. dielectric layer applied over interconnect structure (see also U11-C05D01), planarisation layers, patterning etching dielectric layers with metallic interconnect aspects (see other relevant codes e.g. U11-C05D1, U11-C05D3). Also covers passivation films, films for moisture protection, etching stop layers and films for radiation protection.

Smoothing, field oxide

U11-C05B9B [1997]

Insulating side wall formation

(U11-C05B9)

Includes forming side wall spacers.

U11-C05B9C [1997]

Buried insulating film formation

(U11-C05B9, U11-C08A1)

Buried layer

U11-C05C

Electrode and interconnection layer formation

Includes methods of deposition of conductive layers. For apparatus details see U11-C09 codes. From 1997, U11-C05C codes cover specific deposition methods for superconductive films (see also U14-F02A). Prior to 1997 for superconductive film deposition see U11-C01 codes.

Silicide, polysilicon, metallisation

U11-C05C1* [1983-1986]

Interconnections

*This code is now discontinued, but remains searchable and valid for records from 1983 to 1986. See U11-C05D from 1987.

U11-C05C2 [1987]

Physical deposition of conductive layer

E.g. sputter, thermal evaporation, electron beam evaporation, etc. For apparatus see U11-C09A.

Magnetron sputter deposition, refractory metal silicide

U11-C05C3 [1987]

Reactive chemical deposition of conductive layer

For apparatus, see U11-C09B.

CVD

U11-C05C4* [1983-1986]

Electrodes

*This code is now discontinued, but remains searchable and valid for records from 1983 to 1986. See U11-C05E from 1987.

Silicide

U11-C05C5 [1987]

Localised deposition of conductive layers, selective deposition

Covers beam induced deposition or use of masks.

Anisotropic directional deposition

U11-C05C6 [1987]

Other methods of forming conductive layer

Includes electroplating, transformation of deposited layer, (e.g. semiconductor into conductor, or insulator into superconductor), deposition by solution process (electroless by chemical reaction) etc. For doping aspects related to permanent or temporary change of conductivity, e.g. reduction of contact resistance, see also U11-C02J3.

U11-C05C7 [1987]

Chemical, metallurgical details of conductive layers, using CVD, sputter deposition

Includes pre or after-treatment of deposited layer or substrate on which conductive layer is deposited.

U11-C05C9 [1983]

Other aspects of conductive layer formation

From 198701 for formation of resistive layers and bumps see U11-C05G.

U11-C05D [1987]

Interconnections

(U11-C05C1)

U11-C05D1 [1987]

Nature of material

Mainly used for multilayer wiring insulating layers, e.g. for smoothing surface topography. Covers use of dielectric layers in multilayer interconnects both in integrated circuit chips and in multichip modules. Includes interlayer insulating film for mutually insulating wires (including electrodes) arranged on same plane or upper and lower wires. Includes shaping of insulator around deposited interconnection (see also U11-C05B9).

U11-C05D2 [1987]

Multilayer metallisation manufacturing techniques

Includes sequence of steps to result in multilayer structure i.e. deposition, shaping in which the techniques may be routine, but succession of steps or final structure is novel. Covers metallic layer deposited simultaneously over two differing apertures on two different levels. Includes Damascene processes.

U11-C05D3 [1987]

Lateral/vertical interconnection manufacture

Includes lithographical aspects, etching, deposition for shaping conductor, through holes to accommodate contacts to devices and contacts between levels. For opening, etching vias, windows into dielectric over region to be contacted see also U11-C07D2. Also covers filling of contact holes with conductive material or forming conductive plugs in windows. For 'back-side metallisation', vias, substrate through holes see also other relevant codes, e.g. U11-C05G2, U11-D03B3, U11-D03C3. For metallurgical aspects, e.g. electromigration, diffusion barriers, low resistance interconnection, see also U11-D03B2. Includes dual-damascene processes.

Buried interconnections, windows, contacts, step coverage, runners

U11-C05D4 [1987]

Interconnections to semiconductor device electrodes

Includes metallisation that facilitates electric current conduction to and from semiconductor device (see also U11-C05E, U11-C05F codes). For metallurgy related to e.g. electromigration, low resistance interconnections, see also U11-D03B2.

U11-C05E [1987]

Electrode manufacture

(U11-C05C4)

Includes metallic, dielectric and doped semiconductor regions that form electrode with or without electrical connection thereto. For contacts to electrodes see also U11-C05D4, for metallurgical aspects see also U11-D03B2. For electrode bump see U11-C05G2B and/or U11-D03B1. If electrode structure is novel see also U12-E02.

U11-C05E1 [1987]

Ohmic, Schottky etc. electrode manufacture

For contacts to semiconductor device electrodes see also U11-C05D4, for metallurgical aspects see also U11-D03B2.

U11-C05E2 [1987]

Geometric structure miniaturisation for electrode manufacture

Includes e.g. submicron gate, T-shaped gate manufacture.

U11-C05E3 [1992]

Self-alignment for electrode manufacture

Used e.g. for self-aligned silicon gate manufacture (see also U11-C05F1), self-aligned emitter-base contacts in bipolar transistor (see also U11-C05F2).

U11-C05F [1987]

Electrode manufacture for specific device, semiconductor substrate

U11-C05F1 [1987]

Electrode manufacture for FET

U11-C05F1A [2005]

Gate insulation layer manufacture

Includes forming insulated gate structures for all MOS gated devices.

U11-C05F2 [1987]

Electrode manufacture for bipolar device

Includes electrode manufacture for diodes, bipolar transistors.

U11-C05F2A [1992]

Electrode manufacture for bipolar device with polysilicon emitter

U11-C05F3 [1987]

Electrode manufacture for non-silicon semiconductor

U11-C05F3A [1992]

Electrode manufacture for AIII-BV substrate

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride

U11-C05F3B [1992]

Electrode manufacture for AIV substrate

Diamond, germanium, silicon carbide

U11-C05F3D [1992]

Electrode manufacture for AII-BVI substrate

Includes complex ternary and quaternary compounds.

Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-C05F3X [1992]

Electrode manufacture on other semiconductor substrate

U11-C05F4 [1987]

Electrode manufacture for heterojunction

Heterojunction gate

U11-C05F5 [1987]

Electrode manufacture for thin film transistor

U11-C05F6 [1987]

Electrode manufacture for other devices e.g. SAW, CCD, semiconductor lasers, photovoltaic, superconducting devices

This code is used in conjunction with other relevant codes to identify type of device, e.g. U14-G for SAW, U13-A02 for CCD, U14-F for superconducting devices, etc. It also includes electrode manufacture for resistors (see also U11-C05G1A), capacitors (see also U11-C05G1B).

U11-C05G [1987]

Passive component manufacture

Includes formation of resistive layers, contact bumps, fuses.

U11-C05G1

RLC component manufacture

U11-C05G1A [1992]

Resistor manufacture

For details regarding resistor structure see also U12-C03.

U11-C05G1B	[1992]
Capacitor manufacture	
For details regarding capacitor structure see also U12-C02 codes.	
U11-C05G1C	[1992]
Inductor manufacture	
For details regarding inductor structure see also U12-C03.	
U11-C05G2	[1987]
Fuses, contact bumps and pads, vias manufacture for semiconductor device	
U11-C05G2A	[1992]
Fuses manufacture	
Includes antifuse manufacture. See also U12-C04 for fuse structure after 2002. Prior to 2002 see U11-D03B2A.	
U11-C05G2B	[1992]
Contact bumps, bonding pads manufacture	
See also U11-D03B1 for metallurgical details.	
U11-C05G2C	[1992]
Vias, pillars, studs manufacture	
See also U11-C05D3, U11-D03C3, U11-D03B9. Includes e.g. back side metallisation (see also U11-D03B9) and metallised vias through ceramic substrate for HF circuits. <i>'plated through holes', plug</i>	
U11-C05X	[1992]
Other aspects of layer formation	
U11-C06	
Mechanical treatment, surface chemical treatment of semiconductor substrate and beam lead manufacturing techniques	
U11-C06A	[1987]
Mechanical and surface chemical treatment	
U11-C06A1	[1992]
Cleaning, polishing or grinding	
(U11-C04A1)	
Prior to 1992 all cleaning processes are covered by U11-C04A1. From 1992 for cleaning processes relating to microlithography see U11-C04A1A. For cleaning leads after package encapsulation see U11-E02B. For materials involved e.g. polishers, abrasives, etc. see also U11-A10.	
U11-C06A1A	[1992]
Grinding, bevelling, lapping, polishing	

U11-C06A1B	[1992]
Cleaning	
(U11-C04A1)	
Includes drying of wafer after cleaning process. Includes dry cleaning e.g. electrostatic. It also covers native oxide removal, but not etching of previously deposited insulating layer. Includes cleaning apparatus but excludes cleaning of processing apparatus or package.	
U11-C06A1C	[2002]
Process endpoint detection for cleaning, polishing or grinding	
U11-C06A2	[1992]
Cutting, dicing	
Includes wafer production by crystal slicing or sawing, also dice preparation from wafer by scribing, making grooves, cracking, cleaving, breaking or cutting. For 'sticky-back' adhesive tape which holds wafer in place while cutting it into separate dice see also U11-F02A2. <i>Grind, groove, slice, divide</i>	
U11-C06B	[1987]
Beam lead device manufacturing techniques	
See also U11-C08A5 when beam lead technique is used as isolation method between circuit elements. See also U11-C05D4 or/and U11-D03A1 codes when metallisation process is emphasised as main part of lead beam technique. Also includes manufacture of other structures on wafer usually assembled after dicing, e.g. lenses and encapsulant structures.	
U11-C06C	[2007]
Masking techniques unrelated to microlithography	
Masks and masking techniques for general etching, deposition or treatment, for semiconductor manufacture. Before 2007 see U11-C04D for all masking, along with other relevant codes, e.g. U11-C05D3 for masking techniques applied to interconnection manufacture, U11-C07D1 for masks used in etching fine details, U11-C18D and U14-K01A1C for masks used in optical filter manufacture for LCD, etc.	
U11-C07	
Etching; Chemical treatment for semiconductor manufacture	
Includes processes, e.g. dry, wet, beam etching to produce patterned structures. Also covers nature of material being etched and techniques to obtain intended etched structure.	

U11-C07A [1983]

Dry etching

For microlithography, e.g. plasma ashing, see U11-C04A1D.

U11-C07A1 [1987]

Reactive vapour, plasma-assisted etching techniques

Includes reactive ion etching, sputter etching and ion milling, plasma etching, reactive ion beam etching. For apparatus, see also U11-C09C. For etchant composition see also U11-A10.

U11-C07A2 [1987]

Using optical or particle beam to induce localised etching in ambient atmosphere of reactive gas

Includes e.g. selective laser induced etching (e.g. for metal-interconnection etching, where laser beam cracks oxide formed on metal surface prior to reactive etching).

U11-C07A3 [1987]

Detecting dry etching completion

Includes instrumentation and control. See also appropriate S02-A codes.

Monitor, endpoint

U11-C07A4 [1987]

Laser or beam scribing, usually using air/inert atmosphere

Used also for fuse cutting or melting by laser (see also U11-D03B2), circuit trimming or repair (see also U11-C19A). For apparatus see also V05-F05A1.

Pattern, surface, trim, laser zapping

U11-C07B [1987]

Other wet-etching

Includes apparatus used for wet etching. For etchant composition see also U11-A10. For wet etching intended as cleaning process see also U11-C06A1B. For microlithography see also U11-C04A1 codes.

Solution, tank, water, fluid, acid, spray etching, aerosol jet, electrolytic etching

U11-C07B1 [1987]

Detecting wet etching completion

Includes instrumentation and control. See also S02-A codes.

Monitor, endpoint

U11-C07C [1987]

Nature of materials being etched

U11-C07C1 [1987]

Etching silicon

For polysilicon used as conductive layer, or in gate manufacture see also U11-C07C2.

U11-C07C2 [1987]

Etching conducting layers

U11-C07C3 [1987]

Etching insulating layers

U11-C07C4 [1987]

Etching non-silicon semiconductor

U11-C07C4A [1992]

Etching AIII-BV compounds

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride

U11-C07C4B [1992]

Etching AII-BVI compounds

Includes complex ternary and quaternary compounds.

Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide

U11-C07C4C [1992]

Etching AIV elements and their compounds

Excludes elemental silicon.

Silicon carbide, diamond

U11-C07C4X [1992]

Etching other semiconductor material

U11-C07C5 [1987]

Etching thin film

Layer

U11-C07D [1987]

Etching techniques

Includes techniques for specific objectives.

U11-C07D1 [1987]

Etching to produce finer details

Includes use of sequence of etch and mask stages. For lift off see also U11-C04D1.

U11-C07D2 [1987]

Etching to produce taper or structural profiles of deposited layers on substrate

U11-C07D3	[1987]
Planarisation by etching	
Includes e.g. etching followed by smoothing layer (which may be also covered by U11-C05B9A).	
<i>Smoothing layer</i>	
U11-C07D4	[1992]
Etching to produce trenches, grooves in semiconductor substrate	
(U11-C07D9)	
U11-C07D9	[1987]
Other etching aspects	
U11-C08	
Isolating IC components	
U11-C08A	[1987]
Methods for isolating IC components	
U11-C08A1	[1987]
P-N junction for isolating IC components	
From 1997 buried insulating layer is coded in U11-C05B9C.	
<i>Diode isolation, buried layer</i>	
U11-C08A2	[1987]
LOCOS or local substrate chemical reaction for isolating IC components	
<i>Bird's beak, sidewall masked isolation, SWAMI, sealed interface local oxidation, SILO, selective polysilicon oxidation, SEPOX</i>	
U11-C08A3	[1987]
Dielectric, polycrystalline silicon trench for isolating IC components	
Includes trench refilling with dielectric or e.g. polysilicon. If used as sidewall isolation e.g. for SOI structures, P-N junction structures, see also U11-C05B9B, U11-C08A6 and U11-C08A1 codes as appropriate.	
<i>Buried oxide, BOX</i>	
U11-C08A4	[1987]
Dielectric isolation process (sacrificial substrate) for isolating IC components	
<i>Dielectric islands, epitaxial passivated IC, EPIC</i>	
U11-C08A5	[1987]
Other methods for isolating IC components	
Includes proton bombardment, combination of above methods. Includes air gaps for isolation.	

U11-C08A6	[1992]
Semiconductor on insulator	
(U11-C08A5, U13-D)	
Includes bonded wafers (see also U11-C01 and U11-C01J8A), full isolation by porous oxidised silicon (FIPOS), zone melted recrystallisation (ZMR), separation by silicon implanted buried oxide layer (SIMOX). See also U11-C08C for recrystallisation over insulating layers, selective epitaxial growth.	
<i>SEG, epitaxial lateral overgrowth, ELO, SOI, silicon on sapphire, SOS</i>	
U11-C08B	[1987]
IC component isolation characterised by non-silicon semiconductor substrate	
U11-C08B1	[1992]
Isolating IC components on AIII-BV substrate	
Includes complex ternary and quaternary compounds.	
<i>Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium nitride, cubic boron nitride</i>	
U11-C08B2	[1992]
Isolating IC components on AII-BVI substrate	
Includes complex ternary and quaternary compounds.	
<i>Mercury sulphide, cadmium mercury telluride, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium sulphide</i>	
U11-C08B3	[1992]
Isolating IC components on AIV element/compound substrate	
<i>Silicon carbide, diamond</i>	
U11-C08B9	[1992]
Isolating IC component on other substrate material	
U11-C08C	[1987]
Isolating IC component combined with subsequent further semiconductor material deposition	
Includes recrystallisation of semiconductor over insulating layers (see also U11-C03J1), 3-D structures (see also U13-D05), selective epitaxial growth/epitaxial lateral overgrowth.	
<i>SEG, ELO</i>	

U11-C09 [1983]

Sputtering, vapour deposition, plasma etc. apparatus for semiconductor processing

From 1997 vacuum apparatus for semiconductor processing is covered by U11-C09Q. For electrical details see also X25-A04 codes. For generic deposition process masks use appropriate U11-C09 code with U11-C06C, and for specific material deposition use U11-C06C with other U11-C codes.

Chamber, vessel, gas, vacuum, holder, wafer boat

U11-C09A [1987]

Sputtering and other physical deposition apparatus

Includes targets, power supply and control. Also covers apparatus for thermal evaporation. See also V05-F05C codes.

Chamber, vessel, gas, vacuum, holder

U11-C09B [1987]

Chemical vapour deposition apparatus

For Plasma enhanced CVD apparatus, electron cyclotron resonance CVD apparatus see also U11-C09C. Also cover vapour phase epitaxy (VPE) apparatus.

CVD, PECVD, ECRCVD, vertical reactor

U11-C09B1 [2002]

Gas delivery head details for chemical vapour deposition

Showerhead, gas flow

U11-C09C [1987]

Plasma, reactive ion apparatus

Includes dry etching apparatus (see also U11-C07A1), and apparatus for plasma activated CVD (see also U11-C09B). See also V05-F05C codes.

Microwave, source, generator, PECVD, ECRCVD

U11-C09D [1992]

Molecular beam epitaxy apparatus

(U11-C09X, U11-C01A2)

Includes molecular beam and ion beam apparatus.

U11-C09E [2002]

Sintering/curing furnaces

Details of furnaces used for ceramic sintering, photoresist/other layer baking/drying, or encapsulant curing. For all other heating methods and equipment for semiconductor manufacture see U11-C03A.

U11-C09F [1987]

Cleaning and maintenance of apparatus

Refers mainly to apparatus covered by U11-C09 codes.

Surface-trap, particle

U11-C09F1 [2006]

Testing of manufacture apparatus

See also U11-C09 codes for type of apparatus being tested.

Fault diagnosis

U11-C09G [2010]

Laser Treatment apparatus

Includes all laser treatment apparatus used for manufacturing semiconductor devices. If used for heating a semiconductor substrate or wafer then also see U11-C03D.

U11-C09M [1997]

Multi-chamber apparatus for semiconductor processing

(U11-C09)

Includes self-contained apparatus with several rooms for various processes e.g. cleaning, deposition, etching.

U11-C09Q [1997]

Vacuum equipment and pumps for semiconductor processing

(U11-C09)

Prior to 1997, for vacuum equipment see U11-C09.

General pumps, vacuum, holder

U11-C09X [1987]

Other apparatus for semiconductor processing

U11-C10 [2005]

Prevention of charge build-up on wafer

Includes methods and apparatus for removing charge build-up on wafer which can cause incorrect operation of apparatus or damage to wafer during e.g. plasma process, charged particle beam lithography and charged particle beam microscopy. See also U11-F01B1 and S01 codes for monitoring of wafer charging.

Plasma damage

U11-C11	[2005]
Pattern formation using scanning tunnelling microscope	
Includes e.g. patterning, localised deposition and oxidation using scanning probe microscopes and other analogous microscopy techniques. Use in conjunction with other U11-C codes where applicable to particular process (e.g. U11-C11 and U11-C05C5 for localised deposition of conductive layer using SPM). Does not include microscopy per se, see S03-E02F codes and U11-F01B4 for application to semiconductor wafer measurement. See V05-F codes for novel apparatus and methods of apparatus monitoring, operation and control. <i>Scanning probe microscope, SPM, scanning tunnelling microscope, STM, atomic force microscope, AFM</i>	
U11-C12	[2006]
Self-assembly monolayers	
Includes self-assembled monolayer deposition of all material types for semiconductor manufacture. <i>SAM, viral deposition</i>	
U11-C13	[2007]
Nano scale structure formation and deposition	
U11-C15	[1987]
General aspects of semiconductor manufacture	
U11-C15A	[1992]
Wafer identification, shaping	
Includes wafer labelling and reading wafer markings. Covers also shaping, bevelling wafer edges (see also U11-C06A1A). For marking IC package see U11-E02B. For marking defective chips on wafer as result of testing procedure see U11-F01D. <i>Wafer tracking, optical character recognition, bar code</i>	
U11-C15B	[1992]
Semiconductor plant and facilities	
U11-C15B1	[1997]
Semiconductor equipment and clothing	
(U11-C15B)	
Includes systems for air conditioning, filtering, hazardous gas leak monitor. Covers protective clothing and anti-static materials used in clean room. <i>Air conditioning, filtering, environmental control, anti-static systems, gas supply, hazardous gas leak monitor</i>	
U11-C15B3	[1997]
Water purification	
(U11-C15B)	
<i>Water purification</i>	

U11-C15C	[1992]
Semiconductor manufacture process control	
For large scale process control, not for single processes. See also T01-J07B2 for computerised control systems. <i>Production management</i>	
U11-C15D	[2006]
Control and monitoring of single or specific process/apparatus only	
Includes automated fluid/gas control systems. See also U11-F01B and S02/S03 codes for film measurement. See U11-C04 codes or U11-C03A for control of lithography or temperature respectively. For process control of complete production facility and multiple processing stages see U11-C15C and T06 and T01 codes. <i>Feedback</i>	
U11-C15Q	[1997]
Waste reprocessing and disposal in semiconductor processing	
(U11-C15X)	
Includes exhausts and exhaust management systems. For vacuum pumps and systems associated with exhaust and gas removal see also U11-C09Q. Prior to 1997 see U11-C15X.	
U11-C15X	[1992]
Other semiconductor plant aspects	
U11-C18	[1987]
Multistep processes for semiconductor device manufacture	
U11-C18A	[1987]
Complete manufacture of transistor devices	
This code is used for a sequence of steps with claims encompassing several of the above sections. For phototransistor manufacture see U11-C18B4. For BiCMOS complete manufacture see U13-D03B2. For CMOS manufacture see U13-D02A.	
U11-C18A1	[1992]
Thin film transistor manufacture	
(U11-C18)	
For TFT manufacture for active matrix LCD see also U14-H01A and/or U14-K01A2B.	
U11-C18A2	[1992]
Bipolar transistor manufacture	
This code may be used in conjunction with U12-D01A codes to identify type of transistor.	

U11-C18A3 [1992]

Unipolar transistor manufacture

This code may be used in conjunction with U12-D02A to U12-D02X codes to identify type of transistor.

FET

U11-C18B [1987]

Multistep processes for manufacture of electronic devices other than transistors per se

Capacitor manufacture is covered by U11-C05G1B, resistor manufacture by U11-C01G1A, inductor manufacture by U11-C05G1C. For Hall-effect device, galvanomagnetic device manufacture, see U12-B01 codes.

U11-C18B1 [1992]

Complete manufacture of diode devices

Photodiode manufacture is covered by U11-C18B4.

U11-C18B2 [1992]

Complete manufacture of thyristor devices

U11-C18B3 [1992]

Complete manufacture of charge coupled devices

U11-C18B4 [1992]

Complete manufacture of optoelectronic devices

Includes manufacture of monolithic and thin film photosensitive device e.g. photodiode, phototransistor, light emitting diode, laser diode, integrated optics. Laser diode manufacture is also covered by U12-A01B2. For LED manufacture see also U12-A01A2.

OEIC

U11-C18B5 [1992]

Complete manufacture of memory

See also appropriate codes in U13-C, U13-D and/or U14.

U11-C18B9 [1992]

Complete manufacture of other devices

Includes manufacture of e.g. SAW devices (see also U14-G), field emitting structures (see also U12-B03D), superconductive devices (see also U14-F02B), photovoltaic devices (see also U12-A02).

U11-C18C [1987]

Mechanical structures e.g. membranes etc., transducers manufacture

See also U12-B03E or U12-B03F.

Pressure diaphragm, anisotropic, pressure

U11-C18D [1987]

Optical filter, lens array manufacture

Includes e.g. filters for CCD, transparent conductive layers for e.g. LCD, integrated optics. See also U14-H01E for thin-film spin-coated or dipped layers. Includes pixel/colour filters, lithography for general imager/display use.

U11-C19 [1992]

Trimming, circuit repair, safety circuits for semiconductor device

(U11-C20)

U11-C19A [1992]

Circuit repair and redundant circuitry for semiconductor device

Includes late stage tailoring, cutting fuses with laser, focused ion beam (see also U11-C07A4), or opening fusible links with high current. For circuit repair by localised deposition see also U11-C05C5. For trimming thin/thick film for hybrid circuit see U14-H04B3B. For repair of integrated circuits using redundant circuitry. For memory redundancy see U14-D01A.

Laser zapping

U11-C19B [1992]

Method of securing IC from unauthorised copying and use

Includes narrow circuit cuts in metallised connections lines, disordering lattice structure or changing the doping level of a semiconductor region, by using e.g. laser or ion beam. For package adaptations see U11-D01C4.

U11-C20

Other aspects of semiconductor manufacture

U11-D

Packages, mountings and terminals for semiconductor devices

Includes on-chip interconnection layout and metallurgical details.

U11-D01

Containers, enclosures and housing for semiconductor device

From 1997 sockets, connectors, holders for semiconductor devices are coded in U11-D01Q and V04-K02.

U11-D01A [1987]

Integrated circuit packages and mountings

Includes substrates, mountings, e.g. ceramic, glass, metallic, used in packaging. Multilayer circuit packages, e.g. high density interconnect, are covered by U14-H03A1, U14-H03A4, and also, where appropriate, U11-D03C3 and/or U11-D03B codes. See also U14-H03C for high grade ceramic substrate, e.g. aluminium nitride. Multilayer ceramic substrates are also covered by U14-H03B codes for materials/structure.

U11-D01A1 [1987]

Lead frame or brazed type ceramic/resin encapsulated/metallic packages

Includes packages for both through hole and surface mounted devices (see also U11-D01A3). Prior to 199201 brazed type packages are covered by U11-D01A9.

Case, dual in line package, DIP, single in line package, SIP, zigzag in line, ZIP, CERDIP, CERQUAD, pin insertion type, chip in tape, TAB, anodised aluminium, hollow package, LOC, lead on chip

U11-D01A3 [1987]

Leadless/Surface mounting for semiconductor packages

Includes leadless with via holes, but leadless arrays with stand-offs, e.g. pad grid arrays, are also covered by U11-D01A5. Prior to 199201 for chip carrier package see U11-D01A. For sockets for surface interconnect package to board see U11-D01 and V04-B01 or V04-K02. For flip-chip process and package see U11-E01C.

Surface mounted device, SMD, small outline integrated circuit, SOIC, flat pack, chip carrier, plastic leaded chip carrier, PLCC, gull-wing leads, TAB package, chip in tape, plastic quad flat pack, PQFP, ball grid array, BGA

U11-D01A3A [1997]

Chip on board packages

Includes direct attachment with protective polymer overcoat (see also U14-H03A3).

COB, glob top

U11-D01A4 [1992]

High frequency packages

(U11-D01A9)

Includes packages for high speed IC with large number of transmission and power lines. See also U14-H03C2 for microstrip/stripline circuitry and/or U11-D03B9 for metallurgical details. For terminals for high frequency devices see U11-D03A6.

Microwave, MMIC package

U11-D01A5 [1987]

High pin count packages

E.g. pin/pad grid arrays, and high ball count BGAs (see also U11-D01A3).

Pad grid array, PGA, BGA

U11-D01A6 [1992]

Multichip modules, high density packages

(U11-D03D, U14-H03C3)

For multichip PGA modules see also U11-D01A5. For high-density package mountings, e.g. high density interconnect, see U14-H03A1 and/or U14-H03A4, with manufacture covered by the appropriate subclasses in U11-C05D, U11-D03B, U11-D03C, U14-H04A. For hybrid circuit package see also U14-H03C3.

MCM

U11-D01A7 [1987]

Low profile card type packages for e.g. un-encapsulated IC

Includes package for 'smart' card (see also T04-K). See U14-H01D for thin film aspects.

U11-D01A8 [1987]

Wafer level packages

Includes chip packaging on wafer.

U11-D01A9 [1987]

Other types of packages

Includes e.g. transistor outline (plug type) package and bare chips (unpacked).

TO package

U11-D01B [1987]

Discrete device package structure

Aspects regarding terminals for low/high power devices are covered by U11-D03A4/U11-D03A5.

Seal

U11-D01B1 [1987]

Two terminal packages

For LED packages see U12-A01A4, for laser diode package see U12-A01B3, for solar cell see U12-A02A1, for photodiode package see U12-A02B3.

Diode

U11-D01B3 [1987]

Three or more terminal packages

Includes bridge rectifier. For phototransistor package see U12-A02B3.

Transistor, bipolar, FET

U11-D01C [1987]

Special package adaptations

Includes package getters.

U11-D01C1 [1987]

Window structures e.g. for image sensors, ROM's

Glass, pick-up, light, transparent, translucent, UV erasable memory

U11-D01C2 [1992]

Package protection against radiation

Includes protection against e.g. light, alpha radiation, etc.

U11-D01C3 [1992]

Package protection against electrostatic discharge

(U11-D03C1)

See X25-S for general applications for static electricity prevention.

U11-D01C4 [1992]

Package protection from inspection and reverse engineering

(U11-D01C9)

Includes e.g. security coatings and/or other adaptation to prevent unauthorised reproduction of the integrated circuit.

U11-D01C5 [1997]

Electromagnetic shielding for semiconductor packages

(U11-D01C9)

U11-D01C6 [1997]

Thermal protection for semiconductor packages

(U11-D01C9)

U11-D01C9 [1987]

Other special package adaptations

Includes e.g. special moisture barrier, protection against short-circuit. For fire retardant barriers. Hermetic seal structures (for sealing process see also U11-E02A2)

U11-D01Q [1997]

Sockets, connectors and holders

(U11-D01)

Previously coded in U11-D01. For conversion sockets. Sockets, connectors, holders for semiconductor devices are also coded in V04-K02. See also appropriate package code.

U11-D02

Cooling, heating and ventilating arrangements for semiconductor packages

See V04-T03 codes for cooling/heating of electronic equipment in general.

Fin, heat sink, block, radiate, coolant, liquid

U11-D02A [1987]

High power thyristor, transistor, rectifier cooling arrangements

U11-D02A1 [1987]

Stacks, installations cooling

U11-D02B [1987]

Medium power transistor modules and heat sinks

Includes materials that facilitate heat transfer.

U11-D02B1 [1987]

Internal cooling structures on chip or within package

Includes permanent, non-removable heat sinks.

U11-D02B2 [1987]

External heat sink mounted on package

Includes mainly detachable heat sinks.

U11-D02C [1987]

Cryogenic - for photodetector or superconductor electronics

Search with U14-F for superconductor aspects. See X25-V for electrical aspects of cryogenic system per se.

Cryostat

U11-D02D [1987]

Cooling for surface mounted chip assemblies, modules, chip on substrate

U11-D02D1 [1992]

Cooling arrangements with heat transfer by fluid means

U11-D02D2 [1992]

Cooling arrangements with Peltier element

U11-D02E [2007]

Heating arrangements for semiconductor package

Testing using X-rays

U11-D03

Lead-frames, terminals, interconnections, wiring layout

U11-D03A [1983]

Lead and terminal arrangements

U11-D03A1 [1987]

Lead frames; Carrier tapes (structure, manufacture)

U11-D03A1A [1992]

Lead frames

For transporting, handling lead frames see also U11-F02A. Materials, e.g. metallic alloys, are also covered by U11-A08B and U11-D03B. Includes manufacture, although if particular aspects of manufacture are emphasised, other relevant codes may be used, e.g. U11-C05C6 for electroplating.

U11-D03A1B [1992]

Carrier tapes

Includes leads in insulating substrates, e.g. tapes for TAB; multilayer metal beam tape e.g. for area array TAB. Also covers editing or cutting to remove defective pattern units from TAB tape and to rearrange remaining desired portions. For carrier tapes for transporting semiconductor device packages see U11-F02A4.

ATAB

U11-D03A2 [1987]

Connection details between lead frame and chip terminals

Includes wire and gang bonding (see also U11-E01A, U11-E01B respectively). For bonding pads, bump terminals, e.g. raised pad on bonding tape, see also U11-D03B1.

U11-D03A3 [1987]

Details of other types of terminals for IC packages

Includes aspects regarding shape of leads, pins. For forming leads after encapsulation see U11-E02B.

J leads, gull-wing leads

U11-D03A4 [1987]

Terminals for low/medium power diodes and transistors

U11-D03A5 [1987]

Terminals for higher power diodes/transistors/thyristors

U11-D03A6 [1987]

Terminals for high frequency devices

Microwave

U11-D03A9 [1987]

Other types of connection to chips

For solder preforms see also U14-H03A2 (hybrid circuits). See also V04-A06 for direct connections to PCBs using conductive adhesives, and V04-A11 for direct connection using anisotropic connectors.

U11-D03B [1983]

Metallurgical connections, materials, structure, details of interconnections on or within chip, bonding pads, wire bonds

U11-D03B1 [1987]

Terminals to chip, bonding pads, wire bonds, bonding wire, bump terminals

Includes flip chip pads (see also U11-E01C). For complete manufacture of contact bumps or bonding pads see U11-C05G2B.

Ball limiting metallurgy, BLM, top surface metallurgy, TSM

U11-D03B2 [1987]

Metallurgical aspects of interconnections within chip, packaging

Includes forming of diffusion barrier, e.g. titanium nitride, titanium tungsten, to prevent spiking, methods and structure to prevent electromigration, e.g. slits in bent wiring section etc. Also includes metallurgical aspects related to electrodes. Covers structure which ensures minimum resistance interconnections, also air-bridges, fuses (for fuse manufacture, see U11-C05G2A).

Electromigration, air bridges

U11-D03B2A* [1997-2001]

Fuses, antifuses

(U11-D03B2)

*This code is now discontinued, but remains searchable and valid for records from 1997 to 2001. See U12-C04 from 200201. For manufacture of fuse see U11-C05G2A.

U11-D03B3 [1987]

Metallurgy, solder, conductive adhesive connecting chip base to substrate or lead-frame

Includes forming conductor patterns on ceramic, glass based packaging, joints or bonds in multilayer packages between metallised components such as pins, leads or heat sinks and ceramic substrates. Covers joining metal-ceramics when, e.g. attaching lids to ceramic package (see also U11-E02A2). Also includes adhesives for die bonding (see also U11-E02A3).

Plated heat sink, eutectic alloying, self-soldering, solder reflow, solder mask

U11-D03B9 [1987]

Other metallurgical aspects

Includes high frequency monolithic signal transmission lines (see also U14-H03C2 and, where appropriate, U11-D03C1, U11-D03C3), wafer scale and thin film circuit multilayer interconnection. Also covers back-side metallisation for MMIC.

Microstrip

U11-D03C [1987]

Integrated circuit wiring details

Includes layout, logic, signal transfer and multichip interconnection details. See also corresponding U13 and U14 codes where appropriate.

Cell

U11-D03C1 [1987]

Power supply, grounding details, wiring layout

Includes analogue wiring, capacitors or other passive components, protection fuses fixed inside package, I/O pad layout, wiring reconfiguration, wafer test pad wiring layout e.g. for built-in testing (see also U11-F01D2). For design aspects regarding wiring layout see U11-G.

U11-D03C1A [1997]

Wiring layout, power supply

(U11-D03C1)

Includes analogue wiring, I/O pad layout, wiring reconfiguration, wafer test pad wiring layout e.g. for built-in testing (see also U11-F01D2). For design aspects regarding wiring layout see U11-G.

U11-D03C1B [1997]

Passive elements within package

(U11-D03C1)

Includes by-pass capacitors or other passive components, protection fuses fixed inside package.

Decoupling capacitor

U11-D03C2 [1987]

High density digital wiring

Includes wiring for gate arrays (see also U13-C04D).

Master-slice

U11-D03C3 [1987]

Power/signal transfer

Includes e.g. opto-electronic, inductive, capacitive, feed-through arrangements for high speed devices. For multichip high-density interconnect see also U14-H03A1 and/or U14-H03A4.

U11-D03C3A [1997]

Noise reduction

For noise reduction interconnections, and removal of cross talk, coupling/decoupling capacitance.

Cross talk, Parasitic capacitance

U11-D03C3B [1997]

3-D interconnection, chip on chip

Includes e.g. opto-electronic, inductive, and capacitive feed through arrangements for high speed devices. For multi-chip high density interconnect see also U14-and/or U14-H03A4. Also includes interconnects for spherical ICs.

U11-D03D [1987]

Other metallurgical aspects of lead frames

U11-E

Assembly for semiconductor package

U11-E01

Attaching leads to semiconductor package

U11-E01A [1983]

Wire bonding for semiconductor package

For wire material see also U11-A08B and U11-D03B1.

Includes e.g. thermosonic and thermocompression bonding.

Capillary

U11-E01B [1987]

Tape automated bonding for semiconductor package

Includes inner and/or outer lead bonding by, e.g. thermosonics, thermocompression, laser bonding. Also covers beam lead bonding. For carrier tape structure and manufacture, see U11-D03A1B.

TAB, Bread-board, ILB, OLB, gang bonding

U11-E01C [1992]

Flip chip technology for semiconductor package

Contact bump manufacture is covered by U11-C05G2B.

For metallurgical aspects relating to bumps, e.g. ball limiting and/or top surface metallurgy, see also U11-D03B1.

Controlled collapse bonding, CCB, controlled collapse chip connection, C4, face down

U11-E01X [1987]

Other methods for attaching leads to package

Covers e.g. cleaning aspects related to lead attaching, fitting PGA pins, etc.

U11-E02

Mounting; Encapsulating; Filling

U11-E02A [1987]

Encapsulation

For non resin or metallic encapsulation.

Seal, glass, glaze

U11-E02A1 [1987]

Resin encapsulation

Includes mould design, manufacture, materials. Also covers coatings to protect stress sensitive areas, e.g. wires or die during encapsulation. If mentioned covers are meant to improve radiation immunity, see also U11-D01C2. For encapsulant materials see U11-A07.

Transfer moulding

U11-E02A2 [1987]

Package assembly. Attaching covers, joining dissimilar materials

Includes CERDIP technology to ensure hermetic seal ceramic packages. For joining metal-ceramic interfaces see also U11-D03B3.

Alignment, airtight seal, hollow package

U11-E02A3 [1987]

Handling chip, die bonding

Includes die attachment to appropriate mount media, e.g. paddle of lead frame or refractory ceramic packages. If die attach pad is novel, e.g. for reducing die stress in semiconductor die assembly, see also U11-D03A1. For metallurgical aspects of eutectic, solder or polymer die bonding see also U11-D03B3. For positioning aspects see also U11-F02B.

Wafer, slice

U11-E02A9 [1987]

Other encapsulation details

Includes e.g. positioning of chip in rapport with predeterminable stress factors to reduce voltage offsets, marking TAB before encapsulation, forming lens on package, etc. Also includes use of phosphor within package encapsulant e.g. for white light LED (see also U12-A01A4A).

U11-E02B [1987]

Processes undertaken after encapsulation

Includes opening package for internal inspection and package repairs.

U11-E02B1 [1997]

Shaping and trimming leads

(U11-E02B)

Includes isolation of leads and paddle from each other and frame, i.e. lead frame trimming, lead forming. Also covers forming shorting bar protection to prevent lead deformation during transport, lead cladding or solder application to outer leads.

Cut, bend, press, shape, soldering barrier, chip carrier ring

U11-E02B3 [1997]

Cleaning and marking package

(U11-E02B)

Includes cleaning, deburring and marking package.

Mark, deflashing, deburring

U11-F

Measuring; Positioning for semiconductor technology

U11-F01 [1983]

Measuring; Testing (including sorting) for semiconductor technology

See also S01-G01, S01-G02, for testing electrical properties. For checking store/memory operation see also U14-D. Measurement of non-electrical properties, e.g. dimensions, flaw detection etc., is also coded in S02 and S03 as appropriate.

U11-F01A [1983]

Measuring material properties for semiconductor manufacture

U11-F01A1 [1992]

Doping and carrier transport related measurements

Includes measuring doping level, concentration, minority carrier lifetime, carrier mobility, semiconductor wafer conductivity. See also S03-E02 codes.

Deep level

U11-F01A2 [1992]

Measuring level and nature of defects in semiconductor material

Includes measurements related to e.g. stacking faults, dislocations, inherent stress in material.

Oxidation-induced stacking fault, OSF

U11-F01A3 [1992]

Surface topography measurements for semiconductor processing

See also S02-A codes.

Flatness, curvature, profile, smoothness

U11-F01A4 [1992]

Measurements of physical parameters, e.g. temperature for semiconductor processing

Includes measurements for various processes in semiconductor manufacture, e.g. annealing, deposition. See also S03-B, S03-A codes.

U11-F01A5 [1997]

Chemical composition measurement for semiconductor processing

Bragg diffraction testing for semiconductor wafer. Also includes impurity analysis.

Spectroscopy

U11-F01A9 [1992]

Other measurements for semiconductor processing

Includes energy bandgap measurement. Covers also dielectric test (e.g. measuring relative dielectric constant). For crystal structure.

U11-F01B [1983]

Film parameter measurement for semiconductor processing

U11-F01B1 [1987]

Measuring during semiconductor manufacturing process, within reaction vessels

In situ

U11-F01B2 [1987]

Measuring using beam scanning

Includes measurements related to point defects, e.g. dust on wafer surface. For optical inspection in general see S03-E04 codes, In particular, S03-E04F codes cover optical techniques for flaw detection or contamination. For Electron beam microscopy see also U11-F01B4 and V05-F01 codes as appropriate. See also V05 codes for novel electron beam methods and apparatus aspects.

U11-F01B3 [1987]

Measuring using image recognition

See T04-D codes also.

Pattern, memory, compare, discriminate

U11-F01B4 [1997]

Optical or electron microscopy for semiconductor processing

(U11-F01B9)

Includes visual inspection. For electron microscopy at film level. For electron microscopes per se see also S03-E06B1 and V05-F01 codes.

U11-F01B5 [1997]

Film thickness measurement for semiconductor processing

(U11-F01B)

Includes measuring thickness of deposited layer, profile of semiconductor structure. (See also S02-A02 codes). Prior to 199701 see U11-F01B.

U11-F01B9 [1987]

Other measuring/testing aspects for semiconductor processing

U11-F01C [1983]

Semiconductor device testing

Includes measurements on individual semiconductor chips, after separation from wafer and/or individual module package. Measurements at internal circuit nodes for wafers are covered by U11-F01D. If details regarding type of testing are emphasised, see appropriate code in U11-F01C and U11-F01G. For on-chip testing, e.g. built-in test, see U11-F01D2, U13-C07, U21-C03D.

Known good die

U11-F01C1 [1987]

Probes, connector apparatus for semiconductor device testing

Includes probe heads, contact parts, e.g. clips, sockets, liquid or conductive rubber contacts, connection to mount, strip line. See also S01-G02B5 and S01-H03 codes. Probes for testing semiconductors mounted on PCB's are coded in V04-R06 codes.

Burn in board, prober

U11-F01C3 [1987]

Testing integrated circuits

Includes measurement on encapsulated chip, or die prior to encapsulation, the IC being regarded as a functional block (see also S01-G02B codes). Covers also automated testing by using off-chip random pattern generators (see also U11-F01D2B).

"Stuck at" fault testing, IDDQ, quiescent current, DUT

U11-F01C5 [1987]

Testing diodes, transistors, solar cells, CCD, others

Includes semiconductor laser testing (see also V08-A04A, V08-A06) and memory testing (see also U14-D codes).

U11-F01D [1983]

Testing circuits on wafer

Includes testing performed on individual device at wafer level, marking defective chips on wafers. Also covers built-in testing (U11-F01D2). For testing at interval circuit nodes see S01-G01A1 or S01-G01C1; for checking device as functional block see S01-G02B1.

U11-F01D1 [1987]
Probes, contacts, signal transfer methods for testing circuits on wafer
Includes wafer prober, probe card. See also S01-G02B1 and S01-H03 codes. For probes for testing semiconductors mounted on PCB's are coded in V04-R06 codes.

U11-F01D2 [1987]
Circuitry on chip to aid testing
See also U13-C07 and/or U21-C03D for digital/logic circuit aspects. For computer processing details see also T01-G02A2B.
Built-in self-test, BIST

U11-F01D2A [1992]
Scan based testing method for integrated circuits
(U11-F01D, U13-C07)
Includes level sensitive scan design.
LSSD, scan path, set/scan logic

U11-F01D2B [1992]
Signature analysis and random pattern generation for testing integrated circuits
(U13-C07, U21-C03D)
For off-chip random pattern generators see also U11-F01C3.

U11-F01D3 [1987]
Separate electronic testing apparatus for testing semiconductor devices, ICs, etc
Includes all apparatus for testing of semiconductor devices, separate or at substrate level, includes apparatus for testing of e.g. LED/OLED displays, solar panels etc.

U11-F01E [1987]
Testing circuit packages, chip carriers and multilayer circuit boards
Includes e.g. bonding strength test, detection of abnormal bonding, air-tightness test, moisture resistance of encapsulation, lead or bump inspection. For automatic visual inspection see also T04-D07 codes.
Pin

U11-F01F [1987]
Hybrid circuit testing
Includes also testing matrix array, for LCD (see also U14-K01A8). For hybrid circuits testing see also U14-H04B9.

U11-F01G [1992]
Characterised by type of tests being carried out
This code is usually applied with one of above U11-F01 codes depending on device being tested. Includes life test, ageing, e.g. acceleration test, burn-in test, fatigue test, also mechanical strength test, e.g. vibration, impact test, moisture resistance, e.g. pressure cooker test, thermal impact test (see also appropriate codes in S01, S02, S03).

U11-F02 [1983]
Handling components

U11-F02A [1983]
Wafer/chip holders and conveyors
Includes e.g. lead frame transfer, transport (see also U11-D03A1 codes).

U11-F02A1 [1987]
Wafer holders and conveyors for storage, transport
Includes transfer from processing station to another. Also includes transfer and storage of LCD parts during LCD panel manufacture and assembly, also U14-K01A1K.
Carry, position, feed, support, tweezers, SMIF, standard mechanical interface, pod

U11-F02A1A [1992]
Wafer protection during transport and storage
Includes covering wafer with cling film, oxide layer for protection during wafer handling.

U11-F02A2 [1987]
Jig holders for handling wafers within processing apparatus
Includes also clamping mechanism with temperature regulated platen (see also U11-C09 codes).
Chuck, table, vacuum, hold down, susceptor, electrostatic

U11-F02A3 [1987]
Chip die handling
Includes carrier tapes for die transport.

U11-F02A4 [1987]
Holders and transport for IC packages, encapsulated devices
Includes carrier lines to e.g. test devices (see also U11-F01C), integrated circuit magazine, sockets to prevent lead deformation during transport, carrier tapes. For transporting packages and storage of devices.

U11-F02B [1983]

Positioning for semiconductor device manufacture

Includes detecting, positioning, of wafer orientation flat.
Orient, angle, align, rotate, stage, control, notch

U11-G [1987]

Integrated circuit design including wiring layout, use of CAD etc.

Includes geometrical layout of components, e.g. standard cell, custom LSI, semi-custom input/output layout, automatic routing. See also T01-J15A2. See also U11-C15C for computer simulation of manufacture process. For computer simulation of semiconductor device operation see also U11-F01.
Pattern, LSI, connect, computer aided design

U11-G01 [2002]

Integrated circuit design using CAD

U11-G02 [2002]

Automated component/interconnect layout design

Includes software packages. For software simulation see T01-J15 and U11-C15C codes.
VHDL

U11-G03 [2002]

Circuit simulation and/or fault-finding techniques

Includes software simulations.

U11-G09 [2002]

Other IC design aspects

U11-H [2007]

End of life-cycle product recycling

Includes: old displays, LCDs or any U11 to U14 product recycling that has reached the end of its life-cycle.

U12: Discrete Devices

This section deals with individual semiconductor devices for use either as discrete device per se, or as an element of an integrated circuit. U12 codes are also used for inventions involving manufacture (together with U11 codes) to define as far as possible the nature of the device being manufactured. From 9201 U12-Q code has been introduced to indicate devices used in integrated circuit embodiments.

U12-A

Opto-electronic devices

U12-A01

Light emitting devices with jump or surface barrier

Including packages, arrays and electronic drive circuitry.

U12-A01A

Light emitting diodes

U12-A01A1 [1987]

Semiconductor structure of individual LED

Covers chip layer structure of LED. See U12-A01A4 for LED package structure.

U12-A01A1A [1992]

LED with AIII-BV compound layers

Includes complex ternary and quaternary compounds.

Gallium arsenide, gallium indium phosphide, gallium phosphide, gallium aluminium arsenide, indium phosphide

U12-A01A1B [1992]

LED with AII-BVI compound layers

Includes complex ternary and quaternary compounds.

Cadmium telluride, cadmium sulphide, zinc sulphide, mercury selenide, cadmium selenide, cadmium mercury telluride

U12-A01A1C [1992]

LED with AIV element/compound (except elemental silicon) layers

Diamond, silicon carbide

U12-A01A1D [1997]

LED with indirect bandgap semiconductor

Silicon, germanium

U12-A01A1E [2006]

LEDs with Organic Materials

(U12-A01A1X)

OLED

U12-A01A1X [1992]

LED with other type of semiconductor

From 2006 see U12-A01A1E for polymeric and organic LEDs, see also U12-B03C for general organic device aspects.

Lead sulphide

U12-A01A2 [1987]

LED manufacture

Includes manufacture of single LED device of LED display, or more specific aspects e.g. polarizing/optical film, electrodes, arrays of LEDs. If deposition/etching techniques are emphasised, see also U11-C01/U11-C07 codes.

LED, OLED, QLED display manufacture

U12-A01A3 [1987]

Monolithic or hybrid circuit LED arrays

Display, optical print head

U12-A01A4 [1987]

Package construction for LED

See also U11-D01B1.

Resin, seal, lens

U12-A01A4A [2005]

Packages for white LEDs

Covers package aspects for white LEDs, including phosphors for white LEDs.

U12-A01A4B [2006]

Packages for coloured LEDs

Covers package aspects for red, green or blue and other non-white LEDs, including phosphors for coloured, non-white LEDs.

U12-A01A5 [1987]

Drive circuitry for LED

See also under application.

Switch, control, modulator

U12-A01A5A [1992]

Drive circuit for individual LED

U12-A01A5B [1992]

Drive circuit for LED array

U12-A01A6 [1987]

Arrays of encapsulated LEDs

Display, optical print head

U12-A01A7 [2007]

Light emitting diode displays

For display drivers see also U12-A01A5 codes. For monolithic and un-encapsulated LED array displays see also U12-A01A3, and for encapsulated LED array displays see also U12-A01A6.

LED display, OLED display

U12-A01B

Semiconductor lasers

See V08-A04A also. For testing of semiconductor laser see U11-F01C5.

U12-A01B1 [1987]

Semiconductor details of laser body

Includes p-n junction lasers. For manufacture of laser electrodes see U11-C05F6 and V08-A01B also.

Ohmic contact, Schottky barrier layer, PN-junction, homojunction laser

U12-A01B1A [1992]

Heterojunction semiconductor laser

Includes carrier confinement structures e.g. inverted rib, ridge waveguide, etched mesa, buried heterostructure, channelled substrate buried heterostructure, constricted mesa. For quantum well, superlattice lasers U12-A01B1B takes precedence.

U12-A01B1B [1992]

Quantum well semiconductor laser

Includes superlattice aspects.

Vertical-cavity surface-emitting, stripe confinement, double heterojunction

U12-A01B1J [1992]

Semiconductor laser arrays

(U12-A01B1, U13-D04)

U12-A01B2 [1987]

Laser diode manufacture

Use instead of U12-A01B1 if emphasis is on manufacture rather than semiconductor body details. See also appropriate codes in U11 if particular aspects of e.g. deposition, etching, isolation, electrode manufacture are emphasised. Excludes any packaging aspects.

Etch, cladding layer

U12-A01B3 [1987]

Packages for semiconductor lasers

For particular aspects of packaging which may be also applicable to other semiconductor devices, see also U11-D codes. Includes impedance matching, terminals. For connection to optical fiber see also U12-A01C.

Bond, mount, cap, cover, glass, interconnect

U12-A01B3A [1992]

Cooling arrangements for semiconductor laser package

See also appropriate codes in U11-D02 and V08-A05.

U12-A01B4 [1987]

Electronic drive circuitry for individual semiconductor laser

See also V08-A02A.

U12-A01B6 [1992]

Semiconductor laser characterised by type of semiconductor material

This code does not apply to semiconductor lasers using conventional materials belonging to AIII-BV group. It includes e.g. heterojunction with beryllium carbon nitride, boron nitride, cadmium telluride layers.

Chalcopyrite, zinc blend crystal

U12-A01C [1987]

Optical fiber connections to LEDs, lasers or photoreceivers

When the connection to optical fiber implies package alterations see also appropriate code i.e. U12-A01A4 for LED, U12-A01B3 for laser, U12-A02B3 for photoreceiver. See also V07-G10C.

Couple, align, waveguide, photocoupler

U12-A01X

Other aspects of light emitting devices

U12-A02

Radiation sensitive devices

U12-A02A

Radiation sensitive devices for energy conversion

See X15 also for solar power generation.

Photovoltaic, solar cell

U12-A02A1 [1983]

Single solar cell

Prior to 1997 all packaging aspects of individual solar cells were covered by this code, from 1997 they are covered by U12-A02A4E.

U12-A02A2 [1987]

Semiconductor materials and structures for solar cells

E.g. for monocrystalline, amorphous and heterojunction structures. For thin film solar cells see also U12-B03B.

U12-A02A2A	[1992]
Solar cells with AII-BVI compounds	
U12-A02A2B	[1992]
Solar cell with AIII-BV compounds	
U12-A02A2C	[1992]
Solar cell with AIV compounds	
Excludes elemental silicon.	
U12-A02A2D	[2006]
Solar cells with organic materials	
Excludes elemental silicon.	
U12-A02A2E	[1997]
Solar cell with chalcogenide/chalcopyrite compounds	
(U12-A02A2X)	
Includes materials not covered by U12-A02A2A to U12-A02A2C codes, e.g. AI-BII-CVI, AII-BIV-CV, AII-BIV-CVI group semiconductors. For heterojunctions with e.g. copper indium selenide/cadmium sulphide films or copper indium selenide/cadmium sulphide films see also U12-E01 codes.	
<i>Copper indium sulphide, copper gallium selenide, copper indium selenide, lead sulphide</i>	
U12-A02A2F	[1992]
Solar cell with amorphous, polycrystalline semiconductor	
<i>Hydrogenated a-Si</i>	
U12-A02A2Q	[1992]
Solar cell structure	
For tandem solar cells see U12-A02A4C.	
<i>Back surface field, textured cell, V-groove multijunction</i>	
U12-A02A2X	[1992]
Other semiconductor materials for solar cells	
From 2006 see U12-A02A2D for devices using polymeric and organic layers. Includes perovskite material for solar cells.	
U12-A02A3	[1987]
Characterised by solar cell manufacture	
Includes manufacture of single or assembly of solar cells and manufacturing apparatus. If material manufacturing details are emphasized use U12-A02A2 section. See also U11-C18B9 for photovoltaic devices manufacture.	
U12-A02A4	[1987]
Solar cell substrate, electrode and packaging	

U12-A02A4A	[1992]
Solar cell electrodes	
Include electrode structure and material. For manufacture see U11-C05F6. For thin film transparent conductive layer details see also U14-H01E.	
U12-A02A4B	[1992]
Solar cell substrate details	
U12-A02A4C	[1992]
Multijunction tandem solar cells	
Includes both mechanically stacked cells (held together by an adhesive or bonding techniques), and monolithically integrated multijunction cells.	
U12-A02A4D	[1992]
Covering layers for solar cells	
Includes e.g. passivating, anti-reflection film, back surface layers. Also resin layers and/or adhesive layers as part of protection film/barrier layer only.	
U12-A02A4E	[1997]
Packaging aspects for solar cells	
(U12-A02A1)	
U12-A02A5	[1983]
Assemblies of solar cells	
(U12-A02A5, U12-A02A6)	
Microlithography for forming interconnections. Monolithic integration. Solar battery. Also includes frame assembly, installation of solar panels, supporting of solar power generation module.	
<i>Solar battery</i>	
U12-A02A6*	[1987-1996]
Assemblies of cells on separate substrates	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1996. From 1997 all aspects regarding solar cell assemblies are covered by U12-A02A5.	
U12-A02A7	[1992]
Power transfer, circuitry arrangements for solar cells	
(U12-A02A9)	
<i>Control, voltage/current regulator, charge</i>	
U12-A02A8	[2005]
Dye sensitised solar cells	
See also X15 codes as appropriate.	

U12-A02A9 [1987]

Other radiation sensitive devices for energy conversion

Includes e.g. hybrid systems (wind-photovoltaic, thermophotovoltaic, etc.). For photoelectrochemical cells after 2005 see U12-A02A8.

U12-A02B

Photoreceiver for controlling current flow

Optical, IR, light, photoelectric, photodetector, avalanche

U12-A02B1 [1987]

Photoresistor, photoconductor

U12-A02B2 [1987]

Phototransistor, photodiode

Infrared light, optical, photoelectric

U12-A02B2A [1992]

Photodiode

Includes p-n junction diode, p-i-n diode, metal-semiconductor diode (Schottky barrier), heterojunction diode, avalanche photodiode.

APD, PD, PIN

U12-A02B2B [1992]

Phototransistor

Includes bipolar and field effect phototransistor.

FET

U12-A02B2C [1992]

Photothyristor

(U12-A02B, U12-A02B2, U12-D01B)

Light activated thyristor

U12-A02B3 [1987]

Package details for photoreceiver

Includes packages for devices in U12-A02B1 and U12-A02B2. For specific packaging aspects which may be also applicable to other semiconductor devices, see also U11-D codes.

Window, cap

U12-A02B4 [1987]

Electronic circuits for photodiodes and phototransistors

See also under application, e.g. for opto-receiver amplifiers in general see U24-G01A5, and for such amplifiers in optical communication systems see also W02-C04A3B.

Bias, current, amplify, demodulate

U12-A02B5 [1992]

Photoreceiver characterised by material

(U12-A02B)

U12-A02B5A [1992]

Photoreceiver with AII-BVI compounds

Includes complex ternary and quaternary compounds.

Cadmium sulphide, cadmium telluride, mercury selenide, cadmium mercury telluride, zinc sulphide, mercury zinc selenium telluride

U12-A02B5B [1992]

Photoreceiver with AIII-BV compounds

Includes complex ternary and quaternary compounds.

Gallium indium arsenide, gallium arsenide phosphide, gallium arsenide, gallium phosphide, indium arsenide

U12-A02B5C [1992]

Photoreceiver with amorphous, polycrystalline semiconductor

Hydrogenated a-Si

U12-A02B5D [1997]

Photoreceiver with AIV elements and their compounds

(U12-A02B5X)

Diamond, silicon carbide, germanium

U12-A02B5E [2006]

Photoreceiver with organic materials

(U12-A02B5X)

U12-A02B5X [1992]

Photoreceiver with other semiconductor materials

Includes materials not covered by U12-A02B5A to U12-A02B5D codes, e.g. AI-BIII-CVI group and AII-BIV-CV group semiconductors.

Chalcopyrite compounds, copper indium sulphide, copper gallium selenide, chalcogenide compounds, zinc tin arsenide, cadmium germanium arsenide, lead sulphide, bacteriorhodopsin

U12-A02C

Structurally combined with light emitter

U12-A02C1 [1987]

Optocouplers, optoisolators

Includes structure, packaging aspects.

Light, LED, photodiode, phototransistor, photocoupler

U12-A02C2	[1987]
Light path emerging from package	
E.g. for reflective light barrier, rotary encoder. (See also S03-C09, U21-A03J/W05-D01 codes respectively).	
<i>Light switch, photointerrupter, reflection switch</i>	
U12-A02C3	[1987]
Semiconductor light transmitting and receiving device	
Includes light amplifiers, modulators (see also V07-K01A, V07-K01C1).	
U12-A03	[1992]
Devices sensitive to X-ray, gamma ray, particle and ions	
(U12-A02B, U12-B03X)	
See S03-G02B2G for radiation intensity measurement using semiconductor sensors or S03-E06H5A for semiconductor x-ray imaging detectors.	
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U12-B	
Hall-, Ovshinsky- and Gunn-effect devices; Dielectric triodes and other devices not catered for elsewhere in U12	
U12-B01	[1987]
Hall-effect, magnetoresistive or spintronic devices	
U12-B01A	[1992]
Hall effect devices	
Includes materials, manufacture and structure of device.	
U12-B01B	[1992]
Magnetoresistive or spintronic devices	
Covers manufacture or structure of all magnetoresistive devices. Includes spintronic devices that involve giant magnetoresistance. Also covers spin detection in ferromagnetic semiconductor sources.	
<i>Giant magnetoresistive (GMR) device, spintronic device</i>	
U12-B02	[1987]
Ovshinsky devices. Bulk negative differential resistance (NDR) devices	
For negative resistance FET see U12-D02J1.	
U12-B02A	[1992]
Gunn-effect devices	
Includes Transferred-Electron Devices.	
<i>TED</i>	

U12-B03	[1987]
Other devices and thick/thin film and organic semiconductor devices	
See also U14-H codes for film circuits.	
U12-B03A	[1987]
Thin/thick film transistors (inorganic)	
Covers materials and structural details of individual device rather than array or layout details. Includes coplanar type, stagger structure TFT.	
<i>Reverse staggered</i>	
U12-B03B	[1987]
Thick/thin film devices (inorganic) other than transistors	
Includes e.g. thin film solar cells (see also U12-A02 or U12-A02A2Q).	
U12-B03C	[1987]
Organic devices	
Excludes chemical or pressure-sensitive transducers (see U12-B03E). For LEDs, Solar cells and photoreceivers with organic layers see U12-A01A1E, U12-A02A2D and U12-A2B5E respectively.	
<i>Bacteriorhodopsin</i>	
U12-B03D	[1992]
Cold cathode field emission devices	
(U12-B03X)	
See also V05 codes. Covers micro-scale, or smaller, devices created using IC manufacturing processes. For complete manufacture see also U11-C18B9, or relevant U11-C codes for specific processes.	
<i>FED</i>	
U12-B03E	[1992]
Semiconductor transducers	
(U12-B03X)	
See also appropriate codes in S02, S03 and V06 classes. For non-semiconductor piezoelectric elements/transducers see V06 codes only. Includes e.g. pressure sensitive (see also S02-F04B3), piezoresistive, and chemical sensors. For manufacture see also U11-C18C.	
<i>CHEMFET, ISFET</i>	
U12-B03F	[1992]
Microstructural or nanostructural devices or systems	
(U12-B03X)	
For manufacture, see also U11-C18C codes. See X25-L01A and X25-L03A codes for microvalves and micropumps respectively, and V06-M06G codes for micromotors.	

U12-B03F1	[2002]
Microstructures	
See S03-H02A for micrometre scale instrumentation.	
U12-B03F1A	[2002]
Microstructural devices	
Includes individual MEMs devices	
U12-B03F1B	[2002]
Microstructural systems	
Includes assemblies of MEMs devices, and MEMs systems.	
U12-B03F1C	[2006]
Micromachine packages	
See also V06 codes. For package details see also U11-D codes and for packaging processes see also U11-E codes.	
U12-B03F2	[2002]
Nanostructures	
See S03-H02B for nanometer scale instrumentation.	
U12-B03F2A	[2002]
Nanostructural devices	
U12-B03F2B	[2002]
Nanostructural systems	
U12-B03X	[1987]
Other discrete devices	
From Jan 2002 see U12-B03F2 codes for nanotechnology.	
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U12-C	
Other two terminal devices (incl. resistors, capacitors)	
Resistors and capacitors not implemented in semiconductor form are covered by V01 codes.	
U12-C01	[1983]
Diodes (incl. rectifier assemblies)	
The following codes are no longer applied but they remain valid for records prior to 9201: U12-C01A, U12-C01B. For complete manufacture of diode devices see U11-C18B1. For Gunn diodes see U12-B02A. For variable capacitance diode, see U12-C02B. For Shockley diode and two terminal semiconductor controlled rectifier (SCR) see U12-D01B4.	
U12-C01A*	[1987-1991]
Diodes - low, medium power	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U12-C01C to U12-C01X codes.	

U12-C01B*	[1987-1991]
Diodes - high power	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U12-C01C to U12-C01X codes.	
U12-C01C	[1992]
Rectifier diodes	
Includes Schottky, planar, p-i-n diodes. <i>PIN, PN, hot carrier diode, hot electron diode, Schottky barrier</i>	
U12-C01D	[1992]
Breakdown diodes	
Includes Zener, avalanche diodes. <i>Avalanche breakdown, voltage reference</i>	
U12-C01E	[1992]
IMPATT and related transit time diodes	
(U12-B, U12-B02)	
Includes barrier junction injection and transit time diode, trapped plasma avalanche triggered transit diode, double velocity transit time diode, mixed tunnelling avalanche transit time. <i>BARRITT, TRAPPATT, DOVETT, MITATT</i>	
U12-C01G	[1992]
Tunnel diodes	
(U12-C, U12-B)	
Includes metal-insulator-semiconductor tunnel diode, metal-insulator-metal tunnel diode, Esaki diode, but also quantum effect diodes, e.g. resonant tunnelling diodes. <i>MIS, MIM, RTD</i>	
U12-C01X	[1992]
Other types of diode	
U12-C02	[1987]
Capacitors	
U12-C02A	[1987]
Metal-insulator-semiconductor capacitors e.g. MOS	
U12-C02A1	[1987]
For memories e.g. dynamic RAM	
U12-C02B	[1992]
p-n junction capacitors	
Includes variable capacitance diodes, e.g. varactors. See V01-B02B1 for discrete diode embodiments.	

U12-C02C [1992]

Metal-insulator-metal capacitors

When used as LCD driving element in active matrix see also U14-H01A and U14-K01A2A.

MIM

U12-C02F [1997]

Ferroelectric capacitor for integrated circuits (U12-C02X)

For capacitors used in ferroelectric memories see also U14-A03F.

U12-C02X [1992]

Other types of capacitor

U12-C03 [1987]

Resistors, inductors

Includes resistors with PN junction.

U12-C03A [2002]

Resistors

Includes PN junction structure aspects.

U12-C03B [2002]

Inductors

Includes structure of inductive aspects of monolithic microwave integrated circuits (MMIC) (see also U14-H03C2 codes). For telecommunications aspects see W01 codes.

U12-C04 [2002]

Fuses

For all structural aspects of fuses/antifuses including memory redundancy circuits (see also U14-D01A). Before Jan 2002 see U11-D03B2A for structural aspects. For fuse manufacture see U11-C05G2A.

U12-D

Electrically controllable semiconductor devices

Codes in this section are used on their own for novel device structures, but also together with U11 codes to identify type of device whose manufacture is covered by U11 codes. For example, electrode manufacture for SOI insulated gate field effect transistor is coded in U11-C05F1 and U12-D02A4. For thin film transistor see U12-B03A and appropriate U12-D codes according to type of transistor.

U12-D01

Bipolar devices

U12-D01A

Bipolar transistors

Bipolar junction, Darlington transistor

U12-D01A1 [1992]

MOS gated bipolar transistor

Includes insulated gate bipolar transistor
IGBT, conductivity modulation MOS

U12-D01A2 [1992]

Heterojunction bipolar transistor

See also U12-E01 for details regarding materials, structures of the heterostructure.

U12-D01A3 [1992]

Hot electron bipolar transistor

This code takes precedence over U12-D01A2, e.g. for HBT with heterostructures. For hot electron unipolar transistors see U12-D02J.

Auger transistor

U12-D01A4 [1992]

Bipolar transistor with tunnelling mechanism

Includes resonant tunnelling bipolar transistor.

RTBT

U12-D01A5 [1992]

Bipolar transistor with semiconductor on insulator substrate

(U11-C08A5, U13-D, U12-D01A)

For manufacturing aspects regarding silicon-on-insulator structures see U11-C08A6.

SOI

U12-D01A9 [1992]

Other types of bipolar transistor

Covers aspects such as lateral/vertical collector diffused isolation structure.

U12-D01B

Thyristors

For light activated thyristors see U12-A02B2C.

U12-D01B1 [1992]

Field controlled thyristor (FCT)

For MOS gated control turn-off see also U12-D01B3.

MCT

U12-D01B2 [1992]

Bidirectional thyristors

Includes triacs (triode ac switch), diacs (diode as ac switch).

Bilateral diode switch, diac, bilateral triode switch, triac

U12-D01B3 [1992]

Gate turn-off thyristor

GTO

U12-D01B4 [1997]

Semiconductor controlled rectifier

(U12-D01B9)

Prior to 1997 for SCR see U12-D01B. For bilateral devices see U12-D01B2. Includes Shockley diodes.

Forward blocking, reverse blocking

U12-D01B5 [1997]

Static induction thyristor

(U12-D01B9)

Static induced thyristor

U12-D01B9 [1992]

Other types of thyristor

Includes silicon unilateral/bilateral switch. From 1997 see U11-D01B4 for Shockley diodes and U11-D01B5 for static induced thyristors.

U12-D02

Unipolar devices

U12-D02A

IGFETs

Also includes device in which insulator is made of material other than oxide e.g. nitride, and gate electrode is made of material other than metal, e.g. polysilicon. See also S03 codes for FETs used as sensors.

MOSFET, MISFET, CHEMFET, ISFET

U12-D02A1 [1983]

FET with floating gate

For memories using floating gate FETs see U13-C04A, U13-C04B2, U14-A03B7 codes.

U12-D02A2 [1992]

FET with metal-insulator-silicon oxide-silicon (MIOS) structure for memories

Includes metal-nitride-oxide-semiconductor type. For memories using this type of transistor see U13-C04 codes and/or U14-A03B7.

MNOS

U12-D02A3 [1992]

FET with lightly doped drain

(U11-C02J6, U12-D02A)

LDD

U12-D02A4 [1992]

FET with semiconductor on insulator substrate

(U11-C08A5, U12-D02A, U13-D)

For manufacturing aspects regarding silicon-on-insulator structures see U11-C08A6.

SOI

U12-D02A5 [1992]

IGFET with heterostructure

HIGFET, SISFET, heterostructure MISFET

U12-D02A7 [1997]

Ferroelectric transistor

(U12-D02A9)

U12-D02A9 [1992]

Other IGFETs

Includes vertical MOS, trench, U-shaped grooved MOS, double diffused MOS, trench type MOSFET, Schottky barrier source and drain MOS. Also includes magnetoelectric FET, Spin-FET, Magnetic-FET MAGFET. For superconductive FET see also U14-F02B. From Jan 2006 see U12-D02E for multigate MOSFETs.

VMOS, UMOS, DMOS, DIMOS

U12-D02B [1992]

FET with pn-junction or Schottky barrier diode gate

(U12-D02X)

MESFET, JFET, dual-gate MESFET

U12-D02C [1992]

Transistor with static field regions

(U12-D02X)

Includes static induction transistor, permeable base transistor.

SIT, PBT

U12-D02D [1992]

FET with quantum well, wire

(U12-D02X, U12-E01)

Includes doped channel hetero-MISFET (see also U12-D02A5), semiconductor gate heterostructure FET (see also U12-D02A5), double heterostructure FET. See also U12-E01 codes for details regarding materials, structures of the heterostructure.

U12-D02D1 [1997]

One-dimensional charge carrier FET

(U12-D02D)

Quantum wire FET

U12-D02D2 [1997]

High electron mobility transistor

(U12-D02D)

Includes Modulation doped FET, Two dimensional electron gas FET, Separately doped FET, Quantum well FET, Two dimensional hole gas FET.

SQWFET, HEMT, MODFET, TEGFET, 2DHGFET, SISFET, DHFET, HFET, doped channel heterojunction

U12-D02E	[2006]
Multi-gate Unipolar transistors	
Used in conjunction with other U12-D02 codes where necessary to indicate the type of device, e.g. for Dual-gate MESFET see also U12-D02B.	
<i>Double-gated MOS, FINFET</i>	
U12-D02J	[1992]
Hot electron transistor (HET)	
(U12-D01A, U12-D02X)	
Includes metal base transistor, planar doped barrier transistor.	
<i>PDB</i>	
U12-D02J1	[1992]
Real space transfer transistor	
Includes negative resistance FET, charge injection transistor.	
<i>NERFET, CHINT, delta doping</i>	
U12-D02J2	[1992]
FET with tunnelling mechanism	
Includes resonant tunnelling hot electron unipolar transistor, resonant tunnelling gate field effect transistor, ballistic transistor, tunnelling hot electron transfer amplifier, MIMIM structure tunnel transistor.	
<i>RHET, RT-FET, THETA</i>	
U12-D02K	[1992]
Quantum interference devices	
(U12-D02X)	
Covers devices whose operation is based on wave phenomena (e.g. electrons in two parallel high-mobility channels are made to interfere constructively).	
U12-D02X	
Other unipolar devices	
<hr/>	
U12-E	
General	
U12-E01	
Semiconductor bodies	
<i>Heterojunction</i>	
U12-E01A	[1992]
Semiconductor body characterised by materials	

U12-E01A1	[1992]
Semiconductor body with AIII-BV compound layers	
Includes complex ternary and quaternary compounds.	
<i>Gallium arsenide, gallium phosphide, indium phosphide, gallium aluminium arsenide, gallium indium arsenide, gallium indium phosphide, gallium nitride, cubic boron nitride</i>	
U12-E01A2	[1992]
Semiconductor body with AII-BVI compound layers	
Includes complex ternary and quaternary compounds.	
<i>Mercury sulphide, cadmium sulphide, zinc sulphide, mercury selenide, zinc selenide, cadmium selenide, cadmium telluride, cadmium mercury telluride</i>	
U12-E01A3	[1992]
Semiconductor body with group IV element/compound (except elemental silicon) layers	
Includes silicon-germanium layers.	
<i>Silicon carbide, diamond, germanium</i>	
U12-E01A4	[1997]
Semiconductor body with chalcogenide/chalcopyrite compounds	
For solar cells, see U12-A02A2E. Includes semiconductors such as Al-BII-CVI, AII-BIV-CV, AII-BIV-CVI, etc.	
<i>Copper indium sulphide, copper gallium selenide, copper indium selenide</i>	
U12-E01A5	[1997]
Silicon-on-insulator structure	
(U12-E01A, U12-E01A9)	
For SOI manufacture, see U11-C08A6. This code is used for discrete device with SOI substrate. For integrated circuit with SOI substrate see U13-D07.	
<i>SOI</i>	
U12-E01A9	[1992]
Semiconductor bodies characterised by other materials	
U12-E01B	[1992]
Characterised by semiconductor structure	
U12-E01B1	[1992]
Semiconductor body with heterojunctions	
U12-E01B2 code takes precedence.	

U12-E01B1A [2006]

Device with strained layer structure

Includes strained channel to enhance charge-carrier mobility. For strained layer super lattice see also U12-E01B2.

Strained silicon, strained layer, relaxed layer, SLS

U12-E01B2 [1992]

Semiconductor body with quantum wire, wells, superlattice

SQW, multi-quantum well, MQW

U12-E02

Electrodes for semiconductor devices

Includes ohmic electrodes, Schottky barrier electrodes and metal-insulator-semiconductor electrodes. Also includes novel gate structures. For electrode manufacture see U11-C05E and U11-C05F codes.

Schottky, ohmic

U12-Q [1992]

Device intended to be used as part of integrated circuit

This code is used for individual devices intended to be used as elements of an integrated circuit. For example, a floating gate transistor for an EPROM is coded in U12-D02A1, U12-Q, U14-A03B7 and, if integration aspects are important, in U13-C04A.

U13: Integrated Circuits

U13-B/C codes in this section are not used for circuitry which is routinely integrated e.g. logic gates, low power amplifiers etc. for which codes indicating the form of implementation in the appropriate sections of U21-U25 should be used. See U14-H01 for thin film circuitry e.g. for memories, display devices and large area contact image pick-up devices. For individual devices intended to be used in an integrated circuit see U12-Q and the more specific U12 code indicating the type of device (e.g. U12-D02A1 for floating gate IGFET, U12-C02A1 for capacitors used in DRAMs).

U13-A

Charge transfer devices; Radiation sensors/detectors

Includes most types of solid state image sensors e.g. charge coupled devices, MOS. For video cameras see W04-M01.

U13-A01 [1983]

IC radiation sensors, e.g. imagers characterised by detecting element

For complete manufacture see U11-C18B4. For Line image sensors (thin film) see U14-H01B. For CMOS image sensor structure and manufacture see also U13-D02A.

Image pick-up, matrix, row, column, photoelectric

U13-A01A [1987]

IC radiation sensor with photodiode, photoconductor

For individual device see U12-A02B2A. Includes MOS imagers.

U13-A01B [1987]

IC radiation sensor with phototransistor

For individual device see U12-A02B2B.

Vertical, horizontal transistor

U13-A01B1 [1987]

IC radiation sensor with static induction transistor (SIT)

U13-A01D [1997]

Packaging aspects of IC radiation sensor (U13-A01X)

Specific package aspects for individual photodiode, phototransistor are covered by U12-A01B3.

U13-A01F [1997]

Optical elements for IC radiation sensor (U13-A01X)

Includes optical filters, lenses. For complete optical filter manufacture see U11-C18D. For package window structures see U13-A01D and U11-D01C1.

Filter, lens

U13-A01G [2002]

Wavelength conversion layers for IC radiation sensors

Includes phosphors coated onto photodiode-based MOS imagers which fluoresce under X-ray radiation (see S05 codes for medical applications).

U13-A01H [2006]

Circuits, drivers for IC radiation sensors

U13-A01X [1987]

Other aspects of IC radiation sensors

Includes focal plane array constructional details.

Smear, blooming

U13-A02 [1983]

Charge transfer devices

Includes acoustic charge transport devices, (see also U14-G if SAW driving employed). For complete manufacture see U11-C18B3. For CTD used as shift registers see U14-A01B. See also W04-M01 codes for area imagers, and S06-D05 codes for linear imagers. Includes any aspect regarding discrete CCD and also integrated CCD for imagers (see also W04-M01B).

Read, shift, register, clock

U13-A02A [1992]

Charge transfer device structure

Includes charge coupled devices, bucket brigade devices, charge injection devices.

Surface channel, SCCD, buried channel, BCCD, fill and spill, CCD, BBD, CID

U13-A02B [1992]

Circuits, drivers for CCD

U13-A02C [1992]

Packaging aspects of CCD

U13-A02D [2006]

Optical elements for CCD imagers

Includes optical filters, lenses that are inside, or part of, the package. For complete optical filter manufacture see U11-C18D. For package window structures see U13-A02C and U11-D01C1.

U13-A02X [1992]

Other aspects of CCD

Smear, blooming

U13-B

Analogue circuits

Mainly used for A-D and D-A converters (see also U21-A codes), but includes also modulators, demodulators, mixers and active filters which are integrated and do not have a specific code breakdown indicating IC details. Prior to 1997 for analogue and digital circuits integrated on same semiconductor chip see U13-B and U13-C; from 1997 for analogue/digital integration on same semiconductor substrate see U13-C09.

U13-B01

Analogue circuits with bipolar devices

For semiconductor structure see U13-D01 codes.

U13-B01A* [1987-1991]

With FET elements

*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U13-B03.

U13-B02

Analogue circuits with FETs

For semiconductor structure see U13-D02 codes.

U13-B02A [1987]

Analogue circuits with MOSFETs

CMOS

U13-B02B [1987]

Analogue circuits with MESFET, JFET

U13-B02C* [1987-1991]

FET with bipolar transistor

*This code is now discontinued, but remains searchable and valid for records from 1987 to 1991. From 1992 see U13-B03.

U13-B03 [1992]

Analogue circuits with combined FET and bipolar devices

(U13-B01A, U13-B02C)

Includes e.g. Bi-FET operational amplifier. For semiconductor structure see U13-D03 codes.

BiCMOS

U13-B04 [1992]

Analogue circuits with diodes and/or capacitors and/or resistors

(U13-B01A, U13-B02C)

For semiconductor structures see U13-D01B.

U13-B09 [1987]

Other aspects for analogue circuits

Includes custom analogue array.

U13-C

Digital circuits

Binary

U13-C01

Digital circuits with bipolar devices

For semiconductor structures see U13-D01 codes.

U13-C01A [1992]

Digital circuits with diodes, capacitors, resistors

For semiconductor structures see U13-D01B.

U13-C02

Digital circuits with FETs

For semiconductor structures see U13-D02.

Buffer, compound

U13-C02A [1987]

Digital circuits with MOSFETs

CMOS

U13-C02B [1987]

Digital circuits with MESFET, JFET

U13-C02C [1992]

Digital circuit with FET and diodes, capacitors, resistors

For semiconductor structures see U13-D03A.

U13-C03 [1987]

Digital circuits with combined bipolar and FET

For semiconductor structures see U13-D03B.

U13-C04	[1987]
Digital circuits with repetitive structures	
E.g. matrix layout for read-only memories, programmable logic arrays, random access memories, gate arrays (for wiring and layout details see also U21-C01E and/or U11-G).	
U13-C04A	[1987]
Read only memory (non-electrically alterable)	
Includes read only memory, programmable read only memory, erasable programmable read only memory, matrix layout. For more specific memory aspects see U14-A03B7, U14-A06C (for EPROM), U14-A06B1 (for PROM), U14-A06B5 (for ROM). For complete memory manufacture see also U11-C18B5.	
<i>Mask ROM</i>	
U13-C04A1	[1997]
Electrically-programmable ROM	
(U13-C04A)	
<i>EPROM</i>	
U13-C04B	[1987]
For RAMs and electrically alterable ROMs	
Includes matrix layout. For complete memory manufacture see also U11-C18B5.	
U13-C04B1	[1992]
Dynamic/static RAMs	
<i>Random access</i>	
U13-C04B1A	[1992]
Dynamic RAM	
Includes single transistor-single capacitor cell, three transistor cell. For specific aspects regarding capacitor manufacture, see U11-C05G1B, for capacitor structure see U12-C02A1. Prior to 1992 for transistor-capacitor DRAM structure, see U13-D03; after 1991 see also U13-D03A. For data refreshing, see U14-A03B4A.	
U13-C04B1B	[1992]
Static RAM	
For bipolar static RAM, E/R static RAM, flip flop, see also e.g. U14-A03A or U14-A03B1 codes.	
<i>Pseudo-static RAM, PSRAM</i>	
U13-C04B2	[1992]
Electrically erasable (alterable) PROM	
For specific transistor structure see e.g. U12-D02A1, U12-D02A2 as appropriate. See also U14-A03B7 for memory details.	
<i>EEPROM, E2PROM, EAROM, FLASH EPROM</i>	

U13-C04C	[1987]
Integrated circuit Programmable Logic Devices	
Includes field programmable logic devices, programmable logic arrays, programmable array logic, logic cell arrays. See also U21-C01E for circuitry for PLD e.g. power controller, sense amplifiers etc.	
<i>FPLA, PLA, PAL, fixed OR array, FOA, programmable interconnect, user configurable arrays</i>	
U13-C04D	[1987]
Full custom or semi-custom integrated circuit arrays	
Includes application specific integrated circuits e.g. gate arrays, master slice, uncommitted logic arrays, configurable gate arrays.	
<i>Sea of gates, channel-less, channel type gate array, logic array, ASIC, basic cell, ULA</i>	
U13-C05	[1987]
Computer integrated circuit aspects. Single chip computer	
See also T01-M05.	
<i>Microcomputer, microprocessor, one chip, system on chip, SOC</i>	
U13-C06	[1997]
Large scale IC, Ultra large IC, wafer scale digital circuit aspects	
Covers circuit and logic aspects only, for constructional details see U13-D codes.	
<i>Cellular, VLSI, ULSI, LSI</i>	
U13-C07	[1987]
On-chip testing circuits	
Includes scan based testing, pattern generation (See also U11-F01D2A, U11-F01D2B). For computer aspects of shift path maintenance techniques, see T01-G02A1 also. Includes analogue test/trimming and multiple usage of terminals.	
<i>Scan testing</i>	
U13-C08	[1997]
Circuit trimming	
For physical circuit repair see U11-C19A. For trimming thin/thick film for hybrid circuits see U14-H04B3B.	
U13-C09	[1997]
Analogue/digital integration on same semiconductor chip	
(U13-B, U13-C)	
Prior to 199701, see U13-B and U13-C.	

U13-D

Integrated circuit structures

Prior to 1992, for integration on all insulating (e.g. SOI) substrates see U11-C08A5 and U13-D. From 1992 for integrated circuits on insulating substrates see U13-D07.

U13-D01

Integrated circuit structure with bipolar devices

U13-D01A [1992]

Integrated circuit structure with complementary bipolar devices

Includes NPN-PNP structures.

U13-D01B [1992]

Integrated circuit structure with diodes, passive components

Includes bipolar transistor-diode, diode-diode, capacitor, resistor integration.

U13-D02

Integrated circuit structure with FET

Field effect

U13-D02A [1983]

CMOS integrated circuit structure

Includes manufacture.

Complementary metal oxide semiconductor

U13-D03 [1983]

Combined FET and bipolar integrated circuit structure

U13-D03A [1992]

FET in combination with diodes and/or capacitors and/or resistors

For one-transistor DRAM cell see also U14-A03B4. For transistors, diodes, used as protective elements e.g. for MOS devices see also U13-E01.

U13-D03B [1992]

Bipolar-FET transistor integrated circuit structures

Includes BiCMOS, BiFET structures.

U13-D03B1 [1992]

Integrated circuit characterised by novel structure

U13-D03B2 [1992]

Integrated circuit characterised by novel method for structure manufacture

U13-D04 [1987]

Integrated circuit structure in combination with other elements

Includes integration with e.g. SAW devices, piezo-electric, thermoelectric, Hall effect devices.

U13-D04A [1992]

Opto-electronic integrated circuits

For optoelectronics using integrated optical waveguides see also V07-F01A5.

OEIC

U13-D04B [2005]

Lab-On-Chip (LOC)

Includes DNA microarrays or biochips using semiconductor based technology. For instrumentation details see also S03-H01 codes. For MEMs aspects see V06, and U12-B03F codes for micro- and nano-structural electronic or MEMs aspects. For glass microarray or non-semiconductor fluorescence based techniques see S03 codes only.

Microfluidic, microarray, DNA chip, biochip, Gene Chip™

U13-D05 [1987]

Three-dimensional, wafer-scale integration

Includes constructional details of master-slice circuitry. See also U11-D01A8 (packages) and U11-D03C3 (chip-on-chip). For 3-D structure manufactured by semiconductor recrystallisation over insulating substrates see also U11-C08C, U11-C03J1. For wafer scale circuitry see U13-C06.

Laminate

U13-D06 [2002]

Spherical integrated circuit structures

Includes spherical sensor circuits for in-situ monitoring of body functions (see also S05 codes for medical applications).

U13-D07 [1992]

Integrated circuit with semiconductor on insulator structure

For semiconductor on insulator manufacture see U11-C08A6. For bipolar and field effect transistor on insulating substrate see U12-D01A5 and U12-D02A4 respectively.

SOI, SOG, SOS

U13-D08 [1997]

Radiation hardened integrated circuits

Rad hard

U13-D09 [2006]

Integrated circuit with strained structures

Includes CMOS with strained channel structure to enhance charge-carrier mobility (see also U13-D02A), lattice mismatch and bandgap engineering.

Strain

U13-E [1987]

Circuitry in general

U13-E01 [1992]

Electrical and thermal protection of integrated circuit

Includes protection against transient condition, reverse battery condition, electrostatic discharge. For fuses see U11-D03B2. For logic circuit aspects see U21-A03A2. For general low power electronic circuit protection see U24-F codes. For electrostatic, electromagnetic, thermal protection implemented as IC package adaptation see U11-D01C codes.

Latch-up prevention

U13-E02 [1992]

Power supply, substrate biasing of integrated circuit

For supply grounding see U11-D03C1. For amplifier protection see U24-G03C. For logic circuit aspects see U21-C03A2.

Charge pumps

U13-E03 [1997]

Input/output circuitry for integrated circuit

Includes input/output circuitry on integrated circuit chip. For layout design see U11-G.

Buffer

U13-E04 [2002]

Clocking and synchronisation circuitry for integrated circuits

Includes on chip real-time clocks.

U13-E09 [1992]

Other general aspects IC of circuitry

U14: Memories, Film and Hybrid Circuits

U14-A

Digital static stores

Dynamic recording is in T03 and W04. Storage systems for digital computing are in T01-H.

U14-A01

Shift stores (serial access)

U14-A01A

Magnetic devices

For magnetic film/core memories, see U14-A04 codes.

U14-A01A1 [1983]

Bubble memories (non-volatile)

Includes Bloch line memory, but when used as RAM see U14-A04A.

U14-A01B

Charge transfer devices

Includes serpentine, serial parallel serial (SPS) structure, recirculating shift registers. Any aspect regarding CTD structure, packaging is covered by U13-A02 codes.

U14-A01X

Other types of shift store memories

For FIFO aspects see U14-A08B1 also.

Inverter, LIFO

U14-A02

Memories using (electro-, magneto-) optical elements

U14-A02A [1992]

Memories using electro-optical or magneto-optical elements

U14-A02B [1992]

Memories using optical storage elements

U14-A02B1 [1992]

Optical memories with interference, diffraction patterns

Includes e.g. holograms.

U14-A02B9 [1992]

Other types of optical memories

U14-A03

Memories using electric elements

U14-A03A

Memories with bipolar devices

Includes memories with diodes and thyristors.

U14-A03A1 [1992]

Memories with bipolar transistors

Covers memories using bipolar transistors as main constituents. Includes ECL RAMs (bipolar static RAM), ECL and Schottky TTL PROMs (programmed by blowing fusible links, see also U14-A06B1). For static RAM structures and/or complete manufacture see also U13-C04B1B and/or U11-C18B5.

SRAM

U14-A03B

Memories with FETs (NMOS, CMOS)

U14-A03B1 [1983]

Memories with FET in bistable cell configuration

Includes flip-flop, enhancement/resistance, six transistor cell static RAM (see also U13-C04B1B). For complete memory manufacture see also U11-C18B5.

(E/R)SRAM, (4T-2R)SRAM, random access

U14-A03B4 [1983]

Memories with capacitor store

(U14-A03X)

Includes planar, trench, stacked capacitor dynamic RAM. For structure and manufacture see U13-C04B1A, U13-D03 and U11-C18B5. If only capacitor manufacture and/or structure emphasised see U11-C05G1B and/or U12-C02A1.

DRAM, random access

U14-A03B4A [1992]

Data refreshing for memories

(U14-A20)

Includes both internal and external refresh for dynamic RAM, pseudo-static RAM.

U14-A03B5 [1992]

Memories with FET-bipolar integration

(U14-A03A, U14-A03B)

For bipolar static RAM with e.g. CMOS circuitry, i.e. BiCMOS static RAM, see also U14-A03A and/or U13-C04B1B, U13-D03B codes if structure and manufacture are important. For BiCMOS dynamic RAM see also U14-A03B4 and/or U13-C04B1A, U13-D03B codes if structure and manufacture are important. Complete memory manufacture is covered by U11-C18B5.

BIMOS, SRAM, DRAM

U14-A03B7 [1983]

Memories with adjustable threshold MOS transistor

(U14-A03X)

Covers electrically programmable read-only memory, electrically erasable programmable read-only memory, electrically bulk erasable programmable read only memory. Includes variations of floating gate type e.g. floating gate tunnel oxide, textured polysilicon, split gate, floating gate avalanche MOS, stacked gate avalanche injection MOS, as well as variations of silicon-nitride-oxide-silicon type e.g. silicon-oxide-oxide-silicon, metal-nitride-oxide-silicon. For more specific details regarding floating gate MOS transistor or M1OS type transistor see also U12-D02A1, U12-D02A2 respectively. For matrix layout see U13-C04A1 for EPROMs, and U13-C04B2 for EEPROMs.

EPROM, EEPROM, E2PROM, FLASH EEPROM, FLOTOX, FAMOS, SAMOS, SNOS, SONOS, MNOS, Fowler-Nordheim tunnelling, hot carrier injection

U14-A03B9 [1987]

Memories with combined ROM and RAM memory cells

Includes e.g. non-volatile RAM in which SRAM array is duplicated (shadowed) by an equivalent EEPROM.

NOVRAM, shadow RAM

U14-A03F [1992]

Memories with ferroelectric elements

(U14-A03X)

Includes e.g. non-volatile variable resistive EEPROMs, non-volatile ferroelectric RAMs, ferroelectric capacitor memories (see also U14-A03B4).

'Cross point arrays'

U14-A03G [1992]

Memories with superconductive elements

(U14-A03X)

See also U14-F02B.

Josephson, superconducting

U14-A03H [2006]

Programmable conductor RAM (PCRAM)

Includes chalcogenide memories, phase change ovonic unified memories, phase change memories, and programmable resistor memories, resistive memories.

OUM

U14-A03X

Other types of memories with electric elements

Includes e.g. memories based on electrochemical cell, organic films etc. For variable resistance memories see U14-A03H from 2006.

U14-A04

Memories with magnetic elements

U14-A04A [1992]

Memories with magnetic thin films

Includes crosstie random access memory, Bloch line memory element used for non-volatile RAM.

CRAM, magnetoresistive RAM

U14-A04A1 [2006]

Using giant magnetoresistance effect

E.g. using ferromagnetic layers separated by metallic layer. Includes pseudo spin valve MRAM devices.

GMR, spin valve, spin transistor, pseudo spin valve, PSVMRAM

U14-A04A2 [2006]

Using tunnel magnetoresistance effect

E.g. using ferromagnetic layers separated by electrically insulating layer. Includes magnetic tunnel junction or tunnelling magneto-resistance MRAM devices.

TMR, spin tunnel transistor, tunnel junction, MJT

U14-A04X

Memories with core stores

Includes ring shaped ferrite cores.

U14-A05

Associative memories

Includes content addressable memory.

CAM

U14-A06

(Semi-)permanent (non-volatile) ROM

U14-A06A* [1983-1986]

Electrically alterable semiconductor stores

*This code is now discontinued, but remains searchable and valid for records from 1983 to 1986. From 1987 see U14-A03B7.

U14-A06B [1983]

Non-reprogrammable stores (fixed-program memory)

Includes one-time programmable or 'one shot' EPROMS (without guard window to allow UV erasure).

OTP

U14-A06B1 [1987]

Non-reprogrammable memories using diodes or fuses

Includes PROM based on e.g. bipolar transistors (ECL or Schottky TTL) which are programmed by blowing fusible links.

Zener-zap

U14-A06B5 [1987]

Mask programmable, ion implantation programmable ROM

Includes ROM custom programmed during manufacture, obtained both with bipolar or MOS technology, by using e.g. contact window method, diffusion layer method, or ion implantation. For details of manufacture, see appropriate codes in U11 and for structure see also U13-D codes and/or U13-C04A.

U14-A06C [1987]

Non-electrically (e.g. UV) erasable ROM

Includes EPROM which can be programmed by user. See also U13-C04A and/or, prior to 1992, U13-C04B, U14-A03B7, as appropriate.

U14-A06X [1987]

Other non-volatile memories

U14-A07

Reading/writing

Includes data-in/data-out (I/O) control circuits, I/O signal interface, bit line control e.g. precharge and equalisation circuitry, voltage boosters, clocking circuits for read/write operations, safety circuits to prevent inadvertent reading/writing, initialisation circuits. Prior to 1992, some aspects regarding circuitry for reading/writing were covered by U14-A20.

U14-A07A [1983]

Reading, sensing circuits

Includes reading methods, sense amplifiers and associated circuitry e.g. sense reference voltage generator, charge pump circuits for providing current to sense amplifiers.

U14-A07B [1992]

Programming, erasing circuits

Includes voltage boosters for e.g. erasing/programming EEPROMs.

U14-A07C [1997]

Clocking circuits, synchronisation

(U14-A07)

General aspects of digital circuit synchronisation are covered by U22-H.

Time skewing

U14-A08

Address selection; Transmission of information between stores

For shift aspects of FIFO stores see U14-A01X also. Includes address, decoders and associated circuits, word line control circuits, timing circuits for address selection, two dimensional and multiplexed addressing. Prior to 1992 some aspects regarding circuitry for addressing were covered by U14-A20.

U14-A08A [1983]

Address-selection

Includes e.g. page mode and static column mode operation, chip selection circuitry.

Row address strobe, RAS, column address strobe, CAS

U14-A08B [1983]

Transmission of information between stores

Serial transmission, cache memory

U14-A08B1 [1992]

Multiport memories

Includes both random access memories and sequential memories (for the latter see also U14-A01X). Prior to 1992, first in-first out aspects are covered by U14-A08 and, for shift stores, by U14-A01X.

FIFO, dual port RAM, dual port burst access memory, BAM

U14-A09 [1992]

Power supply for memories

(U14-A20)

Includes power back-up and data preservation aspects.

U14-A10 [1992]

Packages for memories

(U14-A20)

For specific aspects of packaging see appropriate subclasses in U11-D, U11-E. Includes special adaptations e.g. small battery provided inside package.

U14-A11 [1992]
Software error prevention modifications
(U14-A20)
Includes e.g. method to prevent errors introduced by radiation (see also U11-D01C2 for package adaptations).

U14-A20
Other memory circuits

U14-B
Electric analogue stores
Sample-and-hold arrangements are coded in U21-B03.
Analogue memory

U14-B01
Multilevel memory
Includes digital memory functionality with cells holding more than two voltage levels (not strictly digital)

U14-B02 [2002]
With elements simulating neuronal cells
For complex neuronal configurations see T01-E05B and/or T02-A04A5.

U14-C
General layout aspects regarding memories; Interconnection arrangements
Core, matrix, plate, unit, frame

U14-C01 [1992]
Interconnecting storage elements
(U14-A20)
Include power/signal transmission line layout relating to bit and word lines. See also appropriate codes in U11-C05, U11-D03, U11-G.
Open bit line architecture, folded bit line architecture

U14-D
Checking store operation, redundancy

U14-D01 [1987]
Memory built-in self test, redundancy
Includes detecting defective memory elements and replacing them with redundant memory elements.

U14-D01A [1987]
Redundant arrangements, fuses
Includes redundant memory cells used to replace defective cells of main memory array and associated techniques e.g. cutting the fuse with laser beam.

U14-D01B [1997]
Testing memory operation using internal circuit
(U14-D01)
Self-test, built-in circuit

U14-D02 [1987]
Testing memory using error correction codes
Includes two dimensional codes e.g. Hamming codes, horizontal and vertical parity, BCH codes and multidimensional codes.

U14-D03 [1987]
Testing memory using external circuit or apparatus
E.g. for testing bubble memories.

U14-D09 [1987]
Other memory testing aspects

U14-E
Thermoelectric/magnetic devices
Peltier effect, Seebeck effect

U14-E01 [1987]
Radiation pyroelectric detector
Includes image sensors. See also S03-A03 and S03-A01B codes.

U14-E01A [1992]
Pyroelectric device characterised by material
(U11-A02, U14-E)
For pyroelectric materials see also U11-A02.

U14-E01B [1992]
Structure of pyroelectric device
See also S03-A03 for pyrometry in general.
Dielectric bolometer, pyroelectric sensor

U14-E01C [1992]
Pyroelectric device manufacture

U14-E02 [1992]
Thermomagnetic devices
(U14-E)
Includes devices using Nernst-Ettinghausen effect. Covers manufacture.

U14-E05 [1987]
Power generation, cooling, temperature sensors
Includes devices with junction of dissimilar materials exhibiting Seebeck, Peltier effect.

U14-E05A	[1992]
Characterised by function of thermoelectric device	
U14-E05A1	[1992]
Power generating thermoelectric device	
<i>Thermopiles</i>	
U14-E05A2	[1992]
Heat extracting thermoelectric devices	
<i>Heat pumps, cooling, Peltier, electrocaloric effect, thin film perovskite PZT</i>	
U14-E05A3	[1992]
Thermoelectric sensors	
(U14-E09)	
See also S03-B01A.	
<i>Thermocouple</i>	
U14-E05B	[1992]
Thermoelectric device characterised by material	
(U14-E)	
<i>Bismuth telluride (with antimony)</i>	
U14-E05C	[1992]
Thermoelectric device manufacture	
U14-E09	[1987]
Other aspects regarding thermoelectric devices	
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U14-F	
Superconductive devices	
<i>Josephson</i>	
U14-F01	[1992]
Materials for superconductive devices	
Includes novel compositions (chemical and crystalline structures), and their manufacture and processing to improve characteristics, (e.g. grinding, mixing, pressing, sintering etc.). Materials, devices and equipment specifically for heavy/power electrical use are covered by X12-C05, X11-H05, X12-D06 codes. Materials for unspecified uses are covered by U14 and X12-D06B codes. For testing aspects see also U11-F01 codes.	
U14-F01A	[1992]
Superconductive metal alloys and their manufacture	
U14-F01A1	[1992]
Superconductive alloy manufacture and processing	

U14-F01A5	[1992]
Novel superconductive metal alloys	
U14-F01B	[1992]
Non-metal superconductive materials and their manufacture	
U14-F01B1	[1992]
Manufacture and processing of ceramic superconductive materials	
<i>Milling, mixing, calcination, sintering, cold/hot pressing</i>	
U14-F01B5	[1992]
Superconductive oxide novel materials	
U14-F01B7	[1997]
Other superconductive materials	
(U14-F01B)	
For materials not covered by U14-F01A5 and U14-F01B5, e.g. for superconductive organic material.	
U14-F02	[1992]
Superconductive device, circuits	
These codes imply use of oxide materials unless specified by presence of U14-F02H code.	
U14-F02A	[1992]
Superconductive thin/thick film	
Includes deposition, patterning, metallurgical details, patterned layers. For techniques of deposition or etching see also U11-C05C codes U11-C01 or U11-C07 codes, for apparatus see also U11-C09 codes. See also U14-H02 for thick film.	
U14-F02B	[1992]
Superconductive devices	
For manufacture of complete device see also U11-C18B9; for specific aspects e.g. electrode manufacture, see also U11 codes e.g. U11-C05F6. For superconductive FET see also U12-D01A9.	
<i>Josephson tunnel junction, SQUID</i>	
U14-F02C	[1992]
Circuits using superconductive devices	
(U21-A03G, U21-C01X)	
For logic circuits see also U21-C01F. For analogue to digital converters using superconductive elements see U21-A03G.	

U14-F02H	[1992]
Superconductive devices, circuits using metal alloys	
This code is used in conjunction with U14-F02 codes to indicate use of alloy material rather than oxide for particular circuit, device.	
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U14-G	
Acoustic wave devices	
For surface acoustic wave generator, see also V06-V01E1. For acoustic charge transport device using SAW see also U13-A02A.	
<i>Elastic, surface, SAW</i>	
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U14-H	
Film and hybrid circuits, multilayer substrates, IC chip mounting	
See V04-R also for details applicable to PCB manufacture.	
U14-H01	
Thin film	
U14-H01A	[1987]
Thin film two dimensional arrays e.g. for memories, LCDs, ELDs	
Used for layout and manufacturing aspects. Use U12-B03A for semiconductor physics, material and heterostructure details. For LCD see also U14-K01A2 codes; for electroluminescent displays see also U14-J codes.	
<i>Display, matrix</i>	
U14-H01B	[1987]
Thin film transducers, printers, line image sensors	
For facsimile applications see S06-D05 also. Used for sensor arrays not having sufficient semiconductor body details for inclusion in U12-A02B. For thermal printer heads/materials see S06-H03 or for thermal ink jet printer see S06-G01. Does not include thin film magnetic heads, for which see T03-A03E.	
U14-H01C	[1987]
Thin film circuits, amplifiers, filters	
For thin film capacitors, resistors with emphasis on semiconductor body see U12-B03B and U12-C02 or U12-C03 as appropriate.	
U14-H01D	[1987]
Thin film packages, interconnections	
See also U11-D codes.	

U14-H01E	[1987]
Thin film transparent conductive layers	
See U11-C18D also for sputtered optical layers. Includes pixel/colour filters, lithography, and general imager-display use.	
<i>Indium tin oxide, ITO, lead oxide, zinc oxide</i>	
U14-H01E1	[2015]
Transparent conductive oxides	
Includes indium tin oxide (ITO), zinc oxide compounds etc.	
U14-H01E2	[2015]
Transparent conducting polymers	
Includes polythiophenes, e.g. Poly(3,4-ethylenedioxythiophene) (PEDOT), Poly(4,4-dioctylcyclopentadithiophene) etc.	
U14-H01E3	[2015]
Metal compositions	
Includes metal halides, such as silver halide, copper iodine. Can be used in conjunction with U14-H01E1 for example film containing indium oxide (ITO) and copper iodide.	
U14-H01E4	[2015]
Nanowire transparent conductive films	
Includes use of carbon, silver or copper nanowires or nanotubes or nano-particles as transparent conductive films.	
U14-H01E5	[2015]
Mesh structured films	
Includes copper mesh, silver mesh, metal mesh PET	
U14-H01F	[1987]
General thin film layer details	
Includes e.g. insulating, conductive, lithography, multi-layer structures (e.g. for chip-carrier boards), using thin-film deposition (see also U11-C and U11-D codes).	
U14-H02	
Thick film	
For material composition of thick films see U11-A05 codes.	
U14-H03	
Hybrid circuits	
From 2009 IC chip mountings have been transferred to U14-H05. See also V04-R and V04-Q codes.	

U14-H03A* [1987-2008]
Mountings for unpackaged IC chips onto substrate (ceramic, polymer, dielectric)

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes.

U14-H03A1* [1987-2008]
Un-encapsulated IC chip mounting arrangement (ceramic, multilayer ceramic, polymer, semiconductor substrate)

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. Used for chip carrier which implies subsequent encapsulation of device once mounted (for encapsulation see U14-H03A3). See also U11-D01 for package details. For general chip carrier substrate aspects see U11-D01A. For high density multilayer interconnect see U14-H03A4. Multilayer ceramic boards are also covered by U14-H03B for structure/material, and by U14-H04A3 for manufacture.

U14-H03A2* [1987-2008]
Other chip to substrate connection

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. For solder preforms see also U11-D03A9 (semiconductor mountings and terminals). Prior to 1992 this code included flip chip technology, (from 1992 see U11-E01C).

U14-H03A3* [1987-2008]
Encapsulation details for individual chip mounted on substrate

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. For general aspects regarding multi-chip module, see U11-D01A6 or, for hybrid circuit packages see U14-H03C3.

U14-H03A4* [1987-2008]
Interconnections between several chips on substrate

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. Includes use of e.g. wire bonding between chips on same substrate (which may also include semiconductor, e.g. silicon). Covers Advanced VLSI packaging, high density interconnect. Also includes optical contactless connection for communication between chips (see also U11-D03C3). *AVP, HDI, high density multi-chip interconnect, HDM*

U14-H03A4A* [1992-2008]
Thick film modules using e.g. ceramic dielectric
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. See also relevant codes in U11 class, e.g. U11-D03B9, U11-D03C3 and/or other relevant codes in U14 class, e.g. U14-H03A1, U14-H02, U14-H03B, U14-H04A3.

U14-H03A4B* [1992-2008]
Thin film modules using e.g. polymer dielectric
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. See also relevant codes in U11 class e.g. U11-C05A, U11-C05D2, U11-C05D3, U11-D03B9, U11-D03C3 and/or relevant codes in U14 class, e.g. U14-H01D, U14-H01F, U14-H03A1.
Polyimide thermoset, KAPTON

U14-H03B* [1987-2008]
Multilayer ceramic wiring boards
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. For chip carriers see also U11-D01A, for un-encapsulated IC mountings see also U14-H03A1. For high density multilayer interconnect see U14-H03A4.

U14-H03B1* [1987-2008]
Details of materials/structures for multilayer ceramic substrates

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes.

U14-H03B2* [1987-2008]
Other details associated with chip mounted on multilayer ceramic substrate

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. Includes e.g. recess to facilitate enclosure of chip, terminals, capacitors included in the multilayer board (see also U11-D03C1) etc.

U14-H03C* [1987-2008]
Hybrid circuits (general)

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03G. Includes substrates not covered elsewhere in U14-H03. See also U11-A05B for material aspects, and U11-D01A for chip carrier.
Aluminium nitride, silicon carbide

U14-H03C1*	[1987-2008]
Alignment of chips in array	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. E.g. for line image sensor, facsimile, photoelectric reader.	
<i>Facsimile, reader, photoelectric</i>	
U14-H03C2*	[1987-2008]
Analogue circuitry - transistor and transmission line details	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. See W02-A also for microstrip/stripline circuitry.	
<i>Triplate</i>	
U14-H03C2A*	[1997-2008]
High frequency integrated circuits (U14-H03C2)	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see code U14-H03H for high frequency circuits. Includes monolithic microwave integrated circuits. For package aspects see U11-D01A4. For integrated circuit structures see also U13-D codes.	
<i>MMIC</i>	
U14-H03C3*	[1987-2008]
Hybrid circuit packages and terminals	
*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H03D to U14-H03H codes. For multi-chip modules see also U11-D01A6.	
<i>Lead, Pin</i>	
U14-H03D	[2009]
Hybrid circuits using thick films	
U14-H03E	[2009]
Hybrid circuits using thin films	
U14-H03F	[2009]
Substrates for hybrid circuits	
U14-H03F1	[2009]
Ceramic substrates	
Includes any details of ceramic substrates to do with hybrid circuits.	

U14-H03F2	[2009]
Other substrates types	
Includes all substrates other than ceramic substrates associated with hybrid circuits.	
U14-H03G	[2009]
Hybrid circuits(general)	
Covers general hybrid circuit aspects that are not covered in above H03 codes. Replaces retired code, H03C.	
U14-H03H	[2009]
High frequency integrated circuits (U14-H03C2A)	
Covers all high frequency integrated circuits. Includes high frequency ICs for RFID tags and other RF devices.	
<i>MMIC, RFID</i>	
U14-H04	
Hybrid and thick film circuit manufacture	
U14-H04A	[1983]
Film and substrate processing for hybrid circuits	
U14-H04A1	[1987]
Screen printing; Thick film layer processing	
Includes ceramic 'wafer' dicing.	
<i>Squeegee, print, bake</i>	
U14-H04A2	[1987]
Electroplating, vapour beam deposition, sputtering processes to apply conductive layers to ceramic or hybrid substrates	
For metallurgical aspects regarding conductor patterns on ceramic substrate see also U11-D03B3.	
U14-H04A3	[1987]
Ceramic circuit board manufacture (For hybrid circuits only)	
U14-H04A4	[2009]
Trimming of thin/thick film components (U14-H04B3B)	
U14-H04A9	[1987]
Other hybrid circuit manufacturing aspects	
U14-H04B	[1983]
Hybrid circuit assembling	
Includes all aspects of hybrid circuit assembling and manufacture, previously coded before 2009 in U14-H04B1 to U14-H04B9.	

U14-H04B1* [1987-2008]

Hybrid circuit packaging

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H04B which now includes all aspects of hybrid circuit assembling and manufacture. Coating with resin, sealing package.

U14-H04B2* [1987-2008]

Applying terminals for hybrid circuits

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H04B which now includes all aspects of hybrid circuit assembling and manufacture. Includes e.g. connector for hybrid circuit (see also V04-K02 and V04-B01).

U14-H04B3* [1987-2008]

Mounting components onto substrate; Trimming of layer components

*This code is now discontinued, but remains searchable and valid for records from 1987 to 2008. From 2009 see U14-H04B which now includes all aspects of hybrid circuit assembling and manufacture.

U14-H04B3A* [1992-2008]

Bonding, mounting components on hybrid circuit substrate

*This code is now discontinued, but remains searchable and valid for records from 1992 to 2008. From 2009 see U14-H04B which now includes all aspects of hybrid circuit assembling and manufacture.

U14-H04B3B* [1992-2008]

Trimming of thin/thick film components

*This code is now discontinued, but remains searchable and valid for records from 1992 to 2008. From 2009 see U14-H04A4.

U14-H04B9* [1992-2008]

Other hybrid circuit assembling aspects

*This code is now discontinued, but remains searchable and valid for records from 1992 to 2008. From 2009 see U14-H04B which now includes all aspects of hybrid circuit assembling and manufacture. Includes e.g. demounting defective components in multi-chip modules (see also U11-E02B). For testing aspects see also U11-F01F.

U14-H05 [2009]

Hybrid circuit package and/or terminal arrangements

(U14-H03)

Includes mountings of chips on substrates, leads, terminals, sockets, holders and packaging.

U14-J

Electroluminescent light sources

For electroluminescent materials see U11-A15. See also X26-J only if device is used for illumination purposes. Excludes devices covered by U12-A01.

U14-J01 [1992]

Electroluminescent source manufacture

U14-J01A [2005]

Manufacture for electroluminescent displays

Includes all methods of manufacture for electroluminescent displays.

U14-J01B [2005]

Equipment for manufacture of electroluminescent devices or displays

Includes all equipment for both electroluminescent devices or displays.

U14-J02 [1992]

Electroluminescent display structure

ELD

U14-J02A [1992]

With electrode details of electroluminescent display

For thin film transparent conductive layer on glass substrate see also U14-H01E. From 2002 use with U14-J02D codes to indicate material aspects of structure.

Indium tin oxide, ITO

U14-J02B [1992]

Module details and sealing arrangements of electroluminescent display

Includes connections to external electrodes or PCBs.

U14-J02C [2005]

EL display optical components

For complete filter manufacture see also U11-C18D.

U14-J02D [2002]

Inorganic/organic electroluminescent displays

U14-J02D1 [2002]

Inorganic electroluminescent displays

U14-J02D2	[2002]
Organic or polymeric electroluminescent displays	
Includes structures with polymeric and organometallic complexes.	
U14-J02E	[2005]
Switching elements for active matrix electroluminescent displays	
Includes two and three terminal switching arrays	
U14-J03	[1992]
Circuits and drivers for electroluminescent devices	
From 2002 use with U14-J02D codes to indicate material aspects of structure.	
U14-J03A	[2007]
Circuits and drivers for electroluminescent displays	
U14-J03B	[2007]
Circuits and drivers for other electroluminescent devices	
U14-J04	[2005]
Testing aspects of Electroluminescent displays	
Testing for active matrix see also U11-F01F and U11-F01D codes. For module testing see also S01-G01A3 and V04-Q02A2.	
U14-J05	[2007]
Electroluminescent device structure	
For electroluminescent devices other than displays.	
U14-J05A	[2007]
Electrode details for electroluminescent devices	
U14-J05B	[2007]
Module/Package details and sealing arrangements of electroluminescent devices	
U14-J05C	[2007]
Optical elements for electroluminescent devices	
U14-J05D1	[2007]
Inorganic electroluminescent device	
U14-J05D2	[2007]
Organic electroluminescent device	

U14-K	
Passive displays	
Refers to displays modifying light generated elsewhere.	
U14-K01	[1983]
Liquid crystal displays	
For materials see U11-A03A, V07-K10A. For light valves, shutters, light spatial modulator see V07-K01A2. Testing aspects of active matrix are also covered by U11-F01F. For storage effect see U14-A02A.	
<i>LCD</i>	
U14-K01A	[1983]
Cells, constructional details, and circuits of LCD	
U14-K01A1	[1987]
Transparent conductive films, alignment layers, spacers of LCD	
U14-K01A1A	[1992]
LCD alignment layer	
(U11-A09, U14-K01A1)	
Includes films and materials used for alignment, cloths for rubbing the alignment coating, etc.	
<i>Orientation</i>	
U14-K01A1B	[1992]
Transparent conductive films, and electrodes of LCD	
Includes electrode details for passive LCD, i.e. with parallel conductive tracks. See also U14-H01E for transparent conductive film.	
U14-K01A1C	[1992]
LCD optical components	
Includes filters, polarisers, phase retarders. For complete filter manufacture see also U11-C18D.	
U14-K01A1D	[1992]
Spacers used in LCD	
(U14-K01A, U14-K01A2)	
U14-K01A1G	[1992]
Characterised by specific electro- or magneto-optical effect of LC material	
Includes field induced birefringence, guest-host effect, dynamic scattering, etc. For optical addressing (thermally induced phase transitions) see V07-K01A2.	
<i>Field induced phase change, cholesteric, twisted nematic, orientation, plechroic dye</i>	

U14-K01A1J [1992]

LCD manufacture

(U14-K01, U14-K01A)

Include e.g. filling the cell with LC material. For manufacture of switching elements for driving active matrix see U14-K01A2 codes.

U14-K01A1K [2005]

Equipment for manufacture of LCDs

Includes all equipment for manufacture of LCD, including substrate handling equipment, etching, lithography etc. See also U11 codes for individual processes and equipment.

U14-K01A1L [2007]

LCD repair and correction

See also U14-K01A8 for LCD testing aspects.

U14-K01A2 [1987]

Other constructional details, coating, and optical layers of LCD

Includes manufacture and structural details regarding switching elements for driving active matrix display. Also covers antireflective coatings.

U14-K01A2A [1992]

For two terminal switching elements of LCD

Includes diodes, MIM elements, varistors. For thin film aspects see also U14-H01A. See also other appropriate codes in U11 and U12 e.g. U11-C05G1, U11-C18B1, U12-C01, U12-C03.

U14-K01A2B [1992]

For three terminal switching elements of LCD

Includes thin film transistor (TFT) aspects. See also U14-H01A and where appropriate, U11-C18A1, U12-B03A, U12-D02A.

U14-K01A2C [1997]

Plasma addressed LCD

(U14-K01A2, U14-K01A1B)

See also V05-A01A7.

U14-K01A2D [1997]

LC cells integral with photoconducting, ferroelectric layer

Prior to 1997 see also U14-K01A1G, V07-K01A, V07-K05.

U14-K01A2E [2007]

Coatings for LCD

Covers all protective coatings, includes anti-reflective films coating for LCDs

U14-K01A3 [1987]

Circuits, drivers of LCD

Includes mainly drive circuitry integral with LCD or circuitry which depends on specific characteristics of LCD., e.g. feedback control for detection of ambient light and control of light valve. More general aspects of drive circuitry are covered by T04-H03C2 or W03-A08B codes. See also under application.

U14-K01A4 [1987]

LCD associated with mountings, PCB connectors.

Module details

Includes back-lighting aspects (see also W05-E05B).

U14-K01A4A [1997]

Modular details of LCD

(U14-K01A4)

Includes sealing aspects.

U14-K01A4B [1997]

Connections of LCD to external electrodes or PCB

(U14-K01A4)

See also V04 codes. Includes connections from electrodes to cell terminals.

U14-K01A4C [1997]

LCD illumination arrangements

(U14-K01A4)

Includes internal and reflection type LCD illumination. From 2007, also see X26-U04A1 for backlighting and backlight circuitry including ambient environment detection and feedback control. See W05-E05B1 and relevant X26 codes prior to 2007.

U14-K01A5 [1997]

LCD substrate details

(U14-K01A, U14-K01A2)

For production and processing aspects of substrate. See U11 codes also. For active matrix aspects see U14-K01A2 codes.

Glass

U14-K01A8 [1997]

Testing aspects of LCD

(U14-K01A)

For testing of liquid crystal materials see also S02-J04A3; for active matrix testing see also S02-J04A3A and U11-F01F and/or U11-F01D codes. For module testing see also S01-G01A3 and V04-Q02A2.

Probe

U14-K02 [1992]

Electrochromic displays

(U14-K09)

For building and vehicle windows using electrochromic layers see X25-U01 and X22-J codes respectively.

U14-K02A [1992]

Constructional details and manufacture of electrochromic display

(U14-K09)

U14-K02A1 [1997]

Structural arrangements for electrochromic display

(U14-K02A)

Includes spacers, gaskets, electrodes.

U14-K02A2 [1997]

Electrochromic display manufacture

(U14-K02A)

For materials see U11-A03C only.

U14-K02B [1992]

Circuits, drivers of electrochromic display

(U14-K09)

U14-K03 [1992]

Electrophoretic displays

(U14-K09)

Includes materials, constructional details. For electrostatic ball displays see appropriate W05-E08 codes.

U14-K03A [2005]

Constructional details and manufacture of electrophoretic displays

U14-K03A1 [2005]

Structural arrangements for electrophoretic displays

U14-K03A2 [2005]

Electrophoretic display manufacture

U14-K03B [2005]

Circuits, drivers of electrophoretic displays

U14-K04 [1992]

Electro-optic displays based on ceramics or electro-optical crystal exhibiting Kerr or Pockells effect

(U14-K09)

For optical shutters see V07-G15 and V07-K01A.

PLZT

U14-K05 [2014]

Electrowetting displays

Includes manufacture, structure, drive circuits etc.

U14-K09 [1983]

Other passive displays

Includes electronic paper, can be used in conjunction with any other U14-K codes. For electronic paper in general see also W05-E10.

Magnetophoretic

U14-L [2021]

Non-display switchable glass panels

Includes electronic switching glass panels used for non-display purposes, e.g. for privacy, or light dimming in places such as building windows, privacy screens, vehicle windows, dimming mirrors etc.

Smart glass, Electrolytic PDLC Film, Electrochromic glass, LCD Glass

U21: Logic Circuits, Electronic Switching and Coding

U21-A

Coding, decoding

Encode, compress, predict

U21-A01* [1980-1991]

Pulse code modulation

*This code is discontinued from 1992. In addition to U21 codes, inventions involving PCM may be assigned the following codes depending on applications and their precise nature:

- (1) W02-C06 for general transmission systems using PCM
- (2) W02-F07 codes for PCM TV transmission systems
- (3) S06-K07A4D for facsimile coding and compression
- (4) W04-F01F codes for video recording using compression coding
- (5) W04-G01F for audio signal recording coding and compression
- (6) W04-P01A codes for video signal coding
- (7) W04-V05G codes for speech signal coding
- (8) W04-V10 codes for coding of audio signals in general

U21-A02

D/A conversion

Search with U21-A04A for sigma-delta type.

U21-A02A [1987]

Digital-to-analogue converters

DAC

U21-A02A1 [1992]

Binary-weighted D/A converters

Weighted resistor

U21-A02A2 [1992]

Ladder-type D/A converters

R-2R ladder

U21-A02A3 [1992]

D/A converters with intermediate conversion to time or frequency of pulses

U21-A02A4 [2006]

Resistor string

U21-A02A5 [2007]

Switched capacitor D/A converters

U21-A02A9 [1992]

Other D/A converters

Includes e.g. multiplying D/A converter.

U21-A02B [1987]

Broader system details, testing of D/A converters

U21-A02B1 [1997]

Broader system details

(U21-A02B)

U21-A02B1A [2005]

Input/output circuitry

U21-A02B1B [2006]

Voltage reference circuits

Also see relevant U24 codes for novel voltage reference circuits.

U21-A02B1C [2005]

Clock arrangements

U21-A02B1X [2005]

Other details

U21-A02B2 [1997]

Testing and calibrating

(U21-A02B, U21-A03F1)

Prior to 1997 testing and calibrating for DAC was covered by U21-A02B and U21-A03F1.

DC offset, auto-zero

U21-A02B3* [1997-2004]

Noise reduction and error correction

(U21-A02B, U21-A03F3)

*This code is now discontinued and from 2005 noise reduction and error correction for DACs is covered by U21-A02B7G. Prior to 1997 noise reduction for DAC was covered by U21-A02B and U21-A03F3.

U21-A02B7 [2005]

Improvements to DA converter performance

U21-A02B7A [2005]

Increased resolution

U21-A02B7C [2005]

Increased conversion speed

U21-A02B7E [2005]

Increased range

Covers increase in number of bits or other change in representation of data, or on analog side by increasing dynamic range, output voltage swing, etc.

U21-A02B7G	[2005]
Noise reduction and error correction	
U21-A02B7J	[2006]
Reducing power consumption	
U21-A02B7L	[2006]
Size reduction	
U21-A02B7N	[2012]
Increased accuracy or precision	
Prior to 2012 see U21-A02B7G or U21-A02B7X depending on emphasis.	
U21-A02B7X	[2005]
Other DA converter performance improvement	
U21-A03	
A/D conversion	
Search with U21-A04A for sigma-delta type.	
ADC	
U21-A03A	
A/D converters with conversion to duration/frequency	
Includes counter ramp (counting) converter when type of conversion is emphasised, otherwise coded in U21-A03B as a converter with feedback. Also includes integrating type e.g. dual slope or ratiometric converter. Search U21-A03X also prior to 1983.	
<i>Tracking, servo converter</i>	
U21-A03B	
A/D converters using D/A converter (feedback type)	
Includes successive approximation type.	
<i>SAR, serial comparator</i>	
U21-A03B1	[2006]
SAR	
Successive approximation type converters.	
U21-A03B3	[2006]
Pipeline	
U21-A03B5	[2007]
Switched capacitor A/D converters	
U21-A03B9	[2006]
Other feedback types	

U21-A03C	[1987]
Flash A/D converters	
<i>Parallel comparator, simultaneous ADC</i>	
U21-A03E	[1987]
Interpolating A/D converters, hybrid arrangements combining different converters	
Includes serial-parallel type (see also U21-A03B).	
U21-A03F	[1987]
Testing and calibrating, broader system details	
U21-A03F1	[1992]
Testing and calibrating	
<i>DC offset, auto-zero</i>	
U21-A03F3*	[1992-2004]
Noise reduction and error correction	
*This code is now discontinued and from 2005 noise reduction and error correction for ADCs is covered by U21-A03F7G.	
U21-A03F5	[1992]
Broader system details	
U21-A03F5A	[2005]
Input/output circuitry	
Includes scaling and gain control arrangements, see U24-C codes for novel amplifier/gain control aspects.	
U21-A03F5B	[2006]
Voltage reference circuits	
U21-A03F5C	[2005]
Clock arrangements	
U21-A03F5X	[2005]
Other details	
U21-A03F6	[2005]
Sampling	
This code covers sampling arrangements and wider sampling aspects. See U21-B03 for novel sample and hold arrangements and U21-A04A for sigma delta converters.	
U21-A03F6A	[2005]
Novel sampling circuit	
This code covers all novel sampling arrangements. See other U21-A03F6 codes for sampling function aspect.	
U21-A03F6B	[2005]
Oversampling	

U21-A03F6C	[2005]
Undersampling	
U21-A03F6D	[2005]
Sample modification	
Modification of digital samples in DSP is covered by U22-G03B1 codes ('Re-sampling').	
U21-A03F6X	[2005]
Other sampling functions	
U21-A03F7	[2005]
Improvements to AD converter performance	
U21-A03F7A	[2005]
Increased resolution	
U21-A03F7C	[2005]
Increased conversion speed	
U21-A03F7E	[2005]
Increased range	
U21-A03F7G	[2005]
Noise reduction and error correction	
U21-A03F7J	[2006]
Reducing power consumption	
U21-A03F7L	[2006]
Size reduction	
U21-A03F7N	[2012]
Increased accuracy or precision	
Prior to 2012 see U21-A03F7G or U21-A03F7X depending on emphasis.	
U21-A03F7X	[2005]
Other AD converter performance improvement	
U21-A03G	[1987]
A/D converters implemented using other technology	
Includes use of e.g. SAW, optical, Josephson junction devices (for superconductive devices, circuits, see also U14-F02 codes).	
U21-A03H	[1992]
Reversible converters	
(U21-A02B, U21-A03F)	

U21-A03J	[1992]
Position encoders	
(U21-A03X)	
For absolute encoders for which displacement directly generates unique digital value U21-A03J5 is assigned with other U21-A03J codes as appropriate. See also S02-K03	
U21-A03J1	[1992]
Optical position encoders	
(U21-A03X)	
<i>Rotary encoders, shaft angle, moire fringes</i>	
U21-A03J2	[1992]
Magnetic or inductive position encoders	
(U21-A03X)	
U21-A03J5	[2002]
Absolute position encoders	
This code is assigned with other U21-A03J codes as appropriate, depending on technology, and refers to encoders with a unique relation between position and output code. Such types were indicated by the additional assignment of W05-D01 codes (now discontinued) prior to 2002.	
<i>Gray code, disc, scale, track.</i>	
U21-A03J9	[1992]
Other types of position encoders	
(U21-A03X)	
Includes electric type e.g. capacitive, brush arrangements.	
<i>Wiping contact, potentiometer</i>	
U21-A03X	
Other aspects of A/D conversion	
U21-A04	
Delta and differential modulation	
For testing aspects see also U21-A03F1.	
U21-A04A	[1992]
Delta-sigma converters	
Includes oversampled converter architectures. Where sampling is novel see U21-A03F6 and also see U21-A02/A03 codes as appropriate.	
<i>Sigma-delta, continuously variable slope delta, CVSD, delta modulator, oversampling</i>	
U21-A04B	[1992]
Differential modulation	
<i>Adaptive differential PCM, ADPCM</i>	

U21-A05

Code conversion

See W01-A02 also for application of code conversion to data transmission in general. Coding of audio and video signals is not included and is covered by W04-P01A codes (video signals), W04-V05G codes (speech signals) and W04-V10 codes (audio signals in general). Coding for error detection and correction in general is covered by U21-A06 codes.

Bit structure, character interval, format, mapping, recoding

U21-A05A

Static code converters

U21-A05A1 [1987]

Parallel code conversion. Conversion to or from (non-) weighted or stochastic codes

Includes decimal code, binary coded decimal code, conversion from or to n out of m codes, to or from one out of m codes, conversion to or from floating point codes, conversion to or from Gray codes.

BCD

U21-A05A2 [1987]

Compression, expansion, suppression of redundancy

This code is used in a general way to represent 'coding', e.g. for data compression. It is assigned alone or in conjunction with other codes - e.g. for audio or video coding, or coding for data transmission - if U21-A05A2 codes can highlight additional detail e.g. if using U21-A05A2A enables 'variable length coding' to be highlighted. When specific codes exist for the type of coding involved in an invention and U21-A05A2 codes do not provide additional focus, they are not assigned. Specific codes for particular coding applications are : S06-K07A4D for document imaging and copying; T01-D02 for computer data coding; T01-J10D for image compression; T03-P01B for compression of recorded data; W01-A02A for data transmission; W04-F01F for video signal recording coding, W04-G01F for audio signal recording coding, W04-P01A codes for video signal coding, W04-V05G for speech coding; W04-V10 for general audio coding.

U21-A05A2A [1992]

Conversion to or from variable length codes

Shannon-Fano code, Huffman code, Morse code

U21-A05A2B [1992]

Conversion to or from run length codes

U21-A05B [1987]

Parallel/series and series/parallel conversion

Series-in parallel-out register, SIPO, series-in series-out register, SISO, parallel-in series-out register, PISO, serial-parallel, parallel-serial

U21-A05C [1987]

Series transmission code. Manchester, biphase level coding

Includes conversion to or from representation by three or more level pulses.

NRZ

U21-A05D [1987]

Coding associated with computer keyboard or printers. Language scripts

For key scanning and coding aspects see also T04-F01A5. For keyboard interfacing see also T01-C codes.

U21-A05D1 [1987]

Language script coding techniques

Includes coding for dealing with e.g. Chinese, Arabic characters. Search with W01-C01B8M for application to coding for telephone keys.

Kanji, Kana, Arabic characters

U21-A06

Error detection and correction

U21-A06 codes are assigned for error detection/correction in general, and to provide specific details of error correction coding in conjunction with codes in other classes, such as with T03-P01A for data recording error correction. For applications specific to telecommunications alone, W01-A01B codes are applied instead.

U21-A06A [2005]

Using block codes

Covers error detection/correction coding where a predetermined number of check bits are joined to a predetermined number of information bits.

U21-A06A1 [2005]

Cyclic redundancy check

U21-A06A2 [2005]

Parity bit

U21-A06A3 [2005]

Hamming codes

U21-A06A4 [2005]

Reed Solomon coding

U21-A06A9 [2005]

Other block codes

U21-A06C [2005]

Using convolutional codes

Covers error detection/correction coding where the coded sequence is algorithmically achieved through the use of current data bits plus some of the previous data bits from the incoming stream.

U21-A06C1 [2005]

Viterbi coding

U21-A06C2 [2005]

Turbo coding

U21-A06C3 [2005]

Trellis coding

U21-A06C9 [2005]

Other convolutional codes

U21-A06E [2005]

Using Interleaving techniques

Covers error detection/correction arrangements where the data structure is re-organised to reduce errors.

U21-A06G [2006]

Using multiple coding techniques

This code covers error correction/detection using either multiple (two or more) block or convolutional codes or a combination of block and convolutional. The coding types of the combination are applied in addition to this code. Please note, this code is only applied where the combination is the novel aspect and not where multiple coding techniques are merely listed as separate possibilities.

U21-A06G1 [2014]

Multiple codes used together

Covers the simultaneous use of two or more error-detecting or error-correcting codes, e.g. either multiple block or multiple convolutional codes or a combination of block and convolutional codes, used together.

U21-A06G5 [2014]

Multiple codes used separately (i.e. one at a time)

Covers the separate use of two or more error-detecting or error-correcting codes, e.g. either multiple block or multiple convolutional codes or a combination of block and convolutional codes, used at different times.

U21-A06X [2005]

Other error detection/correction

U21-B

Electronic switching or gating

Purely mechanical and electromechanical switches using moving metallic contacts are covered in V03 and X13. Note that mechanical details of actuating elements and the like for electronic switches in which part of the switch moves (e.g. as denoted by U21-B02C2) are also covered in V03 (e.g. by V03-B and V03-C codes) when necessary. Electronic switching without any physical movement is covered in U21 only.

U21-B01

Electronic switching or gating characterised by switching device

U21-B01A

Switching using bipolar transistors and diodes

Includes Darlington configuration.

U21-B01A1 [2006]

Switching using IGBTs

U21-B01B

Switching using field effect transistors

U21-B01C

Switching using thyristors, triacs etc.

Note that U21-B02H (novel bi-directional switching arrangements) is not routinely applied with this code for devices such as triacs which are inherently bi-directional.

Gate turn-off, GTO

U21-B01D [1987]

Compound switches (FET/bipolar, thyristor/FET), other semiconductor switches

U21-B01D1 [1992]

Switching using transformer coupling

(U21-B01D)

U21-B01E [1992]

Using optoelectronic devices

(U21-B01X)

Opto-coupler

U21-B01P [2009]

Switching using phase-change devices

(U21-B01X)

This code is intended for electronic switching arrangements using devices with phase-change properties, e.g. based on materials such as chalcogenides. Logic circuits applying this technology are covered by U21-C01P. Phase-change memories are covered by U14-A03H and optical recording materials based on phase-change effects are covered by T03-B01B codes.

Amorphous, chalcogen, crystalline, selenide, sulfide, telluride

U21-B01T [2006]

Using nano-tubes

Other U21-B01 codes are applied where applicable, only electronic switches are coded here, if electromechanical see V03 and if solely optical see V07.

U21-B01X

Other devices

Includes switches using Hall effect devices (when used for proximity switches see U21-B02C), superconductive devices (see U14-F02B also), gas or vacuum tubes, etc.

U21-B02

Circuit details

U21-B02A

Controlling switching point/instant

U21-B02A1 [1987]

Introducing delay before switching using capacitor and transistors

U21-B02A2 [1987]

Introducing delay before switching using digital counter, timer, computer modules

U21-B02A3 [1987]

Providing predetermined threshold before switching and switching at zero-crossing

See U22-D07A for circuits delivering a pulse in response to zero-crossing and U22-A04D5 for comparators in general.

U21-B02B

Affecting states; Power-on resetting

Includes storing actual state of switch when supply voltage fails.

Reset

U21-B02C [1983]

Proximity/touch switches

See T04-F01 also for computer keyboard switches.

U21-B02C1 [1987]

Capacitive/inductive/resistive not requiring displacement of switch element

This code covers 'touch' switches operating without any movement of the switch or switch parts and includes electronic switching aspects of touch screens and the like, which in general are also coded as T04-F02A2. Capacitive, inductive, magnetic or resistive electronic 'touch' switches in which part of the switch moves during operation are covered by U21-B02C2.

U21-B02C2 [1987]

Inductive/capacitive/resistive responding to physical displacement of plate or magnetic flux element

U21-B02C3 [1987]

Using optical or other switching elements

See S03-C08 codes.

Light barrier

U21-B02D [1987]

Accelerating switching speed, reducing power consumption, ensuring fully conductive state, increasing max. current or voltage

(U21-B02X)

Includes also modifications for improving heat dissipation.

U21-B02D1 [1987]

Using series/parallel switches to distribute current/voltage

U21-B02E [1987]

Switch protection

(U21-B02X)

See U24-F for protection of electronic circuits in general.

U21-B02F [1992]

Eliminating interference voltages or currents, or other sources of noise

(U21-B02X)

U21-B02G [1992]

Compensating variations of physical values e.g. temperature

(U21-B02X)

U21-B02H	[2006]
Bidirectional switching	
This code covers novel bi-directional switching arrangements and is not routinely applied for devices such as triacs which are inherently bi-directional	
U21-B02J	[2006]
Switch testing	
U21-B02X	
Other aspects of electronic switching	
U21-B03	
Sample-and-hold arrangements	
U21-B05	[1987]
Applications of electronic switching circuits	
U21-B05A	[1987]
Analogue switching	
<i>Transmission gate, multiplexer/demultiplexer, signal selector</i>	
U21-B05B	[1987]
Very high power/speed switching	
Includes power-pulse techniques.	
U21-B05C	[1987]
Power converters and power switching	
For low and very high power converters see separately U24-D and X12-J codes.	
<i>Semiconductor relay</i>	
U21-B05D	[1987]
Logic	
This code is used to indicate the application of electronic switching to logic circuitry and is applied for novel electronic switching inventions which can be used in logic circuits. Details of logic circuits themselves are covered by U21-C codes which can be assigned in addition to U21-B05D when an electronic switching invention includes specific details of those circuits. In general, since it is understood that logic circuits involve switching, inventions presented as novel logic circuits are not also assigned U21-B codes.	
U21-B05E	[1992]
Signal switching	
(U21-B05X)	
Includes digital telecommunications, multiplexing/demultiplexing aspects, single/multiple switch arrangements. See also W01-B codes.	

U21-B05X	[1987]
Other applications of electronic switching circuits	
Includes computer applications, pulse distributors etc.	
U21-C	
Logic circuits	
U21-C01	
Logic circuits characterised by components	
U21-C01A	
Bipolar transistors and diodes	
U21-C01A1	[1992]
Diode- or resistor-transistor logic	
Includes complementary transistor logic, Schottky transistor logic.	
<i>CTL, STL</i>	
U21-C01A2	[1992]
Emitter coupled logic	
Includes emitter function logic, base coupled logic.	
<i>ECL, EFL, BCL</i>	
U21-C01A3	[1992]
Transistor-transistor logic	
<i>TTL</i>	
U21-C01A4	[1992]
Integrated injection logic	
Includes integrated Schottky logic, static induction logic.	
<i>ISL, STIL, IIL, I2L</i>	
U21-C01B	
FET	
U21-C01B1	[1987]
MESFET	
U21-C01B3	[1987]
MOSFET	
<i>Complementary, CMOS, enhancement/depletion mode, source coupled field effect logic, SCFL</i>	
U21-C01B5	[1987]
Dynamic MOSFET	

U21-C01C [1987]

Combined FET and bipolar

Schottky diode-FET logic, SDFL, BiCMOS, BiMOS, BiFET, BiMIS

U21-C01D [1987]

Logic circuits implemented with circuit blocks

Includes use of e.g. operational amplifiers and multiplexers, and also use of logic gates as 'blocks' to make up larger logic circuits and systems.

U21-C01E [1987]

Programmable logic arrays, gate arrays, reconfigurable logic

(U21-C01X)

This code is intended to highlight the use of programmable logic, such as semi-custom ASIC e.g. gate arrays (uncommitted logic arrays, configurable gate arrays, logic arrays), programmable logic devices categorised as programmable logic arrays, programmable array logic, programmable logic sequencers. For physical layout and interconnection details see also U11-D03, U13-C04C. To identify type of transistor employed, U21-C01B or U13-C codes are used. Novel logic circuitry details of programmable logic are covered by U21-C03B3.

PLA, PLD, FPGA

U21-C01F [1992]

Logic circuits using superconductive devices

(U21-C01X)

See also U14-F02C.

U21-C01G [1992]

Logic circuits using optoelectronic devices

(U21-C01X)

For optical logic elements, see V07-K06. For digital computing aspects, see T01-E05.

U21-C01P [2009]

Logic circuits using phase-change devices

(U21-C01X)

This code is intended for logic circuits using devices with phase-change properties, e.g. based on materials such as chalcogenides. Electronic switching circuits applying this technology are covered by U21-B01P. Phase-change memories are covered by U14-A03H and optical recording materials based on phase-change effects are covered by T03-B01B codes.

Amorphous, chalcogen, crystalline, selenide, sulfide, telluride

U21-C01R [1997]

Logic circuits using devices with tunnelling mechanism

Includes resonant tunnelling transistor or diode.

RTBT, RHET, tunnel diode

U21-C01T [2006]

Logic circuits using nano tubes

(U21-C01X)

U21-C01X

Logic circuits using other technology or components

Includes logic circuits using magnetic, galvano-magnetic (Hall-effect) devices, ferroelectric capacitors.

U21-C02

Interface circuits

input circuit, output circuit, buffer, transistor level shifting

U21-C02A [1987]

Inter-family; Logic level shifting

TTL-CMOS, TTL-ECL

U21-C02A1 [2007]

Inter-family

This code is intended for circuits interfacing between different logic families. Circuits providing an interface between logic circuits of the same type operating from different supply voltages are covered by U21-C02A5.

U21-C02A5 [2007]

Logic level shifting

This code is intended for circuits providing an interface between logic circuits of the same type operating from different supply voltages. Interfacing between different logic families is covered by U21-C02A1.

U21-C02B [1987]

Drivers for displays, relays etc.

See also T04-H codes for displays, V03-D02 for relays.

U21-C02C [1987]

Tri-state driver and parallel bus

See also appropriate codes in T01 and W01.

U21-C02D [1987]

Serial line transmission

See also appropriate codes in T01 and W01.

U21-C02D1 [2007]

Differential transmission

This code includes e.g. low voltage differential signalling (LVDS) circuits, from 2007 see also W01-A08D for differential data transmission systems in general.

U21-C02E [2006]

IC termination

Covers interface for termination of transmission line for integrated circuits using active or passive components. Includes stand alone or on-chip, see also U25-D05 and/or W01/W02.

U21-C03 [1983]

Logic function and general integrated circuit details

U21-C03A [1987]

Integrated circuit - general gate aspects

U21-C03A1 [1987]

Input-output details, increased speed

Includes modifications to increase fan-in and fan-out, and protection against short-circuited output.

U21-C03A2 [1987]

Power supply and noise prevention

'Power supply details' refers to **internal** details of the logic circuit. Novel circuits for power supplies in general are covered by U24-D and U24-E codes which are also assigned as appropriate when part of the logic circuit itself.

U21-C03A2A [1992]

Modifications to reduce power dissipation

Includes power supply substrate bias.

U21-C03A2B [1992]

Noise suppression

Includes modifications for eliminating interference or parasitic voltages and currents, compensating for variations in temperature, supply voltage etc.

Ground bounce

U21-C03A3 [1992]

Inverter circuit details

(U21-C03A9)

Includes details of pulses for e.g. NMOS, CMOS, BJT inverters (see also U21-C01A, U21-C01B). For pulse aspects see also appropriate U22-D01 codes. Includes also modifications of threshold for gating or switching. Complete novel inverters are coded as logic gates under U21-C03B.

U21-C03A5 [2006]

Reducing circuit size

U21-C03A9 [1987]

Other aspects of logic circuits

U21-C03B [1987]

Logic gates

Includes novel circuits which perform logic functions e.g. AND, OR, NOR, NOT, EXCLUSIVE-OR, NAND.

U21-C03B1 [1987]

Tri- or multi-level, fuzzy logic

U21-C03B1A [1992]

Tri- or multi-level logic

U21-C03B1B [1992]

Fuzzy logic

See T01-J16B for complex systems.

U21-C03B2 [1987]

Arithmetic

Includes majority and minority circuits. See also T01-E02. *Add, carry, computation, equivalence, multifunction, majority, arithmetic logic unit, ALU*

U21-C03B3 [2005]

Programmable logic circuitry, including programmable controllers

This code covers novel aspects of programmable logic circuits and programmable controllers. The use of this kind of device in logic systems is covered by U21-C01E and both codes can be assigned together when necessary, e.g. for a novel programmable controller implemented by configurable logic circuits. See also T01 codes for programme control aspects and T06 codes for process and machine control aspects. Programmable controllers without any logic circuit details are not coded in U21 and are generally covered in T06, e.g. by T06-A04B1.

PLC

U21-C03B4 [2005]

State machines

See also relevant T01 codes

State Machine, Finite State Machine

U21-C03B9 [1987]

Other types of logic circuits

U21-C03C [1987]

Fail-safe

Monitor, fault detection, majority

U21-C03D [1987]

Logic simulators, design logic circuit construction, circuit board wiring

Includes e.g. piggy-back construction for bus systems. For CAD applied to integrated circuits, see also U11-G.

Computer-aided logic design, logic CAD, layout optimisation, logic synthesis

U21-C03D1 [1997]

Logic circuit testing

See also S01-G01A codes and, for integrated circuit aspects, U11-F01D and/or U13-C07 codes.

Signal analysis, set/scan logic

U21-D

Pulse counters and frequency dividers

U21-D01

Input/output circuits

Serial-in parallel-out, serial-in serial-out

U21-D02

Starting/stopping/monitoring

U21-D02A [1992]

Starting/stopping

Reset

U21-D02B [1992]

Monitoring; Error correction

U21-D03

Synchronous counting chains

Includes both series (ripple) carry and parallel (look-ahead) carry for enable signal of synchronous counter.

U21-D03A [1992]

Ring counters

Includes feedback shift register counters. For random output counters see U21-D05C6.

Twisted-ring, switched tail, moebius, Johnson

U21-D04

Asynchronous counting chains

Ripple counters

U21-D05 [1992]

Characterised by counter details

U21-D05A [1992]

Reversible

Up-down, forward-backward

U21-D05B [1992]

With non-binary base

Excludes counters with base which is power of two.

U21-D05B1 [1992]

With variable counting base

U21-D05B2 [1992]

Divide-by-N counters

U21-D05B2A [1992]

Decade counters

U21-D05B2B [1992]

In which the base is an odd number

U21-D05B3 [1992]

In which the base is a non-integer

U21-D05C [1992]

Counters characterised by random or specific code output

Excludes standard base types e.g. binary, hexadecimal etc. Includes counting systems for specific coding formats e.g. reflected codes.

U21-D05C1 [1992]

Using Gray code

U21-D05C2 [1992]

Using excess three code

U21-D05C3 [1992]

Using biquinary code

U21-D05C6 [1992]

Random counters

See U22-A01A for random pulse generators in general.

U21-D06 [1992]

Characterised by the type of the device used

U21-D06A [1992]

Using semiconductor devices

U21-D06A1 [1992]

Field effect transistors

CMOS counters

U21-D06A2 [1992]

Bipolar transistors

TTL, ECL

U21-D06A3 [1992]

Opto-electronic devices

U21-D06B [1992]

Using electromechanical devices

Includes counters using e.g. relays.

U21-D06X [1992]

Other devices used as counters

Includes counters using semiconductor devices not covered by U21-D06A, e.g. thyristors, diodes, CCD and other types of device e.g. magnetic cores, gas-filled tubes etc.

U21-D09

Other aspects of pulse counters and frequency dividers

U22: Pulse Generation and Manipulation

U22-A

Generating electric pulses

U22-A01

Generators producing trains of pulses

U22-A01A [1983]

Random pulse generators

See T01-E04 for data processing arrangements for generating random numbers. Random counters are covered by U21-D05C6. Random number generators for e.g. gaming purposes are covered by T05-F and W04-X02 codes.

Pseudo-random generator, pseudo-random binary sequence (PRBS), shift register

U22-A02

Characterised by active element

U22-A02A

Bipolar transistors

U22-A02A1 [1987]

In integrated circuit form

U22-A02B

FET

U22-A02B1 [1987]

In integrated circuit form

U22-A02C

Other semiconductor devices

Includes discrete and integrated devices.

U22-A02D [1987]

Using logic blocks

E.g. gates, counters and flip-flops.

RS/JK/D-type, inverter

U22-A02E [1987]

Using operational amplifiers or comparators

This code covers the **use** only of comparators or operational amplifiers, i.e. where the devices themselves are not novel. Novel OPAMPs are covered by U24-G02A5 codes and novel comparator circuits of general application by U22-A04D5. From 1992 – 2011, U22-A04D1 also covered pulse generators with an overall comparator function.

U22-A02X

Other active element

Includes Josephson superconductor (with U14-F), and use of Wiegand wire.

U22-A03

Using energy-accumulating element and external switching signal

Includes capacitor store discharging into load, transmission line, etc. See also X12-J09 for high power types.

Blumlein, inductive store

U22-A04 [1983]

Circuit type

U22-A04A [1983]

Astable

U22-A04A1 [1987]

Blocking oscillator

Transformer, winding, flux, saturation, inverter, converter

U22-A04A2 [1987]

Crystal

Also coded in U23-A01A codes, based on inherent 'single frequency' aspect. Includes oscillator using other electromechanical resonator types, such as ceramic, SAW, etc. See V06-V codes for details of electromechanical resonators per se.

Piezoelectric, quartz, series, parallel, resonance

U22-A04A3 [1987]

Feedback

Includes oscillator with e.g. logic gates (also covered in U22-A02D) in ring circuit or similar. U22-A04A2 takes precedence for feedback arrangement including resonator element.

U22-A04A4 [1987]

Relaxation

Capacitor, charge

U22-A04A9 [1987]

With voltage or current control

Includes VCO.

U22-A04B [1983]

Mono-stable

U22-A04C [1983]

Bi-stable

U22-A04D* [1987-2011]

Comparator

*This code is now discontinued and from 2012 this subject matter is transferred to U22-A02E in the case of pulse generators based on comparators and U22-D01A1C for circuits performing a thresholding function on pulses. U22-A04D remains valid and searchable for records between 1992 and 2011 when it was used for comparator circuit pulse generators in general.

U22-A04D1* [1992-2011]

Comparator pulse generator

*This code is now discontinued and from 2012 this subject matter is transferred to U22-A02E in the case of pulse generators based on comparators and U22-D01A1C for circuits performing a thresholding function on pulses. U22-A04D1 remains valid and searchable for records between 1992 and 2011 when it was used for circuits configured as comparators with the purpose of generating pulses. Novel comparator circuits are coded in U22-A04D5, irrespective of application. (See note for that code).

U22-A04D5 [1992]

General comparator circuits

This code is used to denote novel comparator circuits per se of general application, i.e. without regard to the pulse/continuous nature of either the input signal(s) or the output produced. The following codes may also be applied depending on the purpose of the circuit:

1. Thresholding circuits, i.e. determining that a pulse has reached a preset amplitude are covered by U22-D01A1C.
2. Circuits comparing pulses or pulse trains with one another are covered by U22-D02 codes.
3. Circuits generating a pulse in response to a given characteristic of an input signal, are covered by U22-D07 codes.
4. Circuits providing a switching function in response to a given input signal characteristic are covered by U21-B02A3.

U22-A04X [1983]

Other circuit type

Includes multistable pulse generating circuits.

U22-B

Generator details

See U22-H also, if phase frequency/control is involved.

U22-B01

Output regulation/control

U22-B02 [1987]

On-chip integrated circuit details

U22-B03 [1987]

General details of larger IC systems

Includes e.g. reset circuits.

U22-B05 [1997]

Parameter compensation

U22-B05 codes are assigned for compensation of parameters of the oscillator/pulse generator circuit itself and for the effect of external parameters. The codes are **not** used for similar arrangements applied to subsequent circuitry such as pulse shaping or pulse amplifying circuits.

U22-B05A [1997]

Active device characteristics

U22-B05C [1997]

Physical characteristics

Temperature, voltage

U22-B09

Other pulse generator details

Includes generator starting circuits.

U22-C

Generating finite slope or stepped portion pulses

U22-C01

Generating triangular shape pulses

U22-C09

Other finite slope or stepped portion pulse generation

U22-D

Manipulating pulses

U22-D01

Shaping pulses

U22-D01A

Thresholding, changing duration, limiting, amplifying, steepening

U22-D01A1 [1987]

Thresholding, limiting, amplifying, steepening

U22-D01A1A [1992]

Level clamping

Covers limiting of amplitude and establishment or removal of offsets.

U22-D01A1C [1992]

Thresholding

This code is used for circuits determining that a pulse signal has attained a preset threshold level, i.e. comparing the amplitude of a pulse with a (usually fixed) reference. For example, a circuit re-establishing logic levels in data read from a magnetic hard disc would be coded here (also in T03-A06C3 and T03-A08A1C). When comparators are used for this purpose U22-D10F is also assigned.

Slicing

U22-D01A3 [1992]

General pulse noise reduction circuits

This code is used for anti-contact-bounce arrangements and for circuitry suppressing the effects of other noise sources on pulses.

U22-D01A5* [1987-1991]

Changing duration without time reference signals

*This code is now discontinued and from 1992 this subject matter is transferred to U22-D01A6A.

U22-D01A6 [1992]

Changing pulse duration

This code covers material previously coded in U22-D01A5 and U22-D01A7, and has been introduced to better reflect the hierarchical relationship of those codes which are now no longer used, but remain valid for records prior to 1992.

U22-D01A6A [1992]

Changing duration without time reference signals (U22-D01A5)

Includes use of delay line, resonant circuit, etc.

Pulse stretching

U22-D01A6C [1992]

Changing duration using time reference signals (U22-D01A7)

U22-D01A7* [1987-1991]

Changing duration using time reference signals

*This code is now discontinued and from 1992 this subject matter is transferred to U22-D01A6C.

U22-D01D* [1987-1996]

Characterised by active element technology

*This code is now discontinued. From 1997 see U22-D10 codes which are intended to provide information on active element technology for all U22-D subdivisions. U22-D codes remain valid for records from 1987-1996.

U22-D01D1* [1987-1996]

Integrated circuit implementation

*This code is now discontinued.

U22-D01D3* [1987-1996]

Discrete: FET, bipolar, etc.

*This code is now discontinued.

U22-D01D5* [1987-1996]

Gates, flip-flops, counters

*This code is now discontinued.

U22-D01D7* [1987-1996]

Operational amplifier, comparator

*This code is now discontinued.

U22-D01D9* [1987-1996]

Other technology for pulse shaping

*This code is now discontinued.

U22-D01X

Other pulse shaping

U22-D02

Comparing/sorting pulses

Includes comparison of individual pulses or pulse trains. See note for U22-A04D5 (comparators in general).

U22-D02A [1997]

With respect to amplitude

U22-D02C [1997]

With respect to phase

Includes time-of-arrival comparison pulses.

U22-D02E [1997]

With respect to frequency

U22-D02G [1997]

With respect to duration

U22-D02X [1997]

Pulse comparison based on other characteristic

U22-D03

Monitoring pulses

Includes circuits to detect deviation from desired characteristic of individual pulse and also missing pulses in pulse trains.

U22-D03A [1997]

With respect to amplitude

U22-D03C [1997]

With respect to phase

U22-D03E [1997]

With respect to frequency

U22-D03G [1997]

With respect to duration

U22-D03X [1997]

Pulse monitoring based on other characteristic

U22-D04

Changing timing of pulses at single output

Synchronization, clock, phase, delay, gate

U22-D04A [1997]

Changing pulse timing using active devices

This code covers the use of individual transistors, amplifiers, logic gates etc. to alter the timing of pulses and takes precedence over U22-D04C.

Counter, D-type, flip-flop, memory, register

U22-D04C [1997]

Changing pulse timing using passive devices

This code covers the use of passive components only such as resistors, capacitors, delay lines and networks to alter the timing of pulses.

Coil, CR, filter, inductor, LC, RC, RL, transmission line, winding

U22-D05

Changing pulse train pattern

Includes circuits separating pulses from composite pulse train. For TV synchronizing signal separation in receivers see W03-A06 codes also.

U22-D05A [1987]

Frequency multipliers and dividers

In addition to coverage of circuits providing fixed multiplication or division of pulse signals, from 2011 the scope of this code has been expanded to include digitally controllable devices and circuits, which were previously excluded. Novel aspects of variable divider and multiplier circuits based on counters are covered by U21-D codes which are also assigned as necessary. See U23-B02 for digital frequency multipliers for analog signals, e.g. sinusoidal oscillator signals.

U22-D06

Pulse distributors

Includes clock signal distributors. See T01-K codes also for arrangements specifically for computers.

Clock tree, multiple output

U22-D06A [1997]

With outputs differing in phase

U22-D06C [1997]

With outputs differing in frequency

Clock doubler

U22-D07

Delivering pulse as function of input signal characteristics

Includes comparator type circuits generating a pulse when input signal reaches a preset threshold, and edge triggered circuits. See note for U22-A04D5.

U22-D07A [1987]

Zero crossing, responding to power supply

Includes e.g. power-on-reset circuits (see U21-B02B also). See U21-B02A3 for switching circuits operating at zero-crossing.

U22-D07C [1997]

Individual pulse peak detector

Covers arrangements delivering a pulse in response to the peak value of an input signal. For peak detectors in the context of signal rectifiers see U24-C03A, and for electrical measuring instruments in particular, S01-D01A3.

U22-D10 [1997]

Pulse manipulation circuit implementation

Codes in this section are applied, in conjunction with other U22-D codes, to indicate the technology used only. They do not, in general, represent novel aspects which are indicated by the accompanying code(s) appropriate to the particular pulse manipulation involved. Prior to 1997, technology was indicated for pulse shaping only by U22-D01D codes, which are no longer assigned.

U22-D10A [1997]

Bipolar transistor

U22-D10A1 [1997]

Integrated

U22-D10A2 [1997]

Discrete

(U22-D01D3)

U22-D10B	[1997]
Field effect transistor	
U22-D10B1	[1997]
Integrated (U22-D01D1)	
U22-D10B2	[1997]
Discrete (U22-D01D3)	
U22-D10C	[1997]
Bipolar and FET combined	
U22-D10C1	[1997]
Integrated (U22-D01D1)	
U22-D10C2	[1997]
Discrete (U22-D01D3)	
U22-D10D	[1997]
Using logic blocks	
U22-D10E	[1997]
Using computer/microprocessor	
U22-D10F	[2002]
Using comparator	
U22-D10X	[1997]
Other pulse manipulation technology	

U22-E

Modulating/demodulating pulses; Transforming modulation type

From 1997, this code is expanded to include demodulation of pulses and transformation of modulation type, previously covered by U22-F. U22-F is no longer used but remains valid for records prior to 1997. Pulse amplifying circuits per se are covered by U22-D01A1.

U22-E01 [1997]

Characterised by modulation type

U22-E01 codes are assigned to indicate the type of modulation (or demodulation with U22-E05A) only, and do not themselves represent novel aspects, these being highlighted by other U22-E codes.

U22-E01A [1997]

PWM

PDM, duration, edge modulation, width

U22-E01C [1997]

PPM

Position

U22-E01E [1997]

PAM

Amplitude

U22-E01G [1997]

PFM

Frequency

U22-E01X [1997]

Other pulse modulation type

U22-E03 [1997]

Novel circuitry (including systems)

U22-E05 [1997]

Demodulation of pulses; Transforming modulation type

(U22-F)

Used with other U22-E codes when emphasis is on demodulation.

U22-E05A [1997]

Demodulating pulses

(U22-F)

U22-E05C [1997]

Transforming pulse modulation type

(U22-F)

U22-E07 [1997]

Application of pulse modulation/demodulation

(U22-F)

This code is intended to represent, with U22-E01 and/or U22-E05 codes as appropriate, applications of pulse modulation or demodulation. It may be assigned, therefore, for inventions where circuitry aspects are not novel per se.

U22-E09 [1997]

Other pulse modulation/demodulation

U22-F*	[1980-1996]
Demodulating pulses, transforming modulation type	
*This code is now discontinued and the subject matter is incorporated into U22-E codes. U22-F remains valid for records prior to 1997.	
U22-G	
Digital filters and networks	
U22-G03 codes cover digital signal processing/networks in general and U22-G01 codes are applied in addition when concerned with digital filters. See U25 codes for analogue equivalent filters and networks. See also T01-J08B for data processing aspects.	
U22-G01	[1992]
Digital filters	
Codes in this section are split into filter type and filter function. For construction, performance, operation and application see relevant U22-G03 codes. See T01-J08B for computer aspect.	
U22-G01A	[1992]
Digital filter types	
U22-G01A1	[1992]
Recursive	
Covers filters incorporating feedback. <i>Infinite impulse response, IIR</i>	
U22-G01A1A	[1992]
Wave digital filter	
U22-G01A1B	[2005]
Kalman filter	
U22-G01A3	[1992]
Non-recursive	
Covers filters without feedback and includes digital transversal filters. See U25-A02 for analogue transversal filters. <i>Finite impulse response, FIR</i>	
U22-G01A5	[1992]
Adaptive and variable filter	
From 2015, the title of this code has been changed to reflect the existing coverage of filters with characteristics that are adjustable but not necessarily varied in response to input signal characteristics, i.e. not necessarily adaptive.	

U22-G01A5A	[1997]
Coefficient derivation details	
<i>Tap</i>	
U22-G01A5B	[2005]
Matched filter	
U22-G01B	[1992]
Filter function	
U22-G01B1	[1992]
Low pass	
U22-G01B6 takes precedence where emphasis is on decimation filtering.	
U22-G01B2	[1992]
Band pass	
U22-G01B3	[1992]
High pass	
U22-G01B4	[1992]
Notch filter	
This code covers digital filters which attenuate a band of frequencies and pass those on either side. <i>Band stop filter</i>	
U22-G01B5	[1992]
Comb filter	
U22-G01B6	[1992]
Decimation filter	
U22-G01B9	[1992]
Other filter function	
U22-G01C*	[1992-2004]
Filter construction	
*This code is now discontinued. From 2005 details of components/configuration of digital signal processing/networks in general are covered by U22-G03 codes.	
U22-G01D*	[1992-2004]
Filter operation	
*This code is now discontinued. From 2005 details of operation and application of digital signal processing/networks in general are covered by U22-G03 codes.	
U22-G01X	[1992]
Other digital filter aspects	

U22-G03 [2005]

Digital Signal Processing/Networks

U22-G03 codes cover digital signal processing and networks and are split to cover constructional details (U22-G03A), digital sampling (U22-G03B), functions and performance (U22-G03C) and operation and application (U22-G03E). U22-G01 codes applied in addition to U22-G03 codes to highlight digital filter aspects.

U22-G03A [2005]

Construction

This code covers constructional details including design, z-transform blocks, DSP block architectures, etc. Testing aspects are covered in U22-G03A1. Other U22-G03 are applied where applicable.

U22-G03A1 [2005]

Testing

U22-G03A5 [2015]

Design of digital filters and digital signal processors in general

This code is assigned for novel aspects of apparatus, methods or software for use in the DSP design process. For computer-aided design (CAD) aspects see also T01-J15A codes.

U22-G03B [2006]

Digital sampling

Includes systems that sample signals that are already digital, for sampling of analog signals see U21-A03F6 codes. Interpolation aspects are coded here.

U22-G03B1 [2006]

Re-sampling

Includes arrangements for interfacing two DSP blocks/systems that have different sampling rates.

U22-G03B1A [2006]

Up-sampling

U22-G03B1C [2006]

Down-sampling

U22-G03C [2005]

Functions and performance

U22-G03C1 [2005]

Functions used in digital signal processing

U22-G03C1 codes are applied to highlight functions performed by digital signal processors and networks. These codes are used to highlight block level functions and not the overall application, which is represented by U22-G03E3 codes. Filtering using digital filters is covered by U22-G01 codes.

U22-G03C1A [2005]

Addition and multiplication

For integration function see U22-G03C1G.

U22-G03C1C [2005]

Delay

U22-G03C1E [2005]

Array handling

This code is applied to highlight the function of fetching values from memory locations and/or copying data from memory to memory.

U22-G03C1G [2006]

Integration

U22-G03C1X [2005]

Other function

U22-G03C2 [2005]

Performance

U22-G03C2A [2005]

Size reduction

U22-G03C2C [2005]

Reduction in power consumption

U22-G03C2E [2005]

Increasing processing speed

U22-G03C2X [2005]

Other performance aspect

U22-G03E [2005]

Operation and application

These codes are used to highlight overall operation and application of a DSP system/network, i.e. the use of DSP blocks to perform e.g. Fourier transform, where the novelty may not be the blocks themselves but is the way the blocks are used to perform the operation.

U22-G03E1 [2005]

Operation

This code is applied to highlight general operation of digital signal processing/networks.

U22-G03E1A [2005]

Software and algorithms

See T01-J04B1 for transformation functions in general.
Fourier transform, Hilbert transform, Polynomial transform, WALSH functions

U22-G03E3 [2005]

Applications of DSP

U22-G03E3 codes are applied to highlight the application of a digital signal processor or network. Filtering using digital filters is covered by U22-G01 codes but applications of filtering can be indicated by assignment of U22-G03E3 codes as well, e.g. a digital filter used for reducing noise would be represented by appropriate U22-G01 codes in conjunction with U22-G03E3A.

U22-G03E3A [2005]

Noise reducing/cancelling

U22-G03E3C [2005]

Equalization

U22-G03E3D [2005]

Correlation

See T01-J04B2 for correlation functions in general.

U22-G03E3F [2005]

Phase shifting and delay

U22-G03E3X [2005]

Other DSP application

U22-G05* [1992-2004]

Digital networks

*This code is now discontinued. From 2005 digital Networks in general are covered by U22-G03 codes.

U22-G05A* [1992-2004]

Network construction

*This code is now discontinued. From 2005 digital network construction in general is covered by U22-G03 codes.

U22-G05B* [1992-2004]

Network operation

*This code is now discontinued. From 2005 digital network operation in general is covered by U22-G03 codes.

U22-G09 [1992]

Other digital network aspects.

U22-H

Automatic digital phase/frequency-control and synchronization

This is a general code used to indicate control of phase or frequency in digital systems, especially for synchronization, and includes non-PLL phase control and clock extraction circuits (see W01-A04 codes for data transmission aspects). Other U22 codes are also assigned as necessary, such as U22-D04 codes for delay circuits and U22-D06 codes for clock distribution arrangements. Inventions concerned with digital phase lock loops (PLLs) and delay lock loops (DLLs) are covered by U23-D01 codes which are assigned instead of U22-H.

Fourier, clock signal, clock skew, clock tree.

U23: Oscillation and Modulation

In general this class covers circuits dealing with sinusoidal oscillations, but also includes digital implementations of circuits such as phase-locked loops, phase detectors etc. which may be interfaced with analogue systems. Applications may involve codes in section W for data transmission, radio and TV receivers, etc.

U23-A

Sinusoidal oscillators, (using)

See U23-E codes for control of output.

U23-A01

Amplifier with regenerative feedback

Negative resistance oscillator circuits are coded in U23-A02.

U23-A01A

Electromechanical resonator

Oscillators using logic inverters and the like in a feedback arrangement with an electromechanical resonator are also assigned U22 codes (e.g. U22-A02D and U22-A04A2). Novel aspects of resonators themselves are covered by V06-V01E codes with other V06-V codes as appropriate.

Quartz, crystal, piezoelectric, fundamental, overtone, parallel, series, resonance, effective series resistance, ESR, trim

U23-A01A1 [1987]

SAW resonator

See U14-G and V06-V codes for SAW resonators per se.

Surface acoustic wave, IDT, interdigitated

U23-A01A2 [2006]

MEMs resonator

See V06-V codes for MEMs and NEMs resonators themselves.

Surface acoustic wave, IDT, interdigitated

U23-A01A5 [1992]

With voltage control, e.g. VCXO

This code is used with U23-A01A or U23-A01A1, as appropriate. Voltage controlled oscillators for PLLs are covered by U23-D01A1, and astable multivibrator type VCOs by U22-A04B9.

U23-A01B

Inductive/capacitive resistive elements

U23-A01B1 [1987]

Discrete LCR

Frequency/phase-shift, Wien bridge, parallel-T, tuned circuit, coil, inductor, capacitor, resistor

U23-A01B2 [1987]

Distributed LCR, YIG or dielectric resonator etc.

Includes the use of waveguide-type elements, novel aspects of which are coded in W02-A, e.g. W02-A03A codes for resonators. See U23-Q also for constructional and layout aspects influenced by the frequency of operation.

Coaxial, cavity, tuned line, stripline, microstrip, YIG sphere, magnetic

U23-A01B5 [1992]

With voltage control e.g. VCO

This code is used with U23-A01B1 or U23-A01B2 as appropriate. (See note for U23-A01A5).

U23-A02

Negative resistance element or transit-time effects

Includes oscillators with conventional three-terminal device in negative resistance circuit configuration.

Gunn diode, IMPATT, klystron, magnetron, TWT

U23-A05 [2014]

Oscillators based on spin transport electronics

Covers oscillators using 'spintronics' or 'magnetoelectronics', e.g. spin torque oscillators as used in microwave-assisted magnetic recording, for which T03-A06N3 codes are also assigned. U23-Q is also assigned to denote significant high-frequency (e.g. microwave) aspects.

Giant magnetoresistance, GMR, MAMR, oscillating field, STO, TMR, tunnel magnetoresistance

U23-A06 [2016]

Atomic oscillators

This code is intended to cover oscillators in which signals, e.g. at microwave frequencies, are emitted by electrons in the atoms of gaseous alkali metals changing energy levels. Prior to 2016 this kind of oscillator was coded as U23-A when appropriate but was chiefly covered by U23-D02 which will continue to be assigned for inventions based on the use of such oscillators as a reference frequency source.

Cesium, coherent population trapping, CPT, double resonance, energy transition, gas cell, laser, light, quantum interference, rubidium

U23-B

Frequency multipliers/dividers

U23-B01 [1987]

Analogue

Harmonic resonator, varactor, injection, diode bridge

U23-B02 [1987]

Digital

See U22-D05A for circuits multiplying or dividing pulse rate. Counter circuits are covered by U21-D codes.

U23-C

Phase or frequency comparators

This code covers circuits for comparing the phase of frequency of sinusoidal signals. U23-D01A3A, which covers phase comparators / detectors in phase lock loops or delay lock loops takes precedence over U23-C codes.

U23-C01 [1987]

Analogue phase or frequency comparator

This code covers analogue circuitry used for comparing the phase or frequency of sinusoidal signals.

U23-C02 [1987]

Digital phase or frequency comparator

This code covers digital circuitry used for comparing the phase or frequency of sinusoidal signals. Digital circuits comparing the phase of pulse signals are covered by U22-D02C and their frequency by U22-D02E.

U23-D

Automatic phase/frequency control; Synchronization

Purely digital circuitry e.g. for clock extraction from incoming data stream, is coded in U22-H. From 1992 U23-D01 codes are used for **all** aspects of phase-locked loops, whether of analogue or digital type. U23-D01A8 codes are used to distinguish analogue, digital, or hybrid types when this is significant. Prior to 1992 see U23-D01 codes and U22-H codes as appropriate.

U23-D01 [1987]

Delay lock loop and phase lock loop

In 2005, the title of this code was changed to better reflect its inclusion of delay lock loops as well as phase lock loops. In the case of DLLs U23-D01D is assigned with other U23-D01 codes as appropriate. U23-D01 codes take precedence over the 'general synchronization' code U22-H, which is assigned for digital phase and frequency control circuits not involving a PLL or DLL.

DLL, PLL

U23-D01A [1987]

Loop details

U23-D01A1 [1992]

Voltage controlled oscillator

Reference oscillators for frequency synthesizers are covered by U23-D01B3.

Current/voltage/numerically controlled oscillator, CCO, VCO, NCO, voltage controlled crystal oscillator, VCXO

U23-D01A2 [2007]

Active loop control

Includes control of loop gain, for which U24-C01 codes are also assigned as appropriate.

U23-D01A3 [1992]

Phase detectors and charge pumps

From 2002 the title of this code has been changed to better reflect the previous inclusion of charge pumps, now coded separately as U23-D01A3C.

U23-D01A3A [2002]

Phase detector

U23-D01A3C [2002]

Charge pump

Charge pumps in general are covered by U24-D02A1.

U23-D01A5 [1992]

Lock detector

False lock protection is covered by U23-D01F3.

Out-of-lock detector

U23-D01A6 [2005]

Delay array

Includes delay lines, gates, etc. making up the delay chain. U22-D04 and U25-A05 are also assigned where relevant.

U23-D01A7 [1992]

Loop filter

U23-D01A7A [1992]

Variable bandwidth

U23-D01A8 [1992]

Loop type

U23-D01A8A [1992]

Analogue

U23-D01A8B [1992]

Digital

U23-D01A8C [1992]

Hybrid analogue/digital PLL system

U23-D01B [1987]

Frequency synthesizers

See W02-G03A codes also for application to radio communications equipment in general, and U23-F01 codes for direct synthesizers.

Synthesis, step, select, preset channel, radio receiver, transceiver, transmitter

U23-D01B1 [1992]

Division circuit, e.g. variable ratio divider

U23-D01B1A [1997]

For fractional synthesis

Fractional-N

U23-D01B3 [1992]

Reference oscillator

See U23-A01A also for oscillator circuits employing an electromechanical resonator. VCOs (and VCXOs) are coded in U23-D01A1 and the appropriate U23-A code. For temperature compensation aspects U23-E05 is also assigned.

Quartz, crystal, SAW, oven, temperature, control

U23-D01B5 [1992]

Output filter arrangements, improving purity

This code covers arrangements to reduce noise, spurious signals, etc. which are specific to the synthesizer circuit, i.e. it is not routinely assigned for noise reduction that is actually a property of the PLL itself which is covered by U23-D01F5.

U23-D01B7 [1997]

Characterised by use of more than one loop

Includes dual-loop PLL synthesizers.

U23-D01C [1987]

Modulation/demodulation applications

See also other U23 codes for type of modulation.

U23-D01C1 [1992]

Costas loop system

U23-D01D [2005]

Delay lock loop

This code is assigned to indicate that an invention relates to a delay lock loop rather than a phase lock loop, other U23-D01 codes being assigned with it depending on novelty. When U23-D01 codes are assigned without U23-D01D, it is assumed that a PLL is involved or that the invention is not specific to DLLs.

U23-D01E [2006]

PLL and DLL testing

Includes calibration aspects.

U23-D01F [1997]

Modifications and improvements to loop characteristics

These codes are used with other U23-D01 codes as appropriate.

U23-D01F1 [1997]

Lock acquisition time reduction

See also U23-D01A7A.

In-lock, pull-in, track

U23-D01F3 [1997]

False lock prevention

See also U23-D01A5.

U23-D01F5 [1997]

Noise reduction

Arrangements specific to indirect frequency synthesizers where the improvement is not a function of loop performance itself, e.g. an improved reference oscillator or an output filter, are covered by U23-D01B5 instead, but both codes can be used together when appropriate.

U23-D01F7 [1997]

Broadening capture range

U23-D01F9 [1997]

Other modifications to PLLs

U23-D02 [1987]

Other phase/frequency shift correction

Includes systems not relying solely on PLLs to correct phase or frequency, e.g. non-feedback frequency control of an oscillator based on sensed temperature, injection locking and use of atomic oscillators. (Time and frequency standards based on atomic oscillators are covered by S04-B02X and S04-C09). Prior to 2016 details of atomic oscillators themselves were chiefly assigned this code but from 2016 novel details of such oscillators, e.g. gas cells containing alkali metals, are covered by U23-A06.

U23-E

Oscillator starting and output control

U23-E codes are assigned for oscillator circuit control and for temperature compensation arrangements associated with the oscillator itself. The codes are **not** used for subsequent circuitry such as phase shifting, phase splitting or amplifying circuits. See U22-B codes for analogous arrangements for pulse generators.

U23-E01	[1992]
Output control	
U23-E01A	[1992]
AGC-based system	
See U24-C01 codes also for automatic gain control circuits.	
U23-E05	[1992]
Temperature compensation	
Includes choice of components (e.g. complementary temperature-dependent characteristics), temperature-responsive ‘trimming’ of oscillator circuits, and ‘oven’ arrangements.	
<hr/>	
U23-F	
Miscellaneous oscillation and noise generators	
U23-F01*	[1987-2004]
Direct frequency synthesizers	
*This code is now discontinued. From 2005 direct frequency synthesizers are covered by U23-F03 codes.	
U23-F01A*	[1997-2004]
Memory aspects	
*This code is now discontinued. From 2005 memory aspects of direct frequency synthesizers are covered by U23-F03A1.	
U23-F01C*	[1997-2004]
Improving output signal purity	
*This code is now discontinued. From 2005 improvements in spectral purity of direct frequency synthesizers are covered by U23-F03B5.	
U23-F02*	[1987-2004]
Waveform generators using computer ROM and A-D/D-A converters	
*This code is now discontinued. From 2005 direct frequency synthesis and direct digital synthesis is covered by U23-F03 codes.	
U23-F03	[2005]
Direct Frequency Synthesizers	
From 2005 U23-F03 codes have been introduced to better reflect direct frequency synthesis and includes direct digital synthesis. Indirect frequency synthesis is coded in U23-D01B.	
U23-F03A	[2005]
Novel synthesizer details	

U23-F03A1	[2005]
Memory aspect and look-up tables	
U23-F03A3	[2005]
Phase accumulators	
U23-F03A5	[2005]
D/A and A/D aspects	
U23-F03A7	[2005]
Analog circuitry	
U23-F03A9	[2005]
Other	
U23-F03B	[2005]
Synthesizer performance	
U23-F03B1	[2005]
Improving frequency resolution	
U23-F03B3	[2005]
Increasing frequency transition	
Includes improving hopping speed.	
U23-F03B5	[2005]
Improve spectral purity	
U23-F03B9	[2005]
Other	
U23-F05	[1997]
Noise generators	
<i>Chaos, white noise</i>	
U23-F09	[1997]
Other oscillation generation	
<hr/>	
U23-G	
Amplitude modulation	
This code relates to amplitude modulation of a carrier wave by an analogue signal. For AM using digital modulating signals see U23-P01C codes. See also U23-P codes for relevant additional details and W02-G01D for transmitter application. This code is intended to highlight novel aspects of amplitude modulators, e.g. with U23-P codes, or novel modulation schemes. It is not applied merely to indicate the use of AM in a general sense.	
<i>Balanced modulator, DSB/SSB modulator</i>	

U23-H

Angle modulation

This code relates to frequency or phase modulation of a carrier wave by an **analogue** signal. For FM or PM using **digital** modulating signals see U23-P01A codes. See also U23-P codes for relevant additional details and W02-G01D for transmitter application. This code is intended to highlight novel aspects of frequency or phase modulators, e.g. with U23-P codes, or novel modulation schemes. It is **not** applied merely to indicate the **use** of FM or PM in a general sense.

Reactance modulator, varactor, varicap, phase shifter

U23-J

Mixing; Frequency changing

Radio receiver applications (general) are coded in W02-G03A5.

U23-J01 [1997]

Mixer

See also under applications, e.g. W02-G03A5 for radio receivers in general, W03-B01A5 for broadcast radio receivers, and W03-A01B5 for TV receiver tuners. For image-suppression mixers, search with W02-G03B4A.

U23-J01A [1997]

Characterised by active device

U23-J01A1 [1997]

Diode

U23-J01A3 [1997]

Bipolar transistor

U23-J01A5 [1997]

Field effect transistor

U23-J01A5A [1997]

JFET

U23-J01A5C [1997]

MOSFET

U23-J01A9 [1997]

Other implementation technology

U23-J01C [1997]

Characterised by configuration

U23-J01C1 [1997]

Single-ended

U23-J01C5 [1997]

Balanced

U23-J01C5A [1997]

Single-balanced

U23-J01C5C [1997]

Double-balanced

For ring configurations, U23-J01C5E takes precedence.

DBM

U23-J01C5E [1997]

Ring

This code takes precedence over U23-J01C5C.

U23-J01C5G [2017]

Triple-balanced

Covers use of two double-balanced mixers driven in a push-pull configuration.

Doubly double-balanced mixer, TBM

U23-J01C9 [1997]

Other configuration

U23-J01E [2002]

Integrated or film circuit implementation

This code is assigned with other U23-J01 codes as necessary, to indicate a self-contained mixer in integrated form. Specific novel constructional and manufacturing aspects of monolithic and film circuits are also assigned codes from classes U11-U14 as appropriate.

U23-J05 [1997]

Frequency changing

U23-J05A [1997]

Single conversion

U23-J05C [1997]

Double and multiple conversion

This code denotes two or more frequency conversions being performed.

U23-K

Amplitude demodulation

See also U23-P codes for relevant additional details and W02-G03E for (general) radio receiver applications. Demodulators of signals amplitude modulated by digital signals are covered by U23-P01C and U23-P01J3. Signal rectifiers, e.g. for AGC purposes, are covered by U24-C03.

U23-L

Angle demodulation

See also U23-P codes for relevant additional details and W02-G03E for (general) radio receiver applications. Demodulators of signals frequency or phase modulated by digital signals are covered by U23-P01A and U23-P01J3.

Frequency, phase, FM, discriminator, quadrature detector, limiter

U23-P [1987]

Modulation/demodulation, general

Codes in this section are used either alone, or with other U23 codes as appropriate. Additional codes may be assigned from section W for radio equipment applications.

U23-P01 [1987]

Digital Modulation/Demodulation

From 2005 the title of this code has been changed to better reflect its content. U23-P01 codes are chiefly used with W01-A09 codes for carrier systems data transmission. They describe modulation of a carrier by digital signals.

U23-P01A [2005]

Angle Modulation

Angle modulation with **analogue** modulating signals is covered by U23-H.

U23-P01A1 [2005]

Frequency Shift Keying

FSK

U23-P01A3 [2005]

Phase Shift Keying

PSK, QPSK

U23-P01A5 [2005]

Minimum Shift Keying

MSK

U23-P01A9 [2005]

Other

U23-P01C [2005]

Amplitude Modulation

Amplitude modulation with **analogue** modulating signals is covered by U23-G.

U23-P01C1 [2005]

Amplitude Shift Keying

ASK

U23-P01C9 [2005]

Other

U23-P01E [2005]

Hybrid Modulation

U23-P01E1 [2005]

Quadrature Amplitude Modulation

QAM

U23-P01E9 [2005]

Other

U23-P01G [2005]

Multi-frequency code techniques

U23-P01J [2005]

Novel Modulator/Demodulator Circuits

U23-P01J1 [2005]

Modulator

Amplitude and angle modulators with **analogue** modulating signals are respectively covered by U23-G and U23-H.

U23-P01J3 [2005]

Demodulator

U23-P01J3A [2005]

Coherent detection

U23-P02 [1987]

Analogue circuit details

This code is used in conjunction with U13-B codes for significant integrated circuit aspects.

U23-P03 [1987]

Implementation using digital techniques

See T01-J codes for computer circuit aspects.

U23-P04 [1987]

Broader systems details

Covers circuit blocks used for signal processing, rather than 'internal' circuit details. For amplitude-locked loop demodulation applications, use with U24-C01G.

U23-P05 [1987]

Stereo, mixed AM/FM

See W02-E and W02-F06 codes also for stereophonic broadcasting. Decoders in TV and radio receivers are also coded in W03-A02B1 and W03-B02C3 codes respectively.

U23-Q [1987]

Microwave and HF circuits

(U23-X)

This code is intended to indicate construction and layout aspects of microwave circuits and is used in conjunction with other relevant U23 codes. Waveguide components per se (including microstrip) are covered by W02-A codes. Construction and layout of microwave amplifiers is covered by U24-G04M.

Microwave integrated circuit, MIC, stripline, resonator, cavity

U23-R [2006]

Testing/calibration

This code covers all testing/calibration aspects for U23 type circuits apart from PLLs and DLLs for which U23-D01E is applied. See also S01 codes.

U23-R01 [2006]

Testing

U23-R02 [2006]

Calibration

U23-X

Other aspects of modulation/demodulation

This code includes (de)modulation of EM waves, e.g. in a waveguide, and aspects of modulation or demodulation not otherwise catered for in U23.

U24: Amplifier and Low Power Supplies

Heavy current equipment is in section X.

U24-A* [1980-1986]

Semiconductor/valve amplifiers

*This code is now discontinued. The codes U24-A01 to U24-A09 in this group remain valid for records prior to 1987.

U24-A01* [1980-1986]

DC and low frequency amplifiers

*This code is now discontinued.

U24-A02* [1980-1986]

High frequency and wideband amplifiers

*This code is now discontinued.

U24-A03* [1980-1986]

Power and switching amplifiers

*This code is now discontinued.

U24-A04* [1980-1986]

Differential, operation, push-pull amplifiers; Phase splitters

*This code is now discontinued.

U24-A05* [1980-1986]

Feedback arrangements; Raising efficiency

*This code is now discontinued.

U24-A06* [1980-1986]

Modification for reducing noise/internal impedance effects/ temp. and supply voltage influence/ distortion; Bandwidth extension

*This code is now discontinued.

U24-A09* [1980-1986]

Other (incl. protection circuitry, multi-channel amplifiers)

*This code is now discontinued.

U24-B* [1980-1991]

Parametric, magnetic and dielectric amplifiers, etc.

*This code is now discontinued but remains valid for records prior to 1992. For parametric amplifiers see U24-G04E, dielectric amplifiers see U24-G04X, magnetic amplifiers see U24-E04.

U24-C

Gain control

Includes compression/expansion, AGC, muting, general signal rectifiers.

U24-C01

Automatic gain control

AGC

U24-C01A [1987]

AGC amplifiers with analogue control

U24-C01B [1987]

AGC amplifiers with digital control

U24-C01C [1987]

Control signal derivation

U24-C01C1 [1997]

Novel signal processing per se

Includes processing of derived control signal to achieve particular gain control characteristic.

U24-C01C5 [1997]

Taking other parameters into account

E.g. using ambient acoustic signal, signal produced from mechanical parameters such as vehicle or engine speed, etc.

In-car-entertainment, passenger compartment, microphone, volume

U24-C01G [1997]

Amplitude-locked loop

See U23 codes also for AM and FM demodulation applications. Phase lock loops are covered by U23-D01 codes.

ALL

U24-C02

Companaders; Amplitude limiters

U24-C02A [1987]

Limiters

Clipper circuit

U24-C02A1 [1992]

Soft limiter

(U24-C02)

U24-C02A5	[1992]
DC limiting i.e. level clamp circuit	
Video signal clamping circuits for TV receivers are coded in W03-A04C.	
U24-C02B	[1987]
Companding, compression, expansion	
<i>Emphasis, pre-emphasis, compressor, compander, expander, Dolby®, Dolby-B®</i>	
U24-C03	[1987]
General signal rectifiers	
Covers rectifiers for control signal derivation. Amplitude demodulators in general are covered by U23-K.	
U24-C03A	[1997]
Peak detector	
See U21-B03 for sample-and-hold circuits.	
U24-C05	[1987]
Manual control, combined gain/tone control, muting	
(U24-C09)	
See W03-C codes also for audio amplifier aspects.	
U24-C05A	[1987]
Manual gain control	
Also coded in W03-C03 for audio amplifiers.	
<i>Volume</i>	
U24-C05A1	[1997]
Continuously variable	
<i>Potentiometer</i>	
U24-C05A5	[1997]
Stepped variation	
<i>Ladder, resistor, network, switch, tap</i>	
U24-C05B	[1987]
Digital control details, e.g. by computer	
Includes e.g. computer circuit details.	
U24-C05C	[1987]
Muting	
Muting in radio receivers is covered by W02-G03B1.	
U24-C05D	[1987]
Combined gain and tone control	
U24-C09	
Other gain control	

U24-D	
Power converters	
Includes normally low electronic power converters. High power converters are in X12-J and their controllers in X13-G03. Indeterminate power converters are in U24 and X12. Unregulated or unstabilized converters are in U24-D. Stabilisers or voltage regulators are in U24-E. Does not cover individual components e.g. capacitors, transformers even if specifically intended for converters.	
U24-D01	
General converter details	
U24-D01A	
Generation of control voltages	
See also U21-B01 and U21-B05 codes for electronic switching.	
U24-D01A1	[1992]
For bipolar transistor	
U24-D01A1A	[1992]
For IGBTs	
U24-D01A3	[1992]
For FETs	
U24-D01A7	[1992]
For control of other devices	
U24-D01A8	[2007]
Multi-phase control	
This code is applied in conjunction with other U24-D codes to highlight novel multi-phase control.	
U24-D01A9	[1992]
Characterised by PWM	
See U22-E codes for PWM in general.	
U24-D01B	[1992]
Protection	
See also U24-F. For high power converters see X12-J01B and X13-C04D.	
U24-D01B1	[2005]
Snubber circuits	
U24-D01B1A	[2005]
Passive	
Includes the use of RLC elements and diodes.	

U24-D01B1C [2005]

Active

Includes the use of transistors, etc.

U24-D01B1F [2005]

Dissipative

Includes arrangements for dumping excess switching energy into a resistor. May be used in conjunction with other U24-D01B1 codes.

U24-D01B1H [2005]

Non-dissipative

Includes arrangements for excess switching energy to be fed back or fed forward, respectively, to the input or output.

U24-D01E [1992]

Reducing harmonics and ripples

(U24-D01X)

See U25-E codes for filters in general.

U24-D01E1 [2006]

Harmonics reduction

U24-D01E2 [2006]

Ripple reduction

U24-D01E5 [2014]

Reducing electromagnetic interference

This code covers measures to reduce electromagnetic interference generated by the converter itself, e.g. based on circuitry or on constructional details such as screening for which V04-U codes are also assigned. W02-H01 codes (general codes for EMI/RFI reduction at source) are also assigned as appropriate.

Electromagnetic compatibility, EM, EMC, filter, harmonic, PWM frequency, radio frequency interference, RF, SMPS, switched mode, switching frequency, switching regulator, switching transient

U24-D01G [1992]

General cooling details

(U24-D01X)

See also V04-T03 codes.

U24-D01J [2005]

Measurements/testing/monitoring

Includes self-checking arrangements and also monitoring by external equipment. See S01 codes for related electrical instrumentation aspects.

U24-D01K [2007]

Constructional details

U24-D01X

Other converter aspects

Includes converter details not covered elsewhere.

U24-D02

DC-DC converters

U24-D02A

Without intermediate AC

Charge pump

U24-D02A1 [2005]

Charge pump

U24-D02A2 [2005]

Chopper

U24-D02B

With intermediate AC

U24-D02B1 [1992]

Flyback; Forward

U24-D02B3 [1992]

Half-bridge or single-ended push-pull; Push-pull

SEPP

U24-D02B5 [1992]

Full bridge

U24-D02B7 [1992]

Resonant

U24-D03

AC-AC converters

U24-D04

AC-DC converter

Rectifier

U24-D04A [1992]

Half-wave

U24-D04C [1992]

Full-wave

U24-D04C1 [1992]

Bridge

U24-D04C1A [1992]

Characterised by diodes

U24-D04E	[1992]
Voltage multiplier	
U24-D04G	[2002]
Synchronous rectifier	
(U24-D04C)	
Includes rectifiers using active transistor switches.	
U24-D05	
DC-AC converter	
<i>Inverter</i>	
U24-D05A	
Full- and half-bridge	
U24-D05A1	[1992]
Characterised by bipolar transistors	
U24-D05A1A	[1992]
Characterised by IGBTs	
U24-D05A3	[1992]
Characterised by FETs	
U24-D05A5	[2006]
Characterised by combination of bipolar/IGBTs/FETs	
U24-D05A9	[1992]
Other inverters	
Includes inverters characterised by type of switch not covered elsewhere.	
U24-D05B	[2005]
Inverter-type	
To be used in conjunction with other inverter codes such as U24-D05A.	
U24-D05B1	[2005]
Voltage source inverter	
U24-D05B2	[2005]
Current source inverter	
U24-D05B3	[2005]
Utility inter-tie inverter	
Includes inverters fed by solar/wind power/etc generators for connecting to a mains/utility supply. For high power inverters, see X12-J codes.	

U24-D06	[2005]
Pulse voltage supply	
See X12-J06 for high power pulse supply. See U22-A03 also for energy-storage pulse generation.	
U24-D09	
Other converters	
Includes other converters not covered elsewhere e.g. dynamic types.	
U24-D10	[2007]
Bidirectional converter	
This code is used in conjunction with other codes to indicate a bidirectional novelty.	
U24-D11	[2007]
Multiple input/output	
This code is used in conjunction with other codes to indicate multiple input/outputs aspects. Caters for, for example, converters that output voltages of different magnitudes.	
U24-D12	[2007]
Intelligent power supply	
Includes power supplies characterised by having a microcontroller for providing programmable features. The latter include the ability to adaptively respond to external conditions, adaptive current limit for different phases of the PSU operation, programmable output voltage, supervisory features, fault recovery, status information provision for remote diagnostics, etc. See also relevant T01-J08 codes.	
<hr/> U24-E	
Regulating power/current/voltage	
U24-E01	
Non-feedback systems	
Includes e.g. Zener diode.	
U24-E01A	[2005]
AC variable	
U24-E01C	[2005]
DC variable	
U24-E01C1	[2005]
Zener diode-based	

U24-E01C5 [2005]

Current mirror circuits

Includes current sinking/sourcing configurations for the regulating transistor to connect a load to the ground/DC power supply terminal.

U24-E01C7 [2005]

Band gap reference circuits

Includes, generally, regulators using the difference between base-emitter voltages of two bipolar transistors operating at different current densities. For voltage reference circuits using feedback, see U24-E02B7.

U24-E02

Feedback systems

U24-E02A

For AC

U24-E02B

For DC

U24-E02B1

With overload protection

U24-E02B1A [1992]

With overload protection and series dissipative transistor

(U24-E02B3)

U24-E02B2

With transistor

U24-E02B2A [1992]

Switching regulator or switched mode power supply

(U24-E02B4)

SMPS

U24-E02B2D [1992]

Dissipative regulators

(U24-E02B6)

U24-E02B3* [1983-1991]

With overload protection and series dissipative transistor

*This code is now discontinued and was formerly a subdivision of U24-E02B1. From 1992 this subject matter is transferred to U24-E02B1A to indicate its proper hierarchical relationship to U24-E02B1. It remains valid and searchable for documents from 1983 to 1991.

U24-E02B4* [1983-1991]

Switching regulators

*This code is now discontinued and was formerly a subdivision of U24-E02B2. From 1992 this subject matter is transferred to U24-E02B2A to indicate its proper hierarchical relationship to U24-E02B2. It remains valid and searchable for documents from 1983 to 1991.

U24-E02B6* [1983-1991]

Dissipative regulators

*This code is now discontinued and was formerly a subdivision of U24-E02B2). From 1992 this subject matter is transferred to U24-E02B2D to indicate its proper hierarchical relationship to U24-E02B2. It remains valid and searchable for documents from 1983 to 1991.

U24-E02B7 [2006]

Voltage reference circuit

Includes circuit using feedback. For non-feedback voltage reference circuits, see U24-E01C7.

U24-E02B9

Other DC regulators

Includes other DC feedback systems to control power/current/voltage.

U24-E02C [1987]

Regulation for AC or DC variable

U24-E02D [1987]

Regulation of electric power

U24-E02D1 [1987]

Maximum energy transfer from generator

Includes e.g. solar cell circuits.

U24-E02D1A [1997]

Solar power system and associated converter interconnection with commercial utility system

(U24-E02D1)

Generally includes inverter control (see also U24-D codes) to enable max. power transfer. See also X12-H01B.

U24-E02D2 [1987]

Regulating power factor

Capacitor banks for power factor correction in heavy current systems are in X12-H01A.

U24-E03 [1987]
Regulating electric variables using input deviation detection
Phase/firing angle, phase-switching, fire, zero-crossing detector, trigger

U24-E03A [1987]
AC input with thyristors or triacs

U24-E03B [1987]
AC input with transistors, FETs

U24-E03X [1987]
Other electric output regulation based on input deviation
Includes other electric variables regulation.

U24-E04 [1987]
Regulating magnetic variables
(U24-X)
Includes magnetic amplifiers using e.g. transducers.

U24-F [1983]
Protective circuits
(U24-X)
Protection for heavy current systems is covered by X13-C codes.

U24-F01 [1983]
For automatic disconnection
(U24-X)
This code covers protection arrangements for low-power electrical and electronic circuits involving disconnection which may be capable of being reset or may be non-resettable, e.g. based on fuses. Novel details of fuses themselves are not included and are covered by X13-D01 codes.

U24-F02 [1983]
Limiting excess current/voltage
(U24-X)
Surge protection

U24-F03* [1997-2016]
Smart protectors
*This code is now discontinued and from 2017 this subject matter is covered by U24-F05, i.e. as digital protectors. U24-F03 remains valid and searchable for records between 1997 and 2016 when it covered smart protectors using microprocessors and the like. See also U13-E01 for IC protectors and relevant T01-J08 codes for microprocessor control.

U24-F04 [1997]
Solid-state (analogue) protectors

U24-F05 [1997]
Digital protectors
From 2017 the scope of this code is expanded to cover all low-power circuit protection devices which rely on digital circuitry and devices to detect fault conditions and initiate protective measures, including smart protectors which prior to 2017 were covered by U24-F03.
ADC, analog-to-digital converter, digital relay, digital protective relay, logic, microprocessor, neural network, numerical relay, smart circuit protector, software

U24-F06 [2002]
Electrostatic protection

U24-F07 [2002]
Thermal protection

U24-F08 [2018]
Charging protection
This code covers protection for energy stores such as secondary cells and capacitors, and equipment using them, from damage arising from charging. The protection may be triggered by an undesired electrical condition or by a physical change, such as deformation of battery casing or temperature rise. Other U24-F codes are also assigned as appropriate, e.g. U24-F01 for protection involving disconnection from a charging source or U24-F07 for protection initiated by rise in temperature. Charging of batteries is also covered by X16-G codes and of capacitor energy stores by U24-L and X16-L02. Protection for high-power batteries and battery systems is covered by X13-C04X.
Fast charging, gas pressure, overcharging, rapid charging

U24-G [1987]
Semiconductor/valve and other amplifiers
Codes in this section are divided into categories of circuit application (U24-G01 codes), circuit type and configuration (U24-G02 codes), circuit modifications (U24-G03 codes) and implementation technology (U24-G04 codes). In general, codes from the U24-G01,-G02 and -G04 sections are assigned to describe general aspects of the amplifier, novel features being chiefly represented by U24-G03 codes. From 1992, subject matter previously covered by U24-B has been incorporated in this section.

U24-G01 [1987]
Circuit applications

U24-G01A [1987]
Instrumentation servo, sensor opto-receiver (U24-A01, U24-A09)

U24-G01A1	[1992]
Instrumentation	
Instrumentation in general is covered in section S.	
U24-G01A5	[1992]
Opto-receiver amplifiers	
Covers amplifiers with e.g. photodiode, phototransistor at input. See also codes for application, e.g. W02-C04A3B for optical communication receiving amplifier.	
U24-G01B	[1987]
Power	
U24-G01B1	[1987]
Low frequency	
Also coded in W03-C01C when used as an audio power amplifier.	
U24-G01B5	[1987]
High frequency	
Also coded in W02-G01B when used as transmitter power amplifier. See U24-G04M for microwave amplifier constructional aspects.	
<i>HF, RF, microwave, millimetre, wave</i>	
U24-G01C	[1987]
Audio and general low frequency	
See W03-C codes also for non-power audio amplifiers, e.g. W03-C01A for audio preamplifiers.	
U24-G01D	[1987]
High frequency	
Covers HF/RF signal amplifiers for video and radio equipment. See also under application, e.g. W02-G03A3 for radio receiver RF amplifiers. See U24-G04M for microwave amplifier constructional aspects.	
U24-G01F	[1992]
Logarithmic amplifier	
Compression in general is covered by U24-C02B. Circuit modifications to introduce deliberate nonlinearity are covered by U24-G03K.	
U24-G01X	[1987]
Other amplifier application	
U24-G02	[1987]
Circuit type and configuration	
U24-G02A	[1987]
Differential amplifier, current mirror, operational amplifier	
(U24-A04)	

U24-G02A1	[1992]
Differential amplifier	
From 2002, U24-G02A1C is assigned for amplifiers with both differential input and output, and takes precedence over the other two subdivisions of U24-G02A1.	
U24-G02A1A	[2002]
Differential input	
U24-G02A1B	[2002]
Differential output	
U24-G02A1C	[2002]
Differential input and output	
This code takes precedence over U24-G02A1A and U24-G02A1B.	
U24-G02A3	[1992]
Current mirror	
U24-G02A5	[1992]
Operational amplifier	
U24-G02A5A	[1997]
Transconductance amplifier	
<i>OTA</i>	
U24-G02A5C	[1997]
Current mode operation	
Covers amplifier with predominately current-based feedback.	
U24-G02A7	[1992]
Follower circuit e.g. emitter follower	
U24-G02B	[1987]
Switched capacitor	
This code covers switched-capacitor amplifier technology, and includes any amplifier circuit using this technique. Circuits of this type using 'off-the-shelf' (i.e. not novel) operational amplifiers, used as a functional block or 'black box', are covered by U24-G04C1, which is assigned as well as U24-G02B when necessary. Switched capacitor filters and switched capacitor networks in general are covered by U25 codes.	
U24-G02C	[1987]
Push-pull, phase splitters	
U24-G02C1	[1992]
Phase splitter circuits	
This code is used for novel phase splitting circuits of general application.	
<i>Transformer, transistor</i>	

U24-G02C5	[1992]
Push-pull amplifier	
U24-G02D	[1987]
DC coupled	
U24-G02E	[1987]
Switching Amplifier	
From 2005, the title of this code has changed to better reflect its content. This code covers switching amplifier arrangements or as they are more commonly known Class D amplifiers. Digital Amplifiers and Class E amplifiers are also covered here. See U22-E codes for pulse modulation in general, U21-B codes for electronic switching in general and U24-G01 codes and W03-C codes for audio applications.	
<i>Digital Amplifier, Class D, Class E, PWM, Switching Amplifier</i>	
U24-G02F	[1987]
Gated, two-way, cascode, bridge, and combination amplifiers	
U24-G02F1	[1992]
Gated amplifier	
Amplifier muting in general is covered by U24-C05C.	
U24-G02F2	[1992]
Multichannel amplifier	
U24-G02F3	[1992]
Bidirectional amplifier	
<i>Two-way</i>	
U24-G02F4	[1992]
Bridge amplifier	
U24-G02F5	[1992]
Cascaded amplifier	
<i>Multistage</i>	
U24-G02F7	[1992]
Cascode amplifier	
U24-G02X	[1987]
Other amplifier circuit configurations	
Includes reflex amplifiers.	
U24-G03	[1987]
Modifications and improvements to amplifiers	
(U24-A05, U24-A06)	

U24-G03A	[1987]
Negative feedback	
<i>NFB</i>	
U24-G03B	[1987]
Positive feedback, feedforward	
U24-G03B1	[1992]
Feedforward	
See U24-G03D5 also when object is distortion reduction.	
U24-G03C	[1987]
Protection	
(U24-A09)	
Overvoltage or overcurrent protection in general is covered by U24-F codes.	
U24-G03D	[1987]
Noise/distortion reduction	
U24-G03D1	[1992]
Noise reduction	
For application to radio receivers, see W02-G03B codes also.	
U24-G03D1A	[2002]
Noise arising from amplifier components	
U24-G03D1B	[2002]
Reducing effect of external noise sources	
U24-G03D3	[2002]
Improvement in dynamic range	
U24-G03D5	[1992]
Distortion reduction, linearity improvement	
For pre-distortion see U24-G03K and when relating to RF systems, W02-G04B codes also.	
U24-G03D5A	[2002]
Harmonic distortion	
U24-G03D5C	[2002]
Intermodulation distortion	
U24-G03D5X	[2002]
Other distortion	

U24-G03E [1987]

For integrated circuits

Inventions coded in U24-G03E codes deal with improvements to amplifiers where the integrated aspect is a significant factor, and are not normally coded in U13 unless structural aspects are involved. See U24-G04A codes for general integrated circuit implementation aspects of amplifiers.

U24-G03E1 [1992]

Measures improving performance

This code may be used with other U24-G03 codes depending on the nature of the improvement. Includes e.g. improvement in noise figure, slew rate, (see U24-G03D1 and U24-G03J respectively also) etc.

U24-G03E5 [1992]

Physical measures

This code is used to denote measures not involving changes to the circuit per se, but to physical characteristics, e.g. enabling reduction of chip area.

U24-G03F [1992]

Offset reduction

For application to DC amplifiers search with U24-G02D.

U24-G03G [1992]

Improving immunity to supply voltage change, novel biasing networks

U24-G03G1 [1997]

Novel biasing networks

U24-G03H [1992]

Improving immunity to temperature change

U24-G03J [1992]

Extending bandwidth

Includes improvements to wideband performance, increasing slew rate, etc.

U24-G03K [1992]

Deliberate nonlinearity introduction

For pre-distortion see U24-G03D5 and when relating to RF systems, W02-G04B codes also.

U24-G03L [1992]

Measures to improve stability

Bode, Nyquist, compensation, open, loop, closed loop, feedback

U24-G03N [1992]

Improving efficiency, reducing supply voltage
(U24-G03X)

U24-G03N1 [1997]

Improving efficiency

This code mainly relates to power amplifiers in which case U24-G01B codes are also applied.

Battery saving, headroom improvement

U24-G03N5 [1997]

Reducing supply voltage

Includes arrangements for enabling operation with reduced supply voltage, e.g. in battery-operated equipment.

Headroom, saturation, voltage swing, rail

U24-G03P [1997]

Improving CMRR, improving gain

(U24-G03X)

U24-G03P1 [1997]

Improving CMRR

(U24-G03X)

See U24-G02A5 codes for differential amplifier per se.

Common mode rejection ratio

U24-G03P5 [1997]

Improving gain

(U24-G03X)

U24-G03Q [1997]

Reducing dependence on device characteristics

This code may be used with U24-G03E and U24-G04 codes as appropriate.

U24-G03R [1997]

Modifying input-output impedance

(U24-G03X)

U24-G03X [1987]

Other modifications and improvements to amplifiers

U24-G04 [1987]

Amplifier implementation technology

These codes are applied whenever the implementation is specific to a single main type.

U24-G04A	[1987]
Integrated transistor circuits	
Inventions assigned U24-G04A codes are not normally coded in U13 unless structural aspects are involved.	
U24-G04A1	[1987]
Bipolar	
U24-G04A2	[1987]
Field effect transistor	
<i>CMOS, FET, IGFET, JFET, MESFET, MISFET, MOS, MOSFET</i>	
U24-G04A3	[1992]
Bipolar and FET combined	
U24-G04B	[1987]
Discrete transistor circuits	
U24-G04B1	[1987]
Bipolar	
U24-G04B2	[1987]
Field effect transistor	
<i>CMOS, FET, IGFET, JFET, MESFET, MISFET, MOS, MOSFET</i>	
U24-G04B3	[1987]
Bipolar and FET combined	
U24-G04B9	[1987]
Other discrete semiconductor device implementation	
U24-G04C	[1987]
Amplifier modules using operational amplifiers	
Includes circuits using general amplifier configurations as functional blocks. (Analogue computing elements are covered by T02-A04B codes).	
U24-G04C1	[1987]
Switched capacitor amplifier using OPAMPs	
This code covers the use of non-novel operational amplifiers in switched capacitor amplifier circuit configurations. All aspects of switched capacitor amplifiers are covered by U24-G02B (which is therefore assigned with this code). Switched capacitor networks in general are covered by U25-A01.	
U24-G04D	[1987]
Valve	
Includes klystron, travelling wave tube, etc. amplifiers. For novel details of tubes themselves see V05-B and V05-C codes.	

U24-G04E	[1992]
Parametric amplifier	
Parametric amplifiers are generally coded in U24-G01D also.	
U24-G04M	[1992]
Amplifiers using microwave or millimeter wave constructional techniques	
From 2017 the title of this code has been changed to clarify its coverage of amplifiers whose operating frequency dictates the techniques used, e.g. distributed or transmission line amplifiers (also assigned U24-G02F5) and those employing distributed-constant elements such as waveguides, cavity resonators, and the like. Novel constructional details of amplifiers in general, such as PCB mountings, housings etc. are covered by U24-G05A which can be assigned with this code as necessary. Small-signal amplifiers of this kind are also assigned U24-G01D and RF power amplifiers are also assigned U24-G01B5. Distributed-constant elements such as waveguides, filters and resonators are covered by W02-A codes.	
<i>Dielectric resonator, directional coupler, finline, microstrip, probe, stripline</i>	
U24-G04X	[1987]
Other amplifier implementation technology	
U24-G05	[1997]
Constructional details and testing	
U24-G05A	[1997]
Constructional details of amplifiers	
Includes cooling, housings, mounting details, etc. V04-S and V04-T codes for electronic equipment casings and constructional details in general are also assigned as necessary. Amplifiers using microwave or millimeter wave constructional techniques, e.g. microstrip or other types of waveguide, are covered by U24-G04M and are only assigned this code as well for novel constructional details of the amplifier as a whole.	
<i>Circuit board mounting, coolant, fan, heatsink, PCB mounting, pillar, rack mount, screening, shielding</i>	
U24-G05C	[1997]
Testing	
Includes amplifier calibration, self-testing and testing using external equipment. To denote testing of a specific amplifier property U24-G03 codes are also assigned as appropriate, e.g. U24-G03F and U24-G05C are assigned for measurement of amplifier offset voltage. For electrical tests S01 codes are also assigned as appropriate.	
U24-G09	[1987]
Other amplifier details	

U24-H [1992]

Low power systems

(U24-X)

This code is analogous to X12-H.

U24-H01 [2005]

Protection

Includes arrangements to protect LV power networks. For example, vehicle 12V network protection. To be used with U24-F codes, as appropriate. For individual PSU protection, see U24-D01B/F. For high power networks, see X13-C codes.

U24-H02 [2005]

Wireless/non-contact power distribution

Includes low level non-contact power transfer. For non-contact high power distribution see X12-H01E codes. See X16-G03 for non-contact battery charging, W01-C01E5E for wireless phone charging and X21-B01A1C for offboard non-contact charging of electric vehicle batteries.

WPT, near-field

U24-H02A [2021]

Using capacitive coupling

U24-H02B [2021]

Using inductive coupling

Also see V02 for novel inductive components, e.g. V02-G01D for inductive connections. See S05 for biomedical and implant applications.

U24-H02C [2021]

Using radio waves or microwaves

See also W02 codes for novel RF details such as directional array or Yagi antennae, satellite communications and telemetry.

U24-H02D [2021]

Using light

Includes use of off-board mains supply. See X16-G01 for mains battery charging.

U24-H02E [2021]

Using ultrasonic waves

See also V06 codes for novel ultrasonic transducers.

U24-H02L [2021]

Wireless power transmission control, monitoring and optimization

Includes optimizing position for non-contact power transfer; reducing electric, magnetic or electromagnetic leakage/interference; detecting foreign objects; as well as transmitting data during power transfer.

U24-H03 [2005]

Arrangement of power bus(es) fed by multiple sources

Includes several PSUs supplying main bus, or several buses at same or different voltages, that feeds power to one or more loads. Covers, for example, switch control to distribute power where required.

U24-H04 [2005]

Power management techniques

Includes operation of a PSU to save/reduce battery energy dissipation and mains power. Operation measures may include switching off or operating in low power consumption mode, slowing of processor clock frequency, current/voltage control (for which U24-D/E codes are also assigned), to reduce power consumption. Changes to the operation of a PSU within portable equipment so as to reduce battery dissipation are covered by U24-K.

U24-H05 [2006]

Power distribution over communication network

Includes power supply distribution, and its control, over a communication network such as a LAN, for which W01-A06 codes are also assigned as appropriate. The use of power distribution conductors as a communications medium for a data network is covered by W01-A06C6, and for communications in general, by W02-C01A3.

PoE, power over Ethernet®

U24-H06 [2006]

Low power network control

U24-H07 [2006]

Vehicle LV distribution network

Includes systems for IC engine-driven vehicles for voltages up to 42V. HV electric traction vehicle distribution systems are covered by X12-H01B codes and X21/X23. Also includes low voltage electric distribution systems for vehicles (see also X21-B and X22-F codes).

U24-J [1992]

Standby power supply

Includes uninterruptible power supplies. See T01-L01B for computers, W01-A07K for data communications and W01-C07B for telephone systems.

U24-J01 [2005]

Battery back-up

U24-J02 [2005]

Capacitor back-up

U24-J03 [2005]

Power converter back-up

U24-J04 [2005]

Combination of battery and capacitor back-up

U24-K [2005]

PSU power-saving mode/operation

This code covers operation of a power supply unit within portable equipment to reduce battery dissipation. Power management techniques with the emphasis on power distribution are covered by U24-H04.

U24-L [2005]

Capacitor charging circuits

This is analogous to X16-G for battery chargers.

U24-T [2017]

Constructional details of low power supplies and power distribution systems

Includes construction details of all types of low power supply except power converters covered by U24-D01 codes (e.g. U24-D01K). Also covers constructional details of power distribution systems. This code is assigned in conjunction with other U24 'power' codes as necessary, and is intended to highlight mechanical or physical details, including cooling, of inventions in this field. V04 codes dealing with electronic equipment constructional details in general are also assigned as necessary.

Bracket, casing, circuit board mounting, fan, fixing, heatsink, housing, PCB, printed circuit board mounting, ventilation

U24-X

Other low power supply details

Portable power supply, power bank, wearable power supply.

U25: Impedance Networks and Tuning

This section includes mainly lumped-constant circuit elements. Impedance networks with distributed-constant elements are covered by W02-A codes. Subject matter coded in U25 is generally for use in analogue circuits. Digital implementations of filters and similar networks are **not** included here and are covered chiefly by U22-G codes and T01-J08 codes for computing aspects. For application to radio equipment see W02 and W03 codes as appropriate.

U25-A

Time delay and time-varying (incl. adaptive) networks

U25-A01 [1983]

Switched capacitor networks; N-path filters

Switched capacitor amplifiers are covered by U24-G02B.

U25-A02 [1983]

Transversal filters

Digital transversal filters are covered by U22-G01A3.

U25-A03 [1992]

Comb filters

Digital comb filters are covered by U22-G01B5.

U25-A05 [1992]

Time delay circuits

Covers arrangements with emphasis on achieving a required time delay. Circuitry to produce a specific phase shift is covered in U25-F01 codes. Other delay aspects, e.g. for equalisation, are covered by U25-E05Q.

U25-B

Electromechanical networks

This code covers networks of electromechanical devices, i.e. two or more resonators forming e.g. a lattice or ladder filter such as a bandpass filter or a duplexer for a radio transceiver (in which case W02-G02A5B is also assigned). Individual piezoelectric, electrostrictive and magnetostrictive devices are covered by V06-V codes and SAW devices by U14-G, and are not assigned U25-B unless specifically intended for use in a network made up of these devices. U25-B also includes matching transformers (with V02-F02) and other components for electromechanical networks, for which other codes are also assigned as appropriate. U25-D codes are also assigned as necessary, e.g. U25-D01 codes when a splitting function is performed, U25-D03 for a balun function, and U25-D05 for impedance matching aspects.
Crystal filter, ceramic filter, block filter

U25-C

Active networks simulating reactances; impedance converters

This code covers circuits for simulating reactances, changing their sign (e.g. producing an inductive reactance from a capacitor) and changing their magnitude, such as a 'capacitor amplifier' or 'capacitor multiplier'.

Gyrator, negative/positive impedance converter, NIC, PIC, reactance multiplier, Miller effect

U25-D

Signal splitting/combining, impedance matching, balanced-to-unbalanced networks; Attenuators

U25-D01 [1992]

Signal splitters and combiners

This code and its subdivisions cover active and passive networks for splitting and combining signals, generally without regard to frequency. Splitting and combining circuits based on electromechanical filters are assigned U25-B and U25-D01 codes as appropriate. Where splitting or combining networks involve use of frequency-selective elements such as filters implemented with coils and capacitors, U25-E05K is assigned (with other U25-E codes as appropriate) **instead of** U25-D01 codes. Note that loudspeaker cross-over networks are not included in U25 unless other aspects or wider applications are involved, being covered by W04-T05 and V06-V02S.

U25-D01A [1997]

Active

U25-D01C [1997]

Passive

Transformer

U25-D03 [1992]

Balanced-to-unbalanced converters

Distributed-constant balanced-to-unbalanced converters are covered by W02-A02A5.

Balun

U25-D05 [1992]

Impedance matching networks

Distributed-constant impedance matching is covered by W02-A02A5.

U25-D07 [1992]

Attenuators

Waveguide-technology attenuators are covered by W02-A04C codes.

Insertion loss

U25-D07A [1997]

Active

This code covers the use of semiconductor devices in attenuator circuits, both as switches and as controllable resistances.

PIN diode, FET

U25-D07C [1997]

Passive

U25-E

Frequency selective networks

Codes in this group are used for filters (excluding those covered by U25-A codes and U25-B) involving at least two types of elements, i.e. RC, RL, or LC networks. Thus individual components described as 'filters' or 'noise filters' in a power supply or other circuit are not included, unless intentionally using a secondary property such as series inductance of a capacitor, or stray capacitance of an inductor. Noise filters for RFI suppression are covered in general in W02-H01 codes and for power supply lines in W02-H03 and U24/X12 codes, whether single components or combinations. Where filter function is specified, codes from the U25-E05 section are used with either U25-E01 or U25-E02. Active networks other than filters are assigned appropriate codes elsewhere in U25. For digital filters see U22-G01 codes. Waveguide technology filters are covered by W02-A05 codes.

Filter, lowpass, bandpass, highpass, notch

U25-E01

Active

U25-E01A [1997]

Biquadratic filter

Biquad

U25-E02

Passive

U25-E02A [1997]

With structurally-associated components

Includes networks implemented with 'composite' components. See also V01-A02G5 and V01-B03C8 for composite resistor and capacitor aspects respectively, and V02-F01J for filter inductors.

U25-E05 [1992]

Characterised by function and operation

From 2009 U25-E05K is introduced for frequency selective networks with emphasis on separation or combination of frequency bands and takes precedence over other U25-E05 codes.

U25-E05A [1992]

Lowpass filter

U25-E05B [1992]

Bandpass filter

U25-E05B1 [1997]

Single LC resonant circuit

U25-E05C [1992]

Highpass filter

U25-E05D [1992]

Notch filter

This code covers analog filters which attenuate a band of frequencies and pass those on either side.

Band stop filter

U25-E05H [1992]

Variable characteristic

This code is used with other U25-E05 codes or alone, as appropriate.

U25-E05K [2009]

Combining or separating different frequencies

(U25-E05X)

This code is intended for frequency selective networks, i.e. filters normally, where the emphasis is on combination or separation of frequency bands. Examples include duplexers for radio transceivers, for which W02-G02A5B is also assigned. Where there are **significant novel aspects** in specific filters making up the frequency separating or combining network other U25-E05 codes are also assigned as appropriate, but otherwise U25-E05K takes precedence. Combining and splitting networks (lumped constant type) in general, **without** emphasis on frequency separation, are covered by U25-D01 codes. When frequency-based separation is involved U25-E05K takes precedence. Note that loudspeaker cross-over networks are not included, being covered by W04-T05 and V06-V02S

U25-E05Q [2009]

Delay equalisation and all-pass networks

(U25-E05X)

This code is intended for circuits in which emphasis is on delay equalization (and not amplitude equalization) and all-pass networks, in which all frequencies are passed, but the phase of the output is modified. Analogue circuits based on lumped constant impedances for correcting amplitude-frequency distortion are covered by U25-E05X but U25-E05Q takes precedence when delay equalisation is the main purpose.

Group delay

U25-E05X [1992]

Other filter network function

This code includes frequency-dependent circuits used for amplitude equalisation, e.g. to compensate for increasing attenuation in a circuit or transmission line with frequency. (W02-C01B2B is also assigned when the application is to equalization of transmission lines for communications purposes and W01-A08B2 when the emphasis is on pulse shaping for data transmission). Prior to 2009 U25-E05X was also used for circuits with emphasis on delay equalization, now covered by U25-E05Q which takes precedence over this code when both amplitude and delay equalization are involved. Analogue time delay networks are covered by U25-A05. See U25-F01 codes for networks with emphasis on achieving a particular phase shift. From 2009 frequency selective networks (i.e. filters normally) with emphasis on the separation or combining of frequency bands are no longer coded here and are covered by U25-E05K.

Amplitude fall-off, frequency-dependent loss, lowpass characteristic, peaking, roll-off

U25-F

Tone or bandwidth control; Other impedance networks (incl. phase shifters)

U25-F01 [1992]

Phase shift networks

Covers arrangements to produce a particular phase shift, e.g. at a single frequency. Time delay networks are covered by U25-A05 and delay equalisation networks by U25-E05X.

U25-F01A [1992]

Variable phase shifter

U25-F05 [1992]

Bandwidth control

See W03-C05 codes also for audio amplifier tone control circuits.

U25-F05A [1992]

Automatically varied or switched

U25-F05A1 [1992]

Continuous variation

U25-F05A5 [1992]

Switched bandwidth

U25-F05C [1992]

Manual control

U25-F05C1 [1992]

Continuously variable

U25-F05C5 [1992]

Switched bandwidth

U25-F09 [1992]

Other impedance networks

U25-G

Continuous tuning

Includes tracking adjustment.

U25-G01 [1992]

Mechanically varied

Covers tuning by conventional variable capacitor or inductor, either manually or by motor drive. For capacitors and inductors per se see V01-B and V02 codes, e.g. V02-F01.

MEMS actuator, permeability

U25-G03 [1992]

Electrically varied

Includes use of varactor diodes, saturable core inductors, etc.

Varicap, reactance circuit, Miller

U25-H

Discontinuous tuning; Band selection

Step, preset, pushbutton, select

U25-H01 [1992]

Bandswitching

Includes electromechanical and electronic methods and circuits for switching tuning range. (Step tuning within a frequency band is covered by U25-H03).

U25-H03 [1992]

Step tuning e.g. by synthesiser

See U23-D01B codes for details of PLL synthesisers and U23-F03 codes for direct types. (Switching between frequency bands is covered by U25-H01).

U25-H03A [1992]

With channel memory

U25-J

Automatic band scanning; Automatic frequency control

Lock, AFC

U25-J01 [1992]

Bandscanning

Bandscanning arrangements for spectrum analysers/panoramic receivers are coded in S01-D03C1 also, and in W02, e.g. W02-C05 and W02-G03A codes.

Sweep, scan

U25-J01A [1992]

Using synthesiser tuning

See U23-D01B codes for details of PLL synthesisers per se and U23-F03 codes for direct types.

U25-J01A1 [1992]

With channel memory

Preset, select, priority channel

U25-J01C [1992]

Stopping on detected station

U25-J05 [1992]

Automatic frequency control

See U23-D codes for frequency/phase control circuits, and under application, e.g. W03-A02A for AFC in TV receivers, W03-B01B for broadcast radio receivers respectively.

AFT, automatic fine tuning

U25-K

Other tuning

Includes testing and production trimming of tuned circuits and filters, either manually or automatically. (See S01-G08 codes also, together with appropriate code in e.g. W02 or W03). This code also includes remotely-controlled tuning per se. For wider aspects of remote control see W03-A02C, W03-G05A and W04-E04A codes for remote control of TV receivers, audio/video equipment, and recording equipment respectively. (Remote control in general is covered by W05-D codes).

Tuning scale, dial, drive, drum, pointer, illumination, test, align, set-up

Section V

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V01: Resistors and Capacitors

This section deals with resistors and capacitors usable as discrete components, so that components forming part of an integrated circuit are **not** included. Similarly, thick and thin film circuits are **not** included and are covered by U14-H codes. Power resistors and capacitors are covered by X12-A and X12-B codes respectively.

V01-A

Resistors

V01-A01

Mounting, housing, coding; Terminals

Marking, colour coding, lead, wire

V01-A01A [1992]

Substrate details

Includes composition, structure etc.

Baseplate, ceramic

V01-A01B [1992]

Housing, encapsulation, mountings

Casing

V01-A01B1 [1992]

Encapsulation

Includes compositions.

V01-A01C [1992]

Electrodes and terminals

V01-A01C1 [1992]

Electrodes

Film, end cap, contact

V01-A01C5 [1992]

Terminals

Includes lead arrangements.

Wire, axial, tag, pad

V01-A01D [1992]

Coding, marking

Colour code, value, tolerance

V01-A01X [1992]

Other

Includes shielding and cooling arrangements (for low-power resistors only).

V01-A02

Fixed resistors

V01-A02A

Thermistors

For temperature measurement application see V01-A02A7A and S03-B01F also. This code is intended for resistors using e.g. oxides of transition metals, and not linear TCR devices based on metallic conductors, for which S03-B01B is assigned, (although novel details of such resistances are assigned other V01 codes when appropriate).

Temp, coefficient resistance, PTC, NTC, circuit protector, cold conductor

V01-A02A1 [1992]

Novel thermistor composition

V01-A02A1A [1997]

Manufacture of thermistor material

This code covers the manufacture of material for use in thermistors and does **not** relate to manufacture of thermistors per se, which is covered by V01-A04 codes (especially V01-A04K1).

V01-A02A5 [1992]

Characterised by temperature dependence

TCR, resistance, coefficient

V01-A02A5A [1992]

Negative temperature coefficient

NTC

V01-A02A5B [1992]

Positive temperature coefficient

PTC

V01-A02A7 [1992]

Characterised by intended function

V01-A02A7A [1992]

Measurement of temperature per se

Temperature measurement using thermistors is also coded in S03-B01F.

Thermometer, sensor

V01-A02A7B [1992]

Current limiting

Includes use as cold conductor.

Circuit protector

V01-A02A7C [1992]

Time-dependent current control

Includes use of heating to gradually decrease or increase current, e.g. for degaussing CRT, (see W03-A08A4C also) or for motor starting (see V06-N05 also).

Decay, decrease, time delay, demagnetising

V01-A02A7D [1992]

For self-regulating heating

See X25-B01 codes also.

Self heater

V01-A02A7X [1992]

Other thermistor function

V01-A02B

Voltage dependent resistors

Includes current-responsive resistors.

Nonlinear resistor, varistor, VDR, protection, zinc oxide, sintered

V01-A02B1 [1992]

Novel varistor composition

V01-A02B1A [1997]

Manufacture of varistor material

This code covers the manufacture of material for use in varistors and does **not** relate to manufacture of varistors per se, which is covered by V01-A04 codes (especially V01-A04K2).

V01-A02C

Film resistors

Note - resistors forming part of a film or integrated circuit are not coded in V01- see appropriate codes in section U, e.g. U11-C05G1A for manufacture, U12-C03 for resistors per se, and U14-H01C for film circuit resistors.

Thick film, thin film, layer resistor

V01-A02C1 [1992]

Novel film resistor composition

See U11-A05 also for film compositions.

V01-A02C3 [1992]

Film structure

Covers film structures for discrete resistor components only.

V01-A02C3A [1992]

Thin film

V01-A02C3C [1992]

Thick film

V01-A02D [1987]

Chip resistor

Leadless, surface mounting

V01-A02F [1992]

Wire-wound resistor

(V01-A02X)

V01-A02G [1992]

Composite resistor

(V01-A02X)

Includes resistors structurally associated with other discrete components.

Multiple

V01-A02G1 [1992]

With other resistive components

(V01-A02X)

Includes resistor array.

V01-A02G5 [1992]

With other non-resistive components

(V01-A02X)

Includes RL and RLC elements.

RC, CR, capacitor, inductor, coil

V01-A02H [1992]

Temperature compensation

(V01-A02X)

Resistors with deliberately manufactured positive or negative temperature coefficient are covered by V01-A02A codes.

V01-A02X

Other

Includes low-power liquid resistors. Power types are coded in X12-A only.

V01-A03

Variable resistors

Codes in this section include variable resistors as preset or manual controls, and also resistive transducers in which physical movement is involved. For other types see V01-A02 codes.

Linear, rotary, potentiometer, dual, ganged, winding, track, shaft, spindle

V01-A03A [1992]

Housing, casing, mounting kit

(V01-A01, V01-A03)

From 1992 housing and mounting details of variable resistors are coded in V01-A03 codes only.

V01-A03A1	[1992]
Variable resistor housing (V01-A01, V01-A03)	
V01-A03A5	[1992]
Mounting details for variable resistors (V01-A01, V01-A03) <i>Bushing, nut, washer, bracket</i>	
V01-A03B	[1992]
Electrodes, terminals, slider (V01-A01, V01-A03)	
V01-A03B1	[1992]
Electrodes and terminals (V01-A01, V01-A03) Covers end-of-track electrodes. Slider/wiper is covered by V01-A03B5.	
V01-A03B5	[1992]
Slider, contact brush (V01-A01, V01-A03)	
V01-A03C	[1992]
Novel resistance element details Includes compositions. Codes in this section are applied to indicate novel aspects only. V01-A03D codes are used for general aspects (not necessarily novel).	
V01-A03C1	[1992]
Film track	
V01-A03C3	[1992]
Wire track Includes wirewound variable resistors. Power variable resistors are covered by X12-A.	
V01-A03C5	[1992]
Linear track Covers shape of track only. Arrangements to achieve a particular control law are covered by V01-A03C8. For general details of slide-type potentiometers, see V01-A03D6.	
V01-A03C7	[1992]
Rotary track For general details of rotary potentiometers, see V01-A03D5.	
V01-A03C7A	[1992]
Helical Includes track having shape of short section of helix.	

V01-A03C8	[1992]
Characterised by resistance law or characteristic <i>Linear, logarithmic</i>	
V01-A03C9	[1992]
Other Includes other resistive component configurations, such as switched resistance network, and use of magnetoresistors and movable permanent magnet. (Magnetoresistors per se are not covered in V01 - see U12-B01B codes and S02-K03A5A for transducing aspects, these codes also being assigned for this type of 'potentiometer').	
V01-A03D	[1992]
Characterised by type of adjustment/component Codes in this section are applied irrespective of claimed novelty to indicate the type of device/adjustment only, either in combination with novel aspect codes, or alone.	
V01-A03D1	[1992]
Manual e.g. front panel control <i>Volume, gain, tone, adjust, set</i>	
V01-A03D2	[1992]
Semi-variable Covers preset control, adjusted for e.g. setting-up. <i>Trimmer, test</i>	
V01-A03D3	[1992]
Measurement transducer Covers component with variation of resistance value by physical movement, including force, compression, etc. Variation of resistance due to physical parameter other than movement is covered by V01-A02 codes.	
V01-A03D4	[1992]
Surface mounting variable resistor <i>Chip, leadless</i>	
V01-A03D5	[1992]
Rotational adjustment <i>Rotary</i>	
V01-A03D5A	[1992]
With more than 360 degree rotation Includes helical potentiometer.	
V01-A03D6	[1992]
Linear Includes slide-type potentiometer. <i>Audio, mixing, fade, balance, graphic equaliser</i>	

V01-A03F	[1992]
Control knob, actuator mechanism	
Includes mechanical drive arrangement for e.g. joystick (see T04-F02B3 also).	
<i>Gear, proportional, two-dimensional, X-Y</i>	
V01-A03X	[1992]
Other	
V01-A04	
Manufacturing resistors	
Includes single and multiple-step resistor manufacturing methods and equipment, and testing of manufactured resistors.	
V01-A04A	[1992]
Substrate processing	
Includes firing, sintering, etc.	
V01-A04B	[1992]
Coating	
Covers deposition of resistive material.	
<i>Sputtering, vapour, flame spraying</i>	
V01-A04C	[1992]
Treating deposited layer	
Use V01-A04E also for heat treatment.	
V01-A04D	[1992]
Encapsulation	
V01-A04E	[1992]
Firing, heat treatment	
Includes sintering, etc.	
V01-A04F	[1992]
Attaching leads, manufacturing electrodes	
V01-A04G	[1992]
Multistep manufacturing process and novel manufacturing equipment	
V01-A04G1	[1997]
Multistep manufacturing process	
This code is used when a sequence of manufacturing steps is claimed without apparent emphasis on any one aspect.	
V01-A04G5	[1997]
Novel manufacturing equipment	
Use with other V01-A04 codes as appropriate.	

V01-A04H	[1992]
Testing, sorting, trimming, marking	
V01-A04H1	[1992]
Testing and sorting resistors	
See S01-D05B1 and S01-G12A for electrical testing of resistors.	
V01-A04H3	[1992]
Trimming resistor value	
See X24-D03B for laser trimming apparatus.	
V01-A04H5	[1992]
Marking resistors	
V01-A04J	[1992]
Tape carriers, packing	
Includes 'bandolier' tape carriers per se (see V04-V01A also), loading finished resistors onto tapes, shipping containers, etc.	
V01-A04K	[1992]
Resistor type	
Codes in this section are used to indicate the type of resistor being manufactured only. V01-A04K codes are not used if a manufactured resistor is also claimed resulting in the assignment of a V01-A02 or V01-A03 code.	
V01-A04K1	[1992]
Thermistor	
Manufacture of thermistor material is not covered here - see V01-A02A1A.	
V01-A04K2	[1992]
Varistor	
Manufacture of varistor material is not covered here - see V01-A02B1A.	
V01-A04K3	[1992]
Film resistor	
V01-A04K4	[1992]
Chip resistor	
V01-A04K5	[1992]
Wirewound resistor	
V01-A04K6	[1992]
Variable resistor	
<i>Potentiometer</i>	

V01-A04K9	[1992]
Other resistor type	
V01-A04R	[2005]
Resistor manufacture process waste disposal and recycling	
(V01-A04X)	
V01-A04R1	[2005]
Waste handling and disposal	
Includes all aspects of waste disposal and waste treatment equipment to make the waste safe in the environment.	
V01-A04R2	[2005]
Materials treatment and recycling	
Includes all aspects of recovery of materials, solutions, and the like for reuse in resistor manufacture.	
V01-A04X	[1992]
Other resistor manufacturing details	
<hr/>	
V01-B	
Capacitors	
V01-B01	
Electrolytic devices	
V01-B01A	
Electrodes	
<i>Lead, terminal wire, anode, tag, lug</i>	
V01-B01A1	[1983]
Sintered	
This code is assigned alone or with V01-B01A4 codes describing composition or manufacture of materials.	
<i>Tantalum, solid powder, oxide, alloy, anodised</i>	
V01-B01A3	[2006]
Double-layer and supercapacitor electrodes	
This code is assigned alone or with V01-B01A4 codes describing composition or manufacture of materials. For all other aspects of double-layer and supercapacitors V01-B01D codes are assigned with other V01-B codes as appropriate. Manufacture of these capacitor types is covered by V01-B01G8D and other V01-B01G codes as appropriate.	

V01-B01A4	[2006]
Novel electrode materials composition and materials manufacture	
These codes are normally assigned with V01-B01A1 or V01-B01A3 as appropriate. For details relating to foil electrodes, see V01-B01A5 codes.	
V01-B01A4A	[2006]
Novel electrode materials composition	
V01-B01A4C	[2006]
Manufacture of electrode materials	
This code is intended to cover manufacture of materials to be subsequently used as an electrolytic capacitor electrode, and does not include manufacture or treatment of electrode materials forming part of a process for mfg the capacitor itself, which is covered by V01-B01G1.	
V01-B01A5	[1983]
Foil	
<i>Aluminium, etched, wound</i>	
V01-B01A5A	[1992]
Foil manufacture	
Manufacture and preparation of foil other than as a step in a complete process for making a capacitor is coded here, otherwise see V01-B01G1.	
V01-B01A5C	[1992]
Foil composition	
V01-B01A7	[1992]
Terminals and lead arrangements	
<i>Wire, axial</i>	
V01-B01B	
Electrolytes and electrolyte manufacture; Separators; Containers	
From 2006 the scope of this code has been expanded to allow electrolyte compositions and electrolyte manufacture to be separately highlighted, and where neither of these aspects are novel, the solid or liquid/paste nature of the electrolyte to be indicated (to define the overall capacitor type) by means of V01-B01B6 codes.	
<i>Encapsulation, mounting</i>	

V01-B01B1 [1983]

Novel details of solid electrolytes

From 2006, this code has been subdivided to allow novel solid electrolyte compositions (V01-B01B1A) and electrolyte manufacture (V01-B01B1C) to be separately highlighted. The two new codes take precedence over V01-B01B6A which is assigned to indicate that the capacitor is characterised by having a solid (non-novel) electrolyte.

Tetra cyano di-quino methane (TCNQ), complex

V01-B01B1A [2006]

Solid electrolyte composition and materials

Novel details of solid electrolyte composition, and/or materials used in the preparation/manufacture of the solid electrolyte.

V01-B01B1C [2006]

Solid electrolyte and material manufacturing aspects

This code covers the manufacture of materials destined to be used as a solid electrolyte. Manufacture of the capacitor itself is covered by V01-B01G8A and other V01-B01G codes as appropriate.

V01-B01B3 [1992]

Separators

V01-B01B5 [1983]

Novel details of liquid or paste electrolytes

From 2006, this code has been subdivided to allow novel liquid or paste electrolyte compositions (V01-B01B5A) and electrolyte manufacture (V01-B01B5C) to be separately highlighted. The two new codes take precedence over V01-B01B6C which is assigned to indicate that the capacitor is characterised by having a liquid or paste (non-novel) electrolyte.

Aqueous, solvent, ethylene glycol, carboxylic acid, boric acid

V01-B01B5A [2006]

Liquid or paste electrolyte compositions and materials

Novel details of liquid or paste electrolyte composition and/or materials used for the preparation/manufacture of the liquid/paste electrolyte.

V01-B01B5C [2006]

Liquid or paste electrolyte manufacture

This code covers the manufacture of materials destined to be used as a liquid or paste electrolyte. Manufacture of the capacitor itself is covered by V01-B01G8B and other V01-B01G codes as appropriate, e.g. forming aspects in V01-B01G7A.

V01-B01B6 [2006]

Electrolytic capacitor characterised by electrolyte type

These codes are assigned to indicate the physical state of electrolyte only, and are not assigned when novel aspects of electrolyte composition or manufacture can be highlighted by V01-B01B1 or V01-B01B5 codes. For inventions concerned solely with capacitor manufacture V01-B01B6 codes are not assigned and V01-B01G8 codes are applied instead. In cases where novelty exists in both the capacitor and its manufacture V01-B01B6 codes take precedence.

V01-B01B6A [2006]

Solid electrolyte capacitor

This code is assigned just to indicate that a capacitor has a solid electrolyte, which is not itself novel. If the solid electrolyte is novel in some way, V01-B01B6A is not used and V01-B01B1 codes are used instead.

V01-B01B6C [2006]

Liquid or paste electrolyte capacitor

This code is assigned just to indicate that a capacitor has a liquid or paste electrolyte, which is not itself novel. If the liquid or paste electrolyte is novel in some way, V01-B01B6C is not used and V01-B01B5 codes are used instead.

V01-B01B7 [1992]

Housings, seals, mounting

V01-B01B7A [1992]

With pressure-relieving vent

See V01-B01F5 also for pressure relief also causing electrical disconnection.

Blowout, plug

V01-B01B7C [1992]

Mounting kit

Clamp, bracket, lead-spacer, base

V01-B01B7D [1992]

Housing for several capacitors

Multiple capacitor

V01-B01C [1983]

Devices other than capacitors

Electrolytic transducer, photosensitive device, acceleration sensor, electrokinetic cell

V01-B01D	[1987]
Double-layer capacitor	
See X16-L02 also for energy-storage using capacitors, and T01-H01/T01-L01 codes for computer memory module and power supply systems.	
<i>Memory back-up</i>	
V01-B01D1	[1992]
Stack of cells	
V01-B01D5	[2002]
Super-capacitor	
(V01-B01D,V01-B01X)	
See T01-H01/T01-L01 codes for computer memory module and power supply systems, e.g. memory back-up; and for high power applications e.g. electric/hybrid vehicles, see X12-B, and X21-B codes.	
<i>Ultracapacitor, electrochemical double layer</i>	
V01-B01E	[1992]
Leadless electrolytic capacitor	
<i>Surface mounting, chip</i>	
V01-B01F	[1992]
Electrical protective arrangements	
(V01-B01X)	
Excess pressure venting is covered by V01-B01B7A.	
V01-B01F1	[1992]
Involving fuse protection	
(V01-B01X)	
V01-B01F5	[1992]
Involving mechanical disconnection	
(V01-B01X)	
Use with V01-B01B7A for end cap movement rupturing leads.	
V01-B01G	[1992]
Electrolytic capacitor manufacture	
See V01-B04 codes for manufacture of non-electrolytic capacitors.	
V01-B01G1	[1992]
Electrode manufacture	
Includes sintering. Covers treatment of foil to form electrodes, but not manufacture of foil per se which is covered in V01-B01A5A.	
<i>Etching, degreasing, anodising</i>	
V01-B01G3	[1992]
Winding, laminating, dielectric impregnation	

V01-B01G5	[1992]
Assembly	
Includes manufacture of leads and external electrodes. Attachment of manufactured leads and external electrodes is covered by V01-B01G5C. Production of internal electrodes is covered by V01-B01G1.	
V01-B01G5A	[1992]
Encapsulation	
V01-B01G5C	[1992]
Attaching leads	
This code covers the attachment of leads and external electrodes only. Manufacture of leads and external electrodes is covered by V01-B01G5.	
V01-B01G6	[1992]
Multistep manufacturing process and novel manufacturing equipment	
Includes waste treatment and recovery processes.	
V01-B01G6A	[1997]
Multi-step manufacturing process	
This code is used for processes involving a sequence of steps without emphasis on any particular one.	
V01-B01G6C	[1997]
Novel manufacturing equipment	
Use with other B01G codes as appropriate.	
V01-B01G6E	[2005]
Process waste management	
(V01-B01G6)	
This code includes all aspects of treatment of waste and contaminants arising from electrolytic capacitor manufacture, including making safe, waste classification, and separation aspects. Recycling of materials to be reused in the manufacturing process is covered by V01-B01G6G. Prior to 2005 coded in V01-B01G6.	
V01-B01G6F*	[2005-2007]
Waste handling and disposal	
(V01-B01G6)	
*This code is now discontinued. From 2008 all aspects of handling, making safe, and disposal of waste from electrolytic capacitor manufacture are now covered by V01-B01G6E.	

V01-B01G6G	[2005]
Materials recycling	
(V01-B01G6)	
Includes treatment and recycling, handling equipment and environmental protection and safety equipment aspects for electrolytic capacitor manufacture. Prior to 2005 coded in V01-B01G6. See V04-X01C for other electronics components recycling.	
V01-B01G7	[1992]
Forming, testing, ageing, packing	
V01-B01G7A	[1992]
Forming, ageing	
V01-B01G7C	[1992]
Testing	
Measurement of capacitance value in general is coded in S01-D05A3, and general electrical testing of capacitors in S01-G12C.	
V01-B01G7E	[1997]
Packing	
Includes tape carriers.	
V01-B01G8	[1992]
Characterised by type of capacitor	
Codes in this section are applied irrespective of claimed novelty to indicate the type of capacitor only. These codes are not used if a manufactured capacitor is also claimed, for which the appropriate V01-B01 code will be assigned.	
V01-B01G8A	[1992]
Solid dielectric	
V01-B01G8B	[1992]
Liquid/paste dielectric	
V01-B01G8D	[1992]
Double layer capacitor	
V01-B01G8E	[1992]
Leadless capacitor	
V01-B01G8X	[1992]
Other capacitor type	
V01-B01X	
Other	

V01-B02	
Variable capacitors	
Capacitive transducers for physical quantities are coded in V01-B02A, where motion of plates or dielectric is involved, otherwise in V01-B02B. For tuning of resonant circuits see U25 codes.	
V01-B02A	
Mechanically varied	
<i>Tuning capacitor, double, differential, ganged, dielectric, shaft, spindle, preset, trimmer</i>	
V01-B02A1	[1992]
Electrode details	
V01-B02A1A	[1992]
Rotor, moving electrode	
V01-B02A1B	[1992]
Stator	
V01-B02A1C	[1992]
Terminals, external connections	
V01-B02A3	[1992]
Dielectric details	
V01-B02A4	[1992]
Substrate, housing, mounting kit	
<i>Mount, screw, nut, bushing</i>	
V01-B02A5	[1992]
Characterised by type of capacitor	
Codes in this section are applied irrespective of claimed novelty to indicate the type of capacitor only.	
V01-B02A5A	[1992]
Variable during normal operation	
Includes e.g. tuning capacitor operated manually or by motor drive.	
<i>Tune, resonate, peak</i>	
V01-B02A5B	[1992]
Pre-set/semi-variable	
Includes e.g. trimmer capacitor.	
<i>Tune, resonate, peak</i>	

V01-B02A5C [1992]

Transducer

Covers transducer where physical movement of plates and/or dielectric is involved. Non-mechanically varied types are coded in V01-B02B3. See also appropriate code in S02 or S03 for the parameter being measured and, in general, S02-K03A1C.

V01-B02A5E [1992]

Surface-mounted variable capacitor

Chip, leadless

V01-B02A5F [1992]

Multi-section variable capacitor

Covers ganged types.

V01-B02B

Non-mechanically varied capacitors

V01-B02B1 [1992]

Varicap diodes

See also U12-C02B. Covers discrete component embodiments only (or where integrated circuit aspect not specified). Prior to 1992 coded in U12 only.

Varactor, depletion layer, reverse bias, voltage-tuned

V01-B02B3 [1992]

Transducer

Covers capacitors changing value in response to physical variable where movement is **not** involved. Types involving movement of plates or dielectric are covered by V01-B02A5C. See also appropriate code in S02 or S03, and in general, S02-K03A1.

V01-B02B5 [1992]

Electrets

Includes devices in non-circuit application, e.g. as air filter.

V01-B02B9 [1992]

Other

Includes ferroelectric capacitors.

V01-B03

Fixed capacitors

See X12-E also for dielectric compositions. Search dielectric codes with V01-B03E1 for self-healing aspects. Capacitors with mixed, i.e. inorganic and organic dielectrics, are assigned V01-B03A5.

V01-B03A

With inorganic dielectric

From 1992 see V01-B03A1 to distinguish novel capacitor from novel dielectric compositions.

Ceramic, perovskite, metal-oxide, green sheet

V01-B03A1 [1992]

Novel dielectric composition

See X12-E01 codes also, e.g. X12-E01A for ceramic compositions.

V01-B03A3 [1992]

Manufacture of dielectric material

Covers manufacture of dielectric per se other than as part of capacitor manufacture, which is covered by V01-B04 codes.

V01-B03A5 [2005]

Hybrid dielectric (organic-inorganic) polymer material

Includes all compositions of hybrid dielectric material regardless of percentage of organic/inorganic materials ratio in the composite. See V01-B03A1 and V01-B03B1 for new dielectric compositions.

V01-B03B

With organic dielectric

Plastics, polymer, film, paper, impregnated

V01-B03B1 [1992]

Novel dielectric composition

See also X12-E02 codes, e.g. X12-E02B for synthetic polymer materials.

V01-B03B3 [1992]

Manufacture of dielectric material

Covers manufacture of dielectric per se other than as part of capacitor manufacture, which is covered by V01-B04 codes.

V01-B03C

Characterised by structure

Codes in this section are applied to indicate the structure of the capacitor only and do not necessarily represent novel features.

V01-B03C1 [1983]

Wound

V01-B03C3 [1983]

Flat plate

V01-B03C3A [1992]

Multilayer capacitor

Includes stacked types.

Laminated, layer-built, chip, co-fire

V01-B03C5 [1983]

Leadless

Chip, surface mounting

V01-B03C5A [1992]

Film capacitor

Covers discrete components only.

V01-B03C7 [1987]

Feedthrough capacitor

Use with V01-B03C8 for feedthrough-type LC filter. See W02-H codes for noise suppression at source in general.

V01-B03C8 [1992]

Composite capacitor

(V01-B03X)

Covers capacitor structurally associated with other component such as RC, LC, or multiple capacitor. For feedthrough type capacitor filter use with V01-B03C7 also.

V01-B03D

Electrodes; Housings; Terminals

Marking, colour coding, lead wire, tag, lug, can, casing, foil

V01-B03D1 [1992]

Electrodes

This code is intended for **internal** electrodes e.g. in the case of a multilayer capacitor. External electrodes, i.e. terminals if a leadless type, are covered by V01-B03D5.

V01-B03D1A [1992]

Film

Metallisation, sputtered layer

V01-B03D1C [1992]

Foil

V01-B03D1E [1992]

Novel shape or configuration

V01-B03D1G [1992]

Novel composition

V01-B03D3 [1992]

Housing, encapsulation

Includes markings, e.g. of component value.

V01-B03D3A [1992]

Pressure relieving arrangement

See V01-B03E5 for electric protection arrangements.

V01-B03D5 [1992]

Lead and terminal arrangements

This code is intended for **external** electrodes such as terminals of a chip-type laminated capacitor. Internal electrodes are covered by V01-B03D1 codes.

V01-B03D7 [1992]

Mounting kit

V01-B03E [1992]

Protection and self-healing capacitors

V01-B03E1 [1992]

Self-healing dielectric type

See V01-B03A/B codes as appropriate for dielectric details.

V01-B03E5 [1992]

Fuse or other electrical disconnection

See V01-B03D3A for pressure-relief arrangements.

V01-B03H [1997]

Temperature compensation

(V01-B03X)

Use with V01-B03A or V01-B03B codes as appropriate.

V01-B03X

Other

V01-B04

Manufacturing capacitors

Includes testing of manufactured capacitor. See V01-B01G codes for electrolytic capacitor manufacture.

V01-B04A [1992]

Characterised by capacitor type

(As defined by V01-B03C codes). Codes in this section are assigned to indicate capacitor type only. They are not used if the manufactured capacitor itself is also claimed, in which case the appropriate V01-B codes for the capacitor per se will also be applied.

V01-B04A1 [1992]

Wound capacitor

V01-B04A3	[1992]
Flat capacitor	
V01-B04A3A	[1992]
Single layer	
V01-B04A3C	[1992]
Multi-layer	
V01-B04A5	[1992]
Chip capacitor	
V01-B04A5A	[1992]
Film capacitor	
V01-B04A6	[1992]
Variable capacitors	
V01-B04A7	[1992]
Feedthrough capacitor	
V01-B04A8	[1992]
Composite capacitor	
V01-B04A9	[1992]
Manufacture of other capacitor types	
V01-B04B	[1992]
Capacitor manufacturing process	
V01-B04B1	[1992]
Treatment of dielectric	
V01-B04B3	[1992]
Manufacture and application of electrodes	
This code relates to manufacture of internal electrodes only. Manufacture of external electrodes is covered by V01-B04B5.	
<i>Sputtering, metallising, etching, cutting</i>	
V01-B04B5	[1992]
Assembly processes	
Includes winding, laminating, pressing, impregnating, etc., and also manufacture of external electrodes. Production of internal electrodes is covered by V01-B04B3.	
V01-B04B7	[1992]
Heat treatment, firing, drying	
<i>Co-fire</i>	

V01-B04B8	[1992]
Multistep manufacturing processes and novel manufacturing equipment	
Includes waste treatment and recovery processes. From 1997 the scope of this code is expanded to include novel equipment for manufacture, which is assigned V01-B04B8C together with other V01-B04 codes as appropriate.	
V01-B04B8A	[1997]
Multistep manufacturing process	
V01-B04B8C	[1997]
Novel manufacturing equipment	
Use with other V01-B04 codes as appropriate.	
V01-B04B8E	[2005]
Process waste treatment and recycling	
(V01-B04X)	
Includes all aspects of waste and contaminant treatment and recycling equipment, for dielectric capacitor manufacture, and all waste classification and separation aspects. Prior to 2005 coded in V01-B04X.	
V01-B04B8F*	[2005-2007]
Waste handling and disposal	
(V01-B04X)	
*This code is now discontinued and from 2008 all aspects of handling, making safe, and disposal of waste from capacitor manufacture are now covered by V01-B04B8E.	
V01-B04B8G	[2005]
Materials recycling	
(V01-B04X)	
This code covers treatment and recycling of materials, chemicals and the like for reuse in dielectric (i.e. non-electrolytic) capacitor manufacture. Prior to 2005 these topics were covered in V01-B04X. See V04-X01C for other electronics components recycling.	
V01-B04B9	[1992]
Other capacitor manufacturing processes	
V01-B04C	[1992]
Testing, sorting, trimming, marking	
V01-B04C1	[1997]
Testing and sorting capacitors	
See S01-D05A3 and S01-G12C also for electrical tests on capacitors.	

V01-B04C3 [1997]

Trimming capacitor value

See X24-D03B for laser trimming apparatus.

V01-B04C5 [1997]

Marking capacitors

V01-B04E [1992]

Tape carriers, packing, shipping

Includes 'bandolier' tape carrier per se (see V04-V01A also), loading finished capacitors onto tape, packaging cartons, etc.

V01-B04X [1992]

Other capacitor manufacturing aspects

V02: Inductors and Transformers

For power transformers and reactors, see X12-C codes. Inductors/transformers implemented as IC devices are not included; see U11/U12 codes. Printed coils are, however, included here and in V04.

See T03-A codes only for details of recording media and heads.

V02-A

Magnetic materials

From 2007, V02-A01 codes are only applied for magnetic materials of general application. Therefore, V02 codes are no longer routinely assigned for magnetic recording media and heads with the exception of nano-structures, which are coded in V02-B04. See T03-A codes for specific details of recording media and heads.

V02-A01

Hard magnetic materials

V02-A01A

Metals or alloy

Iron, boron, cobalt, ferromagnetic, neodymium, nickel, rare earth metals

V02-A01A1 [1987]

For permanent magnet

V02-A01A2* [1987-2006]

For magnetic recording medium

*This code is now discontinued and has been transferred to T03-A codes from 200701. It remains searchable for records prior to 2007.

V02-A01A8 [2006]

Novel hard magnetic metals or alloys

Composition

V02-A01A9 [1992]

Manufacture of hard magnetic metals or alloys

Includes methods and systems for manufacturing the magnetic composition per se. Other manufacturing details, e.g. magnetic laminations' manufacture, core manufacture, magnet manufacture, etc., are covered by V02-H codes.

V02-A01B

Non-metallic substances

Oxide, ferrite, ferric oxides, metal hydroxide

V02-A01B1 [1987]

For permanent magnet

V02-A01B2* [1987-2006]

For magnetic recording medium

*This code is now discontinued and has been transferred to T03-A codes from 200701. It remains searchable for records prior to 2007.

V02-A01B8 [2006]

Novel hard magnetic non-metallic materials

Composition

V02-A01B9 [1992]

Manufacture of hard magnetic non-metallic materials

Includes methods and systems for manufacturing the magnetic composition per se. Other manufacturing details, e.g. magnetic laminations' manufacture, core manufacture, magnet manufacture, etc., are covered by V02-H codes.

V02-A01C [1992]

Mixtures

Includes mixtures of metallic and non-metallic magnetic substances.

V02-A02

Soft magnetic materials

V02-A02A

Metals or alloys

Iron, silicon steel, boron, cobalt, nickel, aluminium, chromium, ferromagnetic

V02-A02A1* [1987-2006]

For magnetic head

*This code is now discontinued and has been transferred to T03-A codes from 200701. It remains searchable for records prior to 2007.

V02-A02A2 [1987]

For electric machine and reactor core

V02-A02A8 [2006]

Novel soft magnetic metals or alloys

Composition

V02-A02A9 [1992]

Manufacture of soft magnetic metals or alloys

Includes methods and systems for manufacturing the magnetic composition per se. Other manufacturing details, e.g. magnetic laminations' manufacture, core manufacture, magnet manufacture, etc., are covered by V02-H codes.

V02-A02B [1987]

Non-metallic substances

Ferrites, metal oxide

V02-A02B1* [1987-2006]

For magnetic head

*This code is now discontinued and has been transferred to T03-A codes from 200701. It remains searchable for records prior to 2007.

V02-A02B2 [1987]

For electric machine and reactor core

V02-A02B8 [2006]

Novel soft magnetic non-metallic materials

Composition

V02-A02B9 [1992]

Manufacture of soft magnetic non-metallic materials

Includes methods and systems for manufacturing the magnetic composition per se. Other manufacturing details, e.g. magnetic laminations' manufacture, core manufacture, magnet manufacture, etc., are covered by V02-H codes.

V02-A02C [1992]

Mixtures

(V02-A02A, V02-A02B)

Includes mixtures of metallic and non-metallic magnetic substances.

V02-A03 [1997]

Organic or organo-metallic materials

(V02-A01, V02-A02)

Used together with V02-A01 and V02-A02 codes to denote coercivity, if indicated.

V02-A04 [1997]

Magnetic liquids

(V02-A02A)

Used together with V02-A01 and V02-A02 codes to denote coercivity, if indicated.

Ferrofluid

V02-A05 [1997]

Magnetic semiconductor materials

(V02-A01, V02-A02)

Used together with V02-A01 and V02-A02 codes to denote coercivity, if indicated. See also U11-A.

CdCr₂S₄, galvano-magnetic

V02-A09 [2002]

Binders and other additives for magnetic materials

Includes binders/additives for both hard and soft materials. This code will be used in conjunction with the magnetic materials' codes.

V02-A10 [2005]

Nanomaterials and their manufacture

Used in conjunction with hard/soft, metal/non-metallic substances.

V02-A10A [2005]

Novel nanomaterials

V02-A10C [2005]

Manufacture of nanomaterials

V02-B

Thin magnetic films

Prior to 2007, magnetic film details of thin film heads were coded under V02-B03, which has now been discontinued. From 2007, thin film heads are coded only under T03 codes (T03-A03E). However, nanostructures of thin film heads are still coded under V02-B04.

V02-B01* [1987-2006]

For recording medium

*This code is now discontinued and has been transferred to T03-A01 codes from 200701. It remains searchable for records prior to 2007. Includes magnetic films, per se, for tapes, discs or drums. See T03-A01 codes for record carrier details e.g. binders, bases, backing layers.

Magnetic media, photomagnetic/magneto-optical film

V02-B02 [1987]

For bubble memory

See also U14-A01A1 codes.

V02-B03* [1992-2006]

Thin film heads

(V02-B01)

*This code is now discontinued and has been transferred to T03-A03 codes from 200701. It remains searchable for records prior to 2007. See also W04-B codes if audio/video application is intended. Manufacture of thin film heads is covered by T03-A04 codes.

V02-B04 [2005]

Nanostructures

Includes nanostructures of thin film heads. Other details of thin film heads are only coded under T03-A03E codes. Manufacturing details of nanostructures are coded under V02-H02G.

V02-C

Cores, yokes and armatures

For general cases only. For particular application see V02-E, V02-F and V02-G. For high power devices see X12-C.

Magnetic circuits, laminates

V02-D

Coils (incl. connections); (de)magnetising

Includes general coils where an application is not clear. Coils designed for communication or HF applications are coded under V02-F codes (e.g. HF coils are coded under V02-F03B), and coils for power supplies or other uses are coded under V02-G codes.

For high power coils, see X12-C codes.

Degaussing

V02-E

Magnets

High strength magnets and super-conducting electromagnets are, respectively, in X12-C06 and X12-C05A.

V02-E01

Permanent magnets

Rare earth magnets

V02-E02

Electromagnets

Solenoids, operating circuit, coils, cores, energising circuit

V02-E02A

With armature

V02-E02A1 [1987]

For electromagnetic valve

See also X25-L for EM valves and X22 for automotive application.

Fuel injection valves, EM-brake, -gear, -clutch

V02-E02A2 [1987]

For relay, or printer hammer

See also V03-D codes for relays, and S06-D to S06-K codes for details of printers.

V02-E02A3 [2002]

Linear actuator

V02-E02A4 [2002]

Rotary actuator

Rotary solenoid

V02-E02X

Without armature

V02-E02X1 [1992]

Using superconducting coils

V02-E02X2 [2006]

Shim coil

Includes small current-carrying coils that generate the auxiliary magnetic fields for improving the homogeneity of a main field e.g. in an MRI equipment (see also S01-E01 and S03-E07 codes).

V02-F

Inductive components for communications or HF

Inductive components used in applications other than communication or HF applications are coded under V02-G codes. General coils where an application is not clear are coded under V02-D.

V02-F01

Inductances

Includes coils for telecommunications and radio equipment (see also W01 and W02). Constructional details are in V02-F03.

Chokes, HF inductor, antenna coils, radio tuning coils

V02-F01A [1987]

For CRT beam deflection

See also V05-D and W03-A codes for TV deflection.

Vertical-, horizontal- deflection coils

V02-F01D [1992]

Variable

V02-F01G [1992]

MRI/NMR equipment gradient/HF coil

Also see S01-E02, S03-E07 and S05-D02 codes, respectively, for magnetic properties sensor, MRI/NMR equipment and medical use.

V02-F01G1 [2006]

Gradient coil

V02-F01G2 [2006]

HF coil

Includes receiver/transmitter antenna coil for detecting an NMR/MRI signal.

Bird cage-, resonator-, saddle-, surface-coils

V02-F01J	[1992]
Filter coils	
See W02-H and U25-E01 codes also.	
V02-F01L	[1992]
Chip inductor	
V02-F01N	[1992]
Flat coils	
V02-F01N1	[1992]
Printed circuit coils	
See also V04-Q04 and V04-R codes, respectively, for printed circuits and their manufacture.	
V02-F01P	[2005]
Inductive connector	
For HF use. See V02-G01D for power supply inductive connector.	
V02-F02	
Transformers	
Includes pulse, audio and broad-band transformers. Constructional details are in V02-F03.	
V02-F02A	[1987]
For TV	
See also W03-A codes.	
<i>Flyback transformers, television line output transformers</i>	
V02-F02D	[1992]
Rotary transformer	
See also T03-A05D3A, W04-B03B1 codes for helical scan head positioning.	
V02-F02G	[1992]
Variable	
V02-F03	
Construction details	
Includes constructional details of signal and HF transformers and coils. Used in conjunction with the type of coil or transformer, e.g. V02-F02D. Manufacturing details are coded by V02-H codes.	
V02-F03A	[1997]
Casings, mounting, cooling; Magnetic cores	
V02-F01,V02-F02,V02-F03)	
V02-F03A1	[1997]
Cooling	
(V02-F03)	

V02-F03A2	[1997]
Magnetic cores	
(V02-F01,V02-F02)	
<i>Laminates</i>	
V02-F03A3	[2005]
Cases	
<i>Housing</i>	
V02-F03B	[1997]
Windings	
(V02-F01,V02-F02)	
<i>Bobbins, connections, leads, coils</i>	
V02-F03B1	[1997]
Insulating	
(V02-F01,V02-F02)	
V02-F03C	[1997]
Control	
Includes current collector sliding or rolling on, or along, winding.	
V02-F03C1	[1997]
Using tapings on coil or winding	
V02-F03C2	[1997]
Using movable core, coil or winding, or shield	
V02-F03D	[2005]
Shielding	
(V02-F03X)	
Includes screens, shields, etc.	
V02-F03X	[1997]
Other HF transformer/inductor constructional details	
Includes terminals, circuits for changing electrical characteristics e.g. flux linkage by driving device magnetic circuit into saturation, etc.	
<i>Temperature sensors</i>	
V02-F05*	[1992-2006]
Magnetic recording heads	
(V02-C, V02-D, V02-E02X)	
*This code is now discontinued and has been transferred to T03-A03 codes from 200701. It remains searchable for records prior to 2007.	

V02-G

Inductive components for power supplies or other uses

Includes inductive components used in applications other than communication or HF applications. Inductive components used in communications or HF applications are coded under V02-F codes. General coils where an application is not clear are coded under V02-D. High power components are coded in X12-C.

V02-G01

Transformers, reactors, choke coils

Includes vehicle ignition coil (see also X22-A01A).

V02-G01A [1983]

Power transformers

Power supply

V02-G01A1 [1987]

Variable

V02-G01A2 [1997]

Non-linear

Includes transformer, e.g. ferro-resonant, for frequency changing or wave-shape changing.

V02-G01B [1983]

Instrument transformers

Includes current-, voltage-transformers (also in S01-D01D1A), linear variable displacement **transducers** (LVDT).

Measurement transformers

V02-G01C [1983]

Reactors, choke coils

Lamp ballasts

V02-G01C1 [1987]

Variable

V02-G01D [1997]

Inductive connector

For power supply use. See V02-F01P for HF inductive connector.

Inductive coupling

V02-G01E [2002]

Inductive sensor

Includes non-transformer type current/voltage/other sensors.

Voltage-, current-sensor, inductive probe

V02-G01F [2005]

Heating inductor

Low power induction heating coils are included here with high power ones covered by X12-C codes. For general high or low power induction heating, see X25-B02A codes, and X27-C06 for induction cookers.

V02-G02

Constructional details

Manufacturing details are coded by V02-H codes.

V02-G02A

Casings, mounting, cooling; Magnetic cores

V02-G02A1 [1987]

Cooling

V02-G02A2 [1987]

Magnetic cores

Laminates

V02-G02A3 [2005]

Cases

Housing

V02-G02B

Windings

Bobbins, connections, leads, coils

V02-G02B1 [1987]

Insulating

V02-G02C [1987]

Control

(V02-G02B)

Includes current collector sliding or rolling on or along winding.

V02-G02C1 [1987]

Using tapings on coil or winding

(V02-G02B)

V02-G02C2 [1987]

Using movable core, coil winding or shield

(V02-G02B, V02-G02X)

V02-G02D [2005]

Shielding

(V02-G02X)

Includes screens, shields, etc.

V02-G02X

Other power supply transformer/inductor constructional details

Includes terminals, circuit for changing electric characteristics e.g. flux linkage by driving device magnetic circuit into saturation, etc.

Temperature sensors

V02-H

Manufacture

Includes apparatus, methods and testing. Manufacture of recording media and magnetic heads is not coded under V02 anymore, but only under T03-A codes.

V02-H01

Coil manufacture

Includes winding, insulating, connecting leads.

V02-H01A [1987]

For reactor, choke coil

V02-H01B [1987]

For transformer

V02-H01C [2002]

For electromagnet

V02-H01C1 [2002]

For EM relay

See also V03-D06B.

V02-H01C2 [2002]

For EM valve

See also X25-L01A.

V02-H01C3 [2002]

For printer

See also S06-D to S06-K codes for details of printers.

V02-H01C9 [2002]

Electromagnet coil manufacture for other devices

V02-H01X [2002]

Coil manufacture for other devices

V02-H02 [1983]

Applying magnetic films to substrate

(V02-H09)

Manufacture of recording media is not coded under V02 anymore, but only under T03-A02 codes.

V02-H02A [1987]

Vacuum evaporation

V02-H02B [1987]

Sputtering

V02-H02C [1987]

Electroless and electrolytic plating

V02-H02D [2002]

Plasma processing

V02-H02E* [2005-2006]

Magnetic head

*This code is now discontinued and has been transferred to T03-A04 from 200701. It remains searchable for records prior to 2007.

V02-H02F* [2005-2006]

Magnetic medium

*This code is now discontinued and has been transferred to T03-A02 from 200701. It remains searchable for records prior to 2007.

V02-H02G [2005]

Nanostructures manufacture

Non-manufacturing details of nanostructures are covered by V02-B04.

V02-H03 [1987]

Core manufacture

(V02-H09)

Also includes the rest of the magnetic circuit e.g. yoke, armature. From 2007, manufacture of magnetic heads is not coded under V02 anymore, but only under T03-A04 codes. Also includes the rest of the magnetic circuit e.g. yoke, armature. Manufacture of magnetic heads is not coded under V02 from 2007, but only under T03-A04 codes.

Annealing, laminating

V02-H03A [1987]

For transformer

(V02-H09)

V02-H03C [2002]

For electromagnet

V02-H03C1 [2002]

For EM relay

See also V03-D06B.

V02-H03C2 [2002]

For EM valve

See also X25-L01A.

V02-H03C3 [2002]

For printer

See also S06-D to S06-K codes for details of printers.

V02-H03C9 [2002]

For electromagnet core of other devices

V02-H03E [2002]

For inductor

V02-H03X [2002]

Core manufacture for other devices

V02-H04 [1987]

Magnet manufacture

(V02-H09)

V02-H05* [1992-2006]

Magnetic recording heads

(V02-H01, V02-H03, V02-H09)

*This code is now discontinued and has been transferred to T03-A04 codes from 200701. It remains searchable for records prior to 2007. Includes manufacture of coil/winding and core plus other aspects and testing.

V02-H06 [2002]

Terminal manufacture

(V02-H09)

Includes manufacture of terminals for all devices and is generally coded in conjunction with the relevant device code, e.g. V02-G01A for transformer terminals.

V02-H07 [2002]

Case manufacture

(V02-H09)

Includes manufacture of casings for all devices and is generally coded in conjunction with the relevant device code, e.g. V02-G01A for transformer casing.

V02-H08 [2002]

Testing

(V02-H09)

For all aspects of testing transformer, inductor, etc. From 2007, testing of magnetic heads is not coded under V02 anymore, but only under T03-A04 codes.

V02-H09

Other inductive device manufacturing aspects

Includes manufacture of devices not specified above.

V02-H10 [2005]

Device, per se, manufacture

Includes indeterminate detail manufacture as well as multi-step processes.

V03: Switches, Relays

NOTE: V03 codes cover low power mechanical and electromechanical switches, i.e. those involving switching by moving contacts to make and break a circuit.

High power switches, circuit breakers and circuit protectors are coded in X13.

Electronic switching and gating are coded under U21-B codes.

V03-A

Contacts (general)

Relay and connector contacts are in V03-D and V04-D, respectively.

V03-A01

Contact material and structures

V03-A01A [1983]

Material

Includes materials such as composite materials containing noble metals, metal with carbide or oxide, copper, carbon particles or fibers, conducting materials dispersed in binding materials, etc.

V03-A01B [1983]

Surface shape/structure

Includes details of the shape or structure of the contact-making surface, e.g. grooved, wetted with mercury, laminated, etc.

V03-A02

Contact engagement techniques

Includes engagement by abutting and sliding.

V03-A03

Protective enclosures

Includes protective enclosures, baffle plates or screens for contacts. Includes contacts sealed in an evacuated or gas-filled envelope, e.g. for reed switches. Reed switches are coded under V03-C06A.

V03-A08 [1992]

Contact manufacture; Testing; Monitoring

Includes manufacturing details of switches contacts, and details for testing and monitoring the integrity of contacts.

V03-A09

Other contact details

Includes increasing contact pressure, preventing vibration of contacts, holding contacts together after engagement, terminals, cleaning or lubricating contact-making surfaces, heating or cooling contacts, etc.

V03-B

Switch operating mechanisms (general)

Details of relays are in V03-D.

V03-B01

Non-hand-operated switches

V03-B01A [1992]

Limit switches

Includes switches actuated when reaching a specified limit, e.g. safety switches.

V03-B01B [1997]

Foot pedal switches or mouth operated switches

From 2009, this code covers both foot pedal switches and mouth operated switches. For constructional details, see also V03-B04 codes.

V03-B01C [1997]

Door switches

See also V03-U18 for doors and windows. If vehicle doors, see also V03-U03A codes for land vehicles, and X22 codes. For other types of doors, see also X25.

V03-B01D [1997]

Mat switches

Includes mats triggering opening of automated doors when user walks on the mat, dance mats or platforms used with game consoles and arcade games, etc. If the mat is part of a game, see also V03-U08.

V03-B01E [1997]

Seat switches

Includes switches triggered when sitting on a seat. If vehicle seat, see also V03-U03A for land vehicles and X22 codes.

V03-B02

Internal power arrangements and driving mechanisms

Includes pneumatic or hydraulic actuator, motor-drive, electromagnet. Also includes transmitting driving force to contacts by ratchet, belt etc.

Switch-actuating, -operating, -driving

V03-B03

Snap-action and time-delay arrangements

Includes devices for introducing a predetermined time delay between the initiation of the switching operation and the opening/closing of the contacts such as dash-pots, flies (e.g. fan governors), thermal timing devices (see also V03-C06B for thermal switches), etc.

V03-B03A [1987]

Snap-action

Includes use of magnet, deformation of elastic member e.g. coil springs, flexing of blade springs, buckling of disc springs, etc., to first store operation energy which is then released to produce or assist the contact movement.

V03-B04

Housing; Fuse, earthing and safety arrangements

Includes built-in fuses, earthing arrangements, anti-static arrangements, and built-in safety spark gaps.

Anti-static arrangement

V03-B04A [1987]

Housing

Includes dust-proof, splash-proof, drip-proof, waterproof or flameproof casings, bases or covers. Also includes arrangements to enable replacement of switch, e.g. cartridge housing.

Walls, cases, boxes, covers, seals

V03-B05

Indicators and markings

Includes 'on-off' switching conditions, markings for easy location in the dark.

Illuminated marking, light display, symbols

V03-B06

Interlocking, locking or latching; Arc control; Cooling

V03-B06A [1987]

Interlocking, locking or latching

Includes interlocking between casing, cover, protective shutter and operating mechanisms, interlocking of two or more switches, locking using a key, etc.

Safety feature, key, latch

V03-B06B [1987]

Arc control

Includes arrangements for extinguishing or preventing arc between current-carrying parts, for preventing discharge to non-current-carrying parts, and for detecting the presence of an arc or discharge.

Blow-out magnet, arcing horns, corona ring, insulation

V03-B09

Other switch details

Includes mechanical arrangements for preventing or damping vibration or shock, lubricating means, levers, turn-knobs and pushbuttons, etc.

V03-B10 [2002]

Modular construction

V03-C

Switches

V03-C01

Linearly-movable operating parts

V03-C01A

Adapted for actuation in one direction only

Pushbutton switches

V03-C01A1

With single operating member

Includes e.g. button switches for cameras, doorbells, flashlights, etc. See also V03-C01A3 for constructional details.

Camera, doorbell, flashlight

V03-C01A1A [2002]

Membrane switch with single operating member

Includes mechanical contact based membrane switches with single operating member. Includes details of the circuit printed on a polyethylene terephthalate (PET) or indium tin oxide (ITO) layer. For electronic membrane switches e.g. detecting a change in resistance caused by depression of the switch, see U21-B codes instead.

PET layer, ITO layer

V03-C01A2

With two or more operating members

Includes e.g. keyboard-type switches for computer keyboards or telephone key pads. See also V03-C01A3 for constructional details, T04-F01 codes for keyboards details and W01-C01B8 codes for keyboards/keypads details.

Keyboard, keypad

V03-C01A2A [1992]

Membrane switch with at least two operating members

Includes mechanical contact based membrane switches with two or more operating members. Includes details of the circuit printed on a polyethylene terephthalate (PET) or indium tin oxide (ITO) layer. For electronic membrane switches e.g. detecting a change in resistance caused by depression of the switch, see U21-B codes instead.

PET layer, ITO layer, control panel for microwave, air conditioner, etc.

V03-C01A3

Constructional details

Includes cases, housings, covers, casings, driving mechanisms, key structures (for keypads or keyboards), etc. for switches adapted for actuation in one direction only.

Case, housing, cover, casing, driving mechanism, coil spring, blade spring, disk spring, keystroke, key cap

V03-C01B

Adapted for actuation in opposite directions

Includes constructional details and driving arrangements for slide switches.

Slide switches

V03-C02

Rotary switches

V03-C02A

Unlimited or unspecified angle

Includes constructional details and driving arrangements for switches operated by turn-knob.

Turn-knob

V03-C02B

Restricted angle only

Includes constructional details and driving arrangements for lever- or handle-operated switches, toggle switches, knife switches, etc.

Toggle, lever, handle, knife switch

V03-C03

Operating part adapted for pulling or compound movement

Includes cord or chain operated switches.

Cord, chain, pull switch

V03-C03A

[1992]

Compound movement

Includes constructional details and driving arrangements for switches having operating part movable angularly in more than one plane, e.g. joystick, and movable both angularly and rectilinearly.

Joystick

V03-C04

Tumbler switches

Includes constructional details and driving arrangements for tumbler and rocker switches.

Rocker switch

V03-C05

Lockable switches

Includes key, plug or plate type.

V03-C06

Switches actuated by change of physical condition

V03-C06A

Magnetic or electric field

Includes switch actuated by movement of a float carrying a magnet e.g. level detector.

Reed switch, magnetic switch, electromagnetic switch

V03-C06B

Thermal conditions

Includes constructional details and driving arrangements for switches triggered by a change of temperature. See V03-C06B1 for thermally sensitive members per se. See V03-D05D only for electrothermal relays.

Electro-thermal, temperature, thermostat

V03-C06B1

Thermally sensitive members

Includes bimetal thermostats.

Bimetallic member

V03-C06B9

Other thermal switches

Includes details of bellows, diaphragm, Bourdon tube, etc.

V03-C06C

Position, speed, acceleration

Includes switches operated by change of inclination or orientation, centrifugal action, shock or vibration, inertia.

Impact switches, tilt switches

V03-C06D

Fluid pressure or flow

Includes switches actuated by bellows, diaphragm, Bourdon tube, vane, piston and cylinder.

V03-C06X

Other physical condition responsive switches

Includes switches operated by a change of liquid level, humidity or liquid density.

Float switch

V03-C07

Switch manufacture; Testing; Monitoring

For contact manufacture and testing see V03-A08.
Includes all other manufacturing and testing aspects of switches.

V03-C07A [2005]

Micromachining process, method or apparatus

See also U11-C and U12-B03F codes.

MEMS, microswitch, nanoswitch, silicon-machining, micromachining

V03-C08 [1983]

Time (-programme) switches

Includes time or time programme switches operated by rotary or non-rotary parts, thermal action, electrolytic processes or chemical processes. See also S04-C01.

V03-C09

Other switches

Includes liquid contact switches, explosion switches, piezoelectric switches, mercury switches, etc.

Liquid, wet

V03-C10 [1997]

Microswitches; Nanoswitches

Covers details of small-size switches that act by the movement of small levers and used where rapid precise movements are required, especially in keyboards and automatic control devices. For manufacturing details of microswitches or nanoswitches, see also V03-C07A.

Micromachining, MEMS

V03-C10A [2002]

Nanoswitches

For manufacturing details (micromachining), see also V03-C07A.

V03-C15 [1997]

Hybrid switches

Includes combined principle type switches e.g. combined contactless (semiconductor) and contact-type switches.

V03-D

Relays

V03-D01

Circuits and mechanical arrangements modifying relay operation

Includes arrangements for modifying the operation of the relay, e.g. for holding armature in attracted position, for biasing the electromagnet, for introducing delay, etc.

Operation delay arrangement

V03-D02

Energising-current supply circuits

Includes relay coil or coils forming part of a bridge circuit, and EM drive circuit specifically for relay operation.

V03-D03

Magnetic circuits, windings, contacts and driving arrangements

V03-D03A [1983]

Magnetic circuits

Electromagnetic details forming part of relay are also in V02-E02A2.

Armatures, electromagnets, yokes, magnets, cores, poles

V03-D03B [1983]

Windings

Includes magnetic coils or windings, including short-circuited conducting sleeves, bands or discs.

Coils, coil formers, bobbins

V03-D03C [1983]

Contact arrangements

Includes contact spring sets.

V03-D03D [1983]

Magnetic circuit to contact drive

Includes driving arrangements between movable part of magnetic circuit and contact with e.g. lost or snap action, etc. Also includes mechanical arrangements for producing a desired natural frequency using e.g. reed or blade spring, diaphragm, etc.

V03-D04

Electromagnetic relays

V03-D04A

Polarised and sealed relays

V03-D04A1 [1983]

Polarised relays

Includes polarised relays with or without intermediate neutral position of rest.

V03-D04A5 [1983]

Sealed relays

Includes reed relays. For telephony see W01-B.

V03-D04X

Other electromagnetic relays

Includes non-polarised relays, frequency relays, mechanically-tuned relays, self-interrupters, etc.

V03-D05

Non-electromagnetic relays

V03-D05A [1987]

Piezoelectric relays

Includes electrostrictive and piezoelectric relays.

Bimorph elements

V03-D05B [1997]

Magnetostrictive relays

V03-D05C [1997]

Electrostatic relays

Includes electrostatic and electro-adhesion relays.

V03-D05D [1997]

Electrothermal relays

Includes heating arrangements using direct or indirect heat, and self-interrupters. Details of induction or resistance heating per se are also covered under X25-B codes.

Glow discharge, induction or resistance heating, self-interrupters

V03-D05E [1997]

Dynamo-electric relays

Includes electrodynamic relays, ferrodynamic relays, magnetodynamic relays and induction relays.

Electrodynamic, ferrodynamic, magnetodynamic, induction relays

V03-D06

Constructional details; Manufacture; Testing

V03-D06A [1983]

Cases, indicators, shielding, cooling, terminals

Includes bases, casings, covers, indicators, distinguishing marks, electromagnetic or electrostatic shielding, ventilating/cooling of relays and terminal arrangements.

Covers, seals, bases, housing, relay holder

V03-D06B [1983]

Manufacture and testing

Includes materials salvaging, apparatus, methods and testing.

V03-D06B1 [2005]

Micromachining process, method or apparatus

See also U11-C and U12-B03F codes.

MEMS, microrelay, nanorelay, silicon-machining, micromachining

V03-D06C [1987]

Arc control

Includes arrangements for extinguishing or preventing arc between current-carrying parts, for preventing discharge to non-current-carrying parts, and for detecting the presence of an arc or discharge.

V03-D10 [1997]

Microrelays; Nanorelays

For manufacturing details of microrelays or nanorelays, see also V03-D06B1.

Micromachining

V03-D10A [2002]

Nanorelays

V03-D15 [1997]

Hybrid relays

Includes combined principle type relays e.g. combined semiconductor and electromagnetic relays.

V03-D20 [1997]

Smart relays

Includes smart or intelligent relays.

V03-E

Selectors

Includes electrically operated, step-by-step wiper motion switches. For telephony see W01-B.

V03-U [2002]

Switches/relays characterised by applications

V03-U01 [2002]

Domestic

Includes switches for domestic appliances, such as curling irons, ovens, hair dryers, food blenders, washing machines, vacuum cleaners, irons, etc. For switches on personal items, see V03-U02. See also X27 codes for domestic appliances.

V03-U02 [2002]

Personal

Includes switches for personal items, such as toothbrushes, footwear, clothes, razors, etc. For switches on domestic items, see V03-U01. See also X27 codes for personal appliances.

V03-U03 [2002]

Vehicles

Includes switches for unspecified vehicles. If the type of vehicle is specified, see V03-U03A, V03-U03B, V03-U03C, V03-U03D or V03-U03E for land vehicles, avionics, shipping, military or railway vehicles respectively.

V03-U03A [2005]

Land vehicles

Includes switches for land vehicles, such as cars, motor bikes, trucks, tractors, vans, utility vehicles, excavators, etc. See also X22 codes.

V03-U03B [2005]

Avionics

Includes switches for air vehicles, such as planes, helicopters, gliders, etc. See also W06 codes.

V03-U03C [2005]

Shipping

Includes switches for sea vehicles, such as boats, ferries, submarines, yachts, etc. See also W06 codes.

V03-U03D [2005]

Military

Includes switches for military vehicles, such as rockets, tanks, etc. See also W07 codes.

V03-U03E [2010]

Railways

Includes switches for railway vehicles, such as locomotives, carriages, etc. used for passengers, in mines, etc.

V03-U04 [2002]

Information equipment

Includes switches for computers, laptops and notebooks, keyboards, keypads, touchscreens, printers, scanners, copiers, facsimiles, graph plotters, personal digital assistants (PDA), calculators, etc.

See also V03-C01A2 for details of switches, and V03-C01A3 for constructional details. Keypads for mobile phones are coded under V03-U05 only. Also includes switches used in stationary and business equipment, e.g. shredder, etc.

See also T01 codes for computer details, T04 codes for keyboard and plotter details, S06-D to S06-K codes for copier, printer and facsimile details, and X27-A02C for electrical aspects of stationary and business equipment.

V03-U05 [2002]

Telecommunication and broadcasting

Includes switches for phones, mobile phones, pagers, televisions, receivers, set-top boxes, radios, remote controllers for television, etc., RF communication, etc. See also W01 and W02 codes for mobile phones, pagers, phones, etc, and W03 codes for TV receivers, remote controllers for television, set-top boxes, etc.

V03-U06 [2002]

Machine tools

Includes switches for machine tools such as presses, rolling, milling, drilling, turning, polishing, grinding, boring, cutting, abrading and burnishing machines. See also X25 codes.

V03-U07 [2002]

Industrial

Includes switches used in the industrial field, such as on conveyors, excavators (see also V03-U03A for land vehicles), in the mining industry, on packing, bottling, and sorting devices, cranes, incinerators, engraving systems, in manufacturing and assembly plants, etc. Switches especially for machine tools are coded under V03-U06 only. See also X25 codes.

V03-U08 [2002]

Toys; Games; Sports

Includes switches on toys, dolls, fitness and exercises machines, sport equipment, arcade games such as Pachinko or fruit machines, video consoles, handheld game consoles, musical instruments such as electric guitars, keyboards, etc. See also W04 codes.

Toys, sport equipment, arcade games, game consoles, guitars, keyboards

V03-U09 [2002]

Audio/video equipment

Includes switches on projectors, video recorders (VCR), DVD recorders, Hi-Fi systems, etc. Switches for cameras are coded under V03-U12 only. See also W04 codes.

V03-U10 [2002]

Medical

Includes switches on medical devices, such as pacemakers, hearing aids, defibrillators, diagnostic equipment, life support machines, etc., and on hospital, veterinary, and dentistry equipment, etc. See also S05 codes.

V03-U11 [2002]

Lighting

Includes novel slide switches (V03-C01B) used in flashlights, wall-mounted rocker switches (V03-C04) for controlling house lighting, foot-operated switches (V03-B01B) for controlling floor lamps, and inertia responsive switches (V03-C06C) for automatically applying motor vehicle hazard lights after an accident (see also V03-U03A, X22-N and X22-B02X). See also X26 codes for illumination arrangements per se.

V03-U12 [2002]

Cameras

Includes switches for digital still cameras, film-based cameras and video cameras. For other A/V equipment, see V03-U09 only. See also W04 codes for digital and video cameras, and S06-B codes for film-based cameras.

Digital camera, film camera, 35 mm camera, SLR camera, CCD camera, camcorder, video camera

V03-U13 [2005]

Instrumentation

Includes switches on electrical instruments, engineering and scientific instrumentation. See also S01 to S03 codes.

V03-U14 [2005]

Robotics

Includes switches on robots used in assembly lines (see also V03-U07 for industrial and X25), during surgery (see also V03-U10 for medical and S05), in home automation (see also V03-U01 for domestic and X27), welding robots (see also V03-U07 for industrial and X24), etc.

V03-U15 [2005]

Alarms; Signalling

Includes switches used to e.g. activate silent alarm used to covertly alert police during robbery, indicate unauthorised opening of window in house (see also V03-U18 and X25-U01), or to remotely signal to owner that parked vehicle is being tampered with (see also X22-N and X22-D03C). See also W05-B codes for novel details of alarms per se.

V03-U16 [2005]

Monitoring; Control

Includes e.g. key sheets used in television remote control units (see also V03-U09 and W03-A02C), pedestrian traffic light control pushbuttons (see also T07-B05A and T07-C03), wall-mounted switches for remotely controlling lighting (see also V03-U11, X26-C03C and W05-D codes) and switches for monitoring whether patient gets out of bed (see also V03-U10 and S05-G02B2 codes).

V03-U17 [2005]

HVAC; Refrigeration

Includes switches used in heating, ventilating and air conditioning systems, and refrigeration system. See also X27-E and X27-F codes.

V03-U18 [2005]

Doors and windows

Includes switches using on doors, gates and windows. For alarms systems, see also V03-U15 and W05 codes. See also X25 codes.

V04: Printed Circuits and Connectors

NOTES:

- (1) Includes low power electronics and domestic mains type connectors.
- (2) High power connectors for power distribution are in X12-G.
- (3) Thick and thin film circuits and hybrid circuits are in U14-H, although aspects relevant to printed circuits are in V04-Q and V04-R.
- (4) For batteries search V04 and X16, and for telephony V04 and W01 together.
- (5) Indeterminate type connectors are in V04 and X12.
- (6) Direct connections used for 2-part connector terminations are in V04-A and the relevant connector e.g. IDC termination for a 3-pin mains plug is in V04-A03, V04-F, V04-M02 and V04-M07.

V04-A

Direct connections

Relates to electrically conductive connections for two or more conductive members which are in direct contact.

V04-A01

Soldered, welded, riveted

See X24 for general soldering, welding and riveting. Manufacture of such connections is covered by V04-P codes.

V04-A02

Twisted, wrapped, bent, crimped

Crimping sleeve, ferrule

V04-A03

With insulation penetrating/displacement member

See also V04-M07.

Insulation displacement connector (IDC), needle point, prong

V04-A04

Clamped or spring

V04-A04A

Using clamping member acted on by screw or nut

V04-A04B

Using screw or nut clamping member

V04-A04C

Using spring, clip, or resilient member

V04-A04X

Other

Includes connections using cams, wedges, cones or balls to maintain contact.

V04-A05

To earth

Grounding electrode, earthing connector

V04-A06 [1992]

Conductive adhesive

V04-A07 [1992]

'Zebra' connector

(V04-A09)

Includes block of insulating material with alternative conductive areas.

Elastomer block

V04-A08 [1992]

Insulating connections

(V04-A09)

Includes end caps, sleeves etc.

V04-A09

Other

Includes connections using shape memory contact, etc.

V04-A10 [1992]

Superconducting wires connection

For high power superconducting wire connectors, see X12-G02G.

V04-A11 [1992]

Anisotropic connector

(V04-A09)

V04-B

Terminal strips and blocks; Terminals mounted on base

Connectors or connecting arrangements of this type provide a number of mutually insulated connections.

V04-B01

For printed circuits

Includes bed-of-nails connector, see also V04-M05. For semiconductor device holders see also V04-K02, and U11-D01Q codes.

IC socket, holder

V04-B02 [1987]

For flat cables

(V04-B09)

See also V04-M04.

Ribbon cable connector

V04-B03 [1992]

For coaxial cables

(V04-B09)

See also V04-M03.

High frequency, data communication

V04-B04 [1992]

End pieces for multiconductor cables

(V04-B09)

V04-B05 [1992]

**Terminals or binding posts, terminal strips,
terminal blocks, terminal boards**

(V04-B09)

Includes fastening of connecting parts to base or case.

Distributor block

V04-B05A [1992]

**Clip-on terminal blocks for mounting on rail or
strip**

(V04-B09)

V04-B09

Other

V04-C

**End pieces for wires or cables; 2 or more spaced
connecting locations**

V04-C01 [1992]

End pieces

Includes end pieces supported by wire or cable and for connection to another wire, terminal or conductive member. For multiconductor cables, see V04-B04.

Clamps, battery post, eye-, fork-, hook-terminals, crocodile clips, spade terminals, probes, needle points, spring clip, ferrule, sleeve, screw, nut

V04-C05 [1992]

Two or more connecting locations

Includes connectors for conductive members providing two or more spaced connecting locations which are thereby interconnected.

V04-D

Connector details

Details only of connectors of the type covered by H01R-015-033 are included here.

V04-D01

Contact members

Includes composition of contacts; hermaphroditic contacts; etc. Conductive materials in general are covered by X12-D01 codes.

Machined, stamped, formed, single beam, dual leaf, crimp-, wire wrap-, angled solder-, straight solder-pin termination

V04-D01A [1983]

Pins, blades, or prongs

Male, termination

V04-D01B [1983]

Sockets or receptacle contacts

Tongues, termination, female, twin cantilever

V04-D02

Securing contact members to base

V04-D03

Bases; cases; covers

For insulating materials in general see X12-E codes.

Housing, body, seals, dust cap, moulding, hood, potting boot

V04-D03A [1992]

Materials

Includes materials for all types of connectors.

V04-D04

Fastenings; Guides

Includes means for enabling engagement or disengagement of coupling parts with ease or for holding them in engagement using bolt or threaded ferrule.

Latches, locks, securing, coupling nut or ring, bayonet, ZIF connector, zero insertion force, screw, locking lever

V04-D04A [1983]

Snap-action fastenings

V04-D05

Structural association with electrical component

Includes built-in fuse, switch, light bulbs, filter capacitors (see also V04-M08), etc. Details of electrical components are in relevant classes e.g. fuses in X13.

V04-D06

Protective and screening arrangements

Safety arrangements

V04-D06A [1983]

Preventing access to live parts

Involves use of shutters or cover plates, insulating terminals, lockable dummy plug.

V04-D06B [1983]

Earthing; Shielding

Screening, grounding

V04-D06C [1992]

Preventing incorrect coupling

Polarisation

V04-D06D [1992]

Cable strain-relief

Clamp

V04-D06X [1983]

Other

V04-D09

Other

Includes mounting of coupling parts to apparatus e.g. wall or panel, lockable housing for plug not in use, etc.

V04-E

Single-pole two-part connectors

V04-F

Two-pole two-part connectors

Includes coaxial connectors. Communication type connectors are in section W e.g. for cable TV see W02-F codes.

V04-G

Three or more-pole two-part connectors

V04-G01

With parallel sliding contacts

Includes D-type-, rectangular- and trapezoidal-shaped connectors.

V04-G02

For printed circuits

See also V04-M05.

PCB connector

V04-G02A

Edge connectors

V04-G02B

Surface connectors

V04-G09

Other

Includes jacks e.g. for telephone. See W01-C, W01-D codes also.

V04-G15 [2002]

USB connectors

Universal serial bus

V04-H

(Multiway) adaptors, including plug standards converters

Includes coupling parts adapted for simultaneous co-operation with two or more identical counterparts e.g. twin socket for distributing energy to two or more circuits. Also includes coupling parts adapted for co-operation with two or more dissimilar parts, coupling parts for co-operation with counterparts of different voltages.

V04-H01 [1992]

Rails or bus-bars

Includes arrangements allowing counterpart to be mounted either at any point or at discrete locations.

Low power

V04-J

Coupling supported connectors

Includes an intermediate part linking two coupling parts e.g. two male coupling parts interconnected by an intermediate part with two female parts; intermediate parts distributing energy to two or more parallel circuits. Also includes bridging contacts in a counter-part.

Shunt connector, three-part coupling

V04-K

Connectors with holders

V04-K01

Lamp holders

See also X26-F.

Lamp socket

V04-K02 [1983]

For semiconductor devices

(V04-K09)

See also U11-D01Q, and V04-B01 if holder is for PCB mounting.

LED holder, IC socket

V04-K03 [1983]

Fuse holders

(V04-K09)

See also X13-D01B.

Fuse clip

V04-K09

Other

Includes CRT sockets, valve holders. See also V05-D codes.

V04-L

Rotary current collectors, distributors, interrupters

V04-L01

Commutators, slip-rings, contact brushes

For electric machine application, see also V06-M12 or X11-J03.

V04-L01A [1983]

Commutators, slip-rings

V04-L01B [1983]

Brush arrangements

V04-L09

Other

Includes distributors and interrupters. For vehicles see also X22-A01C.

Distributor caps

V04-M

Connectors for specific applications

Normally used in conjunction with above types, as relevant.

V04-M01

High frequency and high speed connectors

Cable TV distribution, coaxial, antenna, RF, computer data, data communications

V04-M02

Mains connectors

Under-carpet cable connection

V04-M03 [1983]

Coaxial cables connectors

V04-M04 [1983]

Flat or ribbon cables connectors

Under-carpet flat cable connector

V04-M05 [1983]

Printed circuits connector

V04-M06 [1983]

Adverse environments (dusty, wet, hot) connector

V04-M07 [1987]

Insulation displacing connectors

IDC

V04-M08 [1987]

Filter connectors

V04-M09 [1992]

Hybrid or mixed signal connectors

Includes combination of e.g. optical and electrical signals, power and data signals.

V04-M10 [1992]

Crimped connectors

V04-M11 [1997]

Smart connectors

V04-M12 [1997]

Combination connectors; Stackable connectors

V04-M15 [2002]

Hot plug connectors

V04-M16 [2005]

ZIF connectors

V04-M17 [2006]

Cable-connector combination

Includes a combination of cable and connector where neither is, or both are, novel. See X12-D03Q also.

V04-M20 [2002]

Microconnectors

V04-M30	[1992]
Characterised by application to specific industry	
These codes are used together, if necessary, with other V04-M codes e.g. HF connector for communications is coded in V04-M01 and V04-M30G.	
V04-M30A	[1992]
Avionics/military/shipping	
V04-M30C	[1992]
Land vehicles	
V04-M30E	[1992]
Data processing	
V04-M30G	[1992]
Telecommunications	
V04-M30J	[1992]
Oil/petrochemical	
V04-M30L	[1992]
Consumer electronics	
V04-M30M	[1997]
Medical	
V04-M30N	[1992]
Domestic	
Includes connectors for irons, fridges, etc. Ordinary mains connectors are in V04-M02.	
V04-M30P	[1997]
Personal hygiene	
V04-M30Q	[2002]
Instrumentation	
V04-M30R	[2002]
Machine tools; Robotics	
V04-M30S	[2005]
Industrial machines	

V04-N
Flexible/turnable/swivel connectors; Non-rotary current collectors
Also includes flat cable arrangement for movable element, e.g. vehicle steering wheel. See also X22-C05, X22-X01.

V04-P

Apparatus and processes for connector manufacture, assembly, testing, repair

Used in conjunction with V04-M. For testing of printed circuit board see V04-R06 instead. For general electric testing also see S01-G codes.

V04-P01

For crimping, wire wrapping, etc.

V04-P01A [1992]

Crimping

See also X12-G01E for heavy crimping tools.

V04-P01C [1992]

Wire wrapping

V04-P02

For commutators, slip-rings, brushes

See also V06-M11A or X11-J08A for application to electric machines.

V04-P03 [1992]

Wire stripping

(V04-P09)

See also X12-G01B for heavy power cables.

V04-P04 [1992]

Plating

(V04-P09)

V04-P05 [1992]

Connecting terminal to housing or moulding

(V04-P09)

V04-P06 [1992]

Contact

(V04-P09)

V04-P07 [1992]

Housing

(V04-P09)

V04-P08 [1992]

Soldering, riveting, welding

(V04-P09)

See also X24.

V04-P09

Other

Metal recovery

V04-P10 [1992]

Connecting superconducting wires

(V04-P09)

See also X12-G01X, X12-D06.

V04-P11 [1992]

Terminating cable

(V04-P09)

V04-P12 [2006]

Testing

V04-Q

Printed circuits

V04-Q01

Printed connections to printed circuit boards

Includes printed elements for providing electric connections to or between printed circuits (See also V04-M05).

V04-Q02

Printed circuits structurally associated with other circuits or non-printed components

Includes printed circuits/boards structurally associated with electronic, electric and 'mechanical' components.

Universal interface board

V04-Q02A [1992]

Association with other non-printed components

V04-Q02A1 [1992]

Switch

V04-Q02A2 [1992]

Multichip modules

See also U11-D01A6 and/or U14-H03A4 and U14-H03C3 codes. MCMs based on silicon substrates are in U11 and U14 only. Indeterminate substrate type MCMs are in sections U and V.

V04-Q02A3 [1992]

Smart cards

See also T01-H, T04-K, and U11-D01A codes for IC card packages. See also U14 codes if thin film aspects are relevant. Connectors for smart cards are coded according to claimed aspects e.g. V04-G02, V04-M05.

V04-Q02A3A [2002]

Contactless cards

V04-Q02A3B [2002]

Contact cards

V04-Q02A3C [2002]

Hybrid/twin cards

V04-Q02A4 [2005]

Non-electrical components

Includes structural association of PCB with non-electrical components, e.g. heat sink clamps, and optical components, such as lens holders, etc.

V04-Q02A5 [2005]

RFI/EMI (non-tracks) shields

Includes individual modules and whole PCB shielding cans/boxes. See also V04-U codes.

V04-Q02A6 [2005]

Buried (non-printed) components

Includes association with components such as capacitors, resistors or inductors buried within layers or under encapsulant. See V04-R03 for PCB encapsulation per se.

V04-Q02A7 [2005]

Semiconductor device association with PCB

V04-Q02A2 and V04-Q02A3 take precedence.

V04-Q02A9 [2006]

Other associated electrical components

Includes PCB association with other electrical components e.g. mountable type antenna.

V04-Q02B [1992]

Association with other circuits

V04-Q02B1 [1992]

Mother/daughter boards

See also V04-T02.

V04-Q02B1A [1992]

Hierarchical Interconnection Technology

See also V04-T02.

HIT

V04-Q03 [1992]

Hybrid circuits

(V04-Q02, V04-Q09)

Includes hybrid circuits per se. Manufacturing is in V04-R05G and relevant processes being claimed e.g. metallisation in V04-R02. All aspects of hybrid circuits are not covered here. For example, packaging and terminals are covered more fully in section U. See also U14-H03 and U14-H04 codes.

V04-Q04	[1992]
Printed resistor, capacitor, or inductor (V04-Q09) See also V01-A02, V01-B03, V02-F01 codes.	
V04-Q04A	[2006]
Printed resistor	
V04-Q04B	[2006]
Printed capacitor	
V04-Q04C	[2006]
Printed inductors; Printed coils Also includes printed coils for transformers (see also V02-F/V02-G codes) and electric motors (see also V06-M08A1).	
V04-Q04D	[2006]
Composite printed components Includes printed RC, RL, RLC or LC component combinations. Passive frequency-selective networks using structurally-associated components are also assigned U25-E02A.	
V04-Q05	[1992]
Printed circuits per se (V04-Q09) Includes track layout, general description of PCB and its components. V04-Q02A takes precedence for specific component association with PCB.	
V04-Q05A	[2005]
Track layout design for EMI/RFI shielding or ESD protection See V04-U codes for general EMI/RFI shielding.	
V04-Q06	[2002]
Printed antenna	
V04-Q08	[2005]
Probe cards Use this code together with other V04-Q and V04-R codes if appropriate, e.g. V04-Q02A for novel structural association with electronic components, V04-Q02B for structural association with other PCBs within probe card assembly or test fixture, or V04-R codes for novel manufacturing aspects. See also V04-Q30Q, S01-G, S01-H and U11-F codes. V04-B01/M05 codes may be applied for highlighting novel features of terminals, pins, blades mounted on PCB.	
V04-Q08A	[2005]
Horizontal probe card	

V04-Q08B	[2005]
Vertical probe card	
V04-Q09	
Other	
V04-Q30	[2005]
Characterised by application to specific industry or equipment	
V04-Q30A	[2005]
Avionics/military/shipping	
V04-Q30B	[2005]
Land vehicles	
V04-Q30C	[2005]
Computers	
V04-Q30D	[2005]
Displays; projectors	
V04-Q30E	[2005]
Data storage	
V04-Q30F	[2005]
Printers; Scanners; Photocopiers; Fax machines	
V04-Q30G	[2005]
Telecommunication and broadcasting	
V04-Q30H	[2005]
Audio/video equipment	
V04-Q30J	[2005]
Cameras	
V04-Q30K	[2005]
Toys; Games; Sports	
V04-Q30L	[2005]
Power supplies	
V04-Q30M	[2005]
Medical equipment	
V04-Q30N	[2005]
Domestic appliances	
V04-Q30P	[2005]
Personal articles	

V04-Q30Q	[2005]
Instrumentation	
V04-Q30R	[2005]
Machine tools; Robotics	
V04-Q30S	[2005]
Industrial machines	
V04-Q30T	[2005]
Alarms; Signalling; Telecontrol	
V04-Q30U	[2010]
Lighting; Lamps	
Includes printed circuits used in illumination applications such as street lamps, table lamps and LED lamps.	
V04-Q30X	[2010]
Other	
Includes oil/petroleum application and chemical industry.	
<hr/>	
V04-R	
Printed circuit manufacture	
V04-R01	
Removing conductive material; resists	
V04-R01A	[1983]
Resist	
Includes photoresist for use as solder mask. See also V04-R03, V04-R04A2.	
V04-R01A1	[1992]
Material	
V04-R01A2	[1992]
Stripping	
V04-R01A3	[1992]
Protector	
V04-R01A4	[1992]
Liquid	
V04-R01A5	[1992]
Dry	
V04-R01A5A	[1992]
Laminating	

V04-R01A6	[1992]
Developing	
V04-R01B	[1992]
Phototool	
Includes all etching resist exposure methods and apparatus. For all other types of PCB exposure methods and apparatus see V04-R12.	
<i>Photomask</i>	
V04-R01C	[1992]
Metal removal	
V04-R01C1	[1992]
Chemical etching	
V04-R01C5	[1992]
Mechanical removal	
Includes metal removal using e.g. laser.	
V04-R02	
Applying conductive material	
Includes wire embedded onto substrate or encapsulated PCB (see also V04-T01), processes to improve adhesion between substrate and metal layer (see also V04-R07), bonding metal foil to substrate is in V04-R07P1.	
<i>Conductive ink, circuit pattern production, metallising, masking tape</i>	
V04-R02A	[1987]
Electroless plating	
<i>Catalysts, chemical plating</i>	
V04-R02B	[1987]
Electroplating	
Includes electrolytic plating methods or baths. See X25-R04 also.	
V04-R02C	[1987]
Through-hole or via plating	
<i>Through-vias, blind vias, buried vias</i>	
V04-R02D	[1992]
Sputtering	
For general sputtering apparatus, see X25-A04.	
V04-R02E	[1992]
Evaporation	
V04-R02F	[1992]
Screen printing	

V04-R02G	[2005]
Adhesion aids	
Includes arrangements or materials for improving adhesion between a conductor track and substrate. Materials related to additives incorporated within the conductive material (see also V04-R02P) and additives incorporated within a substrate material (see also V04-R07L). If the adhesion aid is particularly for either a track or metal foil/layer use either this code or V04-R07P5, respectively. For general cases, use both codes.	
V04-R02P	[1992]
Conductive materials	
Conductive materials in general are covered by X12-D01 codes.	
V04-R02Q	[1992]
Baking conductor tracks	
V04-R02R	[1992]
Plating resists	
V04-R02S	[2006]
Ink-jet printing	
Includes the forming of conductive tracks by using an ink-jet printer (see S06-G codes for printer details).	
V04-R03	
Secondary treatment	
Includes polishing etc.	
V04-R03A	[1992]
Repairing conductive pattern faults	
V04-R03C	[1992]
Cleaning	
Includes chemical and mechanical cleaning.	
<i>Defluxing</i>	
V04-R03C1	[1992]
Brush cleaning	
V04-R03C2	[1992]
Vapour degreasing	
V04-R03C3	[1992]
Wave cleaning	
V04-R03C4	[1992]
Ultrasonic	
V04-R03C9	[1992]
CFC-free cleaner	

V04-R03E	[1992]
Protective coatings	
Includes also solder mask left on PCB for protection.	
<i>Conformal coatings</i>	
V04-R03E1	[1992]
Applying coatings	
V04-R03G	[1992]
Drill smear removal	
V04-R03J	[1992]
Correcting soldering defects	
Includes de-soldering, resoldering components, removing excess solder. etc.	
V04-R03L	[1992]
Drying	
V04-R04	
Assembling with components	
Includes mounting of electric, electronic and mechanical components. Includes also component removal. V04-R04 codes are used in conjunction with each other as appropriate. For example, surface mounted components and their soldering is in V04-R04B and V04-R04A codes.	
V04-R04A	[1983]
Soldering	
Details of soldering methods and apparatus are also in X24-A. Unsoldering of components is also included here if precise method is not indicated.	
V04-R04A1	[1987]
Wave soldering	
<i>Soldering baths</i>	
V04-R04A2	[1987]
Solder mask and its application	
See also V04-R03.	
<i>Solder resist</i>	
V04-R04A2A	[1992]
Permanent	
<i>Screen printing, photoprint, thermal-, UV-curing</i>	
V04-R04A2F	[1992]
Temporary	
<i>Solvent, peelable, aqueous</i>	
V04-R04A3	[1992]
Reflow soldering	

V04-R04A3A	[1992]
Infrared	
V04-R04A3C	[1992]
Laser	
V04-R04A3G	[1992]
Thermal conduction	
V04-R04A3J	[1992]
Hot gas	
Includes vapour phase soldering also.	
V04-R04A3L	[1992]
Soldering iron	
Prior to 1992 soldering irons were coded in V04-V09. This is now discontinued.	
<i>Desoldering</i>	
V04-R04A4	[2010]
Ultrasonic soldering	
See also X24-A02X for general ultrasonic soldering.	
V04-R04A5	[1992]
Flux/solder material	
V04-R04A5A	[1992]
Flux, solder paste/cream application	
<i>Screen printer, stencil printer, pressure dispensing</i>	
V04-R04A5C	[1992]
‘Clean flux’; Fluxless soldering	
Includes materials which need no secondary cleaning step.	
V04-R04A7	[1992]
Inspecting solder joint	
See also V04-R06D3.	
V04-R04B	[1987]
Surface mounting	
<i>Component onserters</i>	
V04-R04B1	[1992]
Adhesive application, drying and curing	
V04-R04B2	[1997]
Adhesive materials	

V04-R04C	[1987]
Wiring	
See also V04-V02 for records prior to 1992. From 1992 onwards, see V04-V02 only for general circuitry manufacture.	
V04-R04D	[1992]
Leaded component mounting	
V04-R04D1	[1992]
Lead clinching, cutting, shaping, etc.	
(V04-R04, V04-V01)	
V04-R04F	[1992]
Component placement machine	
(V04-R04, V04-R04B, V04-V01)	
Used in conjunction with V04-R04B or V04-R04D.	
V04-R04F1	[1992]
Robot	
V04-R04F3	[1992]
Pick-and-place	
V04-R04G	[1992]
Component feeding, orienting	
(V04-R04, V04-R01)	
See also V04-V01 for records prior to 1992. From 1992 onwards, see V04-V01 only for general circuit manufacture. For component handling within placement machine see only V04-R04F.	
<i>Positioning</i>	
V04-R04G1	[1992]
Component magazine or bandolier per se and its handling	
(V04-R04, V04-V01A)	
See also V04-V01A for records prior to 1992. From 1992 onwards see V04-V01A only for general circuit manufacture. See also U11-F codes.	
V04-R04J	[1992]
Checking for correct mounting and presence of component	
See also V04-R06D5.	
V04-R05	
Types of PCB	
This code is used in conjunction with other codes relating to PCBs/hybrids and their manufacture except in those cases where the type of PCB is evident from other claimed features e.g. multilayer substrate material is in V04-R07A and V04-R07L.	

V04-R05A	[1992]	V04-R06D	[1992]
Multilayer		Loaded board	
V04-R05A1	[1992]	(V04-R06, V04-V09)	
Ceramic		<i>In-circuit</i>	
V04-R05B	[1992]	V04-R06D1	[1992]
Double-sided		Functional	
(V04-R05)		V04-R06D3	[1992]
V04-R05C	[1992]	Soldering	
Rigid		V04-R06D5	[1992]
V04-R05D	[1992]	Correct component position	
Flexible		V04-R06G	[1992]
V04-R05E	[1992]	Test fixtures	
Three-dimensional		V04-R06G1	[1992]
V04-R05G	[1992]	Contact probes	
Hybrid		See S01-H and appropriate V04 codes also.	
(V04-Q09)		<i>Spring-loaded probes</i>	
V04-R05H	[2005]	V04-R06G1A	[1992]
Flex-rigid		Bed-of-nails	
V04-R06	[1983]	V04-R06G1B	[2002]
Testing		Flying-probes	
(V04-R09)		V04-R06G1C	[2002]
See also S01-G, S02-A, S03-E, T01-J, T04-D codes. The		Generic probes	
V04-R06 codes are used in conjunction with each other as		V04-R06G2	[2005]
appropriate e.g. method for conductivity testing of a bare		Non-contact probes	
board by using bed-of-nails contact probe is coded in		V04-R06G3	[1992]
V04-R06A3 and V04-R06G1A.		Automatic Test Equipment	
<i>Detecting defects, inspecting, shorts, pinholes, open</i>		V04-R06G4	[2005]
<i>circuit, specks</i>		Wireless fixture	
V04-R06A	[1992]	Includes fixture having wires replaced by PCB.	
Bare board		V04-R06G5	[2005]
V04-R06A1	[1992]	MEMS-based probes	
Isolation		V04-R06J	[1992]
Includes testing of spacing between conductor tracks,		Techniques/types	
short circuit between tracks etc.		V04-R06J1	[1992]
V04-R06A3	[1992]	Optical	
Conductivity			
Includes testing of open circuit in conductor tracks.			

V04-R06J1A	[1992]
Visual inspection	
V04-R06J1C	[1992]
Image processing	
Includes electronic imaging using CCTV, pattern recognition. See also T01-J, T04-D, W02-F codes.	
V04-R06J2	[1997]
X-rays	
V04-R06J3	[2006]
Mechanical or thermal tests	
Includes e.g. vibration, structural, mechanical or thermal testing.	
V04-R06J9	[2006]
Other testing techniques	
V04-R06M	[1992]
Artwork	
Includes checking of traces, position of lands, photomasks/phototool, etc.	
V04-R07	[1983]
Substrates	
(V04-R09)	
Includes measures to improve adhesion of metal to substrates. See also V04-R02.	
V04-R07A	[1992]
Multilayer	
V04-R07A1	[1992]
Ceramic	
V04-R07B	[1992]
Metal-cored	
V04-R07C	[1992]
Flexible	
<i>Polyimide film, polyester film</i>	
V04-R07D	[1992]
Hybrid	
V04-R07E	[2005]
Metal-clad	
V04-R07E1	[2005]
Single-sided	

V04-R07E2	[2005]
Double-sided	
V04-R07F	[2005]
Constructional details	
V04-R07L	[1992]
Material	
Insulating materials per se are covered by X12-E codes.	
<i>LC polymer, epoxy glass laminate, thermoplastic resin, poly(aryl) ether, ceramic, epoxy resin, phenol resin, alumina, beryllia, glass-coated alumina, unsaturated polyester resin and glass or synthetic fiber, steel, steatite, aluminium nitride sintered</i>	
V04-R07P	[1992]
Manufacturing	
V04-R07P1	[1992]
Laminating metal foil to substrate	
Selective lamination of metal to form tracks is in V04-R02. See V04-R07P5 for adhesion aids such as materials or arrangements for improving adhesion between a copper foil/layer and the substrate. See note for V04-R02G.	
V04-R07P1A	[1992]
Applying protective coatings	
Includes for e.g. treatment to prevent oxidation of metal foils.	
V04-R07P2	[2005]
Manufacturing metal foil	
Includes manufacture of metal foil which will subsequently be laminated on insulating substrate.	
V04-R07P3	[1992]
Laminating layers of multilayer PCB	
V04-R07P4	[2005]
Depositing (un-patterned) metal layer	
Includes depositing (un-patterned) metal layer directly onto substrate.	
V04-R07P5	[2005]
Adhesion aids	
Includes arrangements or materials for improving adhesion between a conductor foil or layer and substrate. Materials related to additives incorporated within the conductive material (see also V04-R02P) and additives incorporated within a substrate material (see also V04-R07L). If the adhesion aid is particularly for either a track or metal foil/layer use either this code or V04-R02G, respectively. For general cases, use both codes.	

V04-R07P6	[2007]
Insulating layers of multilayer PCB	
Includes application of insulating layers in manufacture of multilayer substrates.	
V04-R08	[1987]
Drilling holes or vias	
(V04-R09)	
<i>Drilling, punching, through-holes, through-vias, blind vias, buried vias</i>	
V04-R09	
Other	
Includes static electricity neutralising, PCB holder/support etc.	
V04-R10	[1987]
Mask registration	
(V04-R09)	
V04-R11	[1992]
CAD of wiring layout, component placement, etc.	
(V04-R09)	
See also T01-J15A2. Also includes general layout design.	
V04-R12	[1992]
PCB exposure	
(V04-R09)	
Includes all non-etching resist exposure methods and apparatus. See V04-R01B for etching resist exposure. For lamp details see X26 codes.	
V04-R13	[1992]
Blanking, shearing, and cutting	
(V04-R09)	
V04-R14	[1992]
Multistep processes	
(V04-R09)	
This code is used when several well-defined steps are claimed.	
V04-R15	[1992]
Materials recovery; Recycling	
V04-R15A	[1992]
Etchant	
(V04-R01)	
V04-R15B	[1992]
Conductive material	
(V04-R02)	

V04-R16	[1992]
Decontamination of wastes; Disposal	
(V04-R09)	
V04-R17	[1992]
Board conveying and handling between processing stages	
See X12-H01E8 for holding board in optimized position for non-contact power transfer.	
(V04-R09)	
V04-R19	[2005]
EMI/RFI shielding tracks manufacture	
Covers RFI/EMI shielding tracks manufacture. See V04-U for general shielding.	
V04-R20	[2007]
Overstress indicators	
(V04-R09)	
Includes arrangements used to highlight areas of PCB with dangerously high stress levels. See also S02-F codes for mechanical stress and S03-B codes for thermal stress measurements.	
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V04-S	
Electronic equipment casing/cabinet, and drawers	
Includes casings for electronic equipment like computers, A-V apparatus, etc. Electrical equipment such as microwave ovens, etc are not included here. For insulating materials (see X12-E codes, too) designated for general electronic equipment or apparatus, see V04-S codes for records prior to 1997. From 1997 onwards, see V04-X01B codes.	
<i>Housing, cases, covers, bases, panels, castors, handle, lifting eye, adjustable feet, ventilation slots, louvres</i>	
V04-S01	
Metal and hermetically sealed casings	
V04-S01A	[1987]
Hermetically sealed casings	
Encapsulation of PCBs is in V04-R03 only and component encapsulation is coded in relevant code for the component e.g. resistors in V01.	
<i>Encapsulants, seals, epoxy resin</i>	
V04-S01C	[2005]
Metal casing with insulative coating	
V04-S02	[1987]
Insulating material casing	
(V04-S09)	
<i>Polyphenylene oxide flame retardant, ABS, plastics</i>	

V04-S02A	[1992]
Sealed or encapsulated	
V04-S02B	[2005]
Insulating casing with conductive coating	
V04-S03	[1992]
Battery holder/compartment associated with electrical/electronic equipment	
(V04-S09)	
See also X16-F06.	
V04-S04	[2005]
Conductive (non-metallic) material casing	
V04-S09	
Other	
Includes casings of indeterminate material.	
<i>Brackets, clips, vibration dampers, nameplate details</i>	
V04-S10	[2002]
Manufacture	
V04-S15	[2002]
Materials	
V04-S20	[2005]
Transparent casing	
V04-S22	[2005]
Fire-proof casing	
V04-S23	[2017]
Water-proof casing	
Includes casings which are waterproof.	
V04-S24	[2020]
Dust-proof casing	
Includes dust proof casing for all electronic devices.	
V04-S30	[2007]
Mechanical details	
Includes inserts, hinges, handles and locks.	

V04-T	
General constructional details of electronic apparatus	
This code is used only for electronic equipment such as computers, A-V apparatus, etc. Electrical equipment such as microwave ovens are not included here.	

V04-T01	
Arrangements of components and wiring	
See also V04-V02 for wiring harnesses. Termination of wire harnesses is in V04-P11.	
<i>Panel mounting, breadboards</i>	
V04-T01A	[1992]
Wiring	
<i>Grommets, wire harness, ties, cable sleeve/marker, wire embedding, wire tie tools, cable trough, duct, trunking, busbar</i>	
V04-T01C	[1992]
Components	
<i>Component (de)mounting tool</i>	
V04-T01C1	[2002]
Modular components	
V04-T02	
Mounting supporting structure in casing or on rack; rack construction	
See also V04-Q02 for PCB in association with other components, W01-B20 for telephone distribution frame.	
<i>Circuit modules, frames, supports, PCB (de)mounting tools, PCB or panel spacer elements, back panel interconnections, mother/daughter board arrangements, card ejector, divider, guides, chassis runner, locating strip</i>	
V04-T03	
Cooling; Heating; Air filtering/cleaning; Dehumidifiers	
Includes cooling of electronic apparatus, systems and devices. Individual component cooling is also coded in relevant classes, e.g. for ICs, see U11-D02 codes.	
V04-T03A	[1983]
Heat sinks, radiative cooling	
<i>Heat conducting plates</i>	
V04-T03B	[1983]
Forced cooling	
V04-T03B1	[2002]
Using fans	
V04-T03B2	[2002]
Using pumps/compressors; Refrigeration	
V04-T03B3	[2002]
Cryogenic cooling	

V04-T03C	[2002]
Thermoelectric cooling	
<i>Peltier, heat pumps, cooling, electrocaloric effect, thin film perovskite PZT</i>	
V04-T03F	[2005]
MEMS-based cooling	
V04-T03G	[2005]
Hybrid cooling	
V04-T03H	[2002]
Heat pipes	
V04-T03J	[2002]
Heating arrangements	
V04-T03K	[2002]
Air filtering/cleaning	
V04-T03L	[2002]
Dehumidifiers	
V04-T03P	[2002]
Materials	
Includes thermal materials and adhesives.	
V04-T03Q	[2002]
Manufacture; Testing; Monitoring	
V04-T03X	[2007]
Other cooling aspects	
Includes cooling aspects not covered elsewhere e.g. involving the use of electro-caloric effects, heat sink mounts, etc.	
V04-T04	[1992]
Hybrid electrical/optical board arrangements	
<hr/>	
V04-U	
Electric and magnetic screening	
Normally includes screening arrangements for an individual equipment and the room containing the equipment. See S01-G08B5 also for screened rooms for electrical equipment testing. For individual measuring instrument screening, see S01-J02 also. For suppressing the emission of interference from an equipment by means of a specific constructional feature of the equipment, see also W02-H01E.	
<i>EM shielding, EMI, RFI</i>	
V04-U01	[1992]
Material	

V04-U01A	[1992]
Superconducting materials	
See also X12-D06B and U14-F01 for superconducting materials per se.	
V04-U02	[1992]
Faraday cage	
Includes arrangements for a room, or whole apparatus.	
V04-U03	[1992]
EMI-proof casings	
See also V04-S codes.	
V04-U04	[2007]
EMI-proofing elements	
Includes elements such as gaskets, panels (see V04-U03 too, if the panel is part of a casing), etc.	
V04-U15	[2002]
Manufacture	
V04-U20	[2002]
EMC testing	
V04-U21	[2010]
Electrostatic protection casing	
Includes electronic device protection from electrostatic effect.	
<hr/>	
V04-V	
General circuit manufacture	
(1) Excludes PCB and its manufacturing from 1992 onwards. Please search relevant V04-R codes.	
(2) Includes general assemblages of electric components and their monitoring.	
(3) Prior to 1992, please search V04-V codes also for PCB component mounting, PCB loaded board testing and (de)soldering irons.	
(4) From 1992 onwards, all PCB testing is covered by V04-R06 codes; V04-V09 is still valid for general circuit testing.	
<hr/>	
V04-V01	
Feeding, orienting, mounting components	
<i>Robot assembler, automatic component insertion, positioning components, pick-and-place machine</i>	
V04-V01A	[1987]
Component magazine or bandolier	
For ICs, see also U11-F.	
<i>Cassettes, carrier tapes</i>	

V04-V02

Wiring

Includes manual and machine wiring. See also V04-T01.
Harness manufacture, automatic wiring, looms, wire tie tools

V04-V02A [1983]

Shaping component leads, cutting

(V04-V09)

Bending-, trimming-, clinching-, forming-leads

V04-V09

Other

Includes component value changing tool and general circuit testing.

Testing circuit, monitoring

V04-X

Miscellaneous

Component marking

V04-X01 [1997]

General electronic components packaging, materials, cleaning, manufacture and disposal

V04-X01A [1997]

Containers, packaging

Storage, shipping, transportation

V04-X01B [1997]

Materials

For insulating materials (see also X12-E codes) designated for general electronic equipment or apparatus, prior to 1997 see V04-S codes.

V04-X01B1 [2005]

Nanomaterials

Includes nanomaterials or nanoparticles for general electronic applications.

V04-X01C [1997]

Materials recovery and recycling

Includes material recovery and recycling of general electronic components.

V04-X01D [1997]

Cleaning

V04-X01E [2002]

Drying

V04-X01F [2005]

Manufacture and testing

Includes general electronic components manufacture and testing.

V04-X01G [2005]

Waste decontamination and disposal

Includes decontamination and disposal of general electronic components.

V05: Valves, Discharge Tubes and CRTs

Notes:

(1) All aspects of discharge tubes for lighting (including manufacture) are covered by X26 and are not included in V05.

(2) Manufacturing aspects of devices are normally only coded in V05-L. However, where important novelty or increased information can be conveyed by inclusion in device codes also, this is done.

(3) In sections where separate codes for tube details are not included or are insufficient, codes from the general section (V05-M) should be used in conjunction with a device code.

(4) From 1992 onwards, new codes were introduced to represent tube types which can be used whether the whole tube or just a component part is claimed. These codes can be applied if the particular tube type is specified and thus should be regarded as a means of limiting a search only, since the precise nature of a tube may be unspecified or unimportant in cases of wider application.

V05-A

Gas-filled tubes

Does not include plasma processing tubes - see V05-F05 codes. Prior to 1992, use V05-M in conjunction with V05-A codes for full coverage.

V05-A01

Plasma display panels and tubes

V05-A01A codes are used to describe the display type in conjunction with codes from V05-A01B to V05-A01G, which describe novel features.

Examples:

(1) A novel barrier rib arrangement of a non-specific plasma display panel type, use V05-A01A3 and V05-A01D3 together.

(2) A novel drive circuit for a plasma-addressed LCD would be coded in V05-A01A7 and V05-A01G, as well as U14 and relevant T04/W03 codes.

Flat panel, matrix, seven-segment, plasma, vessel, housing, electrodes, filling

V05-A01A [1992]

Characterised by type of display

V05-A01A1 [1992]

Segment type display tube

Prior to 2005, tubes limited to displaying characters only in matrix form were covered by V05-A01A3C.

V05-A01A3 [1992]

Plasma display panels

Includes display panels that directly emit the colour of the plasma discharge, as well as panels that use UV emission in order to excite a phosphor. Also includes plasma display panels of unspecified driving voltage type.

V05-A01A3A [1992]

DC display

Includes Self-scan® display panel with sequential discharge transfer.

V05-A01A3B [1992]

AC display

V05-A01A3C* [1992-2004]

For character display only

*This code is now discontinued but covered display panels for alphanumeric data only, i.e. where not all points on screen can be addressed. From 2005, this code is no longer used. See V05-A01A9 for other plasma display types.

V05-A01A3D* [1992-2004]

For character and graphics display

*This code is now discontinued. Covers display with all points addressable. From 2005, this code is no longer used. See V05-A01A9 for other plasma display types.

V05-A01A5* [1992-2004]

Multicolour display

*This code is now discontinued. From 2005, this code is no longer used. See V05-A01A9 for other plasma display types.

V05-A01A5A* [1992-2004]

Full colour display

*This code is now discontinued. Covers display capable of full colour range with primary colours. From 2005, this code is no longer used. See V05-A01A9 for other plasma display types.

V05-A01A7 [1992]

Combined technology displays e.g. Plasma Addressed LCD

Covers displays where gas discharge is not the sole display mechanism, for example in combination with electroluminescent elements, LCD addressing, FED pixels etc. See also U14-K01A2C for plasma addressed LCD.

V05-A01A7A*	[1992-2004]
Using phosphor directly excited by discharge	
*This code is now discontinued. It is assumed that almost all plasma display panels operate using UV emission from the gas discharge in order to excite a phosphor, and thus are just coded in appropriate V05-A01A3 codes.	
V05-A01A7B	[1992]
Using plasma as source of electrons	
V05-A01A9	[1992]
Other types of plasma display	
V05-A01B	[1992]
Light emitting arrangements; Phosphors	
V05-A01B1	[1992]
Gas filling	
V05-A01B1A	[1992]
Gas filling additives	
Includes additives to modify display colour or prolong life.	
V05-A01B1C	[1992]
With several separate gases	
Covers display with gas filling differing between cells, e.g. to display different colours.	
V05-A01B3	[2005]
Phosphor Compositions	
(V05-M01A)	
Includes manufacture of phosphor compositions. For coating of phosphors in plasma displays, see V05-L02 codes. Prior to 2005, coded in V05-M01A.	
V05-A01B5	[2005]
Phosphor arrangements	
(V05-A01B)	
Prior to 2005 coded in V05-A01B.	
V05-A01C	[1992]
Electrode assemblies	
Covers details of electrode construction including materials, supports, insulating coatings, and layout. Lead-in conductors are covered by V05-A01D5.	
V05-A01C1	[1992]
Anodes	

V05-A01C2	[1992]
Discharge triggering and maintaining electrodes	
From 2002 the scope of this code is expanded to allow the inclusion of discharge maintaining or holding electrodes.	
<i>Control electrode, bus/address electrodes</i>	
V05-A01C2A	[2002]
Discharge triggering electrodes	
Covers electrodes specifically intended to initiate gas discharge.	
V05-A01C2C	[2002]
Discharge maintaining electrodes	
Covers electrodes specifically intended to maintain an existing gas discharge.	
<i>Holding electrode</i>	
V05-A01C3	[1992]
Cathodes	
V05-A01C3A	[1992]
Heated cathode	
<i>Hot cathode</i>	
V05-A01C4	[1992]
Microfabricated electrodes	
Covers electrodes produced by semiconductor device manufacturing techniques, (not screen printing).	
V05-A01C5	[1992]
Electrode supports	
V05-A01C7	[1992]
Dielectric coatings	
Includes protective overcoats for electrode insulating layers.	
V05-A01D	[1992]
Vessels, spacers, cell construction	
Includes novel shape or size of cells. Screens and filters not forming part of the vessel are covered by V05-A01F codes.	
V05-A01D1	[1992]
Vessels per se	
Covers materials and construction of front and back panels and sealing arrangements.	
<i>Casing, housing, front plate, back plate, glass</i>	

V05-A01D1A	[1992]
Seals	
Covers seals for main body of vessel and for lead-ins. Internal seals are covered by V05-A01D3A.	
<i>Frit</i>	
V05-A01D1C	[1992]
Conductive coating	
Covers coating e.g. for screening purposes. Electrodes are covered by V05-A01C codes.	
V05-A01D1E	[1992]
Optical coatings	
Includes anti-glare coating. External filters (i.e. as part of a display module) are covered by V05-A01F1.	
V05-A01D3	[1992]
Internal spacing elements and seals	
Includes rib structures.	
<i>Cell spacers</i>	
V05-A01D3A	[1992]
Internal seals	
Covers seals between separate parts of vessel. Main vessel seals are covered by V05-A01D1A.	
V05-A01D5	[1992]
Lead-in conductors	
V05-A01D7	[1992]
Mounting of integral drive circuitry	
Covers circuitry structurally associated with display. Actual circuit details are covered by V05-A01G and, in general, W03-A08D.	
V05-A01E	[1992]
Complete novel display device	
This code is used when a complete novel display device is claimed without specific reference to a particular feature.	
V05-A01F	[1992]
Module aspects	
Includes display device per se (not necessarily novel), with e.g. external filters, housing, and drive electronics. (Circuitry per se is covered by V05-A01G codes). Filters formed as coatings on the discharge vessel are covered by V05-A01D1 codes.	
V05-A01F1	[1992]
Optical filter	

V05-A01F3	[1992]
Housing, screening	
Includes shielding.	
V05-A01F5	[1992]
Drive circuitry PCB mounting; Connectors	
Mounting of circuitry integral with display itself is covered by V05-A01D7.	
V05-A01G	[1992]
Drive circuitry (circuit details)	
Includes circuitry which may be either integral with the display or external to it. Also includes driving methods. See also T04-H03 codes.	
V05-A01G1	[1992]
Integral with display	
V05-A01H	[2006]
Tube cooling	
Note that this only applies to cooling systems used to remove heat from the tube envelope. Drive circuitry cooling is not included per se, but may be included in V05-A01F3 or V05-A01F5 codes where relevant housing or PCB mounting details are required. Prior to 2006, coded in V05-M07 codes.	
V05-A03	[1992]
Gas filled switching tubes	
(V05-A09)	
Details of switching tubes are covered by V05-A07 codes. See X13-A04H also for power switching tubes. Electronic switching in general is covered by U21-B codes.	
<i>Thyratron, cold cathode tube, TR tube</i>	
V05-A05	[1992]
Gas filled circuit protection devices	
(V05-A09)	
For device details see V05-A07 codes. Covers devices designed to limit excess voltage. See also U24-F02 and X13-C03 for low and high power over-voltage limiting in general, and also under application e.g. W01-C08A for telephone systems protection.	
V05-A07	[1992]
Details of gas-filled tubes	
(V05-M)	
Codes in this section relate to devices in V05-A03, V05-A05, and V05-A09 codes.	

V05-A07A	[1992]
Electrodes (V05-M03)	
V05-A07A1	[1992]
Anodes	
V05-A07A3	[1992]
Cathodes	
V05-A07A3A	[1992]
Heated cathodes <i>Hot, thermionic</i>	
V05-A07A5	[1992]
Grids, control electrodes <i>Trigger</i>	
V05-A07B	[1992]
Vessels, seals, lead-ins (V05-M05)	
V05-A07C	[1992]
Gas filling (V05-M09)	
V05-A07G	[1992]
Complete novel device This code is used when the complete device as a whole is claimed, without specific reference to a particular feature.	
V05-A09	
Other gas discharge tubes	
<hr/>	
V05-B	
Classical and cold cathode vacuum tubes	
V05-B01	[1992]
Classical thermionic vacuum tubes Gas-filled tubes are covered by V05-A codes, transit time tubes by V05-C codes. See X13-A04H also for power types. V05-B01A codes are used to indicate the type of device without regard to novelty, which is indicated by V05-B01B codes.	
V05-B01A	[1992]
Tube type	

V05-B01A1	[1992]
Diode	
V05-B01A3	[1992]
Triode	
V05-B01A5	[1992]
Tetrode	
V05-B01A7	[1992]
Pentode	
V05-B01A9	[1992]
Other thermionic tube	
V05-B01B	[1992]
Tube details (novel) (V05-M)	
V05-B01B1	[1992]
Cathodes (V05-M02)	
V05-B01B1A	[1992]
Heater elements (V05-M02)	
V05-B01B3	[1992]
Grids (V05-M03)	
V05-B01B3A	[1992]
Control grid (V05-M03)	
V05-B01B5	[1992]
Anodes (V05-M03)	
V05-B01B6	[1992]
Cooling (V05-M09)	
V05-B01B6A	[1992]
Forced air (V05-M09)	
V05-B01B6B	[1992]
Liquid (V05-M09)	

V05-B01B6C	[1992]
Vapour (V05-M09)	
V05-B01B7	[1992]
Vessels, lead in conductors (V05-M05)	
V05-B01B8	[1992]
Complete novel tube	
V05-B01B9	[1992]
Other thermionic tube details	
V05-B03	[1992]
Cold cathode tubes Covers tubes of similar construction to those of V05-B01. Microminiature cold cathode devices are covered by V05-B05 codes.	
V05-B03B	[1992]
Tube details (novel) (V05-M)	
V05-B03B1	[1992]
Cathodes	
V05-B03B1A	[1997]
Current limiting arrangements (V05-B03B1)	
V05-B03B3	[1992]
Grids	
V05-B03B5	[1992]
Anodes	
V05-B03B7	[1992]
Vessels, lead in conductors	
V05-B03B8	[1992]
Complete novel tube	
V05-B03B9	[1992]
Other cold cathode tube details	

V05-B05	[1992]
Microminiature cold cathode devices Codes in this section cover devices with analogous operation to those in V05-B03 but formed using semiconductor device fabrication techniques. See U11 codes for manufacture aspects (in addition to V05-L codes) and U12-B03D also for devices per se. Field emission electrodes using semiconductor fabrication techniques of general application and not forming part of a complete microfabricated device are coded in V05-M03A1. Microfabricated field emitters for cathode ray tubes are coded in V05-D05C5 codes, and for plasma display panels, in V05-A01C4.	
V05-B05A	[1992]
Characterised by nature of device Codes in this section describe the nature of the device and do not necessarily indicate novel features, which are represented by the additional use of V05-B05B codes (see note in V05 class notes).	
V05-B05A1	[1992]
Characterised by number of electrodes	
V05-B05A1A	[1992]
Diode	
V05-B05A1B	[1992]
Triode <i>Three-electrode, three terminal, controlled device</i>	
V05-B05A1X	[1992]
Other number of electrodes	
V05-B05A3	[1992]
Characterised by configuration Codes in this section are used alone or in combination as appropriate.	
V05-B05A3A	[1992]
Single device	
V05-B05A3B	[1992]
Array of devices	
V05-B05A3C	[1992]
For integration with solid state semiconductor device Covers incorporation with e.g. monolithic or film-type integrated circuit.	

V05-B05A3E	[1992]
For combination with other vacuum conduction devices	
V05-B05A3X	[1992]
Other configurations	
Includes cold cathode heat pumps and analogous devices.	
V05-B05A5	[1992]
Characterised by emitting element	
Also coded in V05-B05B3 when emitting element per se is novel.	
<i>Field emission</i>	
V05-B05A5A	[1992]
pn junction	
Includes 'hot electron' emitting device, i.e. element imparting acceleration to electrons before field emission process.	
V05-B05A5B	[1992]
Film electrode	
V05-B05A5C	[2006]
Carbon nanotube	
<i>CNT, nanohorn</i>	
V05-B05A5X	[1992]
Other emitting elements	
V05-B05A8	[1992]
Characterised by semiconductor or other substrate	
Codes in this section are applied to describe the type of substrate only. When the substrate is the novel aspect V05-B05B1 is also assigned. For inventions with unspecified semiconductor substrate V05-B05A8 is assigned. If the substrate is stated to be of dielectric material V05-B05A8X is assigned. For cases where no details of the substrate are disclosed, V05-B05A8 codes are not assigned.	
V05-B05A8A	[1992]
III - V compounds	
<i>Gallium arsenide</i>	
V05-B05A8C	[1992]
II - VI compounds	
V05-B05A8E	[1992]
Characterised by silicon substrate	

V05-B05A8X	[1992]
Other substrate	
Includes dielectric material substrates.	
V05-B05B	[1992]
Device details (novel)	
Codes in this section are only applied to indicate novel features.	
V05-B05B1	[1992]
Substrate	
Use with V05-B05A8 codes to discriminate type of substrate.	
V05-B05B3	[1992]
Emitting element i.e. cold cathode	
Use with V05-B05A5 codes to discriminate type of emitter.	
V05-B05B5	[1992]
Other electrodes (non-emitting electrodes)	
Emitting electrodes are covered by V05-B05B3.	
V05-B05B5A	[1992]
Control electrodes	
Covers 'grid' control electrodes.	
V05-B05B5B	[1992]
Collector electrode	
Covers 'anode' electrodes.	
V05-B05B5X	[1992]
Other non-emitting electrodes	
V05-B05B7	[1992]
Housing, interconnections, integral circuitry	
V05-B05B7A	[1992]
Housing, encapsulation	
V05-B05B7B	[1992]
Interconnections	
V05-B05B7C	[1992]
Connections to external circuitry	
V05-B05B7D	[1992]
Integral circuitry	
Covers circuitry for driving, interfacing etc.	

V05-B05B8 [1992]

Complete novel device

This code takes precedence over other V05-B05B (i.e. novel feature) codes and is used in conjunction with V05-B05A codes to describe device type when the complete device is claimed as novel.

V05-B05B9 [1992]

Other novel details

V05-C

Transit-time tubes

V05-C01

Tube types

Codes in this section e.g. V05-C01A are used when the tube as a complete device is claimed, otherwise the subdivision 'details' codes e.g. V05-C01A1 (introduced from 1992) are assigned together with appropriate codes from the 'details' (V05-C02) section. Prior to 1992, V05-C02 codes were used alone if only details of a tube were claimed.

Examples:

- (1) Novel magnetron: V05-C01A
- (2) Novel anode for magnetron: V05-C01A1 and V05-C02A1
- (3) Novel anode for any type of transit time tube: V05-C02A1.

V05-C01A [1983]

Magnetrons

Does not cover apparatus for magnetron sputtering or other workpiece processing, which is covered by V05-F05 codes, especially V05-F05C3A.

Multi-cavity

V05-C01A1 [1992]

Tube details

Search with V05-C02 codes for novel details of tube.

V05-C01B [1983]

Travelling-wave tubes

TWT, crossed-field tube, forward wave, backward wave, parametric, BWO

V05-C01B1 [1992]

Tube details

Search with V05-C02 codes for novel details of tube.

V05-C01C [1987]

Klystrons

(V05-C01X)

Reflex, interaction, beam, stream

V05-C01C1 [1992]

Tube details

Search with V05-C02 codes for novel details of tube.

V05-C01D [1992]

Gyrottron

(V05-C01X)

For quasi optical types see V08-B also. Includes gyro-klystron devices.

V05-C01D1 [1992]

Tube details

Search with V05-C02 codes for novel details of tube.

V05-C01E [2006]

Inductive output tubes

Prior to 2006, coded in V05-C01X

IOT

V05-C01E1 [2006]

Tube details

Search with V05-C02 codes for novel details of tube.

V05-C01X [1983]

Other tube types

Multipactor

V05-C02

General constructional details

To link to a particular type of tube use appropriate 'tube details' code from V05-C01 section.

V05-C02A [1983]

Electrodes, screens, magnetic control

V05-C02A1 [1992]

Anodes

See V05-C02C1 codes also when combined function as anode and resonator is significant. Note that slow-wave structures per se are treated as a distributed element, but for manufacture, as an electrode. (See note for V05-C02C3A).

Collector

V05-C02A3 [1992]

Cathodes

Thermionic, dispenser

V05-C02A3A [1992]

Heaters

V05-C02A5	[1992]
Electron guns	
Includes grid electrodes, and electrostatic focusing and beam path control. (Use V05-C02A7 codes for magnetic control of these functions).	
V05-C02A7	[1992]
Magnetic control	
<i>Magnet, electromagnet, coil, winding, solenoid</i>	
V05-C02A7A	[1992]
Focusing	
Focusing by electrodes is covered by V05-C02A5.	
V05-C02A7C	[1992]
Influencing beam path	
<i>Magnetron</i>	
V05-C02A9	[1992]
Other electrodes, screens	
Includes screens.	
V05-C02B	[1983]
Vessels, lead-ins, seals, RFI suppression	
Suppression of RFI other than by lead filtering is covered by V05-C02C codes. V05-C02B codes include cooling and coupling arrangements.	
<i>Housing, heat sink, window, filter, RFI suppressor</i>	
V05-C02B1	[1992]
Vessels	
V05-C02B1A	[1992]
Seals	
V05-C02B1C	[1992]
Coupling windows	
Covers part of vessel enabling transfer of RF energy. See V05-C02C5 for waveguide coupling arrangement.	
V05-C02B3	[1992]
Lead-ins	
V05-C02B3A	[1992]
Lead-in filters	
Includes filter devices preventing radiation of RF energy from e.g. heater power supply terminals, also assigned W02-H01 (RFI suppression at source in general). See U25-E02 codes also for details of filters per se. RFI suppression by internal means is covered by V05-C02C7.	
<i>Radio frequency interference, choke, feedthrough, capacitor, condenser</i>	

V05-C02B5	[1992]
Cooling	
See V05-M07 codes for cooling of tubes in general.	
<i>Heatsink, radiate, air, fan, blower, pump, fluid, liquid, vapour</i>	
V05-C02C	[1983]
Distributed elements	
Includes resonators, delays, etc. See W02-A codes for distributed-constant elements not forming part of tube. (These elements are not assigned W02-A codes when part of a tube, unless wider application is suggested).	
V05-C02C1	[1992]
Resonator structures	
<i>Cavity</i>	
V05-C02C1A	[1992]
Single resonator	
V05-C02C1B	[1992]
Multiple resonator	
<i>Interconnection, multicavity</i>	
V05-C02C1C	[1992]
Tunable resonator	
Includes mechanically- and electrically-tuneable structures.	
V05-C02C3	[1992]
Delay elements	
V05-C02C3A	[1992]
Slow wave structures	
Manufacture of slow wave structure is covered by V05-L01B7, i.e. for manufacturing purposes only, it is regarded as an electrode.	
<i>Helix</i>	
V05-C02C5	[1992]
Distributed coupling	
Includes e.g. waveguide structure for coupling to tube. Window structures forming part of vessel are covered by V05-C02B1C.	
V05-C02C7	[1992]
RFI and harmonic suppression	
W02-H01, general code for RFI suppression at source, is not applied for arrangements internal to the tube per se. External filtering of lead-ins is covered by V05-C02B3A.	
<i>Damping</i>	

V05-C03	[1992]
Circuitry specific to transit time tubes	
Codes in this section are only used for specific circuitry taking into account device characteristics, and where provision does not exist elsewhere. In general, see under application, e.g. W02-G01 codes for transmitters, U23-A02 for oscillators, U24-G04D for amplifiers, etc.	
V05-C03A	[1992]
Power supplies	
<i>HT, LT, anode supply, heater supply</i>	
V05-C03C	[1992]
Control of tube operation	
<i>Output control, oscillation, pulse, magnet current</i>	
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V05-D	
Cathode-ray tubes; Electron beam tubes	
This section relates to CRTs and similar tubes, chiefly for displays or for imaging purposes - video cameras for example. Tubes for beam processing of workpieces, electron microscopes etc. are not included and are covered by V05-F codes.	
V05-D codes are divided into those relating to particular tube types (V05-D01 to V05-D04) and those for details of tubes and associated devices (V05-D05 to V05-D10).	
Within V05-D, manufacture of all tube and device types is covered by V05-L codes only. Codes for the device per se are not used unless that aspect is also claimed. Prior to 1992 tube type codes were only assigned when the tube was presented as a complete novel device. From 1992 onwards, distinction is made between complete novel tubes and codes describing tube type and/or indicating novel details of the tube.	
Note that novel display drive circuitry for CRTs is not included in V05 at all, as generally this is not part of the vacuum tube assembly itself and is instead covered by relevant W03 and T04 codes. However, Field Emission Display drive circuitry (V05-D10) is included as often it is integral to the display substrate, as well as being covered by relevant W03 and T04 codes. Operating circuitry for image converters and intensifiers is also included in V05-D03H.	
Examples	
(1) Completely novel beam penetration CRT: V05-D01A and V05-D01B1C.	
(2) Novel cold cathode for field emission display: V05-D01C3 and V05-D05C5.	
V05-D01	
Image display tubes	
<i>TV, VDU, VDT, video terminal, projection</i>	

V05-D01A	[1992]
Complete novel tube	
This code is used with other V05-D01 codes indicating type.	
V05-D01B	[1992]
Cathode ray tubes	
Includes unspecified CRT display types.	
<i>Braun tube</i>	
V05-D01B1	[1992]
Single electron gun tubes	
V05-D01B1A	[1992]
Monochrome tubes	
V05-D01B1C	[1992]
Beam penetration tubes	
V05-D01B1D	[1992]
Single gun multibeam tubes	
Includes tubes analogous to Trinitron® capable of colour display.	
<i>Aperture grill</i>	
V05-D01B1E	[1992]
Flood gun tubes	
Includes tube with e.g. three primary colour areas on screen usable as multicolour pixel in large display.	
V05-D01B3	[1992]
Multiple electron gun tubes	
This code is used if 'shadow mask CRT' specified with no indication of gun type.	
V05-D01B3A	[1992]
In-line gun tubes	
V05-D01B3B	[1992]
Delta gun tubes	
<i>Triad</i>	
V05-D01B3C	[1992]
Matrix configuration multiple gun tubes	
Covers tube with large number of electron beams, e.g. 'matrix drive with deflection' type. Prior to 2005 included field emission display matrices, now coded in V05-D06A codes.	

V05-D01B3D [1992]

‘Composite’ tube with separate tube necks

Covers tube with e.g. three separate neck sections each with gun system, e.g. for large display area.

V05-D01B5 [1992]

Flat CRT

Includes tubes with electron gun not perpendicular to screen surface. Does not cover flat panel matrix-gun tubes, which are covered by V05-D01B3C.

V05-D01B6 [1992]

Beam index colour CRT

V05-D01B9 [1992]

Other CRT type

V05-D01C [1992]

Vacuum fluorescent display tubes

V05-D01C1 [1992]

For displaying character only

Includes seven segment type display.

V05-D01C3 [2002]

Field Emission Displays

Includes displays with field emission cathodes. For novel details of cold cathodes per se, see also V05-D05C5 codes. For novel emitter arrangements, see also V05-D06A codes.

Prior to 2002 field emission displays can be found in V05-D01C5 with V05-M03A to signify cathode type (if cathode is not novel) or in V05-D05C5 is cathode is novel.

Cold cathode, surface emission, surface emission electron conduction display, SED, FED

V05-D01C5 [1992]

Dot matrix displays

V05-D02

Image pick-up tubes

TV camera tube, vidicon, plumbicon

V05-D02A [1992]

Complete novel tube

V05-D02B [1992]

Tube details

Use with V05-D05 to V05-D09 codes as appropriate.

V05-D03

Image converters and intensifiers

Tubes for night vision equipment are assigned W07-G codes also.

Streak tube, x-ray imaging tube, infrared imaging tube

V05-D03A [1992]

Complete novel tube

For cases where particular detail of tube is the novel aspect, this code is not used. Search V05-D03B to V05-D03E with V05-D05 to V05-D09 codes as appropriate.

V05-D03B [1992]

Tubes with optical output

Covers tubes acting as both converters and intensifiers, which may be viewed directly, photographed, or used to generate visible image for another image pick-up device.

V05-D03B1 [1992]

Tube with non-light input

Includes image converters.

V05-D03B1A [1992]

For X-rays

Radiography

V05-D03B3 [1992]

Tubes with non-visible light input

Includes tube converting IR image to visible light output. Video cameras sensitive to IR are coded in W04-M01E1 codes.

Thermal imaging camera

V05-D03B5 [1992]

Tube with low level visible light input

Includes image intensifier.

V05-D03C [1992]

Tubes with electrical output

Covers camera tubes sensitive to radiation other than visible light. (Electrical output/visible light input tubes are covered by V05-D02 codes).

Note: does not include photomultiplier tubes, see V05-G and K codes as appropriate.

V05-D03E [1992]

Tubes for scientific analysis

Includes streak tube. See also appropriate codes in S02 or S03, e.g. S02-H, S03-A codes etc.

V05-D03H	[1992]
Operating circuitry	
Includes e.g. power supplies for scanning and non-video arrangements. See W04-M01 codes for video camera circuitry and W07-G codes for night vision equipment.	
V05-D04	
Other tubes (Including tubes for data storage, phase shifting)	
V05-D04A	[1992]
Complete novel tube	
V05-D04B	[1992]
Tube details	
Use with V05-D05 to V05-D09 codes as appropriate.	
V05-D05	
Electrodes, screens	
V05-D05A	
Photoelectric and charge-storage screens	
<i>Target, photoconductive screen, photovoltaic screen</i>	
V05-D05A1	[1992]
Photoelectric screen	
<i>Photocathode</i>	
V05-D05A3	[2005]
Semiconductor diode arrays	
(V05-D05A5A)	
Includes e.g. Laser diode CRT screens. Prior to 2005, coded in V05-D05A5A.	
<i>Laser CRT</i>	
V05-D05A5	[1992]
Charge storage screen	
V05-D05A5A*	[1992-2004]
Screen with array of semiconductor diodes	
*This code is now discontinued. See V05-D05A3.	
V05-D05B	
Luminescent screens	
See V05-M01 also for compositions.	
<i>Phosphor screen, fluorescent material, aluminium coating, black matrix, dot, triad, stripe</i>	

V05-D05B1	[1992]
Phosphor compositions	
Includes manufacture of phosphor materials per se. Also coded in V05-M01A if suitable for screens in general. (Prior to 1992, search V05-D05B and V05-M01).	
<i>Activator, host, killer, phosphorous, oxide, persistence</i>	
V05-D05B3	[1992]
Single phosphor screen	
<i>Monochrome</i>	
V05-D05B5	[1992]
Multiple phosphor screen	
Covers screens for display of more than one colour.	
<i>RGB, red, green, blue</i>	
V05-D05B5A	[1992]
With phosphor arranged in dots of different colours	
V05-D05B5B	[1992]
With phosphors arranged in stripes of different colour	
V05-D05B5C	[1992]
With overlaid different colour phosphors	
Includes screen for beam penetration type CRT. Also coded in V05-D01B1C.	
V05-D05B7	[1992]
Non-phosphor aspects of screen	
Covers non-luminous components of screen.	
<i>Binder, vehicle, black matrix</i>	
V05-D05B7A	[1992]
Protective metallic coatings	
Covers metallic coatings applied over screen phosphors for protection.	
<i>Aluminum</i>	
V05-D05C	[1987]
Cathodes	
<i>Coating, emission</i>	
V05-D05C1	[1992]
Thermionic cathodes	
See V05-M02 codes for thermionic cathodes in general.	
V05-D05C1A	[1992]
Thermionic cathode composition	
Includes composition of coatings.	
<i>Barium, scandium, strontium, thorium</i>	

V05-D05C1C [1992]

Heater element
Tungsten

V05-D05C5 [1992]

Cold cathodes
For field emission cathode arrays search with V05-D01B3C.
Field emission, FED, SED

V05-D05C5A [1992]

Microminiature cold cathodes
Covers e.g. carbon nanotube emitters. Also covers cold cathodes formed on semiconductor substrate. See V05-M03A1 and U12-B03D for such structures in general, and V05-B05 codes for complete microminiature devices.

V05-D05C5C [1997]

Current limiting arrangements
(V05-D05C5)
Includes ballast resistors.

V05-D05D [1987]

Shadow masks
Colour selection electrode, aperture mask, slot mask, foil mask, tensed-steel mask

V05-D05D1 [1992]

Mask construction

V05-D05D1A [1992]

Details of apertures

V05-D05D1C [1992]

Shape of mask
This code is used to describe novel shape of the mask as a whole and not apertures, which are covered by V05-D05D1A.

V05-D05D3 [1992]

Mask material
Covers material compositions of mask per se and also coatings.
Nickel, steel

V05-D05D5 [1992]

Mask mounting details
Also coded in V05-D07A3 if vessel aspects involved.
Frame

V05-D05D5A [1992]

For removal and alignment during exposure
Actual exposure process using colour selection electrode as a lithographic mask is covered by V05-L02E3.

V05-D05E [1992]

Internal shield

V05-D05E1 [1992]

Magnetic shield

V05-D05F [1992]

Fluorescent or field emission display screen electrodes
Includes field emission display screen anodes. Also includes beam index electrodes (search with V05-D01B6) and fluorescent screen tube anodes.

V05-D05X

Other electrode or screen details

V05-D06

Beam generating and controlling arrangements
Electron-optical arrangements in general are covered by V05-M04 codes.

V05-D06A

Electron guns, controlling beam cross-section or aberration, focusing arrangements
Grid, anode, electrode assembly, electrode supports, colour purity, convergence adjustment, electron lens, apertured disc

V05-D06A1 [1992]

Electron gun type

V05-D06A1A [1992]

Single gun
Also coded in appropriate V05-D01B1 code.

V05-D06A1B [1992]

In-line multiple gun
Also coded in V05-D01B3A.

V05-D06A1C [1992]

Delta multiple gun
Also coded in V05-D01B3B.

V05-D06A1E [1992]

Matrix of electron guns or field emission devices
See also V05-D01B3C for CRT matrices. See V05-D01C3 for FED matrices. Prior to 2005, coded in V05-D01B3C.
Matrix drive with deflection

V05-D06A1F	[2005]
Field emission device	
Includes novel complete emitter, gate and anode structure.	
V05-D06A2	[1992]
Beam intensity control	
Includes grid/gate electrodes stimulating field emission.	
<i>Acceleration electrode</i>	
V05-D06A3	[1992]
Focusing	
<i>Lens electrodes, quadrupole</i>	
V05-D06A5	[1992]
Beam cross-section and aberration correction	
<i>Halo correction</i>	
V05-D06A7	[1992]
Components associated with electron gun	
Includes resistive potential divider structurally associated with gun. Current limiting arrangements associated with field emission cathodes are coded in V05-D05C5C only.	
V05-D06B	
Beam deflection arrangements	
See also V02-F01A for inductive deflection components, and T04-H01 or W03-A08A1 codes as appropriate.	
<i>Horizontal, vertical, coil assembly</i>	
V05-D06B1	[1992]
Electromagnetic deflection	
Includes convergence coils, also coded in W03-A08A5A.	
V05-D06B1A	[1992]
Deflection yoke assembly	
Includes manufacture of deflection yokes. Also coded in V02-F01A and W03-A08A1B unless TV receiver displays are specifically excluded. Note, convergence coils are covered by V05-D06B1.	
V05-D06B5	[1992]
Electrostatic deflection	
<i>X-plates, Y-plates</i>	
V05-D06B5A	[1992]
With electrodes on tube surface	
Also coded in V05-D07B3A. Includes e.g. deflection electrodes for image pick-up tube (also coded in V05-D02B).	

V05-D06C	[1992]
Post-deflection arrangements	
<i>Post deflection anode, PDA, post-acceleration</i>	
V05-D06E	[1992]
Electron-multiplier arrangements	
For electron multipliers in general, see V05-K01 codes. See V05-L01A5A for manufacture. (Prior to 1992 search V05-D06X and V05-K).	
<i>MCP, microchannel plate</i>	
V05-D06X	
Other beam generating and controlling arrangements	
<i>Afterglow-preventing electron gun blocker, Internal beam reflecting surface</i>	
V05-D07	[1987]
Vessels, seals, cooling, combined optical arrangements etc.	
V05-D07A	[1987]
Vessels, seals, tension band	
V05-D07A1	[1992]
Tension band	
Includes e.g. attaching mechanism of t-band to envelope.	
<i>Anti-implosion band, t-band, reinforcing, adhesive tape</i>	
V05-D07A3	[1992]
Internal electrode supports	
V05-D07A5	[1992]
Vessel per se	
<i>Glass panel, funnel, neck</i>	
V05-D07A5A	[1992]
Shape	
Covers novel shape or contour e.g. for particular aspect ratio display.	
V05-D07A5C	[1992]
Composition	
V05-D07A5E	[1997]
Spacers	
(V05-D07A5)	
Covers internal spacers used to support vessel against atmospheric pressure. See V05-L03A1 for spacer manufacture.	
V05-D07A7	[1992]
Seals for vessel	

V05-D07A7A [1992]

Vessel seal compositions

V05-D07B [1987]

Lead-ins, screening and antistatic coatings

V05-D07B1 [1992]

Lead-in conductors

Connecting pins

V05-D07B3 [1992]

Antistatic, magnetic and EM shielding coatings

Includes conductive coatings in general, where coating function or location (internal/external) is not disclosed or is irrelevant.

Discharge preventing coating, conductive coating, touchscreen, front panel RFI filter

V05-D07B3A [1992]

Internal coating

V05-D07B3C [1992]

External coating

V05-D07B3E [2005]

EM shielding coatings

(V05-D07B3)

X-ray, EMI

V05-D07B3M [2005]

Magnetic coatings

(V05-D07B3)

V05-D07B3S [2005]

Antistatic coatings

(V05-D07B3)

V05-D07B5 [1992]

Separate screening device

Includes detachable radiation screen placed over tube faceplate, for e.g. EM radiation prevention. For detachable optical filters see V05-D07C5E. V05-D07B3 takes precedence over this code if 'screening device' is mentioned without further detail.

V05-D07C

Cooling, optical arrangements structurally combined with vessel

V05-D07C1 [1992]

Tube cooling

For projection TV tube use W04-Q01A also.

Liquid, fluid, faceplate, conduct

V05-D07C3 [1992]

Optical layer on tube surface

Includes filters for e.g. antireflective purposes. For detachable types see V05-D07C5E which takes precedence if 'filter' only is mentioned.

Antiglare, faceplate

V05-D07C3A [1997]

Internal optical layer

(V05-D07C3)

V05-D07C3C [1997]

External optical layer

(V05-D07C3)

V05-D07C5 [1992]

Associated optics

Codes in this section cover optical arrangements which are not part of the tube per se.

V05-D07C5A [1992]

Lens

Includes lens assembly for e.g. projection TV (also coded in W04-Q01A and W04-Q01E).

V05-D07C5C [1992]

Fiber optics

OFT, FOT, optical fiber tube

V05-D07C5E [1992]

Detachable optical filter

Includes anti-reflective filters. This code takes precedence over V05-D07C3 (filter layer on tube surface) if 'optical filter' only is mentioned without further detail.

V05-D07E [1992]

Getters

V05-D08 [1992]

Associated devices and circuitry

Codes in this section deal with ancillary apparatus but not detachable conductive and optical filters which are coded in V05-D07B5 and V05-D07C5E respectively. See also relevant equipment codes in e.g. T04 or W03.

V05-D08A [1992]

Degaussing system

Degaussing/demagnetising in general is covered by V02-D, which is also assigned here. Covers cancelling arrangements for terrestrial magnetism.

V05-D08A1	[1992]
Circuitry	
Includes power supply, current control, etc. For use of thermistors to cause current decay search with V01-A02A7C.	
V05-D08A5	[1992]
Coil	
V05-D08B	[1992]
Radiation preventing coil	
Covers arrangements to cancel radiated fields from e.g. deflection system.	
V05-D08C	[1992]
Connectors	
See also appropriate code in V04.	
V05-D08C1	[1992]
For final anode	
<i>EHT connection, anode cap, HV, anode button</i>	
V05-D08C5	[1992]
For tube base	
Also coded in V04-K.	
<i>CRT Rose</i>	
V05-D08E	[1992]
External shield enclosure for CRT	
Includes external shields which can protect against effects either leaving or entering the body of the CRT other than through the faceplate. Shielding for electrical equipment in general is covered by V04-U codes.	
V05-D09	
Other details of cathode-ray tube; Electron beam tube	
Includes ion traps.	
V05-D10	[2005]
Field Emission and Fluorescent Display Drive Circuitry	
Includes drive circuitry integral with vacuum tube. Note that drive circuitry for Cathode Ray Tubes is not included in V05, and should be searched in appropriate T04/W03 classes.	
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V05-E	
X-ray/Extreme UV tubes and techniques (general); Ion beam tubes	
Ion beam tubes for processing workpieces are not included -see V05-F05 codes, e.g. V05-F05A7C.	

V05-E01	
Electron beam target-impact X-ray tubes and generators	
Covers X-ray generators where operation is by impingement of electron beam on target. See V05-L05E for X-ray tube manufacture.	
<i>Medical therapy/diagnostic source, lithography/materials processing source</i>	
V05-E01A	[1992]
Anode electrode per se	
See V05-L01B3 for manufacture.	
V05-E01A1	[1992]
Material composition	
V05-E01A1A	[1992]
Of separate active target part	
V05-E01A3	[1992]
Shape and construction	
V05-E01A3A	[1992]
Of separate target section	
V05-E01B	[1992]
Rotary anode system	
Does not include details of anode electrode per se, which are covered by V05-E01A codes.	
V05-E01B1	[1992]
Bearings, support shaft	
V05-E01B1A	[1992]
Bearings	
V05-E01B3	[1992]
Rotary drive system	
V05-E01B3A	[1992]
With separate motor drive	
V05-E01B3C	[1992]
With anode assembly forming part of motor	
V05-E01B5	[1992]
Anode cooling system	
For non-rotary anode cooling see V05-E01F.	
V05-E01C	[1992]
Cathodes	
Includes cathode supports.	

V05-E01C1	[1992]
Heater	
V05-E01C5	[1992]
Separate heating arrangement	
Includes use of e.g. laser beam to heat thermionic cathode.	
V05-E01C7	[2006]
Cold cathode	
Note that prior to 2006, cold cathode electron emitters for X-ray generators were coded in V05-E01C combined with V05-M03A codes.	
<i>Field emission, FE</i>	
V05-E01C7A	[2006]
Carbon nanotube based	
Includes all microminiature semiconductor or nanotechnology-based field emitters. Prior to 2006, coded in V05-E01C and V05-M03A1.	
<i>CNT, nanotube, carbon nanofiber</i>	
V05-E01D	[1992]
Electron guns and other electrodes	
V05-E01D1	[1992]
Electron gun	
Includes all X-ray tube electron-optical systems.	
V05-E01E	[1992]
Vessels, lead-ins, seals	
V05-E01E1	[1992]
Vessel construction	
V05-E01E1A	[1992]
X-ray windows	
V05-E01E3	[1992]
Seals	
V05-E01E5	[1992]
Lead-in conductors	
V05-E01F	[1992]
Cooling system	
See V05-E01B5 for cooling of rotary anode.	
V05-E01H	[1992]
X-ray tube type	
Codes in this section are used to indicate the type of tube only, irrespective of novel features which are indicated by other V05-E01 codes.	

V05-E01H1	[1992]
Rotary anode tube	
V05-E01H1A	[2006]
Multiple rotary anode tube	
V05-E01H3	[1992]
Fixed anode tube	
V05-E01H5	[1992]
Tube employing electron gun	
V05-E01H5A	[1992]
With circular electron beam path	
Synchrotron X-ray generators are not included - see V05-E03A.	
V05-E01H7	[1992]
Tube for 'flash' operation	
<i>Pulse operation</i>	
V05-E01H9	[1992]
Other target-impact type tube	
Includes liquid metal target-impact tubes. For non-electron beam target-impact tubes (e.g. laser T-I), see V05-E03.	
<i>Gallium</i>	
V05-E01X	[1992]
Other X-ray tube details	
V05-E02	
Controlling or protecting X-ray apparatus	
See also S05-A03 and S05-D02A for medical therapy and diagnostic apparatus respectively.	
V05-E02A	[1992]
Power supply for X-ray equipment	
See U24-D and X12-J codes for power supplies in general.	
V05-E02C	[1992]
Output control; Tube protection	
Includes setting desired current/time exposure.	
<i>Exposure time control, dose control, measurement, monitoring</i>	
V05-E02C1	[1992]
For flash operation	
<i>Pulse operation</i>	
V05-E02C5	[1992]
Incorporating protection features	

V05-E02C5A	[1992]
Protection of tube per se	
Includes monitoring excess current or temperature.	
<i>Measurement, monitoring</i>	
V05-E02C5C	[1992]
Limiting output level	
Includes control based on e.g. radiation dosage. See also S05-A03 and S05-D02A3 codes for medical applications.	
<i>Dose control</i>	
V05-E03	[1992]
Non-standard X-ray generators	
For tube details, see also V05-M codes.	
V05-E03A	[1992]
Synchrotron	
See also X14-G02.	
V05-E03B	[2006]
Laser target impact sources	
Prior to 2006, coded in V05-E03.	
V05-E03C	[2006]
X-ray laser sources	
Includes tubes which produce coherent, monochromatic X-ray radiation. See also V08-B02. Prior to 2006, coded in V05-E03.	
V05-E04	[2005]
Laser plasma X-ray/EUV sources	
For application to lithography systems, see also V05-F08C1 and V05-F05 codes. See also relevant V05-M codes for novelty not included below. Prior to 2005, coded in V05-E03. In 2005, V05-E04 covered all details of non-standard X-ray generators, but from 2006 V05-E04 specifically covers details of Laser plasma X-ray/EUV sources used in non-standard X-ray generators. Other details of non-standard X-ray generators are coded in V05-E03.	
V05-E04A	[2005]
Gas filling	
Includes gas compositions.	
V05-E04B	[2005]
Ionising arrangements	
V05-E05	[1992]
Ion beam tubes and devices	
Tubes for processing objects are covered by V05-F codes.	
<i>Penning ion source, plasma imploding device, surface ionisation, photo-ionisation tube</i>	

V05-E05A	[1992]
For propulsive effect	
Includes ion thruster for e.g. satellite (also coded in W06-B03A).	
<i>Gas bottle, orient, pitch, yaw, turn, spacecraft</i>	
V05-E06	[2005]
Neutron sources and devices	
(V05-E09)	
Prior to 2005 neutron sources were coded in V05-E09.	
V05-E08	[1992]
X-ray 'optical' elements	
Includes EUV and X-ray lithography masks. See also U11-C04H2 and V05-F05 codes.	
V05-E08A	[2005]
'Optical' manipulation of X-rays	
This code is intended to be used with X-ray optical elements that use wave effects or similar to alter e.g. the focus or direction of the radiation.	
<i>Molybdenum layered mirror, capillary optics, Kumakhov lens</i>	
V05-E08C	[2005]
Absorption, blocking or anti-scatter X-ray optics	
E.g. anti-scatter apparatus, grids and passive (i.e. non-"optical") collimators.	
V05-E09	
Other X-ray tubes and techniques	
V05-E10	[2006]
Complete novel tube	
See also V05-E01, E03, E04, E05 or E06 for individual tube/source where relevant.	

V05-F	
Tubes for processing/examining objects	
This section deals with tubes and analogous devices for processing workpieces (including semiconductor devices) and for examining objects. From 1992, V05-F02 and V05-F03 codes are no longer used and the subject matter previously coded there has been reallocated. V05-F is divided into four main sections.	
V05-F01 codes dealing with analysis devices such as electron microscopes, microanalysers, etc. and, from 1992 including X-ray microscopes. V05-F05 codes dealing with equipment for processing workpieces e.g. by beam or plasma treatment. V05-F04 codes dealing with novel details of both analysis and processing equipment. V05-F08 codes dealing with the actual operation performed by the equipment and enabling a secondary function to be indicated.	

Assignment of codes :

Codes from the V05-F01 or V05-F05 sections are assigned to describe apparatus type and to broadly indicate the novel aspect, e.g. details of the apparatus, complete novel apparatus, control circuitry, etc. V05-F04 codes are used to further highlight novel details e.g. electrodes, vessels, etc., and V05-F08 codes are routinely assigned to indicate the function of the equipment.

EXAMPLES

(1) Novel field emission electrode for scanning electron microscope: V05-F01A1B, V05-F01B3 and V05-F04A3

(2) Control circuit for SEM measuring dimensions V05-F01A1B, V05-F01B5A and V05-F08B (S02-A05A will also be assigned)

(3) Any novel aspect of plasma etching equipment using magnetron effect V05-F05C3A and V05-F08E1.

V05-F01

Microscopes and other analysing tubes

See S03-E06B1 also for microscopes. (Optical microscopes per se are coded in S02-J04B1, and see S03-E04R for microscopy).

Photon microscope, Transmission/scanning electron microscope, SEM, secondary emission detection, focusing deflection, electron/ion-optical system

V05-F01A [1992]

Device type

V05-F01A1 [1992]

Electron microscope

Includes electron diffraction tube.

V05-F01A1A [1992]

Transmission

TEM

V05-F01A1B [1992]

Scanning

SEM

V05-F01A1C [1992]

Combined transmission and scanning

STEM

V05-F01A2 [1992]

Ion microscope

Includes ion diffraction tube.

V05-F01A3 [1992]

X-ray microscope

(V05-E09, V05-F09)

X-ray source details are covered by V05-E01 or V05-E03 codes and not V05-F04 codes.

V05-F01A4 [1992]

Microanalysers

(V05-F09)

Spot analyser

V05-F01A5 [1992]

Tunnel current and analogous devices

Includes tunnel current microscopes and similar devices, e.g. atomic, magnetic force microscopes. For materials investigation see also S03-E02F codes and V05-F08B. For image-producing analysis search with S03-E02F codes and V05-F08A.

Prior to 2005, included processing and recording. After 2005, see V05-F05D, as well as relevant V05-F08C codes.

V05-F01A6 [2011]

X-ray spectrometer

V05-F01A9 [1992]

Other devices

V05-F01B [1992]

Novel details

V05-F01B1 [1992]

Complete device

This code is only used if the analysis device is presented as a completely novel piece of equipment. For cases where actual novelty can not be determined, V05-F01B codes will not be assigned.

V05-F01B3 [1992]

Device details

For specific features see also V05-F04 codes.

V05-F01B5 [1992]

Circuitry and operation of device

Includes power supplies (see appropriate U24 or X12 codes for power supplies in general).

V05-F01B5A [1992]

Control

V05-F01B9 [1992]

Other novel details

Includes cleaning and maintenance of analysing equipment.

V05-F02* [1980-1991]

Electron- or ion-beam tubes for localised treatment of object

*This code is now discontinued and from 1992 this subject matter is transferred to V05-F05A codes (device details now covered by V05-F04 codes). V05-F02 remains valid and searchable for records prior to 1992.

Electron beam cutting/welding/lithography patterning/inscribing/marking/focusing, deflection, electron/ion-optical system

V05-F03* [1980-1991]

Arrangements of electrodes

*This code is now discontinued and from 1992 this subject matter is transferred to V05-F04B codes and appropriate codes from V05-F04A and V05-F04C sections. V05-F03 remains valid and searchable for records prior to 1992.

Accelerating system, electron gun, electrostatic beam position/cross-section/intensity control electrodes

V05-F04 [1992]

Analysis and processing device details

Codes in this section are used with V05-F01 or V05-F05 codes as appropriate, for details of analysis and processing devices respectively.

V05-F04A [1992]

Emission source

Codes in this section relate to electron or ion sources. X-ray sources (including those for X-ray microscopes) are coded in V05-E01 or V05-E03 codes.

V05-F04A1 [1992]

Thermionic emitter

Cathode, oxide, coated

V05-F04A1A [1992]

Heated by non-electric means

Includes laser heating

V05-F04A3 [1992]

Field emission electrodes

Cold cathode

V05-F04A3A [1992]

Microfabricated field emission electrodes

Includes electrodes produced by semiconductor manufacturing techniques. See V05-M03A1 for microfabricated electrodes in general, and V05-B05 codes for complete microfabricated vacuum conduction devices.

V05-F04A3C [1997]

Current limiting arrangements

(V05-F04A3)

V05-F04A5 [1992]

Ion source

V05-F04A5A [1992]

With gas supply

V05-F04A9 [1992]

Other emission sources

V05-F04B [1992]

Electrodes and electrode systems

(V05-F03)

Covers all non-emitting electrodes. Electrodes are also assigned V05-F04C codes when electron/ion optical aspect is significant.

Electron gun

V05-F04B1 [1992]

For beam modulation

Grid, blanking

V05-F04B1A [1997]

Apertures

(V05-F04B1)

Etching mask, electron beam lithography

V05-F04B3 [1992]

For beam scanning

Only includes beam scanning arrangements inside e.g. electron gun structure. For post gun scanning/deflection arrangements see V05-F04C5.

X-Y, raster, deflection

V05-F04B5 [1992]

For gas discharge type apparatus

Use with V05-F05C codes.

Etching, coating, sputtering

V05-F04B5A [1992]

Anodes

V05-F04B5C	[1992]
Cathodes	
<i>Sputtering target</i>	
V05-F04B6	[1992]
Probe electrodes	
V05-F04B6A	[1997]
Tunnel device probe or cantilever	
(V05-F04B6)	
See also S03-E02F codes and V05-F01A5.	
<i>Tunnel current, AFM, SPM, STM</i>	
V05-F04B8	[1992]
Electrode positioning	
V05-F04B8A	[1992]
Dynamic positioning system	
Includes X-Y positioning system and scanning arrangement for tunnel current device.	
<i>AFM, SPM, STM</i>	
V05-F04B9	[1992]
Other electrode details	
V05-F04C	[1992]
Electron/ion-optical systems	
(V05-F03, V05-M04)	
Where electron gun electrodes are significant V05-F04B1 or V05-F04B3 codes are also applied.	
V05-F04C1	[1992]
Characterised by type of system	
V05-F04C1A	[1992]
Magnetic, electromagnetic	
See appropriate V02 codes for details of permanent magnets, electromagnets, coils, etc.	
<i>EM</i>	
V05-F04C1C	[1992]
Combined electromagnetic and electrostatic	
<i>EM-ES</i>	
V05-F04C1E	[1992]
Electrostatic	
<i>ES</i>	
V05-F04C3	[1992]
For focusing	
Includes arrangements to correct for beam aberrations such as coma, astigmatism etc.	

V05-F04C5	[1992]
For deflection	
<i>X-Y, raster</i>	
V05-F04C7	[1992]
For particle selection	
Includes selection of desired ion species. Particle spectrometers are coded in V05-J.	
V05-F04C8	[2005]
For confinement	
V05-F04D	[1992]
Vessels, seals, vacuum locks	
(V05-F09, V05-M05)	
V05-F04D1	[1992]
Vessels and seals	
(V05-F09)	
Includes material compositions of vessels and seals, vessel shape, etc.	
V05-F04D3	[1992]
Vacuum locks, specimen/workpiece introduction	
(V05-F09, V05-M05)	
Includes evacuation apparatus.	
V05-F04D3A	[1992]
Arrangements for introducing specimen or workpiece	
(V05-F09, V05-M05)	
Includes e.g. carriage arrangements introducing specimen or workpiece into analysis or processing chamber. Actual holder is covered by V05-F04G. For semiconductor wafer applications search with U11-F02A1 also.	
<i>Window, viewport</i>	
V05-F04E	[1992]
Gas filling	
(V05-F09)	
Includes compositions. (Chiefly for gas fillings used in plasma apparatus and similar, also coded in V05-F05 codes).	
V05-F04G	[1992]
Specimen/workpiece holder	
Covers holder per se. For semiconductor wafer application search with U11-F02A2. Carriage and drive arrangements for introducing specimen or workpiece into equipment are covered by V05-F04D3A.	

V05-F04H [1992]

Detectors

Includes optical types, secondary electron detectors, etc. (Systems forming an image are covered by V05-F04J). Also includes detectors used to monitor progress of an operation, e.g. etching (with V05-F08E1).

V05-F04H1 [2005]

Scanning probe or cantilever displacement detection system

Includes detectors for all tunnel current and analogous scanning probe type microscopy techniques. See also S02-A03 for optical techniques, and S03 codes.

V05-F04J [1992]

Imaging and display systems

Includes photographic, stimulable sheet recording, video systems and any other novel aspect of analysis equipment image presentation.

Microscope, microanalyser, screen, CRT, raster, scan, synchronise

V05-F04K [1992]

Cooling

(V05-F09, V05-M09)

Includes cooling for the apparatus itself, and also for specimens and workpieces.

V05-F04L [1997]

Antennae and waveguides

(V05-F04X)

E.g. for ICP reactor (See also V05-F05C1 codes).

V05-F04M [2006]

Vibration reduction, control and compensation

V05-F04X [1992]

Other process/analysis device details

Includes device heating and shielding.

Heater, deposition-limiting shield

V05-F05 [1992]

Tubes and devices for processing

(V05-F02, V05-F09)

Processing tubes and devices are also assigned codes based on application. For example, search with U11-C codes for relevance to semiconductor device fabrication, X25-A04 for cathodic sputtering, X25-Q02 for surface treatment in metallurgy, etc.

V05-F05A [1992]

Using beams

Prior to 1992 the code for localised treatment by beam equipment (V05-F02) was only used for focused beams. Flood effect devices were coded in V05-F09.

V05-F05A1 [1992]

With focused beam

(V05-F02)

Scan, raster, X-Y, focus, local

V05-F05A3 [2005]

With multiple beams

Includes e.g. field emission arrays for one-shot electron beam lithography or atomic resolution storage.

V05-F05A5 [1992]

With flood effect beam

(V05-F09)

V05-F05A7 [1992]

Characterised by beam type

(V05-F02, V05-F09)

Codes in this section are applied as appropriate either in conjunction with other V05-F05A codes, or alone.

V05-F05A7A [1992]

Electron beam

V05-F05A7C [1992]

Ion beam

V05-F05A7X [1992]

Other beam type

Includes use of X-ray and Extreme UV (EUV). X-ray/EUV sources per se are not coded in the V05-F04A section and are covered by V05-E01 or V05-E03 codes.

EUV

V05-F05C [1992]

Using plasma, gas-filled tubes

(V05-F09)

See X14-F codes also for general aspects of plasma technique.

Discharge, arc, glow

V05-F05C1 [1992]

With externally-applied ionising energy

(V05-F09)

Includes all ionising arrangements located outside tube envelope. For conductive RF coupling internal to the tube, see V05-F05C2.

V05-F05C1A	[1992]
Microwave (V05-F09) <i>RF, feed, waveguide, port, matching, stub, impedance</i>	
V05-F05C1C	[1992]
Optical (V05-F09) <i>Laser, UV, lamp, irradiate</i>	
V05-F05C1E	[1997]
Inductively coupled (V05-F05C1)	
V05-F05C1G	[1997]
Capacitively coupled (V05-F05C1)	
V05-F05C2	[2006]
With internally applied ionising energy Includes e.g. conductive RF coupling. Prior to 2006, coded in V05-F05C. <i>RF, discharge, arc</i>	
V05-F05C3	[1992]
With confinement or manipulation of plasma (V05-F09) Includes electromagnetic and other confinement systems. <i>ECR, electron cyclotron resonance</i>	
V05-F05C3A	[1992]
With magnetron effect (V05-F09) Equipment using magnetron discharge effect is not coded in V05-C01A.	
V05-F05D	[2005]
Using scanning probe/tunnelling effects (V05-F01A5) Includes all analogous techniques, e.g. AFM. See V05-F08C codes for lithography or recording techniques. Does not include microscopy, see V05-F01A5. Prior to 2005, processing using scanning probe/tunnelling effects was coded in V05-F01A5 in combination with V05-F08C and V05-F05E codes. See U11-C11 for application to semiconductor wafer processing, or T03-C05 for recording or data storage applications.	

V05-F05E	[1992]
Novel details of processing devices Codes in this section describe in a general sense the novel aspects of equipment covered by V05-F05A and V05-F05C codes.	
V05-F05E1	[1992]
Complete device (V05-F09) This code is only assigned if the complete device is presented as novel. In cases where the precise novel aspect cannot be determined, no V05-F05E code will be assigned.	
V05-F05E3	[1992]
Device details For detailed information on novel aspects search with V05-F04 codes.	
V05-F05E5	[1992]
Circuitry and operation of device Includes power supplies. See also U24 and X12 codes for low and high power supplies respectively.	
V05-F05E5A	[1992]
Control and monitoring Includes control circuits to determine completion of e.g. etching or coating. (Search with V05-F08D1 or V05-F08E1 respectively).	
V05-F05E9	[1992]
Other novel details Includes all cleaning and maintenance of equipment.	
V05-F05X	[1992]
Other processing tubes	
V05-F08	[1992]
Equipment function These codes relate to the actual function of the inventive equipment, and not necessarily its primary function. Thus an electron microscope arrangement to measure voltage would be assigned V05-F08B and not V05-F08A (V05-F01A1 codes and S01-D01D7 would also be assigned).	
V05-F08A	[1992]
Imaging In general, S03-E06B codes are also assigned for this aspect.	

V05-F08B	[1992]
Measurement	
Includes measurement of voltage (see also e.g. S01-D01D7), dimensions (see also S02-A05A), and properties of materials (see also e.g. S03-E06 codes).	
V05-F08C	[1992]
Recording, storage	
V05-F08C1	[1992]
Lithography	
Also assigned U11-C04 codes where application is to semiconductor device lithography.	
<i>Semiconductor, wafer, image, pattern</i>	
V05-F08C3	[1992]
Recording	
See also T03-C codes for dynamic recording and U14-A codes for static stores.	
<i>Memory, store, high density</i>	
V05-F08D	[1992]
Coating, implanting ions, surface treatment	
V05-F08D1	[1992]
Coating	
<i>Surface, layer, coat, deposition</i>	
V05-F08D1A	[1992]
Sputtering	
<i>Cathodic, magnetron</i>	
V05-F08D3	[1992]
Ion implantation	
Also assigned U11-C02B codes where application is to semiconductor device manufacture.	
<i>Doping</i>	
V05-F08D5	[1992]
Surface treatment	
<i>Hardening, nitriding</i>	
V05-F08E	[1992]
Removing material, cutting, machining and cleaning	
Includes cleaning of specimen/workpiece, or e.g. resist ashing.	
<i>Ashing, stripping</i>	
V05-F08E1	[1992]
Etching	
See also U11-C07 codes for application to semiconductor device fabrication.	

V05-F08E3	[1992]
Cutting	
Includes welding - also coded in X24-D02.	
V05-F08E5	[1992]
Machining/milling	
V05-F08F	[2005]
Molecular decomposition and fluid processing	
Includes fuel processing, e.g. Plasmatron™.	
V05-F08G	[2005]
Powder synthesis	
Includes e.g. nanoparticulate production.	
V05-F08X	[1992]
Other equipment function	
V05-F09	
Other	
<hr/>	
V05-G	
Photoelectric discharge tubes not involving gas ionisation; Photomultiplier tube	
See also V05-K01 codes where electron multiplier arrangements of PMT are novel.	
<i>PMT, PM, photomultiplier</i>	
V05-G01	[2005]
Photocathodes	
Includes all novel photocathode materials, constructions etc. See also V05-D02/D03 codes for application to camera tubes/image converters or intensifiers.	
<hr/>	
V05-H	
Radiation and particle detectors	
Includes only radiation or particle detectors where incident radiation causes gas ionisation detected via breakdown voltage. See also S03-G codes.	
<i>Geiger-muller tube, Geiger counter, proportional counter tube, multi-wire proportional counters</i>	
<hr/>	
V05-J	
Particle spectrometer or separator tubes; Lenard tubes	
See S03-E10A codes for more details of mass spectrometers.	
<i>Mass analyser, mass spectrometry, mass spectroscopy, static, dynamic, time-of-flight, energy spectrometer</i>	

V05-J01	[1992]
Particle spectrometer/separator tubes	
V05-M codes are also assigned where aspect not covered in V05-J.	
V05-J01A	[1992]
Spectrometer type	
<i>Static, dynamic, quadrupole, time-of-flight, TOF</i>	
V05-J01A1	[1992]
Mass spectrometers	
<i>Secondary ion mass spectrometer, SIMS</i>	
V05-J01A5	[1992]
Energy spectrometers	
V05-J01C	[1992]
Sample introduction arrangement	
Includes sample carriers. For vacuum locks search with V05-M05D codes.	
<i>Chamber, pressure, atomising, sample injection</i>	
V05-J01E	[1992]
Ionising arrangement	
<i>Ionisation chamber, ion gun</i>	
V05-J01G	[1992]
Ion-optical system	
V05-M04 codes are also assigned.	
<i>Electrode, electromagnetic, solenoid, current, deflection, beam, path</i>	
V05-J01J	[1992]
Detection system	
V05-J01K	[1992]
Interface with other equipment	
Includes combination with e.g. chromatography apparatus, for which S03-E09C codes are also assigned.	
V05-J01M	[1992]
Control and monitoring	
Includes operation of device.	
V05-J01X	[1992]
Other details of particle spectrometer/separator tubes	
V05-J05	[1992]
Lenard tubes	
Covers tubes emitting electrons or ions through the vessel. For details of window structures search with V05-M05E.	

V05-K	
Thermionic generators; Secondary-emission tubes; Electron multipliers; Ion pumps; Pressure measuring tubes	
V05-K01	[1992]
Electron multiplier	
For image intensifier application see V05-D03 codes also.	
Night vision equipment in general is coded in W07-G.	
<i>PMT, PM, photomultiplier</i>	
V05-K01A	[1997]
Microchannel plates	
(V05-K01)	
V05-K01C	[1997]
Dynodes	
(V05-K01)	
V05-K01X	[1997]
Other electron multipliers	
(V05-K01)	
V05-K03	[1997]
Ionisation pressure gauges	
(V05-K)	
For novel aspects of gauges (e.g. cathodes), see V05-M codes. Pressure gauges in general are coded in S02-F04D1.	
<i>Penning</i>	
V05-L	
Discharge tube manufacture	
See note (1) of V05 class descriptor.	
From 1992, codes from the V05-L05 section relating to the type of tube or device being manufactured are always assigned, except where the device is also claimed, resulting in the assignment of the code for that device also.	
Manufacture of certain auxiliary devices for tubes, e.g. CRT deflection coils, are not regarded as manufacture of the tube per se, and hence not coded in V05-L. See also the appropriate codes for the auxiliary device and any relevant manufacturing codes in other sections, e.g. V02-H01 codes.	
Also, novel manufacture of phosphor compositions is treated as a novel phosphor per se, and is coded under V05-M01 or other relevant V05 sections.	
V05-L01	
Electrodes	

V05-L01A	[1992]
Emitting electrodes	
<i>Electrodes, emission</i>	
V05-L01A1	[1992]
Thermionic cathodes	
<i>Tungsten, thorium, oxide, carbide, carburising, hydrocarbon, heating, cylinder, mesh, grille, grid</i>	
V05-L01A1A	[1992]
Heaters	
<i>Indirectly heated cathode</i>	
V05-L01A3	[1992]
Cold cathodes	
<i>Field emission electrode</i>	
V05-L01A3A	[1992]
Micro-fabricated cold cathodes	
Also coded in V05-L05B5 when application is to complete vacuum conduction device. Includes use of semiconductor manufacturing techniques, see U11-C18B also for semiconductor manufacturing details.	
V05-L01A5	[1992]
Secondary emission electrodes	
V05-L01A5A	[1992]
Electron multiplier	
Also coded in V05-L05K.	
V05-L01A5B	[1992]
Photoelectric	
V05-L01A5X	[1992]
Other radiation-induced emission	
V05-L01A9	[1992]
Other emitting electrodes	
V05-L01B	[1992]
Non-emitting electrodes	
V05-L01B1	[1992]
Grids	
Includes FED gate electrodes.	

V05-L01B2	[1997]
Tunnelling device probe manufacture	
(V05-L01B9)	
See also V05-F04B6A. For tunnel current device manufacture, see V05-L05F1A. For novel device see V05-F01A5.	
<i>Cantilever</i>	
V05-L01B3	[1992]
Anodes	
Includes FED screen electrodes. For FED gate electrodes, see V05-L01B1.	
V05-L01B4	[1992]
Electron guns, electron-optical systems	
Includes assembly of the electrode system. Mounting of assembly in vessel is covered by V05-L03C1.	
V05-L01B4A	[1992]
For deflection	
V05-L01B5	[1992]
Shadow masks	
Also coded in V05-L05D1.	
V05-L01B6	[2005]
Plasma display panel electrodes	
V05-L01B6A	[2006]
Dielectric coatings	
Includes manufacture of protective coatings for electrode insulating layers.	
V05-L01B7	[1992]
Slow wave devices	
Also coded in V05-L05C. (Slow wave devices per se are coded as transit time tube distributed elements).	
V05-L01B8	[1992]
Screen electrode	
Covers e.g. beam index CRT screen electrodes. For FED screen anodes, see only V05-L01B3. Manufacture of image screens is covered by V05-L02 codes.	
V05-L01B9	[1992]
Other non-emitting electrodes	

V05-L02

Screens

Codes in this section cover the manufacture of screens for producing an image from, e.g. electron impact, and for converting an optical image into an electrical signal.

Image, pick-up, latent, electrostatic, discharge, scan, target, photoconductive, photovoltaic, display, light, fluorescent, phosphor, persistence

V05-L02A [1992]

Screen type

Codes indicating screen type are only used where a code cannot be assigned from the V05-L05 section or from the codes relating to the screen application tube per se. For example, if application to a specific tube type is not mentioned, or if the screen is stated to be applicable to several types of tube.

V05-L02A1 [1992]

Radiation-sensitive screen

V05-L02A5 [1992]

Radiation-emitting screen

V05-L02B [1992]

Substrate preparation

Includes washing, acid rinsing etc.

V05-L02C [1992]

Coating processes

See X25 codes for electrical aspects of coating processes.

V05-L02C1 [1992]

Liquid deposition by e.g. spraying

Spin coating

V05-L02C5 [1992]

Electrical method e.g. electrophoresis

V05-L02C7* [1992-2004]

Material deposited

*This code is now discontinued. See V05-L02M codes for general screen material types.

V05-L02C7 codes are used to describe the material being deposited in conjunction with a code relating to the actual deposition process. Codes in this section are not used if the material is unspecified or a complete manufacturing process is described.

V05-L02C7A* [1992-2004]

Visible radiation emitting material

*This code is now discontinued but prior to 2005 included e.g. use of phosphor in the case of a display tube, such as CRT. From 2005 see V05-L02M1.

Luminescent

V05-L02C7B* [1992-2004]

Radiation-sensitive material

*This code is now discontinued. From 2005 see V05-L02M2.

V05-L02C7C* [1992-2004]

Auxiliary materials

*This code is now discontinued. From 2005 see V05-L02M3.

Includes deposition of specific materials.

Black matrix

V05-L02D [2005]

Baking processes

V05-L02E [1992]

Exposure and development

V05-L02E1 [1992]

Exposure processes

V05-L02E1A [1992]

Multistep sequence of exposure and development

This code takes precedence over separate codes for exposure and development stages of screen manufacturing process.

V05-L02E3 [1992]

Using tube component as mask

Includes use of CRT shadow mask. For details of shadow mask per se see V05-D05D codes.

V05-L02E5 [1992]

Exposure apparatus e.g. lighthouse

V05-L02E5A [1992]

Optical system

Includes lenses, filters, etc.

V05-L02E5C [1992]

Light source

See X26 codes for details of novel lamps etc.

Bulb, discharge lamp, UV

V05-L02E7	[1992]
Development	
V05-L02E1A takes precedence for combined exposure and development.	
V05-L02E8	[1992]
Control of exposure method or apparatus	
Includes general control aspects and also control of light source, sequential operation, etc.	
<i>Monitor, check, registration, time, duration</i>	
V05-L02F	[1992]
Application of protective or other layers	
Includes metallisation of screen internal surface.	
<i>Antireflective, aluminium</i>	
V05-L02H	[1992]
Testing and inspection of screen	
Testing of manufacturing process/apparatus in general is covered by V05-L07E codes. See appropriate codes in S03, e.g. S03-E04F2, for optical inspection of manufactured screen.	
<i>Pattern, defect, flaw, reject</i>	
V05-L02H1	[1992]
During manufacture	
V05-L02H5	[1992]
Finished screen	
V05-L02M	[2005]
Screen material being processed	
V05-L02M1	[2005]
Visible radiation emitting material	
E.g. phosphor.	
V05-L02M2	[2005]
Radiation sensitive materials	
V05-L02M3	[2005]
Auxiliary materials	
Includes e.g. black matrix.	
V05-L03	
Vessels, lead-ins, exhausting, filling	
V05-L03A	[1992]
Manufacture of vessels, spacers, ribs, lead-ins etc.	

V05-L03A1	[1992]
Manufacture of internal ribs and spacing elements	
<i>Spacer</i>	
V05-L03A3	[1992]
Manufacture of electrode supports	
V05-L03A5	[1992]
Manufacture of lead-in conductors	
V05-L03A7	[2005]
Manufacturing of vessel per se	
(V05-L03A)	
Includes glass moulding, baking, toughening etc.	
V05-L03B	[1992]
Applying coatings or markings	
Manufacturing of coating materials per se is not treated as tube manufacture; see appropriate devices codes where relevant.	
<i>Reflection prevention</i>	
V05-L03B1	[1992]
Conductive	
<i>Antistatic, graphite</i>	
V05-L03B3	[1992]
Optical	
This code does not relate to screen manufacture, which is covered by V05-L02 codes, but to coatings acting as e.g. filters.	
<i>Anti-reflective, anti-glare</i>	
V05-L03B5	[1992]
Marking	
Covers application of manufacturer's and product name etc., and also markings such as bar codes used for inventory or control purposes.	
V05-L03C	[1992]
Assembly	
Covers assembly of tube from individual components and joining vessel parts.	
V05-L03C1	[1992]
Inserting electrode system	
<i>Electron gun, support, spacing, mounting, shadow mask</i>	

V05-L03C1A	[1992]
Inserting CRT gun (V05-L03C1) See also V05-D01B for CRT “per se” and V05-L05D1B for CRT manufacture.	
V05-L03C3	[1992]
Pre-treatment of vessel surfaces <i>Cleaning, polishing, etching, machining</i>	
V05-L03C3A	[1992]
To improve seal Actual process of sealing is covered by V05-L03C5A.	
V05-L03C5	[1992]
Joining vessel parts, sealing, evacuating, filling, alignment	
V05-L03C5A	[1992]
Sealing	
V05-L03C5C	[1992]
Evacuating Includes methods and apparatus, e.g. vacuum pumps specifically for evacuating vessels. For electrical aspects of pumps see X25-L03A. Vacuum gauges in general are coded in S02-F04D1 and specifically ionisation-type gauges are additionally coded in V05-K03.	
V05-L03C5E	[1992]
Filling Covers methods and apparatus for filling tubes with desired gas composition of mixture.	
V05-L03C5G	[2006]
Alignment	
V05-L03C7	[1992]
Post sealing treatment <i>Washing</i>	
V05-L03C7A	[1992]
To improve operation or lifetime Includes e.g. getter flashing. (Getters per se are coded in V05-D07E, getter manufacture in V05-L06).	
V05-L03C7C	[1992]
To improve structural strength Includes e.g. tension band fitting. Manufacture of band per se is covered by V05-L03D. <i>T-band</i>	

V05-L03D	[1992]
Tension band manufacture <i>T-band</i>	
V05-L05	[1992]
Type of tube being manufactured Codes in this section are only used for device-specific manufacturing details and generally follow the ‘device’ codes V05-A to V05-K. For further indication of scope, see the definitions accompanying those codes. For inventions involving significant aspects of a tube itself, as well as its manufacture, V05-A to V05-K codes take precedence to indicate tube type and are assigned instead of V05-L05 codes.	
V05-L05A	[1992]
Gas discharge	
V05-L05A1	[1992]
Plasma display panel/segment type display	
V05-L05A1A	[2006]
DC Displays	
V05-L05A1B	[2006]
AC Displays	
V05-L05A3	[2006]
Gas-filled switching/protection devices Prior to 2006, coded in V05-L05A.	
V05-L05B	[2005]
Classical and cold cathode vacuum tubes	
V05-L05B1	[1992]
Thermionic tube	
V05-L05B3	[2005]
Cold cathode devices	
V05-L05B5	[1992]
Micro cold cathode devices	
V05-L05C	[1992]
Transit time tube	
V05-L05D	[1992]
Cathode ray tubes; Electron beam tubes	
V05-L05D1	[1992]
Display tubes	

V05-L05D1A	[2002]
Field emission display tubes	
V05-L05D1B	[1992]
Cathode ray display tubes	
V05-L05D1C	[1992]
Fluorescent display	
V05-L05D2	[1992]
Camera tubes	
V05-L05D3	[1992]
Image intensifiers and converters	
V05-L05E	[1992]
X-ray/EUV generators; Ion tubes	
V05-L05F	[1992]
Analysis and process tubes	
V05-L05F1	[1992]
Analysis tubes	
V05-L05F1A	[1997]
Tunnel current devices	
(V05-L05F1)	
See V05-L01B2 for probe manufacture. See also V05-F01A5.	
<i>STM, SPM, AFM</i>	
V05-L05F5	[1992]
Processing tubes	
V05-L05G	[1992]
Photoelectric tube	
V05-L05H	[1992]
Radiation detector	
V05-L05J	[1992]
Spectrometer tubes	
V05-L05K	[1992]
Electron multiplier	
V05-L05X	[2005]
Other	
Includes e.g. manufacture of radiation image storage screens.	

V05-L06	[1992]
Getter manufacture	
(V05-L09)	
Getter flashing is covered by V05-L03C7A.	
V05-L07	[1992]
General aspects of manufacture	
(V05-L09)	
Codes in this section may be used alone, or with other V05-L codes.	
V05-L07A	[1992]
Multistep process for manufacturing whole device	
(V05-L09)	
V05-L07B	[2005]
Workpiece holder	
V05-L07C	[1992]
Transport equipment moving between processing stages	
(V05-L09)	
V05-L07D	[2005]
Workpiece positioning	
Covers positioning of workpiece with relation to manufacturing equipment.	
V05-L07E	[1992]
Testing, salvage and other general aspects of manufacture	
(V05-L09)	
V05-L07E1	[1992]
Testing	
(V05-L09)	
Where electrical characteristics are being measured relating to the tube per se, S01-G02A is also assigned.	
V05-L07E1A	[1992]
Of partially complete device	
(V05-L09)	
V05-L07E1B	[1992]
Of manufacturing process or apparatus	
(V05-L09)	
This code is used for monitoring the manufacturing process or apparatus only. For testing of tubes per se V05-L07E1A or V05-L07E1C are used.	
V05-L07E1C	[1992]
Of complete device	

V05-L07E3 [1992]

Ageing, soak testing, life testing

(V05-L09)

Burn-in, oven, high temperature, accelerate

V05-L07E5 [1992]

Adjustment, rectification

(V05-L09)

Correct, repair, re-gun, spot-knocking

V05-L07E6 [1992]

Salvage

(V05-L09)

Covers salvage of materials or tube parts for re-use or other purpose. This code is used with other V05-L codes as appropriate.

V05-L07E7 [1992]

Packing, shipping

(V05-L09)

V05-L07E9 [1992]

Other general manufacturing aspects

(V05-L09)

Includes protection arrangement for tube to avoid damage during manufacture, e.g. dummy protective tube base.

V05-L09

Other details of discharge tube manufacture

V05-M

General details

Codes in this section are used to describe details of tubes for cases of very general (or unstated) application, or in conjunction with tube type codes not having the appropriate subdivisions.

V05-M01

Image screens; Luminescent coatings

Radiation converting screens not necessarily part of a tube are included in V05-M01C codes.

Luminescent screen, fluorescent screen, radiation imaging screen

V05-M01A [1992]

Light emitting compositions

Phosphor, rare earth

V05-M01C [1992]

Separate screen not part of tube

Conversion screen, radiography, medical diagnosis

V05-M01C1 [1992]

Radiation image storage screen

Includes e.g. stimulable phosphor. Recording and reproducing equipment for use with stimulable phosphors is coded in S06-K99G and other S06-K codes as appropriate.

V05-M02

Solid thermionic cathodes

Coating, impregnated cathode, dispenser cathode, heater, filament, directly-heated

V05-M02A [1992]

Solid thermionic cathode compositions

V05-M03

Electrode assemblies; Other electrodes

Includes unspecified emitting electrode types.

Electrode support, mountings

V05-M03A [1992]

Emitting electrodes, i.e. cold cathodes

Field emitters, field emission, FE

V05-M03A1 [1992]

Micro-fabricated cold cathode

Includes carbon nanotube based field emitters.

Also covers cathode (or other electrode in conjunction with it) formed using semiconductor manufacturing techniques on e.g. silicon substrate.

CNT, carbon nanofiber, nano-emitter

V05-M03A3 [1997]

Current limiting arrangements

(V05-M03A)

V05-M03C [1992]

Grids

Control, modulation, intensity, screen, suppressor

V05-M03E [1992]

Anodes

V05-M03G [1992]

Electron/ion guns

Also coded in V05-M04A as an electron/ion optical arrangement.

Lens, focus, correct, beam

V05-M03X [1992]

Other electrodes

V05-M04

Electron- or ion-optical arrangements

Electron gun, lens, focusing, deflection, deflection coil, winding

V05-M04A [1992]

Electrostatic

Novel electron guns are also coded in V05-M03G.
ES

V05-M04B [1992]

Electromagnetic

EM

V05-M05

Vessels; Lead-in conductors; Seals

Insulator, support pins, conductive coatings

V05-M05A [1992]

Vessel

Glass composition, shape, form, housing, container

V05-M05B [1992]

Lead-ins

Pin, base, contact

V05-M05C [1992]

Seal

Frit

V05-M05D [1992]

Vacuum locks

V05-M05D1 [1992]

Sample/specimen introducing arrangement

V05-M05E [1992]

Vessel windows

Covers arrangement enabling emission or introduction of e.g. ions or electrons from the vessel. X-ray windows are covered by V05-E01E1A.

V05-M05F [1992]

Coatings applied to vessel

Includes optical or conductive coatings.

V05-M06 [1992]

Getters

V05-M07 [1992]

Tube cooling

(V05-M09)

Cooling of electronic equipment in general is covered by V04-T03 codes.

V05-M07A [1992]

Heat sink, radiative

(V05-M09)

Fin, extrusion, radiator

V05-M07B [1992]

Forced circulation

(V05-M09)

Liquid, vapour, gas, pump, heat exchanger, tank, reservoir, fan, blower, air

V05-M09

Other general tubes details (Including gas filling compositions)

Includes gas filling compositions. Compositions for gas-filled tubes covered by V05-A codes are assigned the appropriate subdivision code in that section.

V06: Electromechanical Transducers and Small Machines

V06-A* [1980-2006]

Loudspeakers

*This code is now discontinued and has been transferred to V06-V04A1 from 200701. It remains searchable for records prior to 2007.

V06-A01* [1980-2006]

Transducers

*This code is now discontinued and has been transferred to V06-V01 and V06-V04A1 from 200701. It remains searchable for records prior to 2007.

All loudspeaker transducers are also coded in V06-E.

Voice-coils, drivers, piezoelectric, moving coil

V06-A02* [1980-2006]

Cones/diaphragms

*This code is now discontinued and has been transferred to V06-V02A and V06-V04A1 from 200701. It remains searchable for records prior to 2007.

General use cones/diaphragms are in V06-F only.

Membranes, vibration plates

V06-B* [1983-2006]

Pick-ups, cutters, microphones; Sonar/ultrasonic transducers

*This code is now discontinued and has been transferred to V06-V from 200701. It remains searchable for records prior to 2007.

V06-B01* [1983-2006]

Gramophone pick-ups and cutters

*This code is now discontinued and has been transferred to V06-V04A3 from 200701. It remains searchable for records prior to 2007.

See also W04-A.

Stylus, Cartridges, Diamond, groove, mechanical recording

V06-B02* [1983-2006]

Microphones

*This code is now discontinued and has been transferred to V06-V04A2 from 200701. It remains searchable for records prior to 2007.

All microphone transducers are also coded in the relevant V06-E code.

Piezoelectric, electroacoustic, electret, condenser, diaphragms

V06-B03* [1983-2006]

Sonar/ultrasonic transducers

*This code is now discontinued and has been transferred to V06-V01N from 200701. It remains searchable for records prior to 2007.

For hydrophones and sonar systems, see also W02-C07 and W06-A05 codes.

Piezoelectric, underwater acoustic transducers

V06-C* [1980-2006]

Headphones; Telephone handsets

*This code is now discontinued and has been transferred to V06-V04A4 and V06-V04B1 from 200701. It remains searchable for records prior to 2007.

Telephone transducers per se are coded in W01-C01M also, and mounting details in W01-C01A3.

Earphones, earpieces, receivers, transmitters, mouthpieces

V06-D* [1980-2006]

Vibration generators for performing mechanical work

*This code is now discontinued and has been transferred to V06-V04C from 200701. It remains searchable for records prior to 2007.

Includes shock wave generators for e.g. lithotripsy which are also coded in S05-B02. For industrial scale vibration generators see X25-L.

Coil, electromechanical

V06-E* [1980-2006]

Transducers

*This code is now discontinued and has been transferred to V06-V01 from 200701. It remains searchable for records prior to 2007.

This code is in general only used for audio or communication-type transducers.

V06-E01* [1980-2006]

Moving coil/strip/wire

*This code is now discontinued and has been transferred to V06-V01A1 and V06-V04A3 from 200701. It remains searchable for records prior to 2007.

Ribbon

V06-E01A* [1987-2006]

Moving coil

*This code is now discontinued and has been transferred to V06-V01A1 from 200701. It remains searchable for records prior to 2007.

Bobbins, voice coils

V06-E02* [1980-2006]
Piezoelectric; Electrostrictive
*This code is now discontinued and has been transferred to V06-V01B from 200701. It remains searchable for records prior to 2007.
Acoustic, ceramic, ultrasonic, quartz, piezo-ceramic

V06-E03* [1980-2006]
Electrostatic
*This code is now discontinued and has been transferred to V06-V01C from 200701. It remains searchable for records prior to 2007.
Includes electrets and other capacitive-effect transducers.
Condenser

V06-E04* [1997-2006]
Digital transducers
*This code is now discontinued and has been transferred to V06-V01L from 200701. It remains searchable for records prior to 2007.

V06-E05* [1997-2006]
Wireless transducers
*This code is now discontinued and has been transferred to V06-V01M from 200701. It remains searchable for records prior to 2007.

V06-E06* [1997-2006]
Microtransducers; Nanotransducers
*This code is now discontinued and has been transferred to V06-V01K from 200701. It remains searchable for records prior to 2007.
Micromachining, micromechanical, microelectromechanical, micromechanism

V06-E06A* [2002-2006]
Nanotransducers
*This code is now discontinued and has been transferred to V06-V01K2 from 200701. It remains searchable for records prior to 2007.

V06-E07* [2005-2006]
Ultrasonic transducer
*This code is now discontinued and has been transferred to V06-V01N from 200701. It remains searchable for records prior to 2007.
Includes audio/communication type ultrasonic transducers.

V06-E08* [2005-2006]
Bone conduction transducer
*This code is now discontinued and has been transferred to V06-V01P from 200701. It remains searchable for records prior to 2007.

V06-E09* [1980-2006]
Other
*This code is now discontinued and has been transferred to V06-V01A2, V06-V01D, and V06-V01X from 200701. It remains searchable for records prior to 2007.
Includes moving armature, magnetostrictive and combined-principle transducers.

V06-F* [1980-2006]
Diaphragms; cones
*This code is now discontinued and has been transferred to V06-V02A from 200701. It remains searchable for records prior to 2007.
Membranes, vibration plates

V06-G* [1980-2006]
Transducer details
*This code is now discontinued and has been transferred to V06-V02 from 200701. It remains searchable for records prior to 2007.

V06-G01* [1980-2006]
Casings; Cabinets, mountings
*This code is now discontinued and has been transferred to V06-V02E and V06-V02F from 200701. It remains searchable for records prior to 2007.
Includes structural association of transducers with electric circuitry; throat mountings for microphones; lead-throughs for earphones; supports for music pick-ups. See also W04-S.
Enclosure, housings, chambers, holders

V06-G02* [1980-2006]
Obtaining desired frequency or directional characteristics
*This code is now discontinued and has been transferred to V06-V02G from 200701. It remains searchable for records prior to 2007.
Includes structural combinations and spatial arrangements of separate transducers responsive to two or more frequency ranges; enclosures modified by mechanical or acoustic dampers; use of horns; use of several identical transducers.
Dampers

V06-G09* [1980-2006]

Other

*This code is now discontinued and has been transferred to V06-V02H, V06-V02J and V06-V02X from 200701. It remains searchable for records prior to 2007.

Leads, mouthpieces, earpieces, sanitary devices

V06-H* [1980-2006]

Circuits for transducers

*This code is now discontinued and has been transferred to V06-V02S from 200701. It remains searchable for records prior to 2007.

Includes circuits for preventing acoustic reaction or correcting frequency response; cross-over networks for loudspeakers. Does not include volume control circuits. See W04-T also.

Frequency/amplitude control, delay circuits

V06-J* [1980-2006]

Transducer manufacture, testing, monitoring

*This code is now discontinued and has been transferred to V06-V03 from 200701. It remains searchable for records prior to 2007.

V06-J01* [1992-2006]

Manufacture

*This code is now discontinued and has been transferred to V06-V03A from 200701. It remains searchable for records prior to 2007.

V06-J01A* [1992-2006]

Diaphragm

*This code is now discontinued and has been transferred to V06-V03A1 from 200701. It remains searchable for records prior to 2007.

V06-J02* [1992-2006]

Testing, monitoring

*This code is now discontinued and has been transferred to V06-V03B from 200701. It remains searchable for records prior to 2007.

V06-J03* [2005-2006]

Micromachining process, method or apparatus

*This code is now discontinued and has been transferred to V06-V03A7 from 200701. It remains searchable for records prior to 2007.

See also U11-C and U12-B03F codes.

MEMS, microtransducer, nanotransducer, silicon-machining, micromachining

V06-K* [1980-2006]

Electromechanical resonators and delay lines

*This code is now discontinued and has been transferred to V06-V01E and V06-V04D2 from 200701. It remains searchable for records prior to 2007.

For networks using resonators see U25-B codes also.

V06-K01* [1980-2006]

Delay lines

*This code is now discontinued and has been transferred to V06-V04D2 from 200701. It remains searchable for records prior to 2007.

V06-K02* [1980-2006]

Piezoelectric, electrostrictive and magnetostrictive resonators

*This code is now discontinued and has been transferred to V06-V01B, V06-V01D and V06-V01E from 200701. It remains searchable for records prior to 2007.

Includes crystal tuning forks.

Oscillator

V06-K03* [1980-2006]

Holders, electrodes, coils

*This code is now discontinued and has been transferred to V06-V02B, V06-V02C and V06-V02F from 200701. It remains searchable for records prior to 2007.

Mounts, seals, bases, housing, supports

V06-K03A* [1987-2006]

Electrodes

*This code is now discontinued and has been transferred to V06-V02B from 200701. It remains searchable for records prior to 2007.

Electrode arrays, forks, comb electrodes, interdigitated electrodes

V06-K04* [1987-2006]

Filters

(V06-K09)

*This code is now discontinued and has been transferred to V06-V04D1 from 200701. It remains searchable for records prior to 2007.

See U25-B also.

V06-K05* [1997-2006]

SAW resonators

*This code is now discontinued and has been transferred to V06-V01E1 and V06-V01E2 from 200701. It remains searchable for records prior to 2007.

See U14-G also.

Surface acoustic wave

V06-K06*	[1997-2006]
MSW resonators	
*This code is now discontinued and has been transferred to V06-V01E3 from 200701. It remains searchable for records prior to 2007.	
<i>Magnetostatic, surface wave, MSSW, forward volume, MSFVW, backward volume, MSBVW</i>	
V06-K07*	[1997-2006]
Microresonators; Nanoresonators	
*This code is now discontinued and has been transferred to V06-V01E and V06-V01K from 200701. It remains searchable for records prior to 2007.	
<i>Micromachining, micromechanical, microelectromechanical, micromechanism</i>	
V06-K07A*	[2002-2006]
Nanoresonators	
*This code is now discontinued and has been transferred to V06-V01E and V06-V01K2 from 200701. It remains searchable for records prior to 2007.	
V06-K08*	[1992-2006]
Manufacture and testing	
(V06-K09)	
*This code is now discontinued and has been transferred to V06-V03A and V06-V03B from 200701. It remains searchable for records prior to 2007.	
V06-K08A*	[2005-2006]
Micromachining process, method or apparatus	
*This code is now discontinued and has been transferred to V06-V03A7 from 200701. It remains searchable for records prior to 2007.	
See also U11-C and U12-B03F codes.	
<i>MEMS, microresonator, nanoresonator, silicon-machining, micromachining</i>	
V06-K09*	[1980-2006]
Other	
*This code is now discontinued and has been transferred to V06-V01E and V06-V02S from 200701. It remains searchable for records prior to 2007.	
Includes circuits; resonators not covered by previous codes.	
V06-K10*	[2005-2006]
Ultrasonic resonator	
*This code is now discontinued and has been transferred to V06-V01E and V06-V01N from 200701. It remains searchable for records prior to 2007.	
Includes ultrasonic delay lines and resonators.	

V06-L*	[1980-2006]
Measuring or general use type piezoelectric, electrostrictive, magnetostrictive or electromagnetic transducers	
*This code is now discontinued and has been transferred to V06-V01A, V06-V01B, V06-V01D, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.	
See V06-M, V06-N and V06-U codes for motors and actuators. Vibration generators for performing mechanical work are in V06-V04C.	
V06-L01*	[1980-2006]
Piezoelectric, electrostrictive, magnetostrictive	
*This code is now discontinued and has been transferred to V06-V01B, V06-V01D, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.	
Materials are also in U11-A02.	
<i>Ultrasonic, acoustic, magnetostrictive, electrostrictive</i>	
V06-L01A*	[1987-2006]
Piezoelectric	
*This code is now discontinued and has been transferred to V06-V01B, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.	
<i>Piezoelectric composition, ceramic, ultrasonic, crystal, igniter, switch, micromechanism, sensor, buzzer</i>	
V06-L01A1*	[1987-2006]
Medical applications	
*This code is now discontinued and has been transferred to V06-V01B, V06-V02, V06-V04G and V06-V04K from 200701. It remains searchable for records prior to 2007.	
See also S05-D.	
<i>Ultrasonic probes, acoustic transducers, ultrasonic diagnostics transducers</i>	
V06-L01A2*	[1980-2006]
General measurements	
*This code is now discontinued and has been transferred to V06-V01B, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.	
See also relevant S02, S03 codes.	
<i>Vibration, pressure, force</i>	
V06-L01A3*	[1997-2006]
Piezoelectric transformers	
*This code is now discontinued and has been transferred to V06-V01B, V06-V02 and V06-V04F from 200701. It remains searchable for records prior to 2007.	

V06-L01A3A* [2002-2006]

Multilayer

*This code is now discontinued and has been transferred to V06-V01B1, V06-V02 and V06-V04F from 200701. It remains searchable for records prior to 2007.

V06-L01A3B* [2002-2006]

Rosen type

*This code is now discontinued and has been transferred to V06-V01B2, V06-V02 and V06-V04F from 200701. It remains searchable for records prior to 2007.

V06-L01A4* [1997-2006]

Piezoelectric (contactless) switches

*This code is now discontinued and has been transferred to V06-V01B, V06-V02 and V06-V04E from 200701. It remains searchable for records prior to 2007.

V06-L01B* [1997-2006]

Magnetostrictive

(V06-L01)

*This code is now discontinued and has been transferred to V06-V01D, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

V06-L02* [1980-2006]

Manufacture, testing

*This code is now discontinued and has been transferred to V06-V01, V06-V03A and V06-V03B from 200701. It remains searchable for records prior to 2007.

Polarising, polymerising, coating, process, assembling

V06-L02A* [2005-2006]

Micromachining process, method or apparatus

*This code is now discontinued and has been transferred to V06-V01 and V06-V03A7 from 200701. It remains searchable for records prior to 2007.

See also U11-C and U12-B03F codes.

MEMS, microsensor, nanosensor, silicon-machining, micromachining

V06-L03* [1997-2006]

Microsensors; Nanosensors

*This code is now discontinued and has been transferred to V06-V01K, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

Micromachining, micromechanical, microelectromechanical, micromechanism

V06-L03A* [2002-2006]

Nanosensors

*This code is now discontinued and has been transferred to V06-V01K2, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

V06-L04* [1997-2006]

Smart sensors

*This code is now discontinued and has been transferred to V06-V01Q, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

Intelligent

V06-L05* [1992-2006]

Electromagnetic sensors

*This code is now discontinued and has been transferred to V06-V01A, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

V06-L06* [2005-2006]

Ultrasonic sensor

*This code is now discontinued and has been transferred to V06-V01N, V06-V02 and V06-V04G from 200701. It remains searchable for records prior to 2007.

Includes measurement type ultrasonic sensors.

V06-L10* [2002-2006]

Resonant sensors

*This code is now discontinued and has been transferred to V06-V02 and V06-V04G2 from 200701. It remains searchable for records prior to 2007.

V06-M

Small electric machines

Includes low power electric machines. Medium and large size machines and their controllers are in X11 and X13, respectively. Indeterminate size machines are in both V06 and X11 classes.

V06-M01

Synchronous machines

Motors, generators

V06-M01A

With permanent magnet

V06-M01A1 [2008]

Interior permanent magnet

IPM

V06-M01B

Without permanent magnet

V06-M01C [1997]

Hybrid synchronous machines

Includes combined permanent magnet and wound rotor type synchronous machines.

V06-M02

DC and induction machines

Includes universal machines.

V06-M02A [1987]

DC machines

Motors, generators, commutator motors, shunt motors

V06-M02B [1987]

AC machines

Induction-, squirrel cage-, asynchronous-, capacitor-start, split-phase-, AC commutator-machine

V06-M03

Non-mechanical commutator machines

Includes both AC and DC type brushless motors.

Brushless, electronic commutator

V06-M03A [1997]

Permanent magnet

PM DC/AC brushless

V06-M03B [1997]

Switched reluctance

SR DC/AC brushless

V06-M03C [1997]

Sensorless

BEMF

V06-M04

Machines with vibrating armatures or coils

Includes voice-coil type motors, solenoidal motors, vibration motors.

Reciprocating/oscillating magnet, polarised-armature, vibration motor

V06-M04A [1997]

Voice coil motors

V06-M05

Stepping motors

V06-M05A [1987]

Variable reluctance

V06-M05B [1987]

Permanent magnet

V06-M05C [1997]

Hybrid

V06-M06

Other electric machines

Includes 'perpetual motion' motors, torque motors.

Electrodynamic-clutches, -brakes, -gears

V06-M06A [1987]

Synchros and selsyns

AC position motors

V06-M06B [1987]

Linear motors

V06-M06B1 [1997]

Asynchronous

Induction, AC, LIM

V06-M06B2 [1997]

Synchronous

AC, LSM

V06-M06B3 [1997]

Direct current

DC, linear

V06-M06B7 [1997]

Piezoelectric or electrostrictive

(V06-M06D)

V06-M06B8 [1997]

Electrostatic

(V06-M06F)

V06-M06B9 [1997]

Magnetostrictive

(V06-M06)

V06-M06C [1987]

Tachogenerators

Includes AC and DC type speed or rpm counters. See S02-G codes also.

V06-M06D [1987]

Piezoelectric or electrostrictive motors, actuators; Piezoelectric generators

Includes piezoelectric elements placed in printheads of inkjet printers (see also S06-G codes for inkjet printers). Also includes surface acoustic wave actuators for which U14-G is also assigned.

Bimorph actuators, SAW actuators

V06-M06D1 [1992]

Ultrasonic motors

V06-M06D2	[1997]
Generators	
V06-M06D3	[2002]
Laminated type	
V06-M06D4	[2002]
Bimorph type	
V06-M06E	[1987]
Servomotors	
V06-M06F	[1992]
Electrostatic motors, actuators, generators	
V06-M06G	[1992]
Micromotors/microactuators; Nanomotors/nanoactuators	
See also U12-B03F. For mfg. see V06-M11 and U11-C18C codes.	
<i>Micromachine, micromachining, micromechanical, microelectromechanical, micromechanism</i>	
V06-M06G1	[1992]
Electrostatic excitation	
V06-M06G1A	[2002]
Comb motors	
V06-M06G1B	[2002]
Wobble motors	
V06-M06G2	[1992]
Magnetic excitation	
V06-M06G3	[2007]
Electro-thermal effect	
For non-MEMS type electro-thermal actuator see V06-M06M.	
V06-M06G8	[2005]
Microgenerators; Nanogenerators	
V06-M06G8A	[2005]
Nanogenerators	
V06-M06G9	[2002]
Nanomotors/nanoactuators	

V06-M06H	[1997]
Magnetostrictive motors, actuators; Generators	
(V06-M06)	
Includes magnetostrictive motors, actuators and generators	
V06-M06H1	[2005]
Motors; Actuators	
V06-M06H2	[2005]
Generators	
V06-M06J	[1997]
Corona motors	
(V06-M06)	
V06-M06K	[1997]
Magnetic-fluid motors, actuators	
(V06-M06)	
Includes electromagnetic pumps used for moving liquid metal or some other magnetic fluid using electromagnetic force. Electromagnetic pumps for high power applications are coded under X11-H03B only.	
V06-M06M	[1997]
Shape-memory alloy motors	
(V06-M06)	
V06-M06N	[1997]
Printed-circuit or pancake motors	
(V06-M06)	
V06-M06P	[1997]
Multidimensional motors	
(V06-M06)	
V06-M06Q	[2002]
MHD generators	
See X11-H03B for medium/high power machines.	
<i>Magneto-hydro-dynamics</i>	
V06-M06R	[2005]
Ultrasonic motors	
Includes non-piezoelectric type ultrasonic motors. See V06-M06D1 for piezoelectric ultrasonic motors.	

V06-M06S [2007]

Electro-active polymer motors

Includes actuators/motors and generators having, for example, an electro-active polymer for electrical to mechanical, and vice-versa, energy conversion. See V06-M06D codes for piezoelectric actuators or motors. The actuator may have either a liquid or solid electrolyte.

EAP

V06-M06T [2008]

External rotor type motor

Includes motor with an outer or external rotor construction.

V06-M07

Magnetic circuits

Magnets, magnetic poles, cores, yokes, tooth, slots, laminations

V06-M07A [1987]

Stator

Includes insulation details of stator.

V06-M07B [1987]

Rotor

Includes insulation details of rotor.

V06-M08

Windings

Slot-closures, wedges, ties, fastening windings

V06-M08A [1987]

Conductor shape, form, construction or layout

Coils, disc, flat

V06-M08A1 [2002]

Printed coils/windings

V06-M08B [1987]

Insulation; Shielding; Protection

Corona protection

V06-M09

Casings; Supports

Includes enclosures, casings, bearing and brush supports, bearing shields or end plates. Also includes lubrication and insulation details of bearings, etc.

Housing, machine mountings, seals, explosion-proofing, vibration-damping, brush holders

V06-M09A [2002]

Connectors; Terminal boxes

V06-M10

Arrangements for handling mechanical energy

Shaft, clutches, brakes, gears, pulleys, mechanical starting, loads, flywheels, balancing arrangements, bearings, couplings

V06-M10A [2002]

Microgears; Microtransmission

V06-M11

Manufacture, testing, repair and maintenance

Includes recycling details (see also X25-W04).

V06-M11A [1983]

Commutators, slip-rings, brushes

Includes wear indicators. See also V04-P02 for manufacture of general commutators, brushes, etc.

V06-M11B [1983]

Windings

Coiling, inserting wires, winding jigs, laying conductors, conductor bending

V06-M11C [1987]

Insulation, balancing, centering

Includes impregnating, insulating, heating or drying of windings, rotors or machines. Also includes centering/balancing details of motor.

Taping

V06-M11D [1987]

Core

For rotor or stator bodies.

Magnetic poles, casting, moulding, laminating, slotting, magnetic circuits

V06-M11E [2016]

Casings and supports

Housing, enclosure

V06-M11G [2005]

Micromachining process, method or apparatus

See also U11-C and U12-B03F codes.

MEMS, micromotor, microactuator, nanomachine, nanoactuator, silicon-machining, micromachining

V06-M11M [1997]

Testing, repair and maintenance

Includes analysis, diagnosis, monitoring, fault detection. This code can be used in conjunction with other V06-M11 codes, e.g. together with V06-M11A, V06 M11B, V06-M11C and V06-M11D for testing of brushes, windings, insulation and cores, respectively.

V06-M11P	[1997]
Characterised by use of microprocessors	
V06-M12	[1983]
Commutators, slip-rings, brushes	
Includes connections with windings, commutation improving arrangements. See also V04-L01.	
<i>Commutator segments, current collectors</i>	
V06-M13	[1992]
Cooling, ventilation	
This code covers cooling and/or ventilation of e.g. the motor itself, and not when the motor is part of the cooling/ventilation system for cooling another device.	
V06-M14	[1992]
Structural association with electric component	
Includes measuring and protecting electronic components e.g. resistors, switches or RFI suppressors.	
<i>Position/rotation/direction detectors</i>	
V06-M15	[2002]
Materials	
V06-M15A	[2002]
Conductive materials	
Includes details of materials for thermal or electrical conduction.	
V06-M15B	[2002]
Magnetic materials	
V06-M15C	[2002]
Insulative materials	
Includes details of materials for electrical insulation.	
V06-M16	[2008]
Non-electrodynamic motor details	
Includes details, such as electrodes, for piezoelectric, electrostatic, etc motors.	
V06-M20	
Other details	
This code includes details of model illustrating / demonstrating how an electric motor works. See also W04-W07C for demonstration of process or effect. Also includes machine simulation/design. Includes motor cable details.	
<i>Motor simulation, generator simulation, electric machine simulation, motor design, generator design, electric machine design</i>	

V06-N	[1983]
Controlling small electric machines	
Includes control of low power motors, actuators and generators.	
V06-N01	[1983]
Stepping motors	
<i>Translation circuit, stepper, step-by-step motor</i>	
V06-N01A	[2005]
Variable reluctance	
V06-N01B	[2005]
Permanent magnet	
V06-N01C	[2005]
Hybrid	
V06-N02	[1983]
DC mechanical commutator motors	
<i>Shunt motor</i>	
V06-N03	[1983]
AC motors	
V06-N03A	[1997]
Asynchronous	
<i>Induction</i>	
V06-N03B	[1997]
Synchronous	
V06-N03B1	[2006]
With permanent magnet	
V06-N03B2	[2006]
Without permanent magnet	
V06-N04	[1987]
DC brushless motors	
V06-N04A	[1997]
Permanent magnet	
<i>PM DC brushless</i>	
V06-N04B	[1997]
Switched reluctance	
<i>SR DC brushless</i>	

V06-N04C	[1997]	V06-N12	[1997]
Sensorless		Voice coil motors	
<i>BEMF</i>			
V06-N05	[1987]	V06-N13	[1997]
Starting		Corona motors	
V06-N06	[1987]	V06-N14	[1997]
Braking; Stopping		Magnetic-fluid motors, actuators	
<i>Reversing, resistive-, regenerative-braking</i>		(V06-N)	
V06-N07	[1992]	V06-N16	[1997]
Piezoelectric or electrostrictive motors, actuators		Shape-memory alloy motors	
<i>Ultrasonic</i>		(V06-N)	
V06-N08	[1997]	V06-N18	[1997]
Electrostatic motors, actuators		Printed-circuit or pancake motors	
		(V06-N)	
V06-N09	[1997]	V06-N20	[1997]
Magnetostrictive motors, actuators		Multidimensional motors	
		(V06-N)	
V06-N10	[1997]	V06-N21	[2018]
Servomotors		Machines with vibrating armatures or coils	
V06-N11	[1997]	Control of ultrasonic motors are coded under V06-N36 only.	
Linear motors		<i>Vibration motor</i>	
V06-N11A	[1997]	V06-N22	[1997]
Asynchronous		Micromotors/microactuators;	
<i>Induction, AC, LIM</i>		Nanomotors/nanoactuators	
V06-N11B	[1997]	<i>Micromachine, micromachining, micromechanical, microelectromechanical, micromechanism</i>	
Synchronous			
<i>AC, LSM</i>		V06-N22A	[2002]
V06-N11C	[1997]	Nanomotors/nanoactuators	
Direct current		V06-N24	[1997]
<i>DC, linear</i>		Smartpower IC controllers	
V06-N11D	[1997]	<i>Integrated circuit controller, integrated smart power circuit</i>	
Piezoelectric or electrostrictive		V06-N26	[1997]
V06-N11E	[1997]	Microprocessor control	
Magnetostrictive		Includes DSP, ECU, PLC.	
V06-N11F	[1997]	V06-N30	[1997]
Electrostatic		Multimotor control	

V06-N35	[2002]
Remote motor control	
V06-N36	[2005]
Ultrasonic motors	
Use this code together with other V06-N codes if required for highlighting the type of motor being controlled.	
V06-N37	[2005]
Vector control	
<i>Field-oriented, flux-vector, direct-torque, control, regulation</i>	
V06-N40	[2005]
Low power generators	
For records prior to 2005, see X13-G02 codes. Medium and high power generator control is in X13-G02.	
V06-N40A	[2005]
Synchronous generators	
V06-N40B	[2005]
DC generators	
V06-N40C	[2005]
Induction generators	
V06-N40D	[2005]
Piezoelectric generators	
V06-N40E	[2005]
Magnetostrictive generators	
V06-N40F	[2005]
Electrostatic generators	
V06-N40G	[2005]
MHD generators	
V06-N40H	[2005]
Microgenerators; Nanogenerators	
V06-N40H1	[2005]
Nanogenerators	
V06-N45	[2005]
Speed control or regulation of electrical machines characterized by specific switching or control device	

V06-N45A	[2005]
Characterized by diodes	
V06-N45B	[2005]
Characterized by bipolar transistors	
V06-N45C	[2005]
Characterized by FETs	
V06-N45D	[2005]
Characterized by IGBTs	
V06-N45E	[2005]
Characterized by combination of switching devices	
V06-N45F	[2005]
Characterized by AC-to-DC converter	
V06-N45G	[2005]
Characterized by DC-to-AC converter	
V06-N45H	[2005]
Characterized by AC-to-AC converter	
V06-N45J	[2005]
Characterized by DC-to-DC converter	
V06-P	[2007]
Power generation plant	
Covers only very low power generation. Medium to large scale power generation is covered in X11, X14 and X15.	
V06-P01	[2007]
MEMS or chip-scale power plant	
Includes the implementation of whole power plants on a MEM device or chip. Covers micro-combustion of fuels to drive a micro steam- or gas- or other- turbine, which drives a micro-generator. Individual MEMS generators are in V06-M06G. See also U12-B03F codes.	
<i>Micro power generator</i>	
V06-P02	[2007]
Small scale power plant	
Includes low wattage power plants typically used for powering small electronic equipment.	

V06-U	[1997]
Electric machines characterised by applications	
V06-U01	[1997]
Domestic	
Includes motors used in domestic and household equipment such as washing machines, dishwashers, vacuum cleaners, office paper shredder etc. Personal items, such as toothbrushes, razors, etc, are coded under V06-U02 only. Domestic and household equipment are also coded under X27.	
<i>Household</i>	
V06-U02	[1997]
Personal	
Includes motors used in personal items such as toothbrushes, razors, hair dryers, etc. Domestic items are also coded under X27.	
<i>Toothbrush, razor, hair dryer</i>	
V06-U03	[1997]
Vehicles	
V06-U04	[1997]
Information equipment	
V06-U04A	[1997]
Disk drives; Tape drives	
V06-U04B	[1997]
Printers; Graph plotters; Scanners; Photocopiers	
V06-U04C	[1997]
Facsimile machines	
V06-U04D	[1997]
Ventilation; Cooling	
Also includes motor for cooling of electronic equipments, printed circuits etc.	
V06-U04E	[2002]
Telecommunication	
Includes mobile telephones.	
V06-U05	[1997]
Robotics	
V06-U06	[1997]
Machine tools	

V06-U07	[1997]
Dispensing / vending machines	
See T05-H codes for details of vending machines, and X25-F03B for details of dispenser, including food/drink dispensers.	
<i>ATM machine</i>	
V06-U08	[1997]
Toys; Games; Sports	
Includes exercise machines.	
V06-U09	[1997]
Audio, video equipment	
Includes motors for projectors, video recorders (VCR), DVD recorders and players, Hi-Fi systems, etc. Also includes motors for digital cameras, including cameras for mobile phones, laptops, etc. Non-digital cameras, or film cameras, are only coded under V06-U13. See also W04 codes for audio / video equipment.	
<i>CCD camera, digital camera, VCR, DVD player</i>	
V06-U10	[1997]
Medical	
V06-U11	[1997]
Electronic equipment manufacture	
Includes semiconductor manufacturing equipment.	
V06-U12	[1997]
Instrumentation	
Includes details of timepieces, e.g. chronograph timepiece.	
V06-U13	[2002]
Non-digital / film cameras	
Includes motor details for non-digital cameras, such as silver halide film cameras, 35 mm cameras, etc. Digital cameras are only coded under V06-U09. All video cameras are coded under V06-U09 only. See also S06-B for electrical details of film cameras.	
<i>Silver halide, 35 mm camera</i>	
V06-U14	[2002]
Optical switches	
V06-U15	[2002]
Industrial machines/components	
Includes industrial vehicles e.g. cranes, concrete mixing lorry, fork lift truck etc.	
V06-U99	[2006]
Other electric machine applications	

V06-V [2007]

Electromechanical transducers

This section covers all electromechanical transducers for audio/communication, resonators, sensors, vibrators (mechanical work) and general transducers not covered elsewhere.

For records prior to 2007, see V06-A to V06-J codes for audio/communication type transducers and vibrators (mechanical work), V06-K codes for resonators and V06-L codes for sensors, and general transducers not covered elsewhere.

See V06-M, V06-N and V06-U codes for small motors/actuators construction, manufacture, testing, monitoring, maintenance, control and applications. See U12-B01B for magnetoresistors, U12-B03E for piezoresistors.

V06-V01 [2007]

Transducers characterised by mode, principle, scale or type

These codes are used to highlight a specific transducer aspect such as mode (ultrasonic), principle (electrostriction), scale (micro) and type (moving coil). V06-V01 codes are used in conjunction with other relevant codes such as V06-V02 for details, V06-V03 for manufacture and V06-V04 for applications. For example, a novel electrode of a piezoelectric resonator for a delay line would be coded in V06-V01B, V06-V01E, V06-V02B and V06-V04D2.

V06-V01A [2007]

Electromagnetic induction

(V06-E01, V06-E09 and V06-L05)

See also V02-G01E for linear variable displacement transducers or transformers (LVDT)

V06-V01A1 [2007]

Moving coil

(V06-E01A)

Voice coil, bobbins

V06-V01A2 [2007]

Moving armature, core or magnet

(V06-E09)

LVDT

V06-V01A3 [2007]

Moving wire or strip

(V06-E01)

Ribbon

V06-V01B [2007]

Piezoelectric; Electrostrictive

(V06-E02, V06-K02, V06-L01A)

Details of piezoelectric or electrostrictive materials are covered by both V06-V01B and V06-V02R ('Materials').

Piezoceramic, quartz, ceramic, crystal resonator

V06-V01B1 [2007]

Multilayer

(V06-L01A3A)

V06-V01B2 [2007]

Rosen type

(V06-L01A3B)

V06-V01C [2007]

Electrostatic

(V06-E03)

Includes electrets and other capacitive-effect transducers (see also V01-B02 codes).

Condenser

V06-V01D [2007]

Magnetostrictive

(V06-E09, V06-L01B)

V06-V01E [2007]

Resonators

(V06-K02)

Includes electromechanical resonators. For networks using resonators, see U25-B codes also.

Oscillators, crystal resonators, elastic wave resonators

V06-V01E1 [2007]

Surface acoustic wave

(V06-K05)

SAW

V06-V01E2 [2007]

Bulk acoustic wave

(V06-K05)

BAW

V06-V01E3 [2007]

Magnetostatic acoustic wave

(V06-K06)

Magnetostatic surface wave, MSSW, magnetostatic forward volume wave, MSFVW, magnetostatic backward volume wave, MSBVW

V06-V01K [2007]

Microtransducers; Nanotransducers

V06-V01K1	[2007]
Microtransducers	
(V06-E06, V06-K07, V06-L03)	
<i>MEMS, micromechanical, microelectromechanical, micromechanism</i>	
V06-V01K2	[2007]
Nanotransducers	
(V06-E06A, V06-K07A, V06-L03A)	
<i>NEMS, nanomechanical, nanoelectromechanical, nanomechanism, (piezoelectric) nano-wire</i>	
V06-V01L	[2007]
Digital transducers	
(V06-E04)	
V06-V01M	[2007]
Wireless transducers	
(V06-E05)	
<i>Bluetooth transducer</i>	
V06-V01N	[2007]
Ultrasonic transducers	
(V06-B03, V06-E07, V06-K10, V06-L06)	
Includes details of supersonic transducers and ultrasonic/megasonic cleaning. Ultrasonic cleaning is also covered by V06-V04C and X25-H09A.	
V06-V01P	[2007]
Bone conduction transducers	
(V06-E08)	
Includes details of bone anchored hearing aids (BAHA). Hearing aids are also coded under V06-V04K for medical applications, and under W04-Y. If the hearing aid is implanted, see also S05-F01.	
<i>Hearing aid, bone anchored hearing aids, BAHA, bone conduction transducers</i>	
V06-V01Q	[2007]
Smart transducers	
(V06-L04)	
Includes details of the processing unit and the communication interface.	
<i>IEEE1451, SensorML, TransducerML, Transducer Markup-Language</i>	
V06-V01X	[2007]
Other transducers	
(V06-E09, V06-K09, V06-L)	
Includes electro-optical(audio), combined-principle and infrasonic transducers.	

V06-V02	[2007]
Transducer details, circuits, materials	
These codes are used in conjunction with other V06-V codes as appropriate. For example, a novel coil construction of a moving coil type transducer for a loudspeaker in a PA system is coded in V06-V01A1, V06-V02C, V06-V04A1 and V06-V04A5.	
V06-V02A	[2007]
Diaphragms; Cones	
(V06-A02, V06-F)	
<i>Membranes, vibration plates</i>	
V06-V02B	[2007]
Electrodes; Terminals	
(V06-G09, V06-K03A)	
V06-V02C	[2007]
Coils; (electro)magnets	
(V06-K03)	
V06-V02D	[2007]
Substrates; Layers	
V06-V02E	[2007]
Casings	
(V06-G01, V06-K03)	
Includes individual transducer housings. Also includes shield element to protect individual transducer. If the shield element is part of the cabinet, V06-V02F should be applied instead.	
V06-V02F	[2007]
Cabinets; Mountings; Supports	
(V06-G01, V06-K03)	
Includes cabinets, mountings, supports for the transducer(s) within a cabinet. Also includes mountings of circuit board.	
<i>Enclosure, chambers, holders</i>	
V06-V02G	[2007]
Obtaining desired frequency or directional characteristics	
(V06-G02)	
Includes structural combinations and spatial arrangements of separate transducers responsive to two or more frequency ranges, enclosures modified by mechanical or acoustic dampers, use of horns, use of several identical transducers.	

V06-V02H [2007]

Leads, connectors

(V06-G09)

Includes earphone jacks, cables for headphone/earphone, etc. Details of cables are also coded under X12-D.

V06-V02J [2007]

Sanitary devices

(V06-G09)

Includes details of waterproof filter protecting the mouthpiece of a microphone, etc.

V06-V02R [2007]

Materials

(V06-L01)

Manufacturing details of materials are covered by both V06-V02R and V06-V03A9 ('Other transducer manufacture'). Details of piezoelectric or electrostrictive materials are covered by V06-V02R and V06-V01B ('Piezoelectric; electrostrictive').

V06-V02S [2007]

Circuits

(V06-H, V06-K09)

Includes circuits for preventing acoustic reaction or correcting frequency response; cross-over networks for loudspeakers. Does not include volume control circuits. See W04-T also.

V06-V02X [2007]

Other transducer details

(V06-G09)

Includes transducer details not covered elsewhere. Also includes details of model illustrating / demonstrating how a transducer works. See also W04-W07C for demonstration of process or effect.

V06-V03 [2007]

Transducer manufacture, testing, monitoring

These codes are used in conjunction with other V06-V codes as appropriate. For example, a novel coil manufacture of a moving coil type transducer for a loudspeaker in a PA system is coded in V06-V01A1, V06-V03A3, V06-V04A1 and V06-V04A5.

V06-V03A [2007]

Manufacture

(V06-J01, V06-K08, V06-L02)

V06-V03A1 [2007]

Diaphragms; cones

(V06-J01A)

V06-V03A2 [2007]

Electrodes; terminals

(V06-J01, V06-K08, V06-L02)

V06-V03A3 [2007]

Coils; (electro)magnets

(V06-J01, V06-K08 and V06-L02)

V06-V03A4 [2007]

Substrates; Layers

(V06-J01, V06-K08, V06-L02)

V06-V03A5 [2007]

Casings

(V06-J01, V06-K08, V06-L02)

V06-V03A6 [2007]

Cabinets; Mountings; Supports

(V06-J01, V06-K08, V06-L02)

V06-V03A7 [2007]

Micromachining process, method or apparatus

(V06-J03, V06-K08A, V06-L02A)

Includes manufacture of MEMS and NEMS. See also U11-C and U12-B03F codes.

Micromechanical, microelectromechanical, micromechanism, microtransducer, nanomechanical, nanoelectromechanical, nanomechanism, nanotransducer

V06-V03A9 [2007]

Other transducer manufacture

(V06-J01, V06-K08, V06-L02)

Includes manufacture of transducer details not covered by the above codes. Includes manufacturing details of materials (see also V06-V02R).

V06-V03B [2007]

Testing, monitoring and calibration of transducers

(V06-J02, V06-L02, V06-K08)

This code includes testing and monitoring details of transducers, and not when the transducers are used as testing or sensing transducers, e.g. when the transducer is used to detect the tire pressure. Sensing, testing and imaging-type transducers are coded under V06-V04G.

V06-V04 [2007]

Transducer applications

These codes are used in conjunction with other V06-V codes as appropriate. For example, a novel coil of a moving coil type transducer for a loudspeaker in a PA system is coded in V06-V01A1, V06-V02C, V06-V04A1 and V06-V04A5. For applications in the communications and audio/video fields, see also W01, W02, W03 and W04 classes. For applications in the instrumentation and medical fields, see also S01, S02, S03 and S05 classes.

V06-V04A [2007]

Audio/video equipment

Includes details of microphone (V06-V04A2) and/or speaker arrangements (V06-V04A4) for non-implanted hearing aids. Bone anchored or implanted hearing aids are only coded under V06-V04K and V06-V01P. Hearing aids are also coded under W04-Y. Also includes musical instruments, such as electronic trumpet, and cameras. Details of digital cameras are also included by W04-M01 codes.

V06-V04A1 [2007]

Loudspeakers

(V06-A)

See also W04-S codes.

V06-V04A2 [2007]

Microphones

(V06-B02)

Pick-ups for musical instruments are coded in V06-V04A3. For microphones used for measurement purposes, see V06-V04G3.

V06-V04A3 [2007]

Pick-ups

(V06-B01)

Includes pick-ups for gramophones and musical instruments. General audio microphones are in V06-V04A2.

Stylus, cartridges, groove, mechanical recording, needle

V06-V04A4 [2007]

Headphones; Earphones

(V06-C)

Also includes hands-free kits, hearing aids. For hearing aids, also apply V06-V04K.

Earphones, earpieces, mouthpieces, hearing aids

V06-V04A5 [2007]

Public address systems

Includes equipment used in sound broadcasting during concerts, in public places such as train or underground stations, exhibition halls, etc. Includes details of long-line public address systems. Details of microphones and loudspeakers are coded under V04-V06A1 and V06-V04A2, respectively. See also W04-S codes.

PA system, loudhailer, concert, exhibition, conference, megaphone, LLPA

V06-V04B [2007]

Communication equipment

Also includes hydrophones used for audio/voice communications. For hydrophones used in instrumentation, see V06-V04G1. For sonar systems, see also W02-C07 and W06-A05 codes.

V06-V04B1 [2007]

Telephone handsets

(V06-C)

Telephone transducers, per se, are also coded in W01-C01M, and mounting details in W01-C01A3.

Receivers, transmitters

V06-V04B2 [2007]

Radio communication

V06-V04C [2007]

Vibrators (mechanical work)

(V06-D)

Includes transducers for performing mechanical work e.g. shock wave generator for lithotripsy. For industrial-scale vibration generators see X25-L codes. See V06-M codes for motors and actuators.

Buzzers, ultrasonic cleaning

V06-V04D [2007]

Filters; Delay lines

V06-V04D1 [2007]

Filters

(V06-K04)

V06-V04D2 [2007]

Delay lines

(V06-K01)

V06-V04E [2007]

Switching (contactless)

(V06-L01A4)

V06-V04F [2007]

Transformers
(V06-L01A3)

V06-V04G [2007]

Instrumentation
(V06-L01A2)

Includes sensing, detecting and imaging type transducers. Also includes transducers described as sensors. See also S02 and S03 codes for transducers used for general instrumentation.

V06-V04G1 [2007]

Sonar
(V06-B03, V06-E, V06-L)

Includes hydrophones for e.g. ranging. For audio/voice communications, see V06-V04B.

V06-V04G2 [2007]

Resonant sensor
(V06-L10)

V06-V04G3 [2007]

Measurement microphone
(V06-B02)

For audio/communication-type microphones, see V06-V04A2.

V06-V04H [2007]

Vehicles
Includes land, sea and air vehicles.

V06-V04J [2007]

Military
See also W07 codes for military applications of transducers.

V06-V04K [2007]

Medical
(V06-L01A1)
Includes details of transducers for hearing aids, including bone anchored or implanted hearing aids. Details of the bone conducting transducers are also coded under V06-V01P, and details of the microphone and/or speaker arrangements are also coded under V06-A04A codes. Hearing aids are also coded under W04-Y. See also S05 codes for transducers used in medical devices.
Hearing aid, veterinary, RIC (Receiver In Canal), in-ear canals

V06-V04L [2007]

Industrial
Includes machine tools.
Drilling, cutting, turning, lathe

V06-V04M [2008]

Information equipment
Includes details of transducers for computers, and computer peripheral devices e.g. mouse, disk drives, etc.

V06-V04N [2008]

Alarms; Signalling

V06-V04P [2008]

Personal

V06-V04Q [2008]

Displays

V06-V04R [2008]

Toys; Games; Sports
See also W04 codes.
Exercise machines, karaoke systems

V06-V04S [2008]

Domestic

V06-V04T [2013]

Purification; Sterilization
Includes details of transducers for purifying/sterilizing air in buildings, rooms, etc. Details of these air cleaners are also coded under X27-E01B2.

V06-V04X [2007]

Other transducer applications
Includes applications not covered elsewhere, e.g. igniters, vending machines, etc.

V07: Fiber-Optics and Light Control

The codes in this class were introduced at the start of 1983 and used to backlog code all basic abstracts to update 198018. Coverage is restricted to components for coupling, guiding, or performing operations - e.g. multiplexing - on IR, visible, or UV radiation. Individual radiation sources and receivers per se are not included, and are coded in U12 and V08. See W02-C04 codes for optical communications systems in general.

V07-F	[1983]
Optical elements	
V07-F01	[1983]
Light guides	
V07-F01A	[1983]
Guiding structures	
Includes guiding structures e.g. rods, rectangular core waveguides. From 1992 for optical fiber bundles see V07-F01A1B.	
V07-F01A1	[1983]
Optical fibers	
Includes individual glass, plastics and high power air-clad optical fibers; core and cladding structures providing desired refractive index profile, e.g. concentric guiding structure; doping.	
<i>Matched, raised cladding, single mode, step-index, graded-index</i>	
V07-F01A1A	[1992]
Light guides with polarisation-maintaining effect	
(V07-F01A1)	
V07-F01A1B	[1992]
Optical fiber bundles	
(V07-F01A)	
Includes image transmission using fiber-optic face plates and imaging bundles, i.e. guides with same relative position of fibers at both ends.	
<i>Image inverters</i>	
V07-F01A1C	[1997]
Optical fiber arrays	
(V07-F01A1B)	
Prior to 1997 coded in V07-F01A1B.	

V07-F01A1D	[1997]
Optical fiber tapes	
(V07-F01A1B)	
Prior to 1997, coded in V07-F01A1B. See V07-F01B4 for optical fiber cables.	
<i>Ribbon</i>	
V07-F01A1E	[2007]
Dispersion compensation optical fibers	
V07-F01A1F	[2007]
Graded Index Fibers	
(V07-F01A1B)	
As opposed to step index fiber. Refractive index with quadratic profile. Graded index fibers are always multimode fibers	
<i>Graduated index, Graded index, Multimode</i>	
V07-F01A1X	[2005]
Other novel optical fibers	
Includes holey fibers, photonic fibers and micro/nano structured fibers. Dispersion compensating and slope compensating fibers may also be coded here. U13-B03F and V06 codes may also be added for micro/nano structured aspects. See V07-K10C for photonic materials, V07-F01A4 for photonic waveguides, and from 2006 see V07-F02D for all other photonic optical elements.	
V07-F01A2	[1987]
Optical preform	
Includes structure, with manufacture in V07-F01A3A. Also includes similar structures for other optical elements, e.g. GRIN lens, tapered waveguide.	
<i>Soot</i>	
V07-F01A3	[1987]
Manufacture, materials for optical fibers	
V07-F01A3A	[1992]
Manufacturing methods for optical fibers and waveguides	
From year 2002, manufacturing equipment for optical fibers is coded in V07-F01A3C	
V07-F01A3B	[1992]
Materials for optical fibers and waveguides	
For non-linear optical and electro-optical materials see V07-K10 codes.	
<i>Silica</i>	

V07-F01A3C [2002]

Manufacturing equipment

Covers equipment for the manufacture of optical fibers. Equipment for preparing fibers goes in V07-G01, and for light guides/cables go in V07-H01.

V07-F01A4 [2005]

Slab and Planar waveguides

Prior to 2005 see V07-F01A. Includes photonic waveguides with novel structure. For photonic materials see V07-K10C, for photonic fibers see V07-F01A1X, and from 2006 see V07-F02D for all other photonic optical elements.

V07-F01A5 [1983]

Integrated optical waveguides

Includes thin film waveguide and its manufacture. Connections, switches and modulators integrated onto waveguide are also included, but see also V07-G or V07-K codes. Thin film optical element e.g. filter or lens is additionally coded in V07-F02. Semiconductor waveguides are also coded in U12-A or U13-D04A but waveguides for lasers are not included.

Substrate, integrated optics

V07-F01A5A [1997]

Characterised by integrated optical waveguide manufacture

(V07-F01A5)

Includes film deposition, substitution of dopant atoms, etching, using polymerisation.

V07-F01A5S [2002]

Integrated optical waveguide sensors

Includes multilayered optical filters.

Fiber gratings, smart skin, smart structure

V07-F01A6 [1997]

Polarisation-independent light guides

V07-F01B [1983]

Light guide protection; Repair and maintenance; Optical cables

V07-F01B1 [1987]

Light guide protection

Includes materials, manufacture of covering layers (i.e. non-optical layers) coated on fiber after extrusion e.g. radiation curable layers and metal coatings.

Sheath

V07-F01B1A [2002]

Dust-proof and water-tight structures

Includes drainage and protection system for relay points of optical cables, communication cable terminations, and enclosures for protecting optical fiber connections from dust and humidity.

Dust-proofing, weather-proofing, environmental protection

V07-F01B2 [2005]

Optical fiber repair and maintenance methods and equipment

V07-F01B4 [1987]

Optical cable

Includes composite electrical and optical fibers cable for transmission line signalling and optical repeaters.

V07-F01B4A [1992]

Characterised by optical cable structure

Helical/S-Z winding, spacers

V07-F01B4B [1992]

Characterised by optical cable manufacture

Includes method and equipment for manufacturing optical cables.

V07-F02 [1983]

Lenses, reflectors, other optical elements

Includes in general passive optical components associated with optical fibers and waveguides e.g. for coupling waveguides, sources and receivers; beam profile correction, etc. Also includes components manufactured from optical fiber e.g. filter, attenuator. For lens formed on fiber end, see V07-G04. Electro- and magneto-optic components are coded in V07-K.

V07-F02A [1987]

Lenses; Reflectors; Refractors

Includes prism; mirror (for scanning, see also V07-K05; incorporating electro-optic light shutter, see V07-K01A and for vehicle rear view/anti-dazzle mirror, see X22-J04).

V07-F02B [1987]

Gratings; Filters; Polarisers

Includes light retardation film, light diffusion film.

Diffraction

V07-F02C [1987]

Holograms

Excludes materials for holograms. For holograms used as optical components e.g. holographic diffraction grating, see also V07-F02B. Holography is in V07-M.

V07-F02D	[2006]
Photonic optical elements	
For waveguides see V07-F01A4. For fibers see V07-F01A1X. For novel band gap aspects of photonic materials, and novel photonic materials, see V07-K10C.	
V07-F03	[1992]
Mode selectors/converters	
(V07-F01A1)	
<i>Multi-mode</i>	
V07-G	[1983]
Coupling light guides	
Codes V07-G01 to V07-G04 are used in conjunction with V07-G10 to V07-G12.	
V07-G01	[1983]
Preparing fiber	
Includes cutting, polishing, stripping protective coating (see also V07-H01). Hand tools are also in V07-H01.	
<i>Cleaving, scoring</i>	
V07-G02	[1983]
Aligning with fiber or source	
Includes alignment using e.g. ferrules or by injecting light into fiber and measuring maximum transmission.	
V07-G02A	[2005]
Optical ferrules	
Includes all aspects of ferrule structure, manufacture, molding, methods and equipment	
V07-G03	[1983]
Fixing separation, fastening	
Includes plugs, screw-ins, lever locking, retainment against pulling force, spring-biasing, strain relief (see also V07-H codes), fixing gap between fiber ends, optical cement, etc.	
V07-G04	[1983]
Beam shaping and focusing	
Includes expanding of beam with lens, forming of e.g. elliptical lens on fiber, heating to alter refractive index distribution, mode, phase, and beam profile matching, anti-reflection coating.	
V07-G05	[2005]
Optical components other than beam shaping and focusing	
Includes filters, polarisers, gratings, mirrors etc. for coupling structures. Filters for beam shaping or lensing are covered in V07-G04, otherwise covered here. For novel optical element aspects see V07-F02 codes.	

V07-G10	[1983]
2- port connections	
Includes coaxial connections, e.g. simplex, duplex, ribbon cable to ribbon cable, bundle to bundle, fiber termination, coupling fiber to thin film waveguide, and connections on thin film waveguide (see also V07-F01A5). V07-G10 is used if it is unclear whether connection is detachable or permanent. When this code is used in combination with V07-F02 it indicates that connection has other optical function, e.g. as attenuator.	
V07-G10A	[1983]
Detachable connectors	
Includes connections intended for repeated connection/disconnection e.g. plug type.	
V07-G10B	[1983]
Permanent connections	
Includes splicing by fusing fiber ends or using heat shrinkable sleeve or using index matching adhesive.	
V07-G10C	[1983]
Coupling guide end to active source/detector	
Includes connections to LED, laser diode, lamp, or photodiode, bi-directional coupling to source/detector. In general, use also V07-G10A if connection is detachable but not V07-G10B, if permanent. Also includes bare fiber inserted into source module package, e.g. as pigtail (see also U12-A01C).	
V07-G10D	[1987]
Optical coupling	
Includes coupling between fibers using e.g. lens, fiber-thin film coupling.	
V07-G10E	[2002]
Orthogonal intersection of parallel fiber optic threads	
Includes intersection of parallel woven fiber optic threads, orthogonal to another fiber optic thread.	
<i>Fabric panel, display, energy beam, internal reflection, light generating pixels</i>	
V07-G11	[1983]
3- or more port couplers	
Includes coupling e.g. by splitting light path or removing cladding, (de)multiplexing (see also V07-K04); circulators, evanescent coupling, star couplers, bi-directional coupling using beam splitter, mode selector/converter (see also V07-F03).	
<i>Branching</i>	

V07-G12 [1983]

Rotary couplers

Slip-ring

V07-G13 [2005]

Optical fiber component packages/modules for optical communications

Includes optical line cards, optical backplanes and other passive optical component modules. Does not include electro-optical packages, which are coded in W02.

Includes manufacture.

V07-G15 [1983]

Optical switching

Includes mechanical, electromechanical, electro/magneto-optic or thin film switches.

Electromechanical or electro/magneto-optic switching is also in V07-K01. Rotary switches are also in V07-G12.

Shutter, fiber displacement

V07-H [1983]

Light guide installation

Covers installations analogous to W01-D, X12-G.

V07-H01 [1992]

Methods and equipment for installing light guides/cables

Includes hand tools for use in-field (see also V07-G01), stripping coating or cladding, dispensers, air blowing, pulling of guide through duct, splicing, cable marking.

Joining, terminating

V07-H02 [1992]

Fittings for optical guides/cables

Includes splice cases, distribution boxes, strain relief, heat shrinkable covers, clamps etc. For installation tools used with these fittings see also V07-H01.

V07-H03 [1992]

Installations for optical guides/cables

Includes details of optical fibers in underwater/underground/overhead power distribution network. For installation tools used on site see also V07-H01.

Conduit, ducting, feed-throughs, bushings

V07-H04 [2005]

Optical fiber excess management

Includes optical cable reels, trays, cable guides and supports for excess cable management, surface inlaid fiber optic installations and pre-assembled fiber-optic installation panels. From 2006 see V07-H04A for excess fiber management for fiber in use, and V07-H04B for excess fiber management for fiber not in use. See also X12-G04A1 for reels for composite optical and electrical cables. Prior to 2005 see V07-H09.

Reels

V07-H04A [2006]

Optical fiber excess handling and management

Includes optical cable reels, trays, cable guides and supports for excess cable management, surface inlaid fiber optic installations and pre-assembled fiber-optic installation panels for fiber-optics connected to communications/light transmitting system. Also includes protection of buried fiber optic nodes.

V07-H04B [2006]

Optical fiber storage and transporting aspects

Includes optical cable reels, trays, cable guides and supports for excess cable management, surface inlaid fiber optic installations and pre-assembled fiber-optic installation panels for excess/spare fiber not connected to anything, e.g. for storage in warehouse/ storage cabinet. Also includes storage space for jacketed fiber.

V07-H09 [1992]

Other aspects of light guide installations

Includes all other aspects of cable installation not covered anywhere else. From 2005 see V07-H04 codes for reels.

V07-J [1983]

Measuring optical element parameters

For measurements during waveguide manufacture, see also V07-F01A3A. Includes measuring/testing guide characteristics e.g. loss, dispersion (see also S02-J04A1); fault location/monitoring of transmission system e.g. breakage (see W02-C codes also). Excludes optical sensors i.e. measuring of non-optical parameter using optical fibers: these are coded in V07-K and in the relevant S01/S02/S03 codes.

Attenuation, intensity, optical time domain reflectometry, OTDR

V07-K	[1983]
Controlling light	
In general, includes modification of optical properties of medium electrically, magnetically, acoustically, and physically (i.e. force, stress, etc.), and by using light (i.e. non-linear optics). Also includes light switching and electro- or magneto-optic materials. For spatial light modulation, prior to 1997, see V07-K01 and V07-K05; from 1997 spatial light modulators are covered in V07-K01A2. For spatial phase correction, prior to 1997 see V07-K02 and V07-K05; from 1997 spatial phase correction is covered by V07-K02 and V07-K01A2. Excludes anti-dazzle electro-optic vehicle mirror (see X22-J), electro-optic spectacles (see X27-A02D), constructional details of electro-optic display (e.g. for liquid crystal, electrochromic displays, see U14-K codes).	
V07-K01	[1983]
Light intensity control, modulation	
Includes physically modifying fiber e.g. by stretching, bending; using acousto- or magneto-optic effects. Also covers optically activated liquid crystal devices.	
V07-K01A	[1987]
Light intensity control/modulation using electro-optical devices	
Includes control using liquid crystal devices; semiconductor light in-light out devices (see also U12-A02C3); MQWs (see also U12-E01B2). From 1992 for optical logic devices see V07-K06.	
<i>Multi-quantum well, Kerr, Pockells, Stark</i>	
V07-K01A1	[1997]
Single optical beam modulation	
(V07-K01A)	
V07-K01A2	[1997]
Area modulation	
(V07-K01, V07-K05)	
Prior to 1997 spatial modulation is covered by V07-K01 and V07-K05. For magneto-optic spatial modulation see also V07-K03.	
<i>Light valves, spatial, SLM</i>	
V07-K01B	[1987]
Light control using shutters	
Includes e.g. electromechanical chopper, ferromagnetic fluid.	
V07-K01C	[1992]
Optical amplification	
(V07-K01, V07-K01A, V08-A04X)	
<i>Repeater</i>	

V07-K01C1	[1992]
Semiconductor optical amplifiers	
(V07-K01A)	
Includes amplifiers derived from conventional laser diodes. See also U12-A02B1, U12-A02C3 or V08-A04A.	
V07-K01C2	[1992]
Optical fiber amplifiers	
(V07-F01A1, V08-A4X)	
Includes fiber doped with rare earth metal (e.g. erbium) amplifier.	
V07-K02	[1983]
Phase	
Includes pulse shaping.	
<i>Sagnac, interferometer, delay, refractive index</i>	
V07-K03	[1983]
Polarisation	
Includes magneto-optic effect, and materials which exhibit this effect. For magnetometers using rotation of polarised light, see also S01-E01.	
<i>Faraday effect/rotator, Kerr, optical isolator, circulator</i>	
V07-K04	[1983]
Frequency, colour	
Includes (de)multiplexing, heterodyning, frequency shifter e.g. using non-linear optics (for materials see V07-K10 codes), wave mixing or mode shifting in optical fiber and 3- or more pole multiplexing connectors (see also V07-G11).	
<i>Up/down converter, frequency doubling, second harmonic generation, SHG, optical harmonic generators</i>	
V07-K05	[1983]
Position or direction	
Includes deflection, scanning using e.g. rotating mirror or acousto-optic devices. Scanners are also coded in S06-D and E, or W04-M01E depending on application, respectively, to copier, printer, facsimile, or opto-mechanical TV systems. Mirrors per se are coded in V07-F02A.	
V07-K06	[1992]
Optical logic	
(V07-K01A)	
Includes bistable devices, optical computer elements, optical ADC. See also relevant codes in U12-A01, U12-E01, U14-A02, T01-E05A, T02-A03, U21-A03G, U21-C01G.	
<i>Self-electro-optic effect, SEED, binary optics</i>	

V07-K10	[1992]
Materials used for controlling light (V07-K) For materials with magneto-optic effect see V07-K03.	
V07-K10A	[1992]
Liquid crystals See also U11-A03A.	
V07-K10B	[1992]
Nonlinear optical and electro-optical materials <i>Second harmonic generation, SHG</i>	
V07-K10B1	[1992]
Inorganic non-linear optical and electro-optical materials Includes lithium niobate, potassium titanyl phosphate (KTP), beta-barium borate (BBO), ceramics e.g. lead lanthanum zirconium titanate (PLZT).	
V07-K10B2	[1992]
Organic non-linear optical and electro-optical materials Includes Langmuir-Blodgett thin films, polymers. <i>Steroidal ketone, organopolysiloxane</i>	
V07-K10C	[2005]
Novel photonic crystals and materials Covers all novel photonic materials, including e.g. new band-gap technology/arrangements. For photonic fibers see V07-F01A1X, for photonic waveguides see V07-F01A4, and from 2006 see V07-F02D for all other photonic optical elements.	
V07-L	[2006]
Manufacture, materials, equipment for optical elements other than optical fibers and waveguides All manufacturing aspects of optical fibers and waveguides are coded in V07-F01A3 codes. Prior to 2006 all manufacturing aspects were coded under the relevant device. Post 2006 see both relevant device code and V07-L code to indicate the manufacturing aspect of the device in question.	
V07-L01	[2006]
Manufacturing methods for optical elements other than optical fibers and waveguides	

V07-L02	[2006]
Materials for manufacturing optical elements other than optical fibers and waveguides For non-linear and electro-optical materials see V07-K10 codes.	
V07-L03	[2006]
Equipment for manufacturing optical elements other than optical fibers and waveguides	
V07-M	[1983]
Holography All aspects are included. Holograms per se are in V07-F02C. <i>Record, image, rainbow</i>	
V07-N	[1987]
Applications of optical fibers Applications other than those in V07-N01 to V07-N03 are coded in V07-N e.g. fiber-optic lasers using Raman/Stimulated Brillouin Scattering (see also V08-A codes). If fiber-optic laser is used as amplifier see V07-K01C2. <i>SBS</i>	
V07-N01	[1987]
Gyroscopes, interferometers, sensors Sensing using optical fibers. If novelty covers control of light, see also V07-K. Semiconductor laser light source for gyroscopes are also coded in U12-A01B1 and V08-A04A. Gyroscopes are also coded in S02-B07 and W06-A07; for interferometers see also S02-A03 <i>Rotating, angular, loop, Sagnac</i>	
V07-N02	[1987]
Endoscopes, fiberscopes Medical and industrial endoscopes are also coded respectively in S05-D04 and S02-J04. <i>Camera, imaging</i>	
V07-N03	[1987]
Illumination See X26-G also. Includes transmission of solar radiation from outside to interior of building, Christmas tree lighting, microscope slide illumination, use of lamp at one end of fiber for lighting.	
V07-X	[1983]
Miscellaneous aspects of light guides Includes (chemical) optrodes, sacrificial/consumable non-waveguide sensors, etc.	

V08: Lasers and Masers

Includes details of sources and amplifiers of coherent optical (i.e. IR, visible light and UV) and other EM waves.

V08-A

Lasers

For aspects directly involved with construction, operation, parameter control and monitoring of laser; and also for equipment, e.g. safety goggles, required for working with laser. For electrical aspects of laser used with weaponry and in laser surgery see W07, according to application, and S05-B01 codes respectively. For lidar see W06-A06 codes. For optical amplifier used in optical communication see also V07-K01C codes.

V08-A01

Construction/shape of optical resonators or active medium

From 1992 details of active medium are covered by V08-A01D.

V08-A01A [1983]

Optical resonators

Includes reflector details e.g. mirror, which is also coded in V08-A08 if it is unclear whether it forms part of resonator. Also includes external mirror for semiconductor laser.

V08-A01A1 [1992]

Ring lasers

(V08-A01A)

For gyroscopes see also S02-B07B and W06-A07.

V08-A01A2 [1992]

With passive optical components to control e.g. laser frequency

(V08-A01A, V08-A03)

Includes prism, diffraction grating, birefringent, non-linear materials placed inside optical resonator. For controlling laser parameters see also V08-A03 codes.

V08-A01A3 [1997]

External optical resonator

(V08-A01A)

External cavity, folded cavities

V08-A01B [1992]

Characterised by electrode details of laser

(V08-A01, V08-A02)

Includes material, structure of electrodes. See also V08-A04B code for arrangement of electrodes passing through discharge tube of gas laser.

V08-A01C [1992]

Gas management systems of laser

(V08-A01, V08-A04B)

Gettering, replenishing

V08-A01D [1992]

Characterised by active medium material of laser

This code is used in conjunction with V08-A04 codes to identify type of laser for which the active material is used. For semiconductor laser see also U12-A01B6 code for e.g. blue and green light emitting lasers.

V08-A01D1 [2002]

Preparation of active material

(V08-A01D)

Includes crystal growth and doping aspects. Does not include semiconductor laser formation (see U11/U12-A01B codes).

V08-A02

Pumping of active medium within laser

Includes thermal, chemical and electron beam pumping; expansion shock (e.g. compressed argon/xenon) excitation system; etc.

Excitation, population inversion

V08-A02A [1987]

Semiconductor laser drive circuit

Semiconductor laser drive circuits, are also coded in U12-A01B4. Control of drive circuit for stabilisation of laser is also in V08-A03A1 for amplitude stabilisation, or V08-A03C2 for frequency stabilisation.

V08-A02B [1987]

Optical pumping of laser

Includes flash-lamps, shining light on semiconductor laser.

V08-A02C [1992]

Pumping of gas laser

Includes pre-ionisation, gas discharge, capacitive or inductive excitation. Covers pumping by electrical discharge in gas laser, pulse drives.

Discharge electrode

V08-A03

Control of laser parameters

Includes control of beam parameters e.g. phase, frequency, mode. For use of feedback to monitor laser output and correct pumping conditions see also V08-A06A. Also includes varying position of optical components inside laser cavity. For control of components outside resonant cavity see also V08-A08, V07-F02, V07-K codes or under application. For stabilisation using temp. control involving cooling see also V08-A05. Also applied for laser using electro-optical device exhibiting Pockells- or Kerr- effect, etc.

Mirror positioning, direction, polarisation, non-linear optics, Brillouin/Raman scattering

V08-A03A [1987]

Control of laser intensity

Power

V08-A03A1 [1992]

Amplitude stabilisation of laser output

V08-A03B [1987]

Control of laser mode

Locking, suppression

V08-A03C [1987]

Control of laser frequency

Line width, tuning

V08-A03C1 [1992]

Frequency multiplication of laser output

(V08-A03)

See also V08-A01A2 if passive optical component is placed inside optical resonator.

V08-A03C2 [1992]

Frequency stabilisation of laser output

V08-A03D [1992]

Laser Q-switching

(V08-A03)

Includes electro-optic, magneto-optic, acousto-optic modulators, rotating mirror or prism, bleachable dye used for giant-pulse technique.

Q-spoiling

V08-A04

Laser types

This code is used in conjunction with other codes as applicable, e.g. gas laser optical resonator is coded in V08-A01A and V08-A04B. For materials or compositions for active medium see also V08-A01D.

V08-A04A

Semiconductor laser

See also U12-A01B codes for semiconductor laser body, package and manufacturing details. Includes DBR and DFB. For light-in/light-out modulators and logic gates see also V07-K codes and U12-A02C3. For testing of semiconductor laser see U11-F01C5 and V08-A06. For semiconductor laser drive circuits see U12-A01B4 and V08-A02A. For optical amplifier see V07-K01C1. For laser used to read optical disk or CD see also W04-C and T03-B codes.

Active, single-heterostructure, double-heterostructure, buried, stripe, surface emitting, electrode, distributed Bragg reflection, distributed feedback, current blocking layer, lateral current confinement, quantum well, cleaved-coupled cavity

V08-A04B [1983]

Gas laser

(V08-A04X)

Includes atomic, molecular, ion, excimer, metal vapour and chemical lasers. For controlling gas pressure see V08-A01C. For electrode details see also V08-A01B. For gas laser excitation see V08-A02C.

TEA, carbon dioxide, helium-neon, argon, krypton/fluoride, xenon chloride, oxygeniodine

V08-A04C [1983]

Solid-state laser

(V08-A04X)

Includes doped insulator, crystal, glass, etc. laser. Excludes semiconductor laser.

Rod, slab, neodymium, YAG, ruby, holmium

V08-A04C1 [1997]

Laser diode pumped solid state laser

(V08-A04C)

Includes solid state lasers pumped by laser diodes or laser diode arrays. For specific optical pumping details see V08-A02B code also.

V08-A04C2 [1997]

Optical fiber laser

(V08-A04X, V08-A04C)

See also V07 codes. For fiber-optic amplifier see V07-K01C2 only. Details of laser pumping of optical fiber are covered by V08-A02B. Prior to 1997 optical fiber lasers were covered by V08-A04X.

Waveguide laser

V08-A04D [1983]

Liquid or dye laser

(V08-A04X)

Rhodamine, crystal violet, coumarin

V08-A04E [1987]

Free electron laser

FEL, wiggler field

V08-A04F [2011]

Infrared lasers and UV lasers, non-visible light sources

Includes IR and UV lasers emitted from non visible light source, For illumination aspects see also X26-Q01 and X26-Q03

V08-A04X

Other laser types

Includes lasers using scattering effects. From 1997 for optical fiber lasers see V08-A04C2. For X-ray lasers and MASERs see V08-B codes.

Raman, Brillouin

V08-A05 [1987]

Cooling/heating aspects of laser

(V08-A09)

Includes cooling as part of gas recirculation system, heat sinks, temperature control and stabilisation. For laser parameter stabilisation and control see also appropriate V08-A03 code. For heat sinks for semiconductor lasers see also U12-A01B3A.

Circulate, coolant, pump, thermostat

V08-A06 [1987]

Measurements and testing of laser

(V08-A09)

Includes monitoring of laser output during operation e.g. arc discharge detection. For photodiode arrangement within laser diode package see also U12-A01B3. For measurements performed on laser beam see also S03-A codes. For testing of semiconductor laser see also U11-F01C5.

V08-A06A [1997]

Monitoring for direct active feedback control of laser parameter

(V08-A06)

For monitoring details of automatic laser parameter control using monitored laser output to stabilise parameter or control laser operation. For semiconductor laser diode drive circuit receiving parameter measurement from e.g. photodiode see U12-A01B4 and V08-A02A codes also. See also applicable V08-A03 code.

V08-A07 [1992]

Assemblies of lasers

Prior to 1992 laser diode arrays were coded in U12-A01B, U13-D04, V08-A04A. From 1992 they are covered by this code and U12-A01B1, V08-A04A.

V08-A07A [1992]

Injection locking within laser assembly

(V08-A01, V08-A03, V08-A04)

Includes master-slave arrangements for continuous wave lasers and, in case of pulsed laser, Master Oscillator-Power Amplifier configuration.

Seed oscillator, CW, MOPA

V08-A08 [1992]

Correcting laser beam parameters outside resonator

(V08-A09)

Includes components for correcting laser beam parameters e.g. profile/field patterns. See also V07 codes. Also includes homogenisation of beam.

V08-A09

Other laser related aspects

Includes packaging and enclosure details. For packages for semiconductor lasers see U12-A01B3, with semiconductor laser package manufacture covered in U11-D01 and E02 codes.

V08-A10 [1997]

Protection equipment for use with laser

Includes passive and active laser protection equipment preventing injury or blinding of person using laser or person upon which laser is operated. For direct active control of laser using parameter measurement feedback see V08-A06A and V08-A03 codes also. For goggles see also X27-A02D.

Goggles

V08-B

Other stimulated emission devices

For frequency standard aspects see U23-D codes, e.g. U23-D02, S04-C09. For atomic clock aspects see S04-B02X.

Atomic frequency standard

V08-B01 [1997]

Sub-IR frequency emitting device

Used for ultra-low frequency emitting device e.g. MASER.

Microwaves

V08-B02 [1997]

X-ray laser

(V08-B)

Prior to 199701 X-ray lasers were covered by V08-B. For ultra-high frequency laser see also V05-E03. For X-ray lithography in semiconductor manufacture see also U11-C04H1.

Section W

W01: TELEPHONE AND DATA TRANSMISSION SYSTEMS 607

W02: BROADCASTING, RADIO AND LINE TRANSMISSION SYSTEMS..... 650

W03: TV AND BROADCAST RADIO RECEIVERS 700

W04: AUDIO/VISUAL RECORDING AND SYSTEMS 729

W05: ALARMS, SIGNALLING, TELEMETRY AND TELECONTROL 774

W06: AVIATION, MARINE AND RADAR SYSTEMS..... 797

W07: ELECTRICAL MILITARY EQUIPMENT AND WEAPONS 812

W01: Telephone and Data Transmission Systems

W01-A

Digital information transmission

Codes in this group relate chiefly to novel aspects of digital transmission and to a lesser extent to its applications. Note that some communications or broadcast systems which are inherently digital, such as GSM or DAB, are not routinely coded here but are included for specific novel data communication aspects which can be usefully represented by the assignment of W01-A codes. (For systems aspects of GSM, see W01-B05A1A and W02-C03C1A; for DAB see W02-D05C1).

From 2002, it is intended to make a greater distinction between these aspects of novel digital transmission technology and applications which are better dealt with elsewhere. Thus, for example, inventions concerned merely with the **use** of the internet, such as for e-business purposes, or with software aspects of email, will **not** be included in W01, and are covered in class T01 (digital computing).

W01-A01

Error detection and prevention

Error correction coding in general is covered by U21-A06 codes.

Monitor, link, check, redundancy, BER

W01-A01A

By diversity, repeating or returning

Diversity radio systems are covered by W02-C03A codes and where an invention is concerned chiefly with radio aspects and data transmission details are not significant, those codes are assigned instead of W01-A01A. However, where radio aspects and data transmission aspects are significant both W01-A01A and W02-C03A codes may be assigned together.

ARQ, retransmission request, MIMO

W01-A01B

Using codes

Generally-applicable error detection using codes, i.e. not specific to data communications, is covered by U21-A06 codes.

Decode, encode, symbol, Reed, Forward Error Correction (FEC)

W01-A01B1 [1992]

Block codes

Covers coding where the final codeword is of fixed, finite length e.g. cyclic block coding.

Parity, cyclic, Hamming distance, BCH

W01-A01B1A [2005]

Using parity

Includes the use of odd and even checking bits.

W01-A01B1C [2002]

Reed Solomon coding

Note: Reed Solomon coding was incorrectly treated as a convolutional code from 2002 to 2004 and coded as W01-A01B2C. That code has now been deleted and the records to which it was assigned have been recoded as W01-A01B1C to place them in the correct block code hierarchy.

W01-A01B1E [2021]

Low Density Parity Check

Includes channel coding in a 5G system for which W02-C03C1L is also assigned.

LDPC

W01-A01B1G [2021]

Polar codes

Includes channel coding for control channels in 5G system for which W02-C03C1L is also assigned.

W01-A01B2 [1992]

Convolutional codes

Covers generation of a digit sequence from the informational digits in which no finite group of digits can be ascribed to one informational codeword. Includes max - likelihood or sequential algorithm for e.g. Viterbi, Fano, ZJ algorithms.

Trellis, punctured code

W01-A01B2A [2002]

Viterbi coding

W01-A01B2E [2002]

Turbo coding

Parallel concatenated convolutional codes

W01-A01B2G* [2002-2005]

Combined convolutional coding scheme

*This code is now discontinued. W01-A01B2G remains valid and searchable for records between 2002 and 2005 for combined convolutional coding schemes. From 2006, all aspects of hybrid or combined error correction coding schemes are covered in W01-A01B4.

W01-A01B2S [2002]

Novel algorithm or software aspects

Codes from class T01 are normally assigned for these aspects also, e.g. from the T01-S group.

W01-A01B2X [2002]

Other aspects of error correction based on convolutional codes

W01-A01B3 [1992]

Using format

Includes checking the format of received data for detection of errors, for example, system for checking complementary nature of received signals when complement of signal is also transmitted.

W01-A01B4 [2006]

Hybrid coding scheme

(W01-A01B2G)

This code covers error correction using either a combination of block and convolution codes or multiple block or convolutional codes. Other W01-A01B codes are assigned as appropriate to highlight the coding types being used. Prior to 2006, combined error correction coding using convolutional codes only was indicated by assignment of W01-A01B2G.

Concatenated, outer-inner coding

W01-A01B4A [2021]

Hybrid Automatic Repeat Request

This code indicates the use of HARQ in a 4G or 5G communication system for which W02-C03C1H or W02-C03C1L are also assigned.

HARQ

W01-A01B5 [2005]

Interleaving

Covers reduction in burst errors by re-organising data structure before transmission.

W01-A01C [1992]

Signal quality detection/testing correct operation

See also S01 and W02 codes. Includes jitter monitoring, using pseudo-errors and comparing transmitted test signals with locally generated replica.

Link quality estimation (LQE), jitter

W01-A01C1 [2002]

Signal quality detection based on measurement of bit error rate

This code is intended to be used when the emphasis is on BER measurement, for whatever purpose. Systems with the emphasis on overall link quality and testing for correct operation are covered by W01-A01C5. BER measurement for radio receivers is covered by W02-G03J5 codes.

W01-A01C1A [2002]

Novel hardware or software aspects for BER measurement

Codes from class T01 are normally assigned for software or algorithm-based aspects also, e.g. from the T01-S group.

W01-A01C1C [2002]

Applications of BER measurement

This code is intended for arrangements which make use of a BER measurement which is already available, and not itself the novel aspect. This code may be used with W01-A01C5 when the purpose is the establishment of a link quality value, QoS, etc.

W01-A01C5 [2002]

Testing correct operation

This code is intended to be used when the emphasis is on testing satisfactory link operation by investigating signal quality, making use of error detection and possibly involving other parameters also, and includes techniques such as eye pattern measurements. Systems with the emphasis on BER measurement, and novel methods or hardware for this, are covered by W01-A01C1 codes. Fault detection and monitoring of data networks is covered by W01-A06A codes and by W01-A07L for data transmission in general, which may be assigned in conjunction with this, and other W01-A01C codes, as necessary.

Eye diagram

W01-A01X [1992]

Other error correction and detection aspects

W01-A02

Code conversion

See also W01-A08A1A for synchronous start-stop systems characterised by code and U21-A05 codes for specific coding formats.

Modulation, trellis coding, biphasic level, Manchester coding, stochastic, parallel weight, NRZ

W01-A02A [1997]

Data compression

See also U21-A05A2 and T01-D02 codes as appropriate.

W01-A03

Multiple use of transmission path

The codes in this section relate to multiple access methods, duplex and multiplex transmission. Multiplex transmission in general is covered by W02-K codes.

Header, data, trailer, fixed-length, variable-length, STM (synch transfer mode), CBX (computerised branch exchange)

W01-A03A*	[1987-2001]
Access control	
<p>*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06F1 codes. W01-A03A remains valid and searchable for records between 1987 and 2001 and was assigned with W01-A06 codes for network aspects, e.g. with W01-A06B5A for access control in LANs. See also T01 codes, such as T01-H05 and T01-H07 codes.</p> <p><i>Access right, protocol, arbitration, code division, CDMA, binding</i></p>	
W01-A03A1*	[1987-2001]
Carrier sense multiple access (CSMA/CD and CA)	
<p>*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06F1A. W01-A03A1 remains valid and searchable for records between 1987 and 2001. During this time W01-A03A1 was combined with W01-A06F to indicate Ethernet. Request handling for interconnection or data transfer in computer systems is covered by T01-H05 codes, e.g. T01-H05B3 for contention avoidance for access to common bus.</p> <p><i>Collision detection, dc level shift, heterodyne, Ethernet®, timeout period, random delay, collision avoidance, contention</i></p>	
W01-A03A2*	[1987-2001]
Time division multiple access (TDMA)	
<p>*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06F1G. W01-A03A2 remains valid and searchable for records between 1987 and 2001. See W02-C03B and W02-K codes, e.g. W02-C03B1D and W02-K02D, for TDMA aspects of satellite radio systems.</p> <p><i>Aloha, slotted, synchronous, frame, burst transmission, DQDB (distributed queue dual bus), CRMA (cyclic reservation multiple access)</i></p>	
W01-A03A3*	[1987-2001]
Token pass	
<p>*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06F1E. W01-A03A3 remains valid and searchable for records between 1987 and 2001.</p> <p><i>Dynamic logical ring, priority token, address, FDDI</i></p>	

W01-A03B	[1992]
Packet transmission	
(W01-A06X)	
<p>Covers all systems where digital data cells or packets are transmitted to a selected destination by a terminal, computer applications program or other data handling device. The destination can be another data handling or data communication apparatus or system. Includes Packet Assembler/Disassembler (PAD). See W01-A06G2 for store and forward packet switching processors and W02-K03 for packet switching in general, e.g. voice packet switching.</p> <p><i>Virtual circuit, VCI, Virtual path, VPI</i></p>	
W01-A03B1	[1992]
Asynchronous Transfer Mode (ATM)	
(W01-A06X)	
<i>Cell, B-ISDN, PTM</i>	
W01-A03C	[1992]
Time division multiplexing (TDM)	
<i>Pulse stuffing</i>	
W01-A03C1	[2005]
Time Division Multiple Access (TDMA)	
<p>See W01-A06F1G for network aspects of access control scheme and W02-C03B and W02-K codes, e.g. W02-C03B1D and W02-K02D, for TDMA aspects of satellite radio system.</p> <p><i>Aloha, slotted, synchronous, frame, burst transmission, DQDB (distributed queue dual bus), CRMA (cyclic reservation multiple access)</i></p>	
W01-A03D	[1992]
Duplex	
Includes half and full duplex systems.	
W01-A03D1	[2002]
Half duplex	
W01-A03D5	[2002]
Full duplex	
W01-A03E	[2002]
WDM and FDM	

W01-A03E1 [2002]

WDM

WDM in general is assigned W02-C04B4B and W02-K04. General aspects of optical data transmission are covered by W01-A07E, and those specific to data networks by W01-A06C1 (optical fiber-based) and W01-A06C3 (free-space transmission). Optical communication in general is covered by W02-C04 codes. Novel optical components are covered in V07, especially V07-K04.

W01-A03E5 [2002]

FDM

FDM in general is assigned W02-K01 codes.

W01-A04

Synchronising receiver with transmitter

See also W02-K02A codes for general aspects of synchronising in TDM and W02-K05B7 for synchronising in spread spectrum communications. Digital synchronising circuits in general are assigned U22-H and PLL circuits are covered by U23-D01 codes.

Clock, phase, synchronous, frame delay, lock, recover regenerate, bit stuffing

W01-A04A

Using synchronisation signals

W01-A04A1 [1992]

Using properties of error detecting/correcting codes or special codes

Includes parity, correlators, PN codes. (Data transmission with error detection/correction codes in general is covered by W01-A01B codes).

Pseudonoise

W01-A04A2 [1992]

Using cyclic recurring signals

See also W01-A01C for jitter monitoring and W01-B02X for clock distribution.

Clock generation

W01-A04A9 [1992]

Other systems using synchronising signals

Includes pulse stuffing. Search with W01-A03C for this aspect in TDM data transmission. See W02-K02A3 for pulse stuffing in TDM systems in general.

W01-A04B [1992]

Signals containing no special synchronisation information

(W01-A04X)

W01-A04B1 [1992]

Tracking or using signal transitions

(W01-A04X)

Includes use of equaliser output; tap values; decision values or transmission code rule.

PLL

W01-A04B2 [1992]

Extraction of synchronisation/clock signal from spectrum

(W01-A04X)

Includes using resonant or bandpass circuit with squaring loop or Costas loop. (See U23-D01C1 for Costas loop demodulation in general.)

W01-A04X

Other data synchronising aspects

Pattern

W01-A05

Secret communication

These codes are intended for secret and secure data transmission systems, including aspects such as authentication (covered in W01-A05B). From 2002, inventions involving the **application only** of these techniques are excluded when specific codes exist elsewhere, such as in T01 (e.g. T01-D01A, T01-J12C).

Secrecy or scrambling systems for digitised speech or video (e.g. with bit order rearrangement) are assigned W01-A05 codes for novel data transmission aspects, but are chiefly covered by W02-L05 for audio and W02-F05A or W02-F10N codes for video systems.

Algorithm, RSA

W01-A05A [1992]

Blockwise coding using registers and memories

Includes DES (Data encryption standard) and AES (Advance encryption standard) systems, and key distribution.

Cryptographic communication, public key, private key

W01-A05A1 [2005]

Wireless

Includes WEP (Wired equivalent privacy) and WPA (Wi-Fi protected access) systems. Prior to 2005, this topic was coded as W01-A05A and W01-A06C4X. From 2005 W01-A06 codes are only assigned for significant network aspects.

WEP, WPA-PSK, WPA-802.1x, WPA2

W01-A05B [1992]

Identity verification/access control

This code covers authentication and identity verification in which data encryption is involved in some way. Verifying entitlement to access data networks is covered by W01-A06E1C, and is not assigned W01-A05B also unless some encryption aspect exists. Applications such as password checking for computer access are not included, and are covered by T01-J12C codes for computer security in general, and from 2002, by T01-N02B1B.

Confidential mail password

W01-A05E [2006]

Quantum cryptography

This code covers the use of quantum physics to provide inherent detection of eavesdropping or interception of data communications. Where optical communications are involved, e.g. single-photon systems, W01-A07E, W01-A06C1, or W02-C04 codes are also assigned as appropriate.

Polarisation, filter

W01-A05L [2007]

Data interception and prevention of interception

This code covers the interception of data communications using any medium. Secret and secure data transmissions using either cryptographic encryption or quantum cryptography are covered by W01-A05A and W01-A05E respectively. Interception and prevention of interception of analogue communication system are covered by W02-L07 codes.

W01-A05L1 [2007]

Data interception

W01-A05L5 [2007]

Prevention of interception

Includes data concealment

Masking, steganography

W01-A05X [1992]

Other secret data communication

W01-A06

Exchanges, connections between exchanges, data networks and network switching

Subject matter covered here has considerable overlap with class T01, especially in the case of computer communication aspects. Searching appropriate T01 codes, e.g. T01-H05, T01-H07, or T01-N codes, in conjunction with W01-A06 codes enables these topics to be further discriminated. In general, a 'network' is regarded here as an interconnection for data transfer of at least three stations, so that inventions involving data communication between only two stations are assigned W01-A07 codes instead. (Although note that W01-A07 codes may be used with W01-A06 codes to highlight a specific aspect, e.g. a power supply for a LAN is represented by W01-A06B5A and W01-A07K).

Note: As stated at the start of the W01-A code group, since 2002 inventions concerned purely with applications of data networks such as the internet, have not been covered in W01-A06 codes where specific T01 codes exist. Similarly, since 2002 electronic mail has been covered in T01-N01C only, unless specific novel data communications aspects are involved which require assignment of W01-A codes. (Prior to 2002 W01-A06E1, W01-A06G2, and W01-A06X, were routinely used, depending on details).

Due to convergence between wireless network and mobile telephone technologies analogous codes should also be considered in these areas when searching particular topics. For example, W01-A06C4 codes denoting wireless networks and W01-B05A1 codes for cellular phone systems may cover overlapping areas. From 2012 W01-E codes have been introduced for mobility-related aspects such as roaming and registration in wireless data networks and mobile phone networks. Prior to 2012 inventions concerned with roaming where the emphasis is on wireless data network access were assigned W01-A06E1R or W01-A06E1S (respectively roaming between same-standard and between different-standard networks) whilst roaming with emphasis on cellular mobile telephone systems was assigned W01-B05A1R. (These codes are now discontinued and replaced by W01-E01 codes).

Mode, outstations, gateway

W01-A06A

Testing and monitoring

W01-A06A1 [1992]

Failsafe and standby systems

Includes standby and back-up systems.

W01-A06A1A [1992]

Standby switching to powered up equipment

Includes hot standby systems. See W01-C02A1C for hot standby systems in telephone exchanges, W02-C01D3A for their use in general line communication and W02-G08A for application to radio equipment.

W01-A06A2 [1992]

Fault detection, isolation

Covers routines, equipment and isolation as part of fault location. Bridging/disconnecting arrangements for faulty equipment are covered in W01-A06A1 codes. See also S01 for measurement of specific electrical parameters. Fault detection in telephone exchanges is covered by W01-C02A1 codes. Communications system fault detection in general is covered by W02-C01D codes for line transmission, W02-C04C1 codes for optical transmission systems, and by W02-C05 codes in general.

W01-A06A2A [2012]

Network apparatus testing

This code covers testing of apparatus that is being used in a network with other codes assigned as appropriate, e.g. router testing is denoted by assignment of W01-A06A2A and W01-A06G5E. Testing of data communications hardware in a 'non-network' sense, i.e. 'bench testing' or otherwise testing the equipment in isolation, is covered by W01-A07L codes, which are also used for fault detection or testing of data communications equipment for general or unspecified application.

W01-A06A3 [2005]

Network usage and operation monitoring

Includes measurement of network activity and quality of service, and detection of overload/blocking condition. See T01-N02B2 for computer network aspects of monitoring. Analogous arrangements in telephone switching are covered by W01-C02A1A. Prior to 2012 this code was assigned with W01-A06E to indicate resource allocation in data networks. From 2012 the topic of network resource allocation is covered by W01-A06E1L but W01-A06A3 will still be assigned also when measurement of network performance is a significant part of an invention. From 2010 resource allocation in radio communication has been covered by W02-C03G1 and cognitive radio systems are covered by W02-C03G5 with W01-A06A3, W01-A06E codes and wireless network codes assigned as appropriate.

Load measuring, network forensics, QoS

W01-A06B [1987]

Characterised by structure

Structural codes are used where novelty exists and are also used with other W01-A06 codes as additional detail or a more general description, for example, W01-A06B2, W01-A06B5A and W01-A06E1 can be used to describe a ring LAN with a novel access or routing system.

Topology

W01-A06B1 [1987]

Bus

Linear network, daisy chain, DQDB

W01-A06B2 [1987]

Loop

Ring, FDDI, Cambridge loop

W01-A06B3 [1987]

Star

Dedicated link, hub, cluster, PBX

W01-A06B4 [1992]

Tree and mesh

From 2005, the title of this code is expanded to reflect the inclusion of mesh configuration networks, and subdivided.

W01-A06B4A [2005]

Tree

W01-A06B4C [2005]

Mesh

W01-A06B5 [1992]

Networks

These codes are intended to define the network by size, scale, or usage.

W01-A06B5A [1992]

Small scale (LAN)

VAN, vehicle area network, CAN, controller area network

W01-A06B5B [1992]

Large scale (WAN)

Public data networks, MAN

W01-A06B5C	[1992]
ISDN	
This code is intended to focus on data network aspects of ISDN. See also W01-C05B7 codes, which are assigned for all aspects.	
W01-A06B7	[1997]
Internet and intranet	
(W01-A06B9)	
From 2002 this code has been subdivided to separately cover internet and intranet systems, and in the case of internet, for novel details and for applications. However, note that the applications code (W01-A06B7C) is only used when no other code is available elsewhere (e.g. in T01). In general, inventions concerned purely with the use of the internet without any communications novelty will not be covered in W01 from 2002.	
W01-A06B7A	[2002]
Novel internet system details	
This code is used for novel aspects of internet systems, and may involve computing aspects represented by T01 codes, e.g. T01-N or T01-M02A codes. Applications of the internet are coded in W01-A06B7C when specific codes elsewhere are not appropriate.	
W01-A06B7C	[2002]
Applications of internet	
This code is intended for applications which cannot be represented by codes elsewhere. Thus, it will not normally be used for inventions involving the application of the internet to e.g. email, e-commerce, chatrooms, etc., for which T01-N01 codes are assigned.	
W01-A06B7E	[2002]
Intranet system	
W01-A06B7G	[2005]
Virtual networks, including virtual private networks	
The title of this code has been expanded to reflect its coverage of virtual networks in general as well as those with the emphasis on restricted access, such as private data networks that make use of public telecommunications infrastructure, e.g. maintaining privacy through the use of tunnelling protocol (see also W01-A06F7C for this aspect) and security procedures (for which W01-A06E1C is also assigned as appropriate). Virtual private telephone networks are covered by W01-C03A.	
<i>VPN, VLAN (virtual local area network)</i>	

W01-A06B8	[2005]
Data network operation and logical structure	
Includes networks operating with a client/server or client/client relationship.	
W01-A06B8A	[2005]
Client-server network	
See T01-N02A2C for computer communication using a client/server relationship.	
W01-A06B8C	[2005]
Peer-to-peer network	
Prior to 2005, all aspects of peer-to-peer network were covered in W01-A06G3. See also T01-N02A2E for computer network aspects of peer-to-peer network.	
<i>P2P</i>	
W01-A06B8E	[2007]
Ad-hoc network	
Includes dynamic network where the device are part of the network only for the duration of a communication session or, in close proximity to the rest of the network. Computer aspects of Ad-hoc network are covered by T01-N02A1B.	
<i>MANET, Mobile Ad-hoc Network</i>	
W01-A06B9	[1992]
Other data network types	
W01-A06C	[1987]
Data networks characterised by medium	
<i>Radio link, free space, optical link, multi-media network, broadband system</i>	
W01-A06C1	[1987]
Optical fiber	
Non-networked optical communication is covered by W01-A07E. Optical communication in general is covered by W02-C04 codes, optical fiber CATV networks are covered by W02-F03A3 and optical components are covered by V07 codes.	
<i>Fiber-optic network, optical coupler, optical modulator, FDDI (fiber distributed data interface), SONET</i>	
W01-A06C2	[1987]
Coaxial cable, twisted pair	
See W02-F03A1 also for LAN using CATV system. Includes dedicated twisted pair system only - see W01-C05B3 codes for shared telephonic and data communication.	
W01-A06C2A	[1992]
Coaxial cable	
Coaxial cables per se are covered by X12-D05, coaxial waveguides by W02-A01A2.	

W01-A06C2B [1992]

Twisted pair

W01-A06C3 [1992]

Free-space optical link

Free-space optical interfaces not specifically for network communication between several stations are covered by W01-A07H3.

W01-A06C4 [1992]

Radio link

See W02-C03 codes for details of radio systems and W02-G codes for radio equipment itself. Short range systems e.g. Bluetooth®, are assigned W01-A06B5A (to denote LAN) as well. Interfaces of this kind not specifically for network communication between several stations are covered by W01-A07H2 codes. Specific aspects of protocol peculiar to the network types listed below are covered by additional assignment of W01-A06F codes, the intention of the W01-A06C4 codes being to characterize the network link from the radio viewpoint. From 2012 W01-E codes are introduced to cover mobility-related aspects such as roaming and registration in wireless data networks (and mobile phone networks) and these codes will be assigned in preference to W01-A06C4 codes for these specific topics unless the use of W01-A06 codes is required to indicate other significant aspects of an invention, in which case W01-A06C4 codes will also be assigned.

W01-A06C4A [2002]

IEEE 802.15 radio link, including Bluetooth®

Radio systems for remote measurement and control are covered by W05-D codes, e.g. W05-D06A1A and W05-D08C1. Sensor networks are covered by W05-D06F and W05-D08E. W01-A06C4A is assigned when the wireless network aspect is significant.

ZigBee, WPAN, 802.15x

W01-A06C4C [2002]

DECT-based radio link

DECT systems for actual telephone usage are assigned W01-B05A1B and W02-C03C3 codes, with handsets covered by W01-C01D1 codes.

W01-A06C4E [2005]

IEEE 802.11 radio link

Includes systems using 802.11x standards e.g. 802.11p that uses 5.9 GHz frequency for communication between vehicles (Dedicated Short-Range Communications). See also X21-K.

DSRC

W01-A06C4G [2006]

IEEE 802.16 radio link

This code covers long-range data communications by radio, including wireless MAN, etc.

WiMAX, WMAN, 802.16x

W01-A06C4K [2005]

UWB and impulse radio link

Covers carrier-free and carrier-based links using time hopping and similar techniques. Novel details of ultra-wideband systems are covered by W02-K05 codes, especially W02-K05A9 codes.

W01-A06C4L [2021]

Millimetre radio link

This code covers the use of millimetre waves, typically operating between 3GHz to 300GHz for communication e.g. in a 5G system for which W02-C03C1L is also assigned.

W01-A06C4N [2021]

Terahertz radio link

This code covers the use of electromagnetic waves with band of frequencies operating between 300GHz to 3THz.

W01-A06C4P [2021]

Long range radio link

For communication systems which operate in frequencies below 1GHz, possibly for long range and low power consumption.

LoRa, LPWAN, LoRa Gateway, LoRaWAN

W01-A06C4X [2002]

Other radio link for networks

W01-A06C6 [2006]

Power line data network

Covers network using power line carrier as the medium for data transmission, and not systems for supplying power via data network conductors, which are coded according to network type and in U24-H codes. Novel aspects of power line communication are covered in W02-C01A3. See also under application e.g. W05-D06P for remote control aspects and X12-H03E codes for power line carrier systems.

W01-A06C9 [1992]

Other transmission media for networks

W01-A06D [1992]

Network modelling

(W01-A06X)

Includes use of CAD (computer aided design) to design and test networks. Search with T01-J15A4 also.

W01-A06E [1992]

Network control and software

(W01-A06X)

Includes hardware and software for control of transmission and reception of messages and/or data across a network. See also T01-N02B1A code for network management software. Prior to 2012 this code was assigned with W01-A06A3 for network resource allocation, but from 2012 this topic is covered by W01-A06E1L. (W01-A06A3 is also assigned as necessary where actual network performance measurement is part of an invention).

W01-A06E1 [1992]

Access and routing

Includes Media Access Control (MAC), see W01-A06G3 also. Network addressing as opposed to routing (i.e. for determining destination of packets, and not the route that they will travel) is covered in T01-N02A1A. From 2006, all aspects of routing are covered by W01-A06E1J and since 2002, routers per se have been covered by W01-A06G5E.

W01-A06E1A [1997]

Data conferencing and broadcasting

Includes transmission of messages to all users on a LAN, for example (with W01-A06B5A). Electronic mail in general is covered by T01-N01C. See W01-C02B1 for telephone conferencing system and W02-F08A codes for video conferencing system.

Message broadcasting, multi-casting

W01-A06E1C [2005]

User privileges/password system

Includes systems for granting or denying access to a network. (See T01-N02B1B for computer aspects of user privileges/password systems).

Security, login, permissions, access control list

W01-A06E1E [2005]

Metering and billing aspects

Covers billing and usage aspects of data network services. Analogous systems for telephone usage charging are covered by W01-C06 codes.

Internet-café, public wireless access point

W01-A06E1G [2005]

Graded service

This code covers the provision of different level/quality of service based on entitlement/agreement in a network context. Analogous arrangements for telephone service are covered by W01-C02B6 codes.

W01-A06E1J [2006]

Routing

(W01-A06E1)

This code covers determination of the appropriate path by which data should travel between two places.

W01-A06E1L [2012]

Data network resource allocation

Prior to 2012 this topic was covered by W01-A06A3 and W01-A06E. Where measurement of network performance is a significant part of an invention W01-A06A3 will also be assigned. From 2010 resource allocation in radio communication has been covered by W02-C03G1 and cognitive radio systems are covered by W02-C03G5 with W01-A06A3, W01-A06E codes and wireless network codes assigned as appropriate.

W01-A06E1R* [2006-2011]

Roaming between same-standard networks

*This code is now discontinued and from 2012 this subject matter will be covered by W01-E01A1. W01-A06E1R remains valid and searchable for records between 2006 and 2011 when it was used for roaming between networks, e.g. wireless LANs for which W01-A06B5A and W01-A06C4 codes were also assigned, it being assumed that the networks are operating on the same transmission standards. Roaming between different-standard networks was covered by W01-A06E1S, which took precedence over W01-A06E1R.

W01-A06E1S* [2006-2011]

Roaming between networks operating on different standards

*This code is now discontinued and from 2012 this subject matter will be covered by W01-E01A3. W01-A06E1S remains valid and searchable for records between 2006 and 2011 when it covered roaming between networks operating on different transmission standards, including switching between wireless data networks and mobile telephone networks when W01-B05A1R was also assigned. When used, W01-A06E1S took precedence over W01-A06E1R, which covered same-network type roaming.

W01-A06E2 [1992]

Network control characterised by mode

W01-A06E2A [1992]

Centralised control

Covers networks where the host exercises control over the tributary stations all of which are connected to it. The host may also act as a message-switching device between remote sites. See W01-A06G1 also for network circuit switching. Prior to 2002 W01-A06E2A was used to denote polling, with W01-A06F also assigned for significant protocol aspects. From 2002, the topic of polling will be covered by W01-A06F1C, with W01-A06E2A only assigned for specific 'centralised control' aspects.

W01-A06E2B [1992]

Decentralised control

Includes hierarchical and distributed systems. Covers networks where each station may be connected to several others in the network; giving the possibility to share resources and to distribute the database to the systems which access the data most frequently.

Random access

W01-A06F [1992]

Network protocol

(W01-A07G)

W01-A06F codes are assigned to highlight the protocol in use in a network without this being necessarily novel. When some aspect of protocol is novel, W01-A06F5 is also assigned. From 2002 access control topics previously covered by W01-A03A codes are transferred to these codes which will cover all the types of protocols. W01-A06F codes take precedence over W01-A07G codes which cover protocol aspects in a general or non-network sense.

CODEC, DQDB, OSI layer, bi-sync, SDLC, HDLC, SDH, PDH

W01-A06F1 [2002]

Access control

Search with W01-A06 codes for network aspects, e.g. with W01-A06B5A for access control in LANs. See also T01 codes, such as T01-H07B and T01-N02 codes.

Access right, protocol, arbitration, code division, CDMA, binding

W01-A06F1A [2002]

Contention protocols

(W01-A03A1, W01-A06F)

Includes Carrier Sense Multiple Access/Collision Detect (CSMA/CD and CA) and Ethernet®. Request handling for interconnection or data transfer in computer systems is covered by T01-H05 codes, e.g. T01-H05B3 for contention avoidance for access to common bus. W01-A06F1A is also used for network access aspects of cognitive radio (with W01-A06C4 codes) based on channel state sensing in which case W02-C03G5 is also assigned from 2010. Resource allocation in data networks in general is covered by W01-A06E1L. (From 2005 to 2012 resource allocation was covered by W01-A06A3 and W01-A06E).

Back-off, channel occupancy, collision avoidance, collision detection, contention, DC level shift, Ethernet®, heterodyne, random delay, timeout period

W01-A06F1C [2002]

Polling protocols

(W01-A06E2A, W01-A06F)

Includes hub and roll call polling. Prior to 2002 polling was covered by W01-A06E2A with W01-A06F for protocol aspects.

W01-A06F1E [2002]

Token pass protocols

(W01-A03A3)

Token pass protocols for ring networks are also coded in W01-A06B2, and in W01-A06B1 for bus networks.

Dynamic logical ring, priority token, address, FDDI

W01-A06F1G [2002]

Time Division Multiple Access (TDMA)

(W01-A03A2)

See W01-A03C1 for non-network aspects of TDMA in data transmission and W02-C03B and W02-K codes, e.g. W02-C03B1D and W02-K02D, for TDMA aspects of satellite radio system.

Aloha, slotted, synchronous, frame, burst transmission, DQDB (distributed queue dual bus), CRMA (cyclic reservation multiple access)

W01-A06F2 [2002]

Network layer protocols

Routing, IP multicast

W01-A06F2A [2002]

IP

(W01-A06B7, W01-A06F)

Mobile IP

W01-A06F2C	[2002]
TCP/IP	
W01-A06F3	[2002]
Application layer protocols	
<i>DNS/BIND, FTP, HTTP, Telnet, MIME, MQTT, Network File System, NNTP, SMTP, SNMP, POP, RTP, UDP, URI</i>	
W01-A06F5	[2002]
Novel protocol	
This code is used with other W01-A06F codes as appropriate to denote that some aspect of the protocol itself is novel.	
W01-A06F7	[2005]
Network protocol conversion, encapsulation, and tunnelling	
(W01-A06F9)	
This code covers arrangements for handling different protocols within a network, the topic previously being covered in W01-A06F9.	
W01-A06F7A	[2005]
Network protocol conversion	
W01-A06F7C	[2005]
Network protocol encapsulation and tunnelling	
For protocol tunnelling in connection with VPNs search with W01-A06B7G.	
W01-A06F9	[2002]
Other network protocol aspects	
W01-A06G	[1992]
Network switching/connection	
(W01-A06X)	
W01-A06G1	[1992]
Circuit switching	
Covers centralised switching method, with one branch exchange (PBX), calls are centralised and switched and distributed switching method with hierarchical network, having a number of DSN's (Distributed Switching Nodes) controlled so that the entire system operates as one exchange. See also W01-A06E2 for centralised and decentralised network control. Includes stored program control and use of time division.	
<i>Clos network, fat tree, folded Clos network, fourth generation PBX</i>	

W01-A06G2	[1992]
Stored and forward switching	
Includes packet routing (with W01-A03B codes), using radio channel (with W01-A06C4), flow control, bandwidth control and message switching systems. For facsimile systems see S06-K07C2B also.	
W01-A06G3	[1992]
Network inter-connection	
(W01-A06X)	
Covers communication conducted between a number of LANs using a MAC (media access control) to connect them through a bridge apparatus. Includes source routing and non-source routing; bridging of networks; and interconnect programs. See W01-A06E and T01 codes for network software in general. Also includes network interfacing. From 2005, all aspects of peer-to-peer network are covered in W01-A06B8C.	
<i>MAU (medium attachment units), BBN (backbone network)</i>	
W01-A06G5	[2002]
Network switching and interconnecting devices	
These codes are intended to highlight particular devices used in networks for connection, switching, routing and repeating purposes. The codes may be used alone if of general application or in conjunction with other W01-A06 codes as appropriate.	
W01-A06G5A	[2002]
Cross-connect switch	
W01-A06G5C	[2002]
Gateway or bridge	
Includes wireless access points (normally with W01-A06C4E), previously coded in W01-A06G5 or W01-A06G5E, depending on specific aspects, and in W01-A06C4X.	
W01-A06G5E	[2002]
Router	
Routers were previously coded in W01-A06E1, which is still assigned for significant control aspects.	

W01-A06G5G [2002]

Network repeaters

This code is intended to be used as a single reference for repeaters for data transmission in general, and replaces W01-A08A2 and W01-A08B1 (repeaters for baseband data transmission), which are discontinued from 2002. Network repeaters for which the baseband aspect is significant will from now on be assigned W01-A06G5G and an appropriate W01-A08 code, while for cases where broadband transmission is significant, W01-A09 codes will be used with W01-A06C5G. Repeaters for line communication in general are covered by W02-C01E codes, for radio by W02-G05C and W02-C03B codes, and for optical communication in general by W02-C04A5.

W01-A06G5X [2002]

Other network switching and interconnecting devices

Includes devices providing simple interconnection without any switching necessarily taking place, e.g. hubs.

W01-A06G9 [1992]

Other switching/connection of networks

W01-A06X

Other data exchange and network aspects

W01-A07

Standard code systems and general data transmission systems or equipment

W01-A07 codes are intended for inventions in the field of data transmission of a generally applicable nature. Although W01-A07 codes may be used with W01-A06 (network) codes to highlight a specific aspect, (e.g. a power supply for a LAN is represented by W01-A06B5A and W01-A07K), in general, inventions involving data communication between only two stations are assigned W01-A07 codes whilst those involving data transfer between three or more stations are regarded as networks and are assigned W01-A06 codes.

Signalling format, text

W01-A07A

Dot-and-dash code systems

Morse code, telegraphy, telegraph operator, training, mark, space

W01-A07B

Equal-length code element systems

Includes telex and analogous systems, also coded in W01-C05B3D.

Teleprinter

W01-A07C [1992]

Transmitter apparatus or circuits

W01-A07D [1992]

Receiver apparatus or circuits

W01-A07E [1992]

Optical communications

Prior to 2006 this code was used with W01-A07H1 to indicate optical fiber interfaces, now covered by W01-A07H4 alone. Data networks using fiber-optic and free-space optical links are respectively covered by W01-A06C1 or W01-A06C3. W02-C04 codes cover optical communication in general and are also assigned for novel details such as light source drive circuitry, photodiode current amplifiers, etc.

W01-A07F [1992]

Communication control and processing

Line termination

W01-A07F1 [1992]

For a number of communication lines

W01-A07G [1992]

Communication protocol

This code and its subdivision are intended for novel or significant aspects of data communication protocols in a general or non-network context. W01-A06F codes are assigned **instead** of W01-A07G codes for protocol aspects specific to networks. Computer communication protocols are covered by T01-N02A1.

W01-A07G1 [1992]

Transmission control procedure

Includes data link level control.

Time out detection, contention type

W01-A07G9 [1992]

Other general protocol aspects

W01-A07H [1992]

Characterised by interface or data terminal

W01-A07H1 [1997]

Wired interface

This code is intended for transmission of data through a wired medium, including serial and parallel interfaces. Prior to 2006 this code included optical fiber interfaces when used with W01-A07E. From 2006 interfaces of that type are covered by W01-A07H4.

C-type, Centronics®, Firewire®, IEEE1394, i-link®, parallel port, RS-232, RS-485, serial port, universal serial bus, USB

W01-A07H2 [1997]

Radio and near-field interface

From 2010 the title of this code has been changed to reflect the previous inclusion of near-field interfaces, now covered by W01-A07H2N. Prior to 2010 search W01-A07H2* with W02-C02 codes or with the terms 'near-field' or 'NFC' for interfaces based on near-field communication. See W02-C02 codes for novel details of near-field systems, W02-C03 codes for details of radio systems and W02-G codes for radio equipment itself. Specific aspects of protocol peculiar to the interface types listed below are covered by additional assignment of W01-A07G codes, the intention of the W01-A07H2 codes being to characterise the interface from the radio viewpoint. Radio links specifically for network communication between several stations (i.e. more than two) are covered by W01-A06C4 codes.

W01-A07H2A [2002]

Bluetooth® and ZigBee® radio interface

From 2010 the title of this code is changed to reflect the previous inclusion of ZigBee-based radio interfaces. Wireless network aspects of Bluetooth and ZigBee systems (i.e. more than two stations communicating using IEEE 802.15 standard) are covered by W01-A06C4A. Novel aspects of the frequency-hopping system are also assigned W02-K05A6 and other W02-K05 codes as appropriate.

W01-A07H2C [2002]

DECT-based radio interface

DECT systems for actual telephone usage are assigned W01-B05A1B and W02-C03C3 codes, with handsets covered by W01-C01D1 codes.

W01-A07H2K [2005]

UWB and impulse radio link

Covers carrier-free and carrier-based links using time hopping and similar techniques. Novel details of ultra-wideband systems are covered by W02-K05 codes, especially W02-K05A9 codes. UWB wireless links between three or more stations (regarded as a network) are covered by W01-A06C4K.

W01-A07H2N [2010]

Near-field interface

This code covers interfaces for transfer of digital data using near-field communication (NFC) systems based on inductive loops and magnetic or electric fields, and also those using antennas with deliberately enhanced near-field or suppressed far-field characteristics, including those operating at microwave frequencies. Interfaces using normal far-field radio communication are not included and are covered by other W01-A07H2 codes. Novel aspects of the near-field system are also assigned W02-C02 and W02-G codes as appropriate. Near-field interfaces for mobile phones are also assigned W01-C01D3C and W01-C01R codes. Use of a mobile phone as an electronic ticket or similar is covered by W01-C01D3C and W01-C01P9.

Coil, coupler, NFC interface, TransferJet™

W01-A07H2X [2002]

Other radio interface

W01-A07H3 [1997]

Free space optical interface

Free space optical communication specifically for data networks is covered by W01-A06C3, and in general by W02-C04B2 codes.

IrDA

W01-A07H4 [2006]

Optical fiber interface

Prior to 2006 this topic was covered by W01-A07E and W01-A07H1. Novel details of optical communications equipment are also assigned W02-C04 codes and those relating to novel fiber-optic technology are also assigned V07 codes.

W01-A07J [1997]

General construction details

See also V04-S or V04-T codes.

W01-A07K [1997]

Power supply

See also U24 codes, e.g. U24-D and U24-E for further details of power supplies.

W01-A07L [1997]

Fault detection and apparatus testing

From 2012 the title of this code has been changed to clarify its coverage of fault detection and testing of equipment for data communications in a general or 'non-network' application. Fault detection in a network environment, i.e. while the equipment is connected in the network, is covered by W01-A06A2 and from 2012 W01-A06A2A has been introduced specifically for network apparatus testing.

W01-A07L1 [2012]

Data communications equipment fault detection and apparatus testing

Fault detection in data networks is covered by W01-A06A2.

W01-A07L5 [2012]

Data communications equipment testing

Testing of equipment while it is connected in a network is covered by W01-A06A2A.

W01-A07X [1992]

Other general data transmission aspects

W01-A08

Baseband and DC data transmission systems

From 2002 the title of this code is expanded to better reflect its coverage of baseband data transmission systems. The codes in this section are used for any aspect of data transmission in which a DC or baseband aspect is significant, e.g. they may be applied to the post demodulation processing in a radio receiver. Data transmission in which **broadband**, modulated carrier, aspects are significant, are covered by W01-A09 codes.

Direct coupled

W01-A08A

Synchronous or start-stop systems

W01-A08A1 [1992]

Transmitting circuits/Receiving circuits

Distributors, repeaters

W01-A08A1A [1992]

Characterised by code

Includes predistortion, insertion, idle bit, using 3 or more amplitude levels, transition code and correlative code. See W01-A02 for data transmission characterised by use of code conversion, and U21-A05 codes for specific coding formats.

HDB3 code, Baudot code

W01-A08A1B [1992]

With storage before transmission or reception

W01-A08A2* [1992-2001]

Repeater, relay circuits

*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06G5G. W01-A08A2 remains valid and searchable for records between 1992 and 2001. During this time W01-A08B1 was regarded as the general code for baseband data transmission repeaters.

W01-A08B

Shaping networks; Repeater and relay circuits

From 2002 data transmission repeaters are covered by W01-A06G5G.

W01-A08B1* [1992-2001]

Repeater and relay circuits

*This code is now discontinued and from 2002 the subject matter covered is transferred to W01-A06G5G. W01-A08B1 remains valid and searchable for records between 1992 and 2001. During this time W01-A08B1 was regarded as the general code for baseband data transmission repeaters and W01-A08A2 was assigned for repeaters specific to synchronous or start-stop systems. From 2002, repeaters specific to baseband data transmission will be indicated by W01-A06G5G and a W01-A08 code as appropriate.

Regenerator, single to double current, semiconductor, optical sensing, modulation

W01-A08B2 [1992]

Shaping networks

Includes decision feedback and transversal equalisers, and passive shaping networks. See W02-C01B2B for general line transmission equalisers and W02-C03E1B for radio receiver equalisers, also assigned W02-G03 codes, e.g. W02-G03B6.

Adaptive, DFE, coefficient, weighting, tap

W01-A08C [1992]

Non-synchronous systems

(W01-A08X)

Includes using 3 or more different amplitudes e.g. cable code.

Asynchronous

W01-A08D [2007]

Differential data transmission

This code covers differential data transmission and is assigned with other W01-A08 codes as appropriate. Novel logic circuits intended for use in differential serial bus systems are covered by U21-C02D1.

LVDS

W01-A08E [2007]

DC offset suppression or adjustment

This code covers the suppression or removal of DC offsets and the clamping of a signal to a desired DC level, primarily in baseband signals. Novel circuits for clamping the level of pulse signals in general to a desired DC level are covered by U22-D01A1A.

W01-A08X

Other baseband and DC data transmission aspects

Interface, coupling

W01-A09

Broadband and modulated carrier systems

From 2002 the title of this code has been changed (formerly 'AC systems') to better reflect its coverage of broadband data transmission systems, generally employing modulated carriers. Data transmission systems in which baseband data is directly transmitted ('DC systems') are covered by W01-A08 codes. Codes are generally assigned to highlight a particular mode of transmission, e.g. OOK, FSK, QAM, and where appropriate to focus on particular novel aspects of modulators or demodulators (W01-A09E codes).

Modulate, modem, demodulate, carrier systems, broadband systems, multilevel

W01-A09A

Amplitude and frequency modulated carrier systems

W01-A09A1 [1992]

AM carrier systems

On-off keying (OOK), single side band (SSB), vestigial side band (VSB), superheterodyne, carrier recovery

W01-A09A2 [1992]

FM carrier systems

FSK, TFM, using filters, oscillators, quadrature

W01-A09B [1987]

PSK

Includes suppressed carrier product modulation methods by means of a digital signal.

Phase shift keying, binary phase-shift keying (BPSK), differential phase shift keying (DPSK), Gaussian minimum shift keying (GMSK), minimum shift keying (MSK), quadrature phase-shift keying (QPSK)

W01-A09C [1987]

QAM and other hybrid modulation

Quadrature amplitude modulation, 16-QAM, constellation, signal points

W01-A09C1 [2005]

QAM

W01-A09C5 [2005]

Layered modulation

W01-A09D [1992]

Using multi-frequency codes

(W01-A09X)

Covers simultaneous transmission of different frequencies each representing one code element and systems where each code element is represented by a combination of frequencies. Multifrequency signalling for telephony is coded in W01-B09 only.

W01-A09E [1992]

Modems, modulators and demodulators

(W01-A09)

Search with other W01-A09 codes for specific modulation type. Telephone line modems are also assigned W01-C05B3A and novel modulator or demodulator circuitry is also assigned U23-P01J codes.

Frequency-multiplexing, microwave, QPSK, CPSK, DPSK

W01-A09E1 [1992]

Modulator circuits

Search with U23 codes e.g. U23-P01J1 for digital aspects and U23-D01C codes for PLL aspects.

W01-A09E2 [1992]

Demodulator circuits

Search with U23 codes e.g. U23-P01J3 for digital aspects and U23-D01C codes for PLL aspects.

Carrier recovery, PLL, Costas loop

W01-A09E3 [1997]

Voice over data transmission

Includes modem, modulation or demodulation aspects only. Covers switching between voice and data transmission, compression, and out of band transmission. Search with U23 codes for modulation aspects as appropriate. Search W01-C05B3G for combination with telephone system or T01 codes for combination with computing system. Voice-over-IP telephone communication is covered by W01-C05B4C from 2002. (Prior to 2002, W01-A06B7, W01-A06F, and W01-C05B3 were used, in addition to T01-H07C5E).

SVD, voice span®, VoiceView®

W01-A09X

Other broadband data transmission aspects

W01-A20

Other data transmission aspects

W01-B

Selecting

Includes selection (i.e. switching), for telephony (W01-C) and other signal applications. Mechanical switches per se are covered by V03, and electronic switching by U21-B codes.

W01-B01

Direct selection

W01-B02

Indirect selection

This code is used for novel signal switches per se, including optical switching. See also V03 codes or U21-B codes as appropriate, e.g. U21-B05E. RF waveguide technology switches are covered by W02-A4A code.

Space switching, optical switching, relay, electronic, switch, matrix

W01-B02A

Common control by centralised logic

Processor control

W01-B02A1 [1992]

Stored program control

See also T01 codes.

SPC, microprocessor, microprogram, microcomputer, computer

W01-B02X

Other indirect selection

Clock signal distribution, distributed control

W01-B03

Connecting to satellite or sub-exchange; Distribution; Caller identification

Inter-exchange link, concentrator, stacking

W01-B03A [1992]

Connecting to satellite or sub-exchange, distribution

(W01-B03)

W01-B03C [1992]

Caller identification

From 2002, transmission of caller ID, and its inhibition, as special subscriber services in an exchange are covered by W01-C02B3C and W01-C02B3E respectively. Prior to then, W01-B03C was assigned for these topics with W01-C02B9. From 2002 W01-B03C is used only for novel aspects of determining caller ID.

Call tracing

W01-B04

Party line selection

W01-B05

Connecting via radio, inductive or free-space optical links

The codes in this subgroup deal with connections that do not involve use of cables or optical fibers, the essential feature being a 'wireless' aspect. Further details are specified by co-assignment of 'transmission system' codes in the W02-C group as appropriate, e.g. W02-C03C codes when mobile radio is involved.

Selective calling, cellular radiotelephone, cordless telephone, paging

W01-B05A [1992]

Radio

This section relates to both base station apparatus and to overall radio systems, and should be used with W02-C03 and W02-G codes as appropriate for these aspects.

W01-B05A1 [1992]

For mobile radio telephone system

See W01-C01D codes for subscriber equipment. Includes multi-handset cordless telephones, see also W01-C01D1.

W01-B05A1A [1992]

Cellular

This code is normally assigned to indicate layout or design of a cellular telephone system, the arrangement of cells and base stations, or novel methods of operating the network involving signalling, paging, and the like. (Note that dedicated 'paging systems' are not coded here, being covered by W01-B05A5 for selective calling aspects). Novel base station details are also included, for which W02-C03C1B is also assigned. In general, other W02-C03C1 'cellular radio' codes are also assigned with W01-B05A1A as necessary when mobile radio system aspects are significant. When emphasis is on 'telephone exchange' and 'switching' aspects of cellular mobile phone systems W01-B05A1C is assigned instead of W01-B05A1A. From 2012 W01-E codes are introduced to cover mobility-related aspects such as roaming and registration in mobile phone networks (and wireless data networks) and these codes will be assigned in preference to W01-B05A1 codes for these specific topics. If the use of W01-B05A1A is required to indicate other significant aspects of an invention the code will be assigned in addition to W01-E codes.

Microcellular, macrocellular, GSM, PCN, NADC, JDC, Qualcomm®, CDMA

W01-B05A1B [1992]

Cordless call-point phone system

Cordless telephones per se are covered by W01-C01D1 codes. Non-cellular mobile radio system aspects are indicated by use of W02-C03C3 codes.

CT2, CT3, DECT, PHS

W01-B05A1C [1992]

Exchange details

This code is normally used instead of W01-B05A1A when focus is on 'telephone exchange' and 'switching' aspects of cellular mobile phone systems. W02-C03C1 codes are not normally required, but may be assigned when specifically relevant. From 2012 W01-E codes are introduced to cover mobility-related aspects such as roaming and registration in mobile phone networks (and wireless data networks) and these codes will be assigned in preference to W01-B05A1C for these specific topics. If the use of W01-B05A1C is required to indicate other significant aspects of an invention the code will be assigned in addition to W01-E codes.

W01-B05A1D [1997]

Direct mode connection between telephones

Search with other W01-B codes for dual mode operation, e.g. W01-B05A1A or W01-B05A1B for switching between cellular or cordless call point systems and direct mode. Direct mode radio telephone sets themselves are covered by W01-C01D2, with further details specified by other W01-C01 codes regarding telephone aspects and W02-C03C and W02-G codes assigned to highlight RF aspects.

Digital short range radio system (DSRRS)

W01-B05A1E [1997]

Satellite telephone connection

W02-C03B1 codes are assigned to indicate aspects of satellite radio relay systems. For the purpose of highlighting the 'mobile radio' aspect, satellite telephone systems are regarded as being of cellular type, i.e. W02-C03C1 codes are also assigned. Satellite telephone sets themselves are assigned W01-C01D3E, and other W01-C01 codes as appropriate.

TFTS, aeroplane telephone

W01-B05A1F [1997]

Short messaging service

This code covers exchange and 'system' aspects specific to mobile telephone networks. Prior to 2009 these aspects of MMS were also covered here (now assigned W01-B05A1H). 'Special subscriber service' aspects of SMS - i.e. aspects of the system as it appears to subscribers in terms of features offered by the service provider - are covered by W01-C02B7D instead. SMS telephones themselves are assigned W01-C01G6A (and W01-C01D3C when a mobile phone is involved).

W01-B05A1G [1997]

Fixed location radio telephone access

W02-C03D codes are also assigned to indicate the 'point-to-point' nature of the radio link.

W01-B05A1H [2009]

Multimedia messaging service

(W01-B05A1F)

This code covers exchange and 'system' aspects specific to mobile telephone networks. Prior to 2009 these aspects of MMS were assigned W01-B05A1F. 'Special subscriber service' aspects of MMS - i.e. aspects of the system as it appears to subscribers in terms of features offered by the service provider - are covered by W01-C02B7F instead. MMS telephones themselves are assigned W01-C01G6B (and W01-C01D3C when a mobile phone is involved).

W01-B05A1M [2006]

Network broadcasting

This code is intended for network broadcast messages for system management and information, and other broadcasting aspects, e.g. involving entertainment aspects with W01-C05 codes assigned as appropriate.

W01-B05A1N* [2006-2011]

Registration of mobile subscriber

*This code is now discontinued and from 2012 this subject matter will be covered by W01-E01C3. W01-B05A1N remains valid and searchable for records between 2006 and 2011 when it covered registration of mobile subscribers in mobile telephone networks.

W01-B05A1Q* [2006-2011]

Location register details

*This code is now discontinued and from 2012 this subject matter will be covered by W01-E01C1. W01-B05A1Q remains valid and searchable for records between 2006 and 2012 when it covered location register aspects of mobile telephone networks.

HLR, VLR

W01-B05A1R* [2006-2011]

Subscriber roaming aspects

*This code is now discontinued and from 2012 this subject matter will be covered by W01-E01A codes. W01-B05A1R remains valid and searchable for records between 2006 and 2011 when it covered roaming in mobile telephone networks and when assigned with W01-A06E1S, switching between wireless data networks and mobile telephone networks.

W01-B05A3 [1992]

Inter-exchange connection

See also W01-C03 for telephone system and W02-C03B codes for radio relay systems.

Trunked radio, TETRA

W01-B05A3A [1992]

Terrestrial

See also W02-C03B codes for radio relay systems and W02-C03D codes for point-to-point radio links.

W01-B05A3B [1992]

Satellite

See also W02-C03B codes.

W01-B05A5 [1992]

Paging system

This code covers selective calling aspects of traditional paging systems i.e. those normally operating over a dedicated mobile radio network in which text messages and the like are transmitted to dedicated portable receivers, frequently operating independently of mobile telephone systems. All aspects of paging systems and equipment are covered by W05-A05C codes and novel mobile radio system details by W02-C03C codes. Note that 'paging' in the sense of a base station transmitting a message to a mobile phone to set-up a call in a cellular telephone system is not included, being covered by W01-B05A1A.

ERMES, FLEX, ReFLEX, POCSAG, code, address

W01-B05A7 [1992]

For non-telephone mobile radio

Includes selective calling for private mobile radio.

Multichannel access, MCA, PMR

W01-B05A9 [1992]

Other radio link selection aspects

W01-B05B [1992]

Inductive

See W02-C02 codes for near field inductive systems also.

W01-B05C [1992]

Optical

See W02-C04 codes for optical transmission systems also.

W01-B05X [1992]

Other wireless telephone connection

W01-B06* [1980-2011]

Telecontrol and telemetry systems

*This code is now discontinued and from 2012 this subject matter will be covered by W05-D02 codes. W01-B06 remains valid and searchable for records between 1980 and 2011 when it was used for selection aspects only of telemetry and telecontrol, and was not regarded as the main code for this topic. All aspects of general-purpose telemetry or telecontrol are covered by W05-D codes which should be searched with application as appropriate. Exceptions to this are: general audio/video remote control, coded in W03-G05A codes; remote control for TV receivers coded in W03-A02C codes; remote control for recording equipment coded in W04-E04A; remote control for TV camera coded in W04-M01D1A.

W01-B07

Selection for multiplex systems

See W02-K codes for multiplex systems in general.

Time switch, time division multiplexing (TDM), frequency division multiplexing (FDM)

W01-B08

Testing equipment

This code is used either on its own or in conjunction with other codes from the W01-B group to indicate the type of switching system under test. W01-B08 is intended for testing of selection apparatus only, and **not** for testing of a whole exchange, which is covered by either W01-A06A or W01-C02A codes depending upon the exchange type.

Selection equipment test/maintenance

W01-B09

Signalling

See also appropriate codes for oscillators and tone generators, e.g. U23-F02.

Multi frequency, DTMF signalling, pushbutton dial signalling, MF, dual tone, PB

W01-B20

Other

Includes distribution frames, circuit card mountings and other constructional aspects. See V04-T02 for rack construction in general.

W01-C

Telephony

W01-C01

Subscriber equipment

Includes analogous equipment when used in conjunction with appropriate code.

W01-C01A

Construction (incl. cradle switch mechanical aspects)

Electroacoustic aspects of telephone handsets are assigned V06-V04B1 also.

Mechanical hook switch, mechanical telephone lock, hygiene attachment, disinfecting, cleaning

W01-C01A1 [1992]

Internal construction e.g. PCB Mounting

W01-C01A2 [1997]

Display

This code is intended for constructional aspects arising from the inclusion of a display and does not cover novel display devices such as LCDs themselves, which are covered by W01-C01B3E. Arrangements for display of incoming call number are covered by W01-C01F3. Constructional aspects relating to touch screens are also assigned W01-C01B8H.

W01-C01A2A [2002]

Back or edge lighting for telephone display

From 2007, these topics in general are covered by X26-U04A codes (now the main codes for backlighting and edge lighting) which are also assigned and in U14-K01A4C, assuming LCD. Prior to 2006, W05-E05B codes (now discontinued) were assigned in this role. During 2006 W05-E05B codes were also assigned when wider applications were stated but were not used with W01-C01A2A for cases specific to telephone displays alone.

W01-C01A2C [2006]

Multiple display aspects

Covers the use of more than one display and arrangements for viewing a display from e.g. both sides of a handset.

W01-C01A3 [1992]

Casing and hand set construction

Telephone handsets as casings for electroacoustic transducers are coded in V06-C also. To link the features represented by the following codes with portable mobile phones search with W01-C01D3C.

W01-C01A3A [2002]

Handset with movable portion

Includes 'folding' or 'flip' aspects, e.g. for mobile phones.

W01-C01A3C [2002]

Handset or casing with detachable fascia or similar portion

This code is intended for fascias and similar parts which can be changed by the user, e.g. for customising mobile phones.

W01-C01A3E [2002]

Handset or casing with novel shape or appearance

This code is intended for telephone sets or casings with unconventional shape, e.g. with some novelty or amusement aspect.

W01-C01A3G [2006]

Telephone set incorporated into clothing

Includes telephones, usually of portable type and hence also assigned W01-C01D3C, forming a permanent part of headgear or other clothing. Mountings for telephones which are **detachable** from clothing are covered by W01-C01A5. X27-A02B1 codes are also assigned in either case.

W01-C01A4 [1997]

Radiation exposure protection features

This code covers constructional arrangements, especially shielding and screening, for protecting the user of a mobile phone from RF radiation and is normally used with W01-C01D3C (for cellular handsets). See also V04-U, S05-A03 and W02 codes, especially W02-B08B5 when antenna details are relevant.

Radio telephone, handset, portable, SAR, specific absorption rate

W01-C01A5 [1992]

Support, mounting bracket

Includes arrangements for e.g. wall mounting, or vehicle dashboard installation (with W01-C01D3B) or attaching to belt etc.

W01-C01A6 [1997]

Telephone cover

This code is intended for hard or soft carrying cases for telephone sets, especially hand-held mobile phones for which W01-C01D3C is also assigned. Detachable covers in the form of coloured fascias which can be changed by the user are not included in W01-C01A6 and are assigned W01-C01A3C.

Mobile, radio, portable, case

W01-C01A7 [1992]

Acoustic constructional details

Includes loudspeaker enclosures external to telephone set per se, e.g. for loudspeaker, conference or car telephone. See W01-C01A1 or W01-C01A3 for mounting of loudspeaker or microphone in telephone. (Also assigned V06-V codes and W04-S01 codes).

W01-C01A8 [2009]

Telephone set cooling

(W01-C08X)

This code is intended for novel aspects of cooling for subscriber telephones and related equipment. Other codes are assigned as appropriate, e.g. battery cooling in a mobile phone is represented by W01-C01A8, W01-C01D3C and W01-C01E5B. Cooling of the transmitter part of a mobile phone is also coded as W02-G01H (e.g. with W02-C03C1C, assuming a cellphone). Cooling of telephone equipment in general is covered by W01-C08X. In all cases V04-T03 codes (for cooling electronic equipment in general) are assigned as appropriate.

W01-C01A9 [1992]

Other constructional details

Includes hygiene arrangements, (see also V06 codes) and mechanical locks (also assigned W01-C01B5D when designed to prevent dialling). Telephone cable connected to subscriber equipment is not included, being covered by W01-C01X.

W01-C01B

Subscriber calling devices

See W01-B09 also for MF tone generator.

Rotary dial, pushbutton, key, select, call

W01-C01B1 [1987]

Autodialers, repertory dialling

Number memory, card storage, last number re-dial, automatic dialler, alarm autodialer, modem autodialer

W01-C01B1A [1992]

Number storage, repertory

W01-C01B1B [1992]

Voice dialling, hands free dialling

See also W04-V codes, e.g. W04-V04A, for voice analysis details. For loudspeaker telephone search with W01-C01G2.

W01-C01B1C [1992]

With bar code, OCR input

Novel aspects of optical bar code readers are coded in T04-A03B1 also. Character and pattern recognition aspects are also assigned T04-D codes.

W01-C01B1D [1992]

With external module

Includes unit usable with any MF dialling telephone, e.g. by acoustic coupling to microphone.

Promotional, free gift, accessory, pager

W01-C01B1E [1997]

Reply dialling

(W01-C01B1, W01-C01F3)

See W01-C02B5A for exchange based system.

W01-C01B1F [2002]

Redialers

This code is intended for external boxes redirecting certain calls to secure more favourable tariff, and may be assigned with W01-C01B4 (for least cost routing aspects) depending on the novelty.

W01-C01B1X [1992]

Other automatic dialling

W01-C01B2 [1992]

Dial signal generator

(W01-B09, W01-C01B)

W01-C01B2A [1992]

Producing dial pulses

(W01-C01B)

DP

W01-C01B2C [1992]

Producing tones (includes MF tone generator)

(W01-B09, W01-C01B)

From 9201, tone generator per se is coded (in W01) as W01-C01B2C only. See also appropriate codes in e.g. U23-F.

Dual tone multifrequency, DTMF

W01-C01B3 [1992]

Dial and user interface display

The title of this code has been expanded from 2002 to better reflect its coverage of novel details of display circuitry and the typical additional uses of displays on telephone sets. Constructional details of displays are covered by W01-C01A2 and the display of caller ID by W01-C01F3.

Dial display

W01-C01B3A [2002]

Drive circuitry

Circuitry aspects specific to touch screen operation are covered by W01-C01B8H, which takes precedence over this code.

W01-C01B3C [2002]

Back lighting circuitry and control

Physical aspects of telephone display back- or edge-lighting, such as light sources, diffusers, etc. are covered by W01-C01A2A, and of displays in general by X26-U04A codes from 2007 (previously W05-E05B codes).

W01-C01B3E	[2002]
Novel display for dialling and user interface	
This code is intended to highlight telephone set applications for displays the novel details of which are coded elsewhere, e.g. U14-K01 codes in the case of LCDs.	
W01-C01B4	[1997]
Least cost routing	
(W01-C01B9)	
See W01-C02A7 and W01-C06A for LCR system based at exchange.	
<i>LCR</i>	
W01-C01B5	[1987]
Security, restricted dialling	
Codes in this section cover the use of both electronic and mechanical safeguards against unauthorised use.	
W01-C01B5A	[1992]
Security based on input code or card	
<i>Password, access code, enter, key, card reader</i>	
W01-C01B5B	[1992]
Security based on voice recognition/input	
Voice or other biometrics-based control of access to the phone as a whole is covered by W01-C01Q8C. W04-V codes, e.g. W04-V04A3, are also assigned for speech recognition aspects.	
<i>Designated user, voice print, voice pattern, speaker-dependent</i>	
W01-C01B5C	[1992]
Preventing dialling of predetermined numbers	
<i>Long-distance dialling detector, leading-zero detector</i>	
W01-C01B5D	[1992]
Using mechanical lock	
See W01-C01A9 also.	
W01-C01B5X	[1992]
Other secure dialling arrangements	
W01-C01B7	[1992]
Dial format detection	
Covers circuitry automatically selecting appropriate dial signal generator to suit format of exchange.	
<i>DP, dial pulse, MF, DTMF, dual tone multifrequency</i>	

W01-C01B8	[1992]
Keyboard and other manual input arrangements	
This code covers details of keyboards, pushbuttons, switches and other manual input arrangements for controlling a telephone. W01-C01B8 and its subdivisions are used with V03 codes if the novel aspect is an electromechanical switch or with U21-B codes for electronic switching.	
W01-C01B8A	[1992]
Layout of keyboard	
Includes configuration of keys, provision of special function keys, etc. Special function keys themselves are covered by W01-C01B8K from 2002.	
<i>Braille</i>	
W01-C01B8C	[1992]
Construction of keyboard per se	
W01-C01B8E	[1992]
Key switching element	
This code is used for novel switching elements per se. For novel electronic switch details, U21-B codes are also assigned.	
W01-C01B8G	[1992]
Keyboard illumination	
W01-C01B8H	[2002]
Manual input devices based on absolute position, including touch screen	
Covers devices such as touch pads and touchscreens. Prior to 2006 touch pads and similar 'absolute position' input arrangements not involving displays were covered by W01-C01B8K. Constructional aspects of touchscreens are also assigned W01-C01A2. This code takes precedence over W01-C01B3A (display drive circuitry). Touch screens in general are covered by T04-F02A2.	
<i>Stylus, tablet</i>	
W01-C01B8K	[2002]
Special function keys per se	
Details relating to the layout of keyboards on which special function keys or analogous controls are provided which are not themselves the novel aspect, are covered by W01-C01B8A. From 2006, trackballs, joysticks and the like are covered by W01-C01B8L.	
W01-C01B8L	[2006]
Manual input devices based on relative position	
Covers trackball, joystick, or analogous arrangements for data input (previously coded in W01-C01B8K). See T04-F codes for further details.	
<i>Mouse, track pad, joystick, track ball</i>	

W01-C01B8M [2007]

Key circuitry and coding

See also U21-A05D codes for key coding aspects, e.g. U21-A05D1 for coding arrangements for handling different language character sets.

W01-C01B8N [2009]

External keyboard arrangements

This code is intended for arrangements for using an external keyboard with telephone equipment, including novel keyboards themselves and arrangements for connecting or interfacing them with e.g. a telephone set. Novel digital interfacing aspects of telephones are covered by W01-C01R, with W01-A07H codes assigned as appropriate to indicate the technology used.

W01-C01B9 [1992]

Other subscriber calling device details

W01-C01C

Automatic answering, speech amplifiers, anti-side-tone circuits

W01-C01C1 [1992]

Speech amplifier details

Amplifiers in general are coded in U24-G.

W01-C01C1A [1992]

For microphone

Microphone transducers per se are coded in W01-C01M and, in general, in V06-B02.

W01-C01C1B [1992]

For earphone or loudspeaker

Transducers per se are coded in W01-C01M. For loudspeaker telephone search with W01-C01G2A.

W01-C01C1C [1992]

Gain control

U24-C codes are also assigned for novel circuitry. Control of gain dependent on dominant transmission direction is covered by W01-C01C3A.

W01-C01C1D [1997]

Muting circuit

(U24-C05C, W01-C01C1C)

Includes muting on hold. See W01-C02B2A for exchange details of call holding.

Mute, hold

W01-C01C1X [1992]

Other speech amplifier details

W01-C01C3 [1992]

Anti-sidetone, noise and feedback suppression

W01-C01C3A [1992]

Control of transmit-receive gain

Includes gain control based on dominant transmission direction, e.g. for loudspeaker telephone, also coded in W01-C01G2A. Speech amplifier gain control in general is covered by W01-C01C1C.

W01-C01C3C [1992]

Local noise cancelling arrangements

Includes arrangement of transducers and/or circuitry to achieve cancellation or reduction of ambient noise level.

W01-C01C3E [1997]

Sidetone or feedback suppression

Includes echo suppression for speakerphone, also coded in W01-C01G2A. See also W01-C08E.

W01-C01C5 [1992]

Automatic answering

Centralised answering systems based within a telephone exchange are covered by W01-C02B4 codes.

W01-C01C5A [1992]

Using dynamic recording

See also T03/W04 for e.g. tape deck details.

W01-C01C5B [1992]

Using static recording (RAM etc.)

For storage of audio signals in general using solid-state memory, see W04-G01B codes.

W01-C01C5C [1992]

Date/time recording

Covers arrangements recording time at which message is received.

W01-C01C5D [1992]

Remote control of playback

W01-C01C5E [1992]

Outgoing message transmission

Includes automatic sending of pre-recorded message at preset time. See also W01-C01B1 codes for automatic dialling aspects.

OGM

W01-C01C5F [1997]

Privacy function

Includes password protection for message retrieval in shared device.

Password, PIN, ID

W01-C01C5G [1997]

Caller telephone number recording
(W01-C015X, W01-C01F3, W01-C01F9)
See W01-C01B1E for reply dialling.

W01-C01C5X [1992]

Other automatic answering details

W01-C01C7 [1992]

Digital speech processing
See U21-A and W04-V05 codes for specific processing and coding details.
PCM

W01-C01C7A [2002]

Comfort noise generation

W01-C01C7C [2002]

Novel coding scheme

W01-C01C7E [2002]

Novel speech coders and decoders

W01-C01C7L [2002]

Scrambling and speech coding for security
This code is intended for scrambling aspects within the telephone itself. Overall systems aspects of security are covered by W01-C08F1 codes. Scrambling for speech communication in general is covered by W02-L05, and secrecy aspects of data transmission by W01-A05 codes.

W01-C01C7X [2002]

Other digital speech processing aspects
Includes significant **novel** aspects of speech synthesis or recognition circuitry, e.g. used for voice dialling (W01-C01B1B or W01-C01B5B also assigned depending on purpose), or overall security (W01-C01Q8C). W04-V codes are also assigned.

W01-C01C9 [1992]

Other speech circuitry and systems

W01-C01D [1987]

Cordless, mobile radio telephone
(W01-C01X)
Use with other W01-C codes as appropriate. Cordless and mobile radio telephones are also coded in the appropriate section of W02 for radio equipment (e.g. W02-G02 for transceivers) if any RF aspect is involved. Inventions concerned purely with the telephone aspect are assigned W01-C01 codes only. Mobile radio telephone systems are assigned W01-B05 and W02-C03C codes.
Portable telephone

W01-C01D1 [1992]

Cordless telephone
Includes home-use, multi-user and call-point systems. Search with other W01-C01D codes for telephone which is capable of switching between operating systems e.g. DECT and cellular.
DECT

W01-C01D1A [1992]

Portable unit details
This code covers cordless telephone usable with one or multiple base stations at the subscriber location.

W01-C01D1B [1992]

Base unit details
See W01-C01E5A also for battery charging and mains power unit details.

W01-C01D1D [1992]

Security, ID
See also T04-K codes for SIM card aspects.
Personal identification number, PIN, subscriber identification module, SIM, ID

W01-C01D1E [1992]

Call-point cordless telephone
Covers personal cordless telephone usable with one or multiple distributed callpoints, solely provided by the service provider. See W01-C01D1A for cordless telephone handsets used with a base station at the subscriber location.
CT2, CT3, JCT, PHS, Personal handyphone

W01-C01D2 [1997]

Direct mode communication telephone
Search with other W01-C01D codes for dual mode operating telephones e.g. with W01-C01D3 for telephone that switches from cellular communication to direct mode when possible.
Digital short range radio system (DSRRS)

W01-C01D3 [1992]

Mobile radio telephone
From 1997 all mobile telephones are considered as cellular. For RF aspects of non-cellular mobile telephones search with W02-C03C3 codes. Search with other W01-C01D codes for telephone which is able to switch between communication systems, e.g. DECT and cellular.
GSM, PCN, NADC, JDC, Qualcomm®

W01-C01D3A* [1992-1996]

Cellular

*This code is now discontinued and since 1997 all mobile telephones have been considered to be cellular. This code is therefore no longer assigned, but remains valid and searchable for records prior to 1997.

W01-C01D3B [1992]

Vehicle telephone

The title of this code has been changed (from 2017) to clarify its previous coverage of mobile phones permanently-installed in a land, marine or air vehicle, and also hand-held phones (for which W01-C01D3C is also assigned) having some adaptation such as connection to an external antenna or vehicle interface, mounting cradles, and the like.

Airplane, aeroplane, automobile, bicycle, boat, car, GSM-R, helicopter, lorry, motorcycle, railway, scooter, train, van

W01-C01D3C [1992]

Portable; Hand-held

This code is assigned as a general reference for 'mobile phone', i.e. the terminology is assumed to refer to a hand-held phone unless there is evidence to the contrary. With the convergence of mobile telephone networks and wireless data networks, W01-C01D3C is also assigned for inventions relating to a 'portable terminal', unless there can clearly be no telephone aspect, with 'wireless network' codes (e.g. W01-A06C4 codes and other W01-A codes) being also assigned when appropriate.

W01-C01D3D [1992]

Telephone identification

From 2009 the title of this code is changed (formerly 'Security, ID') to reflect its main focus on identification aspects within the telephone itself. It includes use of e.g. International Mobile Equipment Identity (IMEI) number, and also Subscriber Identity Module (SIM) cards and the like, in the case of mobile phones for which W01-C01D3C is normally also assigned. (T04-K codes are also assigned for smart card aspects). Use of two or more cards is covered from 2010 by W01-C01D3K, which takes precedence over this code. Arrangements to transmit ID data for security and billing purposes which involve some novelty in the phone itself are included here, but novel telephone system aspects of checking ID and entitlement to access e.g. a mobile telephone network are covered by W01-C02B6A (with W01-B05A1A) and are not assigned W01-C01D3D. Subscriber registration (by the telephone network) is covered by W01-B05A1N. General aspects of telephone security such as preventing access, theft alarms and dialling restriction are not included here, being covered by W01-C01Q8 and W01-C01B5 codes respectively.

ID, IMEI, IMSI, MEID, PIN, SIM, USIM, USIMID

W01-C01D3E [1997]

Satellite telephone

RF details of satellite phones are covered by W02-C03B1C and W02-C03C1C (i.e. they are regarded as cellular mobile satellite ground stations), with W02-G codes assigned as appropriate.

Satphone

W01-C01D3G [2002]

'Third generation' mobile phone

This code is assigned for so-called third generation mobile phones, intended to operate in a UMTS system, and for analogous types based on similar multiple access schemes, i.e. other than TDMA alone. For inventions involving some RF novelty W02 codes are also assigned, e.g. W02-C03C1C and W02-C03C1G, along with W02-G codes. Where the novelty resides in the spread-spectrum aspect, W02-K05 codes are also assigned, e.g. W02-K05A7, as appropriate. Systems based on OFDM are assigned W02-K07C as well as W01 and W02 telephone and 'mobile radio' codes. Other W01-C01 codes are assigned with W01-C01D3G as appropriate, depending on the aspect, e.g. W01-C01G6E for connecting to the internet on a 3G phone.

Universal mobile telephone system, 3G, fourth generation, 4G

W01-C01D3J [2002]

Dual or multi-band mobile phone

This code is assigned for phones capable of operating in two or more cellular bands, e.g. 900 and 1900 MHz. As such, it is likely to involve RF details and corresponding assignment of W02 codes. Prior to 2010 W01-C01D3J was assigned to indicate multiple SIM card aspects of mobile phones with W01-C01D3C and W01-C01D3D. From 2010, W01-C01D3K specifically covers the use of multiple SIM cards and W01-C01D3J will only be assigned for genuine multi-band aspects.

GSM, PCS

W01-C01D3K [2010]

Dual or multiple SIM-card mobile phone

This code takes precedence over W01-C01D3D and is assigned for phones capable of operating with two or more SIM cards or analogous devices, e.g. enabling use of different identities or different service providers. Dual or multi-band mobile phones are covered by W01-C01D3J which is also assigned as appropriate. Prior to 2010 W01-C01D3J was assigned for this topic with W01-C01D3D.

Dual SIM, Multi SIM

W01-C01D4 [1997]

Fixed location radiotelephone

This code is broader in scope than other W01-C01D codes and covers the whole subscriber installation, including antennas and 'outdoor units'. Novel aspects of these are highlighted using codes from W02-B (antennas) and W02-G (radio equipment details) groups, and also W02-C03D codes to highlight the 'point-to-point' radio link aspect. Base station or 'exchange-end' aspects are **not** assigned W01-C01D4, but are covered by W01-B05A1G and W02 codes as above.

Remote location, roadside emergency (radio), radio-in-the-loop, wireless local loop, WLL

W01-C01E [1992]

Power supply

(W01-C01X, W01-C07B)

Low-power power supplies in general are covered by U24 codes, which are also assigned as necessary to highlight novel aspects.

W01-C01E1 [1992]

Derived from subscriber line

W01-C01E5 [1992]

Power supply at subscriber location

W01-C01E5A [1992]

From mains including battery charging

See also X16-G01 for battery charger per se. Charging from e.g. a vehicle battery, is covered by W01-C01E5C.

W01-C01E5B [1992]

Battery per se, battery saving, battery supply

See X16 for novel battery detail.

W01-C01E5C [1997]

Charging from battery, or solar source

(W01-C01E5A)

E.g. charging from vehicle battery. See also X16-G02 codes for charger circuit per se.

W01-C01E5D [2005]

From generator including battery charging

Includes the use of mechanical generator, e.g. hand-operated types, for battery charging or short-term powering of a telephone. See V06 for novel generators per se and X16-G, e.g. X16-G02C for battery charging using generators.

W01-C01E5E [2017]

Non-contact charging

Includes wireless mobile phone charging. Non-contact battery charging in general is covered by X16-G03. Wireless transmission of electrical power in general is covered by U24-H02 for low-power systems and X12-H01E for higher power levels.

Non-contact, wireless charging, remote charging

W01-C01F [1992]

Ringling, call screening, call handling, identification of caller

(W01-C01X)

W01-C01F1 [1992]

Ringling

W01-C01F1A [1992]

Transducer per se

See also V06 codes for transducer details. Transducers for microphone or earphone use are **not** included. See W01-C01M.

W01-C01F1B [1992]

Volume setting, muting, drive circuitry

From 1997, volume control based on sensed ambient lighting is coded in W01-C01F1D only. For disconnection determined by actual time of day, see W01-C01F1C.

W01-C01F1C [1992]

Timed disconnection of ringer

W01-C01F1D [1997]

Disconnection or volume reduction based on ambient lighting

(W01-C01F1B, W01-C01F1C)

W01-C01F1E [1992]

Accessory ringer

(W01-C01X)

Includes unit which can be plugged into telephone socket to warn of incoming call only. Prior to 1992 search W01-C05A and W01-C01X.

W01-C01F1F [1997]

Mechanical ringer

Vibrating, silent alert

W01-C01F1G [1997]

Optical ringer

W01-C01F1K [2002]

Automatic switching between different ringer types

This code is intended for arrangements switching between different types of ringer, e.g. switching from mechanical to acoustic ringing if a call is not acknowledged. Arrangements for signalling different types of incoming call, e.g. by means of different tones or tone sequences, are covered by W01-C01F1M. Facilities for inputting ringing tone sounds or musical extracts to be stored as ringing tones are covered by W01-C01F1P.

W01-C01F1M [2002]

Signalling different incoming call types

Covers arrangements for signalling different types of incoming call, e.g. voice calls and text messages, by means of different tones or tone sequences. For aspects specific to SMS and similar telephones, search with W01-C01G6 codes.

W01-C01F1P [2002]

Memory storage input for ring tone generation

Covers arrangements for inputting, including downloading, of ringing tone sounds or musical extracts to be stored as ringing tones. Search with W01-C01Q2 codes for storage of ringing tones in memory. Sampling in electronic musical instruments is covered by W04-U01C1, and sequencer arrangements in W04-U06, these codes being assigned also as appropriate for genuine novel aspects. Waveform storage for tone generation in general is covered by U23-F codes.

W01-C01F3 [1992]

Display of caller number

Covers display of **incoming** calls originating number only. Display of dialled numbers is covered by W01-C01B3 codes.

W01-C01F5 [1992]

Call screening, password systems

(W01-C01X)

Includes automatic arrangements requiring receipt of additional code signal to actuate ringer, for example. Arrangements displaying calling subscriber's number enabling choice of answering only, are coded in W01-C01F3.

W01-C01F6 [1997]

Controlling built-in and external equipment in response to incoming call

(W01-C01F9, W01-C05B5A, W03-G05)

From 2006 the scope of this code has been expanded and subdivided to allow highlighting of control, e.g. muting or pausing, of built-in audio, video, or other equipment in response to an incoming call, in addition to the previous usage for transmitting control signals to external equipment.

W01-C01F6A [2006]

Controlling internal equipment in response to incoming call

This code covers the control of additional equipment built-in to a telephone, such as audio or video players, in response to an incoming call. W01-C01P6 codes are also assigned as appropriate.

W01-C01F6C [2006]

Controlling external equipment in response to incoming call

This code covers the control of equipment external to a telephone, such as audio or video players, in response to an incoming call.

W01-C01F8 [2005]

Call handling

Covers arrangements for call handling using a variety of methods, e.g. text message, ringing, voice message, etc. Exchange-based call handling systems are covered by W01-C02B codes, especially W01-C02B2 codes.

W01-C01F8A [2005]

Based on Caller ID

Covers handling of incoming calls based on CLI information, e.g. activating ringer for priority numbers, sending a voice or text message for others.

W01-C01F8C [2005]

Based on profile, e.g. Presence-Enhanced Contacts profile

Provides a dynamic profile of the user, visible to others, the user's availability, whereabouts and suitable methods of communication. System aspects of telephone call handling are covered by W01-C02B2N.

W01-C01F9 [1992]

Other incoming call alerting aspects

W01-C01G [1992]

Equipment type

Codes in this section do not necessarily indicate novel aspects and are assigned with other W01-C01 codes as appropriate. Cordless and mobile radio telephones are **not** coded here - see W01-C01D codes.

W01-C01G1 [1992]

Intercom

(W01-C01, W01-C04)

This code is used for an otherwise standard telephone with an intercom facility, and **not** an intercom of e.g. apartment block security type with no telephone aspect, which is coded in W01-C04. See W01-C01D2 for direct communication between radio telephones.

W01-C01G2 [1992]
Loudspeaker and hands-free telephone
(W01-C01, W01-C04)
The title of this code has been expanded from 2002 to better reflect its coverage of loudspeaker telephone and hands free telephone.

W01-C01G2A [2002]
Loudspeaker telephone

W01-C01G2C [2002]
Headset telephone
(W01-C01G9)
Includes 'hands-free kit' mobile phone, for which W01-C01D3C is also assigned. Telephone headset aspects were previously coded in W01-C01G9.
Hands free

W01-C01G3 [1992]
Pushbutton/key telephone
Prior to 1992, pushbutton and key telephone **systems** were coded in W01-B03, W01-C01X and W01-C02X. From 1992 see W01-C02G5C.

W01-C01G4 [1992]
Video telephone
(W01-C01X, W01-C05B1, W02-F09)
Also coded in W02-F08B3. For complete video telephone system see W01-C05B1 codes and W02-F08B1.

W01-C01G5 [1992]
Conference telephone
(W01-C01, W01-C04)
See W01-C02B1 for exchange details. For video conference telephone search with W01-C01G4. Prior to 1992 search W01-C05B1, W02-F09 and W01-C01X.

W01-C01G6 [1992]
Screen text and internet communication telephone
The title of this code has been expanded from 2002 to better reflect coverage of SMS, email and internet communication. Telephone network aspects of text-based communication in general are covered by W01-C05B1A.

W01-C01G6A [2002]
SMS
This code is intended for 'text messaging', primarily in mobile phones, for which W01-C01D3C is also assigned.
Short message service

W01-C01G6B [2005]
MMS
This code is intended for "multimedia messaging", primarily in mobile phones, for which W01-C01D3C is also assigned.
Multimedia messaging service, picture messaging, MMS

W01-C01G6C [2002]
Email
Email in general is covered by T01-N01C, which is also assigned here.

W01-C01G6E [2002]
Internet communication
This code is assigned with W01-C01D3 codes for WAP phone aspects, e.g. W01-C01D3G for '3G' or '4G' handsets, and with W01-C01P1 for multimedia aspects. W01-C01G6E includes telephone sets equipped for placing calls over the internet, e.g. using VoIP. (Systems aspects of VoIP are covered by W01-C05B4C). Phones using push to talk over packet network technology are covered by W01-C01G6H.
i-mode

W01-C01G6F [2005]
Instant messaging
This code covers phones with the provision of real time mobile communication using instant messaging.

W01-C01G6G [2002]
Data streaming and packet handling
This code is intended for telephones capable of data streaming and packet handling, e.g. for GPRS when used with W01-C01D3 codes.
GPRS, EDGE, packet

W01-C01G6H [2005]
Push to talk over packet network
This code covers phones providing direct one-to-one or one-to-many voice communication using 'push to talk' Voice over IP (VoIP) communication over packet-based networks. Telephone systems aspects are covered by W01-C05B4G. Phones using VoIP technology other than push to talk are covered by W01-C01G6E.
PoC

W01-C01G8 [1992]

Feature telephone and smartphone

Covers telephone set with several features, e.g. operated by special keys or additional software modules, including smart phones which from 2016 are covered by W01-C01G8S. (Prior to 2016 W01-C01G8 codes were assigned as appropriate for this topic together with W01-C01P2 for PDA aspects and W01-C01D3C to denote hand-held mobile phones). For program control and software aspects search with W01-C01Q3 codes, T01-F codes and T01-S codes.

W01-C01G8A [2002]

User interface management/menu-driven telephone set

Covers telephone, especially of mobile type (W01-C01D3 codes also assigned in that case), in which particular features are accessible via a menu system or via a special user interface, e.g. using a reduced number of keys. Special function keys themselves are covered by W01-C01B8K. Control circuitry in general for telephones is covered by W01-C01Q codes, which may also be assigned depending on novelty. GUI aspects are also covered by T01 codes, e.g. T01-J12 codes.

UI, pull down menu, window, split screen, icons

W01-C01G8C [2002]

Automatic selection of functions

Covers telephones, especially of mobile type (W01-C01D3 codes also assigned in that case), in which particular features are selected without direct action by the user, based on sensed conditions or environment.

W01-C01G8E [2007]

Haptic feedback control

This code covers sense of touch feedback control, including force and vibrating feedback. Signal processing aspects of feedback control are covered by W01-C01Q6E.

W01-C01G8S [2016]

Smartphone

This code is intended to represent phones (normally mobile for which W01-C01D3C is also assigned) having computing capability using a dedicated or adapted operating system with the ability to run application software that may be downloaded by the user. While it is recognized that the majority of mobile phones now fall into this category the code is intended as a search reference for this topic which prior to 2016 was represented by W01-C01G8 codes with W01-C01D3C and W01-C01P2 as necessary for 'PDA' aspects. For inventions concerned with software and program control aspects such as operating system details or mobile 'apps' search with W01-C01Q3 codes and T01-F codes.

Android®, BlackBerry®, Mozilla Firefox®, OS, iOS, Windows Phone®

W01-C01G9 [1992]

Other telephone set type

Prior to 2002, this code was used for telephone headsets which are now covered by W01-C01G2C.

W01-C01H [1992]

External devices switching interface

(W01-C01X)

This code is used for arrangements to interface with e.g. facsimile equipment (see S06-K07C2B also) and includes automatic switching on detection of type of call.

W01-C01J [1992]

Metering at subscriber equip. location

(W01-C01X, W01-C06)

From 1992 subscriber metering is coded in W01-C01J only, and not W01-C06.

W01-C01K [1992]

Subscriber equipment testing

This code is intended for testing using external apparatus. From 2002, self testing and monitoring as part of a telephone set control system is covered by W01-C01Q1. See W01-C08C codes for testing in general, which may also be assigned with W01-C01K when specifically relevant.

W01-C01L [1992]

Network interface aspects

(W01-C01X)

The title of this code has been expanded from 2002 to better reflect its coverage of ADSL aspects in addition to interfaces for ISDN. Connection of telephone sets with external equipment using a digital interface is covered by W01-C01R.

W01-C01L1 [2002]

ISDN interface

See W01-C05B7 codes for all aspects of ISDN.

W01-C01L3 [2002]

ADSL interface

ADSL is covered by W01-C05B8A.

W01-C01L5 [2002]

Splitter arrangements, e.g. POTS/ISDN splitter

W01-C01L7 [2002]

Standard, i.e. POTS line interface

(W01-C01X)

W01-C01L9 [2002]

Other network interface aspects

W01-C01M [1992]

Acoustic transducers (microphones and loudspeakers)

For full details of transducers search with appropriate codes in V06. (Ringing transducers are covered by W01-C01F1 codes only, e.g. W01-C01F1A for acoustic ringing and W01-C01F1F for vibrating types).

W01-C01N [1992]

Extension and line holding arrangements

Includes automatic arrangement to restore on-hook condition. See W01-C01D1 codes only for cordless telephones.

W01-C01P [1997]

Telephone apparatus integrated with other device (W01-C01X, W01-C05B)

Covers telephone combined with other equipment (in the form of hardware or a software module), forming a single unit. See W01-C05B codes for combination of external devices with telephone equipment and systems.

W01-C01P1 [1997]

Multi media apparatus

See also T01-J30 codes and W01-C05B2 for system aspects. Prior to 2011 this code was also assigned for multimedia aspects of DMB receivers. From 2011 these are covered solely by W01-C01P6G and W03-A11G5.

W01-C01P2 [1997]

Personal digital assistant

See also T01-M06A1A and W01-C01D codes for mobile telephone aspects.

Personal digital organiser, PDA

W01-C01P3 [1997]

Telephone answering machine (W01-C01C5)

See W01-C01C5 for answering machine details.

W01-C01P4 [1997]

Facsimile machine

See also S06- D to K codes. General telephone systems aspects of facsimile are covered by W01-C05B1C.

W01-C01P5 [1997]

Modem

General telephone system aspects of modems are covered by W01-C05B3A.

W01-C01P6 [2005]

Telephone with built-in entertainment device

Novel details of audio and video equipment are also assigned W03 or W04 codes as appropriate.

W01-C01P6A [2005]

Portable audio player/recorder

W04-G01B8 is also assigned for solid-state audio players such as MP3 types, with other W04 codes as necessary for novel aspects.

W01-C01P6C [2005]

Digital camera

W04-M01B1 codes are also assigned, and for novel details of digital cameras other W04-M01 codes are applied as necessary. Video phones are covered by W01-C01G4.

Camera phone

W01-C01P6E [2005]

Broadcast radio receiver

W03-B codes are also assigned for specific radio receiver aspects.

W01-C01P6G [2005]

Broadcast TV receiver and digital multimedia broadcast receiver

From 2011 the title of this code has been changed to reflect the inclusion of DMB receivers for which W03-A11G5 is also assigned, along with other W03-A codes as necessary. Prior to 2011 W01-C01P1 was also assigned to indicate multimedia aspects depending on novelty.

W01-C01P6J [2005]

Video player/recorder

From 2009 the title of this code has been expanded to reflect the previous inclusion of video players as well as recorders. Novel details of the video recorder/player are also assigned W04 codes, e.g. W04-P01C8 for solid-state types.

W01-C01P6L [2005]

Game player

See W04-X02 codes for gaming aspects in general and T01-J30B and T01-N01B1 for computer gaming.

W01-C01P6X [2005]

Other entertainment equipment built into a telephone set

W01-C01P7 [2005]

Navigational receiver

Covers telephones with integrated navigational receiver, e.g. a GPS receiver. See W06-A codes also for details of navigational systems, e.g. W06-A03A codes for GPS.

W01-C01P8 [2007]

Medical parameter monitoring equipment

This code includes arrangements for monitoring physiological parameters such as vital signs to determine the health status of a person, or in connection with sporting activity (in which case e.g. W04-X01A1 or other W04-X01 code is also assigned), using a built-in phone monitoring device. See also S05 codes, for medical monitoring equipment in general, to highlight specific measurements.

W01-C01P9 [1997]

Other equipment built into a telephone set

Includes 'alarm clock' (also assigned S04-B05), built-in smart card or similar (also assigned T04-K codes) for use with ticket gates (also assigned T05-D01A1), built-in OCR facility (also assigned T04-D codes), built-in torch (also assigned X26-E01 codes) or any other built-in equipment not covered by the above subdivisions.

W01-C01Q [2002]

General control circuitry for telephone sets

These codes are intended to cover general aspects of telephone set control and especially microprocessor-based aspects which are also assigned T01-J08A codes as appropriate. For aspects specific to menu-driven telephone sets, search with W01-C01G8A.

W01-C01Q1 [2002]

Self testing and monitoring

Testing of subscriber telephone using external equipment is covered by W01-C01K.

W01-C01Q1A [2002]

Checking remaining battery capacity

This code is assigned with W01-C01E5B. Checking battery charge state in general is covered by S01-G06A and X16-H01.

W01-C01Q2 [2005]

Memory storage

Covers memory storage facilities for data, including application programs, music and video files. See also W01-C01Q3A for software updating and modification and W01-C01B1A with W01-C01D3D (and e.g. W01-C01D3C) for storage of telephone numbers within a mobile phone SIM card.

W01-C01Q2A [2005]

Internal memory

Covers memory forming a fixed part of the phone.

RAM, flash memory

W01-C01Q2C [2005]

External memory

Covers user-changeable memory, e.g. cards. See also T01-H01B3A for memory cards per se.

Memory card, CF[®], SD[™], miniSD[™], MMC[™], reduced size MMC[™], memory stick[®], xD card[™], smartmedia[™]

W01-C01Q3 [2002]

Program control aspects

From 2016 this code is further subdivided to differentiate between program control aspects relating to a phone's operating system (W01-C01Q3C) and those relating to installed or downloaded programs (W01-C01Q3E). Program control in computer and microprocessor systems is covered by T01-F codes, software development by T01-J20 codes and software content by T01-S codes, which are also assigned as appropriate. For application to smartphones search with W01-C01G8S (from 2016).

W01-C01Q3A [2002]

Software updating and modification

Includes arrangements for downloading or otherwise inputting data to modify the control program.

W01-C01Q3C [2016]

Program control aspects and software relating to operation of phone itself

This code covers any novel aspects of the operating system (OS), and also multiple OS phones.

W01-C01Q3E [2016]

Program control aspects and software relating to applications

Includes novel application software ('apps') and their development and also inventions relying on apps, whether pre-installed or downloaded by the user.

W01-C01Q4 [2005]

Voice activated control

Includes the use of voice to control the operational aspects of the telephone. See also W01-C01B1B for voice dialling per se and W01-C01B5B for restricted dialling based on voice recognition. Control of access to the phone as a whole based on voice or other biometric aspects is covered by W01-C01Q8C. W04-V codes, e.g. W04-V04A, are also assigned for speech recognition aspects.

Voice command

W01-C01Q5 [2002]

Sensing systems

Covers arrangements for determining particular conditions relating to the environment or usage of the telephone. Checking battery charge state is covered by W01-C01Q1A.

W01-C01Q5A [2002]

Sensing user proximity

Covers arrangements for determining that a telephone or handset is being held by the user, e.g. by proximity sensing, to control parameters such as loudspeaker volume. This relates especially to portable telephones, in which case W01-C01D3C is also assigned. Human presence detection in general is covered by S03-C06 codes. Arrangements for determining a quiescent state, i.e. non-usage of the telephone, and switching between this and an active state, are covered by W01-C01Q7A.

W01-C01Q5B [2007]

Sensing other users in the vicinity

This code includes arrangement for sensing/detecting other users in the vicinity. See also W01-C01R and W01-A07H codes for the type of medium being used.

Proximity Mail ®

W01-C01Q5C [2002]

Sensing connection of external devices

This relates to sensing the connection of external headsets, car adapters for portable phones, PCs, and any other equipment whose connection requires some change in the operation of the telephone set.

W01-C01Q5G [2014]

Sensing acceleration, orientation and relative position

Covers arrangements for sensing movement or orientation of a phone, especially a mobile phone for which W01-C01D3C is also assigned, e.g. for auto-rotating display images, coming out of standby mode, or camera shake detection for which W01-C01Q6A, W01-C01Q7A or W01-C01P6C respectively are also assigned as necessary. Novel aspects such as transducers are also assigned S02 codes, e.g. S02-B07 codes for gyro-based sensors or S02-G03 for accelerometers. Sensing of direction or absolute position using e.g. a compass or navigational systems is not included and is covered by W01-C01P7.

Angle, landscape, portrait, rotate, turn

W01-C01Q5X [2002]

Other sensing systems for telephone sets

Includes fingerprint sensors.

W01-C01Q6 [2006]

Multimedia processing aspects

Covers processing aspects of the telephone, including graphics and display, audio, haptic and tactile and any general processing aspects.

Acceleration, rendering, GPU

W01-C01Q6A [2007]

Graphics and display processing

(W01-C01B3A, W01-C01Q6)

Previously coded in W01-C01Q6. Includes arrangements for processing graphical and display information that is not part of the display screen hardware. See also T01-C04D for computer display processing. Prior to 2006, all aspects of display/control circuitry were coded in W01-C01B3A.

Acceleration, rendering, GPU

W01-C01Q6C [2007]

Audio signal processing

Includes arrangements for processing audio signals other than for normal speech processing for communication, which is covered by W01-C01C7 codes. In all cases W04-V codes are also assigned for specific processing and coding details.

MIDI, Wave

W01-C01Q6E [2007]

Haptic and tactile processing

This code covers processing necessary for implementation of haptic functions, e.g. in connection with user interface aspects. Novel transducers and drive circuits for haptic features are covered by W01-C01G8E.

W01-C01Q6X [2007]

Other multimedia processing

W01-C01Q7 [2002]

Standby and related systems

This covers arrangements for disabling parts of a telephone, especially a portable type (with W01-C01D3C) as a power-saving measure.

W01-C01Q7A [2002]

Determining quiescent state

This covers arrangements for determining a quiescent state based on e.g. non-actuation of keys for a preset period.

W01-C01Q8 [2002]

Security aspects

This code is used for general security aspects of the telephone control system. SIM card aspects of mobile phones are covered by W01-C01D3D and security aspects involving dialling restrictions are covered by W01-C01B5 codes. From 2010 W01-C01Q8E is introduced for arrangements to prevent access to confidential data stored in a mobile phone.

W01-C01Q8A [2002]

Theft alarms

This code covers alarms warning of the possible theft, or leaving behind, of a telephone set itself, again usually of portable type (with W01-C01D3C). W05-B01 codes for theft alarms are also assigned as appropriate.

W01-C01Q8C [2005]

Security based on biometrics identification

Includes control of access to the phone as a whole based on fingerprint, eye or voice recognition. Restricted dialling alone based on voice recognition is covered by W01-C01B5B. W04-V codes, e.g. W04-V04A3, are also assigned for speech recognition aspects and S05-D01C5A for fingerprint and eye recognition aspects.

W01-C01Q8E [2010]

Preventing access to confidential data

This code is intended for arrangements with the emphasis on preventing access to confidential data stored in a mobile phone or similar. It includes arrangements for erasing data both locally and remotely (e.g. by the owner or service provider in the case of a stolen device), and also for preventing unauthorised access via a Bluetooth® or similar link. Aspects involving the digital interface itself are also assigned W01-C01R. Preventing access to, or use of, the phone as a whole is covered by other W01-C01Q8 codes or W01-C01B5 codes.

Anti-hacking, Bloover, bluejacking, bluesnarfing, intrusion, remote erasure

W01-C01Q9 [2002]

Other general telephone set control circuitry aspects

W01-C01R [2006]

Interfacing systems

(W01-C01X)

This code includes the interfacing of a telephone set (usually mobile, for which W01-C01D3C is also assigned) to a local external device via a digital connection. From 2011 it is subdivided to differentiate between novelty in the interface itself and applications where the **use** of the interface is significant. W01-A07H codes are also assigned to highlight the interface medium used when specific, e.g. W01-A07H2A for a Bluetooth® link. See also T01-C codes for interfacing with a computer. Circuits and components for interfacing with PSTN landlines are not included and covered by W01-C01L codes. 'User interface' aspects such as GUI or menus etc. are **not** included, being covered by W01-C01G8A.

Bluetooth®, Firewire®, IEEE1394, i-link®, infrared data association, IrDA, RS-232, RS-485, serial port, TransferJet™, USB, universal serial bus

W01-C01R1 [2011]

Novel details of telephone digital interface

This code is intended for novel details of digital interfaces for telephones, including software and also hardware aspects such as connectors and circuitry.

W01-C01R5 [2011]

Applications of telephone digital interface

This code is intended for significant applications of digital interfaces for telephones, e.g. where an invention relies on the use of the interface to connect a phone with an external system or equipment.

W01-C01V [2017]

Manufacturing subscriber equipment

Includes manufacturing of home telephones, mobile phones, smartphones, or other subscriber equipment, for which additional W01-C01 codes are assigned as necessary. This code covers assembly of subscriber equipment and also manufacture of items specific to the equipment itself, such as housings, PCBs and the like. Manufacture of bought-in components such as audio transducers, semiconductor devices or displays is not included and for these aspects see codes relating to the component itself, e.g. U14-K01A1J for LCD manufacture.

Assembly, fitting, molding

W01-C01W [2017]

Recycling subscriber equipment

Includes recycling of all kinds of subscriber apparatus including landline telephones, smartphones, and accessories. Other W01-C codes specific to the equipment being recycled are also assigned, e.g. W01-C01G8S for smartphones. Materials recovery and recycling of electronic components in general is covered by V04-X01C and electrical aspects of recycling in general are covered by X25-W04.

Environmentally-friendly, rare earth, recycle, reprocess, reuse

W01-C01W1 [2017]

Equipment design and components improving recyclability

Covers design features including use of recycled components and materials and selection of components and materials that facilitate the recycling of unwanted telephone equipment.

Recyclable

W01-C01W5 [2017]

Equipment and methods of recycling

Covers equipment and methods used in recycling of subscriber equipment, e.g. for disassembly, recovery of reusable components or valuable materials. Machines dispensing a payment in return for deposited recyclable items in general are covered by T05-H02E which is also assigned as appropriate.

Desoldering, dissolving, heating, kiosk, reverse-vend, separating, tools

W01-C01X

Other subscriber equipment

W01-C02

Automatic/semi-automatic exchanges

See W01-B codes for actual selection details. Data exchange e.g. for networks is covered by W01-A06 codes.

W01-C02A

Supervising, testing, indicating faults

See W01-B08 for selection system testing and W01-C08C codes for general aspects.

W01-C02A1 [1987]

Monitoring/testing exchange

Codes in this section are also used with W01-C08C5 for testing of an exchange from an external maintenance centre.

W01-C02A1A [1992]

Statistical metering

(W01-C02A, W01-C06)

Covers detection of overload/blocking condition and general measurements on telephone system usage and performance, including call centre operator call handling (with W01-C02G3 codes)

W01-C02A1C [1992]

Fault location, standby systems

Standby systems for data networks are covered by W01-A06A1 code, for line systems in general by W02-C01D3 codes, and for radio equipment by W02-G08 codes.

Redundancy, hot standby, back-up

W01-C02A5 [1987]

Testing external system incl. subscriber loop

Testing for line systems in general is covered by W02-C01D codes.

Continuity test

W01-C02A5A [1992]

Discriminating line fault from apparatus fault

Internal/external fault discrimination

W01-C02A7 [1992]

Control of exchange

Includes overall control of operation and functions such as least cost routing (also coded in W01-C06A). Network resource allocation is covered by W01-C02A7 and W01-C02A1A. Radio resource allocation in general is covered by W02-C03E7 and when relating to cellular mobile telephone systems W01-B05A1 and W02-C03C1 codes are also assigned as appropriate.

Stored program, control, SPC, computer, microprocessor, microprogram, LCR

W01-C02A7A [1997]

Intelligent network

(W01-C02A7, W01-C02B)

See also W01-C02B codes for special features and T01-J08C codes for communication control aspects.

W01-C02B

Special subscriber services

Codes in this section deal with services wholly provided by the exchange itself, and also those involving external services (W01-C02B7 codes).

Call interception

W01-C02B1 [1987]

Conference systems

See W01-C01G5 for subscriber conference equipment. TV conference systems are covered by W02-F08A, combine with W01-C codes as appropriate for any telephone aspects. For example, moving-picture TV conference system using the telephone network is coded as W01-C02B1, W01-C05B1E, W02-F08A1 and W02-F08B1.

Bridge, multiple subscriber connection

W01-C02B2 [1992]

Call forwarding, transfer and diversion

For topics below relating to automatic exchange functions W01-C02G5A is normally assigned as well.

W01-C02B2A [2002]

Direct-inward dialling

This code is intended for systems allowing direct dialling, e.g. by entering additional digits once a connection to an exchange is made.

W01-C02B2C [2002]

Simultaneous or successive ringing of extensions

This code is intended for arrangements to ring a number of extensions until a call is answered.

W01-C02B2E [2002]

Call diversion

This code is intended for the facility by which a subscriber can set up or cancel call diversion, and specify a number to which calls are to be routed **without** ringing of the subscriber's telephone. Call forwarding based on a call going **unanswered** is covered by W01-C02B2L. Time-dependent operation of this feature is indicated by assignment of W01-C02B2J also. Call barring is covered by W01-C02B2G.

Redial, redirect

W01-C02B2G [2002]

Call barring

This code is intended for the facility by which a subscriber can set up or cancel a call barring facility. Time-dependent operation of this feature is indicated by assignment of W01-C02B2J also. Call diversion is covered by W01-C02B2E.

W01-C02B2J [2002]

Time-dependent call handling

This code is intended for the facility by which a subscriber can establish time windows for operation of call handling features. It is used in conjunction with other W01-C02B2 codes as necessary.

W01-C02B2L [2005]

Call forwarding

This code is intended for the facility by which a subscriber can set up call forwarding, and specify a number to which unanswered calls are to be forwarded. Call diversion **without** ringing is covered by W01-C02B2E and call barring is covered by W01-C02B2G.

Redial, redirect

W01-C02B2M [2006]

Call transfer

This code is primarily intended for manual arrangements for re-directing a received call to another extension. Automatic arrangements for diversion of calls are covered by W01-C02B2E if no ringing of the dialled telephone occurs and W01-C02B2L if the call is forwarded only if unanswered.

Redial, redirect

W01-C02B2N [2006]

Based on profile, e.g. Presence-Enhanced Contacts profile

Provides a dynamic profile of the user, visible to others, the user's availability, whereabouts and suitable methods of communication. Subscriber telephone set aspects of profile-based call handling are covered in W01-C01F8C.

W01-C02B2X [2002]

Other incoming call handling functions

W01-C02B3 [1992]

Camp-on, call-back and caller ID system.

The title of this code has been expanded from 2002 to better reflect its coverage of caller ID systems. See also W01-B03C for **novel** aspects of caller ID systems and call tracing.

W01-C02B3A [2002]

Camp-on and call-back

W01-C02B3C [2002]

Caller ID transmission

(W01-B03C, W01-C02B9)

W01-C02B3E [2002]

Inhibiting ongoing transmission of caller ID

(W01-B03C, W01-C02B9)

This code includes the use of digit sequences entered by a calling subscriber before dialling, to inhibit the caller ID feature of the exchange.

Withheld Number

W01-C02B4 [1992]

Centralised call answering

Automatic answering equipment wholly at the subscriber location is covered by W01-C01C5 codes. Voice mail is covered by W01-C02B7C.

W01-C02B4A [1997]

Call holding

Search with W01-C05B5A for music on hold. Line holding circuits for subscriber telephones are covered by W01-C01N.

Music on hold, call waiting

W01-C02B5 [1992]

Number storage, centralised autodial

Subscriber-based autodial systems are covered by W01-C01B1 codes.

W01-C02B5A [1997]

Reply dialling

See W01-C01B1E for reply dialling based at subscriber apparatus only.

W01-C02B6 [1992]

Graded service

W01-C02B6A [1992]

Determining entitlement to level of service

Includes checking of ID in e.g. cellular telephone network (also coded as W01-B05A1A and W02-C03C1 codes).

W01-C02B6C [2002]

Denying access to telephone service based on non-entitlement

Includes inhibiting access using e.g. stolen mobile phone. Arrangements for inhibiting any mobile phone in a sensitive area are covered by W01-C08F5.

W01-C02B7 [1992]

Involving facilities external to exchange

Codes in this section are used with W01-C05 codes as appropriate to the external service provided. The concept of 'external' is intended to denote facilities not involved in the primary function of the exchange.

W01-C02B7A [1992]

Paging

See also W01-C05A and W05-A05C codes. Short messaging service is coded in W01-C02B7D only.

W01-C02B7B [1992]

Alarm monitoring systems

Covers exchange monitoring of external alarms, see also W01-C05A and W05-B05 codes. From 2002 alarm systems communicating via the telephone network **without** any novelty in the telephone aspect are covered by W05 codes only.

W01-C02B7C [1992]

Voice mail system

See also W01-C05B5E for recording aspects.

W01-C02B7D [1997]

Short messaging service

Covers transmission of paging message to radio telephone. See W01-B05A1F for switching details, and W01-C01G6A for SMS telephones themselves. See W01-C02B7A for telephone exchange aspects of paging systems.

W01-C02B7E [2002]

Automatic directory enquiry services

(W01-C02B7X, W01-C05B5C)

Automatic directory enquiry services are now only also assigned W01-C05B5C for specific details of the database or similar system, for which T01-J05B codes are likely to be used as well.

W01-C02B7F [2005]

Multimedia messaging service (MMS)

Covers transmission of messages to a (usually mobile) telephone including a combination of image, sound and text. Aspects specific to the telephone itself are covered by W01-C01G6B.

Multimedia messaging service, picture messaging, MMS

W01-C02B7G [2007]

Centralised storage of user profile

Includes arrangement of storing user profiles in a central place, and downloading the profile to the phone on power-up when connected to network.

W01-C02B7H [2007]

Transfer of personalised ringtone

Includes arrangements for sending a personalised ringtone to the called person.

W01-C02B7L [2007]

Location based service

Includes arrangement of providing a personalised service, based on the location of the mobile terminal. See also other W01-C02B and W01-C05 codes for the type of service being offered.

W01-C02B7X [1992]

Other external service provision

Prior to 2002, automatic directory enquiry services were coded here as well as in W01-C05B5C. (Now covered by W01-C02B7E)

W01-C02B8 [1992]

Alarm call systems

Includes 'early-morning-call' type system.

Automatic, select, key, dial

W01-C02B9 [1992]

Other subscriber services

Includes interactive voice response (IVR) systems for which W04-V04 codes are also assigned.

IVR

W01-C02C [1992]

Attendant desk, consoles

(W01-C02X)

W01-C02C1 [1997]

Automatic call distribution or call centre console

ACD

W01-C02D [1992]

Interfacing with external network

(W01-C02X)

Includes circuits and arrangements for connection to subscriber lines and inter-exchange trunks (also coded in W01-C03).

W01-C02D1 [1992]

Subscriber line interface circuit

See also W01-C08B for hybrid circuit details.

SLIC

W01-C02D3 [1992]

Transmission of ringing signals

Subscriber set ringers are covered by W01-C01F1 codes. See W01-C07B also where current supply aspects are involved.

W01-C02D5 [1992]

Reception of ringing signals, line state details

W01-C02E [1992]

Power supply details

See also W01-C07B for current supply details. Subscriber set aspects are covered by W01-C01E codes.

W01-C02G [1992]

Exchange type

Codes in this section are used to indicate exchange type only and do not necessarily represent novel aspects.

W01-C02G1 [1992]

Central office type

Attendant/operator system

W01-C02G3 [1997]

Automatic call distribution or call centre

(W01-B03, W01-C02B2)

W01-C02G3A [1997]

Automatic call distribution centre

(W01-B03, W01-C02B2)

ACD

W01-C02G3B [1997]

Call centre

(W01-B03, W01-C02B2)

W01-C02G5 [1992]

Private exchange

Search with W01-B05A1 codes for radio private exchange. Search with W01-C03 for centrex.

W01-C02G5A [1992]

Automatic, i.e. PABX

See W01-C02B2 for direct inward dialling details.

W01-C02G5B [1992]

PBX

(W01-C02X)

Attendant/operator system

W01-C02G5C [1992]

Key telephone system

Prior to 1992, key telephone systems were coded in W01-B03, W01-C01X and W01-C02X. For subscriber set aspects see W01-C01G3.

W01-C02X

Other telephone exchange aspects

From 1992, semi-automatic systems are coded in W01-C02G codes and other W01-C02 codes as appropriate.

W01-C03

Interconnection between switching centres

See also W01-B03A when emphasis is on switching aspects. See W01-B05A3 and W02-C03C3G for trunked radio telephone system.

Inter-exchange connection, telephone trunk, leased line

W01-C03A [1997]

Virtual private network

See W01-C02G5 codes for aspects of private networks. VPNs as data network, i.e. not specifically for telephone service, are covered by W01-A06B7G.

VPN

W01-C04

Interconnection without centralised switching

Includes party-line systems (see W01-B04 for selection aspects). See W01-B05A1D for direct communication between radio telephones. Prior to 1992 this code was also used for loudspeaker telephones, now coded in W01-C01G2.

Feedback suppression, transmission switching, call signal generator

W01-C04A [1997]

Intercom

Includes aircraft crew or mineshaft intercom. For intercom combined with subscriber apparatus see W01-C01G1.

W01-C04A1 [1997]

Entryphone

Search with W02-F01A1 for video entryphone.

W01-C05

Telephonic systems combined with other electrical systems

In general, from 2002 pure **applications** of the telephone network to alarm signalling, telemetry, telecontrol and similar topics are not covered here, the W01 codes being reserved for cases of genuine 'telephone novelty' or where no provision exists elsewhere to highlight the telephone aspect.

W01-C05A

With annunciator or alarm systems

See W05 codes also for application to e.g. selective calling systems or alarms (e.g. W05-B05 codes).

Central station alarm signalling, paging system

W01-C05A1 [2002]

Emergency call location determination systems

See W01-B03C also for call tracing and caller ID aspects, and W02-C03C1E for mobile location determination in cellular telephone systems.

Enhanced 911, E911, FCC

W01-C05B

With telegraphic, entertainment, video, or dictation systems

From 1992, all telephone aspects of ISDN are covered by W01-C05B7 codes. From 1997, multimedia systems are coded in W01-C05B2

W01-C05B1 [1987]

With video, incl. facsimile, videophone, screen text

Telephone ordering system for pay-per-view TV and telephone audience research systems are coded in W01-C05B5 codes.

Picture, video telephone, narrowband TV

W01-C05B1A [1992]

Screen text systems

Includes instant messaging system. Telephone line based screen text systems are also coded in W02-F05B1.

W01-C05B1C [1992]

Still-picture systems

Includes facsimile (see S06-D to K codes also) and still-picture video telephone systems (see W02-F08 codes also).

Video telephone

W01-C05B1E [1992]

Moving picture systems

Includes video telephone (see W02-F08B codes also). Still-picture types are coded in W01-C05B1C. See W01-C01G4 for apparatus details. Search with W01-C02B1 and W02-F08 codes for video conferencing system.

Narrowband TV, picture phone

W01-C05B2 [1997]

Multimedia system

See also T01, W03, W04 codes as appropriate, especially T01-J30 and W04-K10 codes. See W01-C01P1 for telephone subscriber apparatus details.

W01-C05B3 [1987]

Telegraphic telephone line communication

See T01 codes also for computer aspects. Prior to 2002 W01-C05B3 was routinely used to highlight computer telephony integration and internet telephony, now both covered by W01-C05B4 codes, and ADSL which is now covered by W01-C05B8A.

Telecontrol, telemetering, computer access, remote terminals

W01-C05B3A [1992]

Telephone line modem

Covers novel aspects of modem per se. See also W01-A09 codes for modulation/demodulation aspects. See W02-C04B2 or W01-A07H3 for free space optical link or W01-A07H2 or W02-G02 for radio link. See W01-C05B3G for voice over data modem.

W01-C05B3B [1992]

Communication with computer from remote terminal

Novel modems are coded in W01-C05B3A, W01-C05B3G or W01-C05B3H, depending on type. (See also T01 codes).

W01-C05B3C [1992]

Electronic funds transfer

Also coded in T05-L02, and T01-N01A1 from 2002. Note that from 2002, EFT and e-commerce inventions are **not** coded here unless some novel PSTN aspect is involved.

W01-C05B3D [1992]

Telex

W01-C05B3E [1992]

Remote control

See also W05-D06G codes.

W01-C05B3F [1992]

Remote monitoring

See also W05-D06G codes. Search W01-C05A only for monitoring in the context of alarm systems.

W01-C05B3G [1997]

Voice over data modem

(W01-C05B3A)

Voice-over-IP telephone communication is covered by W01-C05B4C from 2002. (Prior to 2002, W01-A06B7, W01-A06F, and W01-C05B3 were used, in addition to T01-H07C5E).

VoD

W01-C05B3H [1997]

Facsimile-modem

(W01-C05B1C, W01-C05B3A)

Fax-modem

W01-C05B3J [1997]

Data streaming

Telephone sets (as opposed to systems) with data streaming capability are covered by W01-C01G6G from 2002.

GPRS, EDGE, packet, radio

W01-C05B3L [1997]

PCMCIA / PC card

This code is intended for PC type interface cards, e.g. used to interface between a mobile phone and a lap top or palm top computer.

W01-C05B4 [2002]

CTI and telephone systems combined with internet system

(W01-C05B3)

Prior to 2002 W01-C05B3 was routinely used to highlight computer telephony integration. Voice over data modem aspects are covered by W01-A09E3, and W01-C05B3G when specifically intended for PSTN usage. Voice over IP transmission is covered by W01-C05B4C from 2002 (previously T01-H07C5E, W01-A06B7, W01-A06F, and W01-C05B3).

W01-C05B4A [2002]

CTI - (Computer Telephony Integration)

(W01-A06, W01-C05B3)

W01-C05B4C [2002]

Telephony via the internet and IP-based telephony

(T01-H07C5E, W01-A06B7, W01-A06F, W01-C05B3).

From 2012 the title of this code has been changed to reflect its existing coverage of IP-based telephony over other networks such as LANs, in addition to the use of the internet as a medium. This code takes precedence over W01-C05B4A and is intended for telephone systems using internet protocol to transfer voice information, over the internet and also private networks. Telephone apparatus equipped for VoIP-based communication is covered by W01-C01G6E, or W01-C01G6H in the case of 'push to talk' technology. Arrangements for access to the internet via the telephone network for general purposes are covered by W01-C05B4E. W01-A06B7A is also assigned where novel aspects of the internet itself are involved. Computer system aspects of the internet are assigned T01-N codes also.

Generic Area Network, GAN, Next Generation Public Switched Telephone Network, NPSTN, Unlicensed Mobile Access, UMA, Voice over internet protocol, VoIP

W01-C05B4E

[2002]

Internet access via telephone system

This code is intended for arrangements for access, via the telephone system, to the internet for general purposes. Telephone systems using VoIP, i.e. using the internet as a medium for telephone traffic, are covered by W01-C05B4C. W01-A06B7A is also assigned where novel aspects of the internet itself are involved. Computer system aspects of the internet are assigned T01-N codes also.

W01-C05B4G

[2006]

Push to talk over packet network system

(W01-C02B1, W01-C05B3J)

Providing direct one-to-one or one-to-many voice communication using Voice over IP (VoIP) over cellular packet network. Prior to 2006, this topic was covered in W01-C02B1 and W01-C05B3J. Telephone sets equipped for this mode are assigned W01-C01G6H. Internet telephony systems are covered by W01-C05B4C. Instant messaging systems using the telephone network are covered in W01-C05B1A, and telephone sets equipped for that mode are assigned W01-C01G6F. Telephone chatlines in general are covered by W01-C05B5A but internet chatroom systems are not included, being covered by T01 codes (e.g. T01-N03A1C).

PoC

W01-C05B5

[1987]

Entertainment, dictation

Value-added telephone services

W01-C05B5A

[1992]

Entertainment systems

See also W02-F10 codes for interactive entertainment systems, and W04-X02 codes and W04-X03A3 respectively for games or karaoke aspects.

Subscription/cable TV, pay-per-view communication, karaoke, chatline

W01-C05B5C

[1992]

Educational and information systems

Time announcement, speaking clock, recorded information, audience research

W01-C05B5E

[1992]

Recording and storage systems

See W01-C02B7C for voice mail per se.

Centralised recording, voice mail

W01-C05B5G

[2005]

Advertising and marketing

Covers transmission of advertising, promotional and marketing information to telephone users. Visual advertising in general is covered by W05-E03 codes, and advertising based solely on audible information by W05-F (from 2014), which are also assigned as appropriate. See T01-N01A2C for transmission of advertising and marketing information in computer networks.

Promotions, offers, adverts

W01-C05B6

[2005]

Mobile commerce

Covers buying and selling of goods and services e.g. financial and business services through wireless telephone systems. Novel aspects of PSTN electronic funds transfer are covered by W01-C05B3C. See T01-N01A2 for computer e-commerce and T01-N01A1 for on-line banking.

m-commerce, on-line shopping, mobile banking, wallet

W01-C05B7

[1992]

ISDN System

Used with other W01-C codes as appropriate.

W01-C05B7A

[1992]

Subscriber apparatus

Also assigned W01-C01L1 for interface aspects.

W01-C05B7B

[1992]

ISDN exchange

Data exchanges interfacing arrangements with ISDN are also coded in W01-A06B5C.

W01-C05B7C

[1992]

Complete system (Architecture), signalling or method of operation

W01-C05B7D

[1992]

Control

W01-C05B7E

[1992]

Broadband ISDN (B-ISDN)

W01-C05B7X

[1992]

Other ISDN aspects

W01-C05B8

[2002]

ADSL and other Digital subscriber line system

(W01-C05B3)

Prior to 2002 ADSL was assigned W01-C05B3.

HDSL, XDSL, SDSL

W01-C05B8A [2002]

ADSL

W01-C06

Metering; Time controlling and indicating

Prior to 1992, use with W01-C01X for meter at subscriber location, (from 1992 covered by W01-C01J only). See W01-C02A for exchange aspects. From 1992, statistical metering is covered by W01-C02A1A. Search with W01-C02A7 for least cost routing at exchange or W01-C01B4 only for system in subscriber apparatus.

Call charge calculation, exchange metering, call-logging system, least cost routing

W01-C06A [2002]

Least cost routing

W01-C06C [2002]

Time control and indication

W01-C06E [2002]

Billing

W01-C06G [2002]

Reduced rate and reverse charge systems

W01-C06G1 [2002]

Reduced rate charging systems

Includes arrangements for reduced rate charging band on e.g. keying in an access code with a pre-paid card. Prepayment telephones in general are covered by W01-C07A codes.

W01-C06G3 [2005]

Toll free calling

Includes arrangements providing free telephone calls through special dial access.

W01-C06G5 [2002]

Reverse call charging

Collect call

W01-C06J [2005]

Prepaid telephone services

Covers provision of telephone service without a contract being established with the service provider. See W01-C07A codes for prepayment public telephones.

Pay-as-you-go, pre-pay

W01-C06L [2005]

Call logging

Covers compilation and storage of telephone usage records, usually for a specific number, e.g. to monitor possible unauthorised calls.

W01-C06X [2002]

Other metering, time controlling and indicating aspects

W01-C07

Prepayment telephones; Current supplies

W01-C07A [1987]

Prepayment/public telephone

See T05-H05C and other T05-H codes also for coin/card-operated aspects.

Coin-operated, card-operated, telephone booth, kiosk

W01-C07A1 [1992]

Constructional details

(W01-C01A, W01-C07A)

See W01-C01A also for construction of telephone set per se as far as analogous to subscriber telephone. From 1992, W01-C07A1 only is assigned for details of telephone kiosk, booth etc.

W01-C07A3 [1992]

Anti-fraud measures

Includes alarms and arrangements to prevent interference with metering etc. Use with W01-C07A5 when coin/card aspects involved.

Security, pin-fraud, antitheft

W01-C07A5 [1992]

Coin/card-freed aspects

See also T04-C, T04-K and T05-H codes, especially T05-H05C.

W01-C07A5A [1997]

Telephone card

See T04-C, T04-K and T05-H codes also.

Phone card

W01-C07A7 [1992]

Control and signalling aspects

Includes arrangements for metering, indicating faults, full cash-box, etc.

W01-C07A9 [1997]

Other

W01-C07B [1987]

Current supplies

Prior to 1992, used with W01-C01X for subscriber set aspects which are now covered by W01-C01E codes.

Power supply, exchange battery, subscriber line feed, ringing current generator

W01-C08	[1987]
General equipment details/circuits (W01-C09)	
W01-C08A	[1987]
Protection, e.g. against lightning strike etc. Protection systems in general are in U24-F and X13-C. <i>Surge protector, gas discharge tube, varistor, fuse</i>	
W01-C08B	[1987]
Line hybrid (transformers and circuit equivalents) See also W02-C01X for general (or non-telephone) application, V02 for inductive components, and U25 for impedance networks, (e.g. U25-C for impedance converters, and U25-D codes for matching, combining, etc.). <i>Two-wire/four-wire circuit, impedance matching/balancing, differential circuit</i>	
W01-C08C	[1987]
Test equipment Covers portable equipment and apparatus used in remote tests. Testing of subscriber devices using external equipment is covered by W01-C01K, which may be assigned with W01-C08C codes for specific cases where the subscriber equipment itself is being tested.	
W01-C08C1	[1992]
Portable test set	
W01-C08C3	[1992]
Remotely operated auxiliary test device Includes device for discriminating line fault and subscriber set fault (see also W01-C01K for subscriber set testing generally and W01-C02A5 for exchange testing of subscriber lines).	
W01-C08C5	[1992]
Maintenance centre system Includes system remotely monitoring telephone installations, e.g. monitoring several exchanges (with W01-C02A1).	
W01-C08E	[1992]
Equalisers, echo cancelling, noise reduction See also appropriate code in W02-C01B or W02-C01C.	
W01-C08F	[1992]
Security aspects and telephone usage control The title of this code has been expanded from 2002 to better reflect its coverage of telephone usage control. See also W02-L codes for secrecy aspects. Includes detection of eavesdropping, and scrambling systems. <i>Secrecy, wire-tap/eavesdropping detector</i>	

W01-C08F1	[2002]
Wiretapping and prevention of wiretapping	
W01-C08F1A	[2002]
Wiretapping	
W01-C08F1C	[2002]
Prevention and Detection of wiretapping	
W01-C08F5	[2002]
Controlling or preventing use of telephone This code is primarily intended for systems inhibiting the use of e.g. portable phones in a sensitive area, such as a theatre, hospital etc., e.g. by 'dummy' base stations or jamming techniques. It is assigned with mobile phone system codes as appropriate, e.g. W01-B05A1A and W02-C03C1B for base station aspects. Arrangements for determining entitlement, and denying access, to different levels of telephone service are covered by W01-C02B6A and W01-C02B6C respectively.	
W01-C08G	[1997]
Telephone line type These codes are only assigned to highlight the significance of the line type to the particular invention, e.g. W01-C08G1 is not assigned for every invention relating to copper twisted pair telephone systems.	
W01-C08G1	[1997]
Wire line <i>Twisted pair</i>	
W01-C08G2	[1997]
Optical fiber (W01-C08X, W02-C04B1)	
W01-C08G9	[1997]
Other telephone line type	
W01-C08H	[2005]
Application of telephone systems and apparatus This code is generally used without other W01 codes, and is intended for inventions relying on use of the telephone systems or apparatus, while not involving novel aspects. The code is assigned only when the particular application cannot be coded elsewhere.	
W01-C08X	[1987]
Other general details of telephone equipment <i>Intermediate amplifier, equipment cooling/environmental control</i>	

W01-C09

Other (incl. manual exchanges)

From 1992, see W01-C02G and other W01-C02 codes for semi-automatic systems.

W01-D

Cable or line installation

W01-D covers novel aspects of cable installations for communications purposes, including telephone, data networks, CATV, alarm systems, and the like. Power line installations are not included and are covered by X12-G codes. See V07-H codes for optical fiber aspects.

W01-D01

Methods and equipment

Includes digging of trenches, erection of supporting poles, drilling through walls, drawing of cables through conduits or pipes, or their laying in trunking, cable trays, or the like.

Cable feeder, cable puller, cable locator, tools

W01-D02

Fittings

Includes devices such as plugs and sockets, junction boxes and splices fitted to the cable, rather than arrangements for supporting it or mounting it which are covered by W01-D03. Novel electrical connector aspects are also assigned V04 codes.

Terminal, Mounting, fixing, socket, junction box, connector

W01-D03

Installations

Includes physical aspects of mounting or positioning cables or cable fittings, rather than electrical connection aspects which are covered by W01-D02. Aspects of installations included are protective hardware such as conduits, grommets, cable trays, cable clamps, or trunking, and arrangements for routing cables through walls, under floors, under the ground, or overhead.

Underwater/underground/overhead installation, conduit, ducting

W01-D09

Other

This code covers any specific topic not fitting into the above subdivisions. Examples include cable reels and installations between two relatively-moving points which may be permanent or temporary arrangements such as a retractable telephone extension cable arrangement which can be wound around a reel or similar when not in use, or devices for shortening a long telephone set lead by winding it around a suitable retaining device.

Drum, elevator intercom, pressurised cable leak monitor

W01-E

[2012]

General aspects of wireless data networks and mobile phone networks

This code and its subdivisions are intended to indicate aspects of wireless systems, normally operating on a cellular model, that may be equally applicable to data networks as covered by W01-A06C4 codes and mobile phone networks and systems as covered by W01-B05A1 and W01-C01D codes. The codes are intended for wireless networks in a general sense and may be used alone in general cases or with specific additional wireless network or mobile phone system codes as appropriate to provide more detail. When relevant, W02 codes are also assigned for radio system aspects, e.g. details of cellular mobile radio systems are indicated by assignment of W02-C03C1 codes and novelty in radio equipment by W02-C03C1 codes and W02-G codes, these codes being assigned in addition to W01-E codes as necessary.

W01-E01

[2012]

Mobility aspects of wireless data and mobile phone networks

This code and its subdivisions cover aspects arising from the movement of mobile phones or wireless terminals and stations in general, such as roaming and registration.

W01-E01A

[2012]

Roaming

This code, or its subdivisions, replace W01-A06E1R, W01-A06E1S and W01-B05A1R and covers arrangements for allowing mobile phones or wireless terminals to move between home and other networks.

W01-E01A1

[2012]

Roaming between networks operating on the same standard

This code replaces W01-A06E1R and covers inventions for roaming between e.g. wireless local area networks of the same type, or between same-standard mobile phone networks. For roaming between wireless data networks and mobile phone networks W01-E01A3E is assigned instead of W01-E01A1 codes.

W01-E01A1A

[2012]

Roaming between wireless data networks operating on the same standard

This code covers arrangements for roaming between wireless data networks, e.g. wireless LANs, which are operating using the same standards.

W01-E01A1C

[2012]

Roaming between mobile telephone networks operating on the same standard.

This code replaces W01-B05A1R and covers inventions for roaming between same-standard mobile phone networks, e.g. between GSM networks.

W01-E01A3 [2012]

Roaming between networks operating on different standards

This code replaces W01-A06E1S.

W01-E01A3A [2012]

Roaming between wireless data networks operating on different standards

This code covers arrangements for roaming in which mobiles may obtain communications service with wireless data networks operating on different standards, e.g. IEEE 802.11 AND IEEE 802.16. W01-A06C4 codes denoting wireless network standards are assigned as appropriate.

W01-E01A3C [2012]

Roaming between mobile telephone networks operating on different standards

This code covers arrangements for roaming in which mobiles may obtain communications service with mobile phone networks operating on different standards, e.g. GSM, 3G, 4G, 5G.

W01-E01A3E [2012]

Roaming between mobile telephone networks and wireless data networks

This code covers roaming arrangements allowing mobiles to obtain communications service with mobile phone networks and wireless data networks depending on availability. This code is assigned in preference to W01-E01A1 codes. Prior to 2012 this topic was indicated by assignment of W01-A06E1S and W01-B05A1R.

W01-E01A5 [2012]

International roaming

This code covers arrangements for allowing mobile phones or wireless terminals to obtain communications services across national boundaries.

W01-E01C [2012]

Registration aspects

This code, or its subdivisions, replace W01-B05A1N and W01-B05A1Q and covers arrangements for registering mobile phones or wireless terminals with a network.

W01-E01C1 [2012]

Location register details

Prior to 2012 this topic was represented by W01-B05A1Q.
Home location register, HLR, visitor location register, VLR

W01-E01C3 [2012]

Registration of mobile user

Prior to 2012 this topic was represented by W01-B05A1N in the case of mobile phone networks.

W01-E01C5 [2012]

Transfer of registration information

This code covers the transfer of information between access points or base stations during roaming or as part of a hand-off procedure. Hand-off aspects are also assigned W02-C03C1D.

W01-E99 [2012]

Other wireless systems and apparatus common to data networks and mobile phone networks

W02: Broadcasting, Radio and Line Transmission Systems

W02-A

Waveguide devices

Includes specific devices and techniques for RF waveguide technology. Lumped-constant frequency-dependent circuits are in U25, optical waveguides are in V07.

W02-A01

Transmission lines of the waveguide type

Covers waveguides per se, i.e. shape, materials etc.

W02-A01A [1992]

Coplanar lines

Covers lines with two longitudinal conductors.

W02-A01A1 [1992]

Fin, slot lines

W02-A01A2 [1992]

Coaxial lines

For coaxial cables in general, see X12-D05, e.g. flexible coaxial cables which are coded in X12-D05 only.

W02-A01A3 [1992]

Microstrips; Striplines

See appropriate U14 codes for microstrip technology relevant to film circuits, e.g. U14-H03C2 codes for analogue circuitry, and V04-Q codes for printed circuit details.

W02-A01A9 [1992]

Other coplanar lines

W02-A01B [1992]

Waveguide conductor

Covers waveguides with single solid longitudinal conductor.

W02-A01B1 [1992]

Wire

W02-A01B2 [1992]

Hollow

W02-A01B2A [1992]

Ridged or grooved

W02-A01B2B [1992]

Circular

Includes elliptic and parabolic cross-section waveguides.

W02-A01B2C [1992]

Flexible

W02-A01B3 [1992]

Dielectric

Covers waveguides without a longitudinal conductor.

W02-A01B4 [1992]

With several layers

Increases operating surface by building-up from several layers e.g. alternate dielectric and conductive layers.

W02-A01C [1992]

Auxiliary devices

W02-A01C1 [1992]

Bends; Corners; Twists

Flange, seal, gasket

W02-A01C2 [1992]

Fixed joints

W02-A01C3 [1992]

Movable joints; Rotating joints

Includes hinged and rotary joints.

W02-A01C5 [1997]

Waveguide windows

Covers window arrangements, e.g. with dielectric material covering aperture in guide wall (see V05-F04L for such arrangements applied to plasma and similar processing equipment). Couplers in general are covered in W02-A02 codes. Dielectric waveguides are covered by W02-A01B3.

W02-A01D [1992]

Materials

Covers materials for waveguides per se only. Materials of general application to waveguide devices are covered by W02-A08C codes.

W02-A02

Couplers, combiners, impedance matching

Waveguide windows are covered by W02-A01C5. From 2002, couplers within distributed-constant-type filters, e.g. those providing coupling between resonators, are assigned W02-A05Q codes, and are **not** covered by W02-A02 codes unless of wider application.

Port, input, transition, probe

W02-A02A	[1992]
Balanced/unbalanced line coupler; Coupling different types of waveguide	
W02-A02A1	[1992]
Waveguide-to-coaxial line	
W02-A02A2	[1992]
Waveguide-to-stripline	
W02-A02A3	[1997]
Coaxial-to-stripline	
W02-A02A5	[2007]
Balanced-to-unbalanced converter	
See U25-D03 for lumped constant balanced-to-unbalanced converters.	
W02-A02B	[1992]
Active coupler with several ports	
W02-A02B1	[1992]
Conjugate devices	
Covers devices with at least one port decoupled from one other port. Isolators and circulators are covered by W02-A04E and W02-A04F codes respectively.	
W02-A02B1A	[1992]
Directional coupler	
Includes couplers consisting of two coupled guides, being either hollow waveguides or arranged in parallel or being coaxial, stripline or microstrip. See W02-A01 codes for claimed waveguide transmission lines, and V04-Q codes for printed circuit details.	
W02-A02B1C	[1992]
Magic-T junction	
W02-A02B1D	[1992]
Hybrid ring junction	
W02-A02C	[1992]
Impedance transformation; Matching	
Lumped constant impedance matching is covered by U25 codes.	
W02-A02D	[1992]
Power combiner, divider	
W02-A03	
Resonators; Delay lines	
Electromechanical delay lines are in V06.	

W02-A03A	[1992]
Resonators	
W02-A03A1	[1992]
Helical; Spiral	
W02-A03A2	[1992]
Lecher; Coaxial	
Coaxial resonators covered here include those comprising concentric electrodes with an air space between (W02-A03A2A) and those in which the space between electrodes is filled by a solid dielectric material (W02-A03A2C). Resonators termed 'dielectric' but having outer and inner electrodes are thus assigned the latter code. Resonators comprising a suitably-dimensioned piece of dielectric material without a pair of electrodes are coded in W02-A03A3C if forming part of a resonant cavity, and in W02-A03A5 otherwise.	
W02-A03A2A	[1997]
Coaxial resonator without solid dielectric	
W02-A03A2C	[1997]
Coaxial resonator with solid dielectric	
W02-A03A3	[1992]
Cavity	
W02-A03A3A	[1997]
Without solid dielectric	
W02-A03A3C	[1997]
With solid dielectric	
See note for W02-A03A2.	
W02-A03A4	[1992]
Stripline; Microstrip	
W02-A03A5	[1992]
Dielectric	
Covers dielectric resonators with magnetic field coupling. Resonators with dielectric filled spaces are coded under W02-A03A2 or W02-A03A3.	
W02-A03B	[1992]
Delay lines	
Includes helical and interdigital lines.	
W02-A04	
Attenuators; Terminations; Isolators; Circulators; Switches	

W02-A04A	[1992]
Switches	
W02-A04A1	[1992]
Ferromagnetic; Mechanical	
See also appropriate V03- codes for mechanical type switches.	
<i>Ferrite</i>	
W02-A04A3	[1992]
Using electrical discharge devices	
See appropriate V05- codes also.	
W02-A04A5	[1992]
Using semiconductor devices	
See appropriate U21-B codes also for electronic switches, e.g. U21-B01A and U21-B05E.	
W02-A04B	[1992]
Absorber	
Absorbers for antenna applications are covered by W02-B03D codes, which are also used as a general place for absorber materials.	
W02-A04C	[1992]
Attenuator	
Attenuators using chiefly lumped-constant elements are covered by U25-D07.	
W02-A04C1	[1992]
Using ferromagnetic material	
W02-A04C5	[1997]
Attenuator using semiconductor devices	
W02-A04C9	[1992]
Other distributed-constant attenuators	
W02-A04D	[1992]
Terminations	
Includes dissipative terminations e.g. resistive, liquid.	
<i>Dummy load, water load</i>	
W02-A04E	[1992]
Isolator	
Includes resonance absorption and field displacement isolators.	
W02-A04F	[1992]
Circulator	
Covers Y-circulators and hollow waveguide circulators.	

W02-A04F1	[1992]
Stripline and microstrip circulators	
W02-A05	
Filters	
From 1997, W02-A05K codes have been assigned to indicate filter function in conjunction with other W02-A05 codes. From 2002, coupling arrangements, e.g. between resonators, are covered by W02-A05Q codes, and are no longer assigned W02-A02 codes unless of wider application also.	
<i>Band pass, notch, high pass, low pass, adjustable, tunable</i>	
W02-A05A	[1992]
Transverse electromagnetic filters	
W02-A05A1	[1992]
Coaxial	
From 1997, cascaded coaxial cavity filters are included in this category to simplify grouping based on physical structure, and are covered by W02-A05A1E.	
W02-A05A1A	[1997]
Without solid dielectric	
W02-A05A1C	[1997]
With solid dielectric	
See note for W02-A03A2.	
W02-A05A1E	[1997]
Cascaded coaxial cavities	
W02-A05A2	[1992]
Stripline; Microstrip	
W02-A05A3	[1992]
Comb or interdigital	
Prior to 1997, this code covered cascaded coaxial cavity filters which are now transferred to W02-A05A1E.	
W02-A05B	[1992]
Hollow waveguide filters	
W02-A05B1	[1992]
Cavity	
W02-A05B1A	[1997]
Without solid dielectric	
W02-A05B1C	[1997]
With solid dielectric	
See note for W02-A03A2.	

W02-A05B1E	[1997]
Cascaded cavities	
Covers cascaded resonators inside hollow waveguide structure.	
W02-A05B2	[1992]
Waffle-iron filters; Corrugated structure	
W02-A05C*	[1992-1996]
Suppressing or attenuating harmonic frequencies	
*This code is now discontinued and from 1997 this subject matter is transferred to W02-A05K6. W02-A05C remains valid and searchable for records prior to 1997.	
W02-A05D*	[1992-1996]
Combining or separating several different frequencies	
*This code is now discontinued and from 1997 this subject matter is transferred to W02-A05K7. W02-A05D remains valid and searchable for records prior to 1997.	
W02-A05E	[1992]
Ferromagnetic material; YIG	
Prior to 1997, this code included magnetostatic wave elements used as non-linear noise-reducing devices (also assigned V06-V codes), which are now transferred to W02-A06E. W02-G03B9 ('Other radio receiver noise reduction') will continue to be applied in addition to indicate the noise-reduction aspect.	
W02-A05F	[1992]
Evanescent mode filter	
W02-A05G	[1992]
Active filters with distributed components	
See U25-E01 codes for active filters using lumped circuit elements.	
W02-A05K	[1997]
Characterised by function and operation	
Codes in this section are assigned with other codes relating to filter technology as appropriate.	
W02-A05K1	[1997]
Lowpass filter	
W02-A05K2	[1997]
Bandpass filter	
W02-A05K3	[1997]
Highpass filter	

W02-A05K4	[1997]
Notch filter	
W02-A05K6	[1997]
Suppressing or attenuating harmonic frequencies	
(W02-A05C)	
Coded under W02-A05C prior to 1997.	
W02-A05K7	[1997]
Combining or separating several different frequencies	
(W02-A05D)	
Coded under W02-A05D prior to 1997. This code includes duplexers and diplexers having a frequency band separation aspect based on filtering using waveguide technology. Duplexers for use in radio transceivers are also covered by W02-G02A5B. Frequency combining or separating using lumped-constant elements is covered by U25-E05K.	
W02-A05K9	[1997]
Other filter function	
W02-A05Q	[2002]
Novel coupling arrangements for filters	
(W02-A02, W02-A05)	
This code is intended to highlight novel arrangements for providing coupling between filter sections, and may be used with other W02-A05 codes denoting filter technology. Novel coupling arrangements in general for waveguide devices are covered by W02-A02 codes, which from 2002 are not used for internal filter coupling arrangements unless of wider application also.	
W02-A05Q1	[2002]
Variable coupling arrangements	
This code is intended for filter coupling arrangements in which the coefficient of coupling may be adjusted in normal use . Arrangements for trimming or adjusting coupling during manufacture are covered by W02-A07 codes.	
W02-A06	
Mode selectors; Phase shifters; Polarizers	
W02-A06A	[1992]
Mode selectors	
W02-A06A1	[1992]
Absorbing spurious modes of propagation	
W02-A06B	[1992]
Polarizer	
See W02-B03C codes for antenna polarizers.	

W02-A06B1	[1992]
Circular polarisation	
W02-A06B3	[1992]
Using Faraday rotators	
W02-A06C	[1992]
Phase shifters	
W02-A06C1	[1992]
Using active elements	
Includes use of e.g. semiconductor devices.	
W02-A06C2	[1992]
Using a ferromagnetic device	
Includes ferromagnetic device having toroidal shape.	
W02-A06E	[1997]
Nonlinear noise reduction devices	
Includes magnetostatic wave devices. See also V06 codes, e.g. V06-V06, and W02-G03B9 for radio receiver noise reduction aspect. Also assigned W03-A01A1 and W03-A01B codes as appropriate if forming part of DBS receiver tuner.	
W02-A07	
Manufacture, testing	
See also S01 for measuring, e.g. S01-H05 for high-frequency measurements.	
W02-A07A	[1997]
Manufacture of waveguides and waveguide components	
<i>Machining, cutting, welding, coating, plating</i>	
W02-A07A1	[1997]
For integrated, hybrid, or film circuits	
See U14 codes as appropriate, e.g. U14-H04 codes.	
W02-A07B	[1997]
Testing of waveguides and waveguide components	
See also S01 codes for specific details of electrical testing, and S02/S03 codes for non-electrical testing, such as measuring dimensions, materials testing, etc.	
W02-A07B1	[1997]
For integrated, hybrid, or film circuits	

W02-A08	[1992]
General details	
W02-A08A	[1992]
Compensation of environmental effects	
Includes protection against the effects of e.g. moisture, temperature.	
W02-A08B	[1992]
Non-specific circuitry	
This code is used for circuitry associated with waveguide devices not catered for elsewhere in section W. See also U23-Q.	
W02-A08C	[1992]
Materials	
Includes materials for waveguide devices in general. Materials for waveguides per se only are covered by W02-A01D.	
W02-A08C1	[1992]
For millimetre wave	
W02-A08G	[1997]
Devices with variable parameters	
W02-A08G1	[1997]
Adjustable resonant frequency	
W02-A08J	[2002]
Waveguides and waveguide devices using superconducting materials	
This code is intended to highlight the use of superconducting materials, not novel themselves, necessarily. Novel superconducting materials are assigned U14-F and X12-D06 codes.	
W02-A09	
Other waveguide devices	
<hr/>	
W02-B	
Aerials	
Aerials per se are also coded under application.	
W02-B01	
Monopoles, dipoles, loop and rhombic aerials, etc.	

W02-B01A [1992]

Loop

Includes circular loops and also rectangular, delta and similar shapes. Parasitic arrays formed from such elements (I.e. 'quad' or 'box kite' antennas) are covered by W02-B04D5. Folded dipole antennas are covered by B01B1A or W02-B01B2A. Includes loop conductor antennas for smart cards, which are also assigned T04-K01C and V04-Q codes for printed circuit details.

W02-B01A1 [1992]

With core e.g. ferrite rod

W02-B01B [1992]

Dipole

Yagi-Uda parasitic arrays formed from dipole elements are covered by W02-B04D1. Dipole arrays with separate feed to each element are covered by W02-B05B1, but note that log periodic types themselves are coded in W02-B01D1.

Folded dipole

W02-B01B1 [1992]

Linear dipole antenna

In 2002 the title of this code was changed to better reflect its actual coverage. Formerly entitled 'Center-fed' (dipoles), the title now refers to the linear arrangement of elements, e.g. as distinct from the ring form covered by W02-B01B2 codes. As before, although centre-fed dipoles constitute the majority of postings for this code, those with an offset feed, e.g. for impedance matching purposes (W02-B08E1 assigned as well) are also included.

W02-B01B1A [2002]

Folded dipole

This code is intended for dipoles which may be regarded as a half-wavelength transmission line pair with shorted ends, or a wavelength-long conductor in the form of a flattened loop. Impedance matching aspects are indicated by additional assignment of W02-B08E1.

W02-B01B2 [1992]

Ring dipole

From 2002 the title of this code has been changed to better distinguish it from spiral antennas as covered by W02-B01B3. It is intended for dipoles with the ends brought close together to form a ring.

Halo

W02-B01B2A [2002]

Folded ring dipole

This code is intended for folded dipoles with the ends brought into proximity so as to form a ring. Impedance matching aspects are indicated by additional assignment of W02-B08E1.

W02-B01B3 [1992]

Spiral dipole

From 2002 the title of this code has been changed to better reflect its intended coverage of spiral dipole antennas, as distinct from those essentially comprising a dipole with the ends brought together in the form of a ring.

W02-B01C [1992]

Unipole, monopole

W02-B01C1 [1992]

Whip, rod

Prior to 1997, telescopic aerials were excluded from this code, being covered by W02-B01X.

W02-B01C1A [1997]

Telescopic antenna

(W02-B01X)

Coded as W02-B01X prior to 1997. From 1997 collapsible antennas in general are covered by W02-B08K, and collapsible supports by W02-B07A5. The latter code was used for both types from 1992 to 1997.

W02-B01C1C [1997]

Whip antenna with loading coil

W02-B01C3 takes precedence for continuously-loaded aerials. See also W02-B08E for antenna impedance matching and tuning.

W02-B01C1G [2002]

Ground plane antenna

This code is intended for monopole arrangements with a associated groundplane in the form of separate elements or a metallic plate, which is part of the antenna itself and not provided by the surface on which it is mounted. Discone antennas are covered by W02-B01C5 (from 2002, formerly W02-B01C and W02-B01X).

W02-B01C3 [1992]

Helical

W02-B01C3A [2002]

Quadrifilar Helix

(W02-B01C3, W02-B05B)

This code is intended for antennas in the form of two bifilar helical loop sections. For use with satellite telephones search with W01-C01D3E (W02-C03C1C is also assigned for this application since satellite phone systems are regarded as being of cellular type) and W02-C03B1C for application to ground stations in general in a satellite radio system. Prior to 2002, antennas of this type were assigned W02-B01C3 and W02-B05B.

QFH, spacecraft, weather, satellite, APT, HRPT, GPS

W02-B01C5 [2002]

Discone and conical-skirt monopoles

(W02-B01C, W02-B01X)

This code is intended for antennas in the form of a cone and monopole combination, normally employed for reasons of wideband performance. Arrangements for increasing the bandwidth of antennas in general are covered by W02-B08P3 and multi-band antennas by W02-B08R1 codes.

Wideband, multi-octave, VHF, UHF, scanning, monitoring

W02-B01D [1992]

Electrically-long aerials

Includes resonant aerials e.g. travelling-wave and non-resonant antennas e.g. rhombic.

W02-B01D1 [1992]

Log-periodic

Arrays made up of several log periodic antennas are covered by W02-B05B5.

W02-B01F [1997]

Inverted-F antenna

(W02-B01X)

W02-B01R [2010]

Novel radiating element

This code is intended to indicate novelty in the radiating element of an antenna, e.g. its shape or configuration, and is used in conjunction with other W02-B01 codes as necessary to highlight novel aspects. Note that W02-B01R is **not** used to denote shape or configuration that is a standard feature of the antenna type, such as a helical antenna which is covered by W02-B01C3 codes alone.

W02-B01X [1992]

Other monopole or dipole antenna aspects

Prior to 1997 telescopic aerials were included. These are now coded under W02-B01C1A.

W02-B02

Waveguide and slot aerials

W02-B02A [1987]

Microstrip/stripline aerials

Printed circuit antennas are covered by W02-B07A3 and V04-Q codes

Conductor pattern, etched, patch, substrate

W02-B02B [1992]

Waveguide horns

W02-B02C [1992]

Resonant slot aerial

W02-B02C1 [1992]

Microstrip slot antenna

See also W02-B02A.

W02-B03

Reflectors, refractors, polarizers, absorbers

W02-B03A [1992]

Refractor, diffractor e.g. lens, prism

Dielectric lens

W02-B03B [1992]

Reflector

From 1997, for collapsible antenna reflector per se (e.g. for on-station deployment from communications satellite, i.e. 'umbrella' type antenna) search reflector type code with W02-B08K (collapsible antenna).

Collapsible supports and mountings for non-collapsible antennas are covered by W02-B07A5, which was used for both aspects from 1992 to 1997.

Circular

W02-B03B1 [1992]

Characterised by shape

Form, contour

W02-B03B1A [1992]

Parabolic

Search with W02-B08K for collapsible reflectors per se from 1997. (Previously coded as W02-B03B1A and W02-B07A5).

W02-B03B1B [1992]

Having plane surface

W02-B03B2 [1992]

Passive reflectors

W02-B03B2A [1992]

Chaff

See also W06-A04E1A, which covers jamming of radar systems.

Window strip

W02-B03B3 [1992]

Having variable properties

W02-B03C [1992]

Polarizer

See W02-A06B codes for (waveguide) polarizers in general.

W02-B03C1	[1997]
Variable polarisation	
W02-B03D	[1992]
Absorber	
This code is used for absorbers that are part of an antenna or antenna system and also as a general reference for radio frequency absorbers and absorber materials (in W02-B03D1). This includes the use of absorber materials on unrelated structures such as buildings or aircraft. Search with W06-A04X for radar signature reduction using absorbers. Absorbers that are part of an RF waveguide system are covered by W02-A04B. RF shielding is covered by V04-U codes.	
W02-B03D1	[1992]
Materials	
Includes e.g. metallic threads, ferrite powders and woven or wound filaments.	
<i>Rubber, polymer, binder, carbon</i>	
W02-B04	
Active elements combined with reflectors, etc.	
<i>Reflector, director, boom, parabolic, dish</i>	
W02-B04A*	[1992-2001]
Reducing undesirable effects, e.g. edge scattering, cross-polarisation	
*This code is now discontinued and from 2002 is replaced by W02-B08P5E, with other W02-B04 codes assigned as appropriate.	
W02-B04B	[1992]
Using refractor or diffractor	
W02-B04C	[1992]
Feed or driven element	
Use with other W02-B codes as appropriate to discriminate types of feed.	
<i>Horn feed, dipole feed</i>	
W02-B04D	[1992]
Yagi and quad antennas	
From 2002, the scope of this code is expanded to include 'quad' antennas. Log periodic antennas are covered by W02-B01D1. Arrays in which each element is driven are covered by W02-B05 codes.	
<i>Parasitic array</i>	
W02-B04D1	[2002]
Yagi antennas	
<i>Yagi-Uda</i>	

W02-B04D5	[2002]
Quad antenna	
This code is intended for 'quad' or 'box kite' antennas with form analogous to Yagi aerials, i.e. driven element arranged between reflector and one or more director elements, with elements typically approximately one wavelength long in total. Quadrifilar helix (QFH) antennas are covered by W02-B01C3A.	
W02-B04E	[1997]
Parabolic reflector antenna	
<i>Dish</i>	
W02-B05	
Aerial arrays	
Parasitic arrays such as Yagi antennas are covered by W02-B04D codes, log periodic types by W02-B01D1.	
W02-B05A	[1992]
Novel feed system	
Includes stripline, modular, slotted waveguide, etc.	
W02-B05B	[1992]
Characterised by elements making up array	
Where a specific subdivision does not exist W02-B05B is assigned together with a code for the antenna type. For example, prior to 2006, an array of helical antennas was coded as W02-B01C3 and W02-B05B (now covered by W02-B05B6).	
W02-B05B1	[1992]
Dipole	
W02-B05B2	[1992]
Horn or slot	
W02-B05B3	[1992]
Microstrip, patch	
W02-B05B4	[1992]
Yagi	
W02-B05B5	[1992]
Log periodic	
W02-B05B6	[2006]
Helical antenna	

W02-B05B8* [1992-2001]

Array radiating different polarisation

*This code is now discontinued and from 2002 this topic is covered by assignment of a suitable W02-B05 code in conjunction with W02-B08R5 which represents antennas with multiple polarisation characteristics in general.

W02-B05C [1992]

Collinear arrangements

W02-B05D [1992]

Phased array

W02-B06

Varying directional pattern

From 2005 W02-B06C is assigned for automatic tracking aspects. Prior to 2005 this topic was covered by assignment of W06-A02A1 with W02-B06 codes as appropriate.

Scanning antenna, direction control system, anti-roll positioning ship, vehicle

W02-B06A [1992]

Using mechanical movement

Rotary support

W02-B06A1 [1992]

Between primary active elements and secondary devices of aerials

Includes arrangement to rotate e.g. reflector only.

W02-B06B [1992]

Using non-mechanical means

Includes electronic beam steering. Phased array antennas are covered by W02-B05D, which is also assigned as appropriate.

Electronic control

W02-B06B1 [1992]

Continuous

Includes the use of continuous phase shifters.

Phase control

W02-B06B5 [1992]

Non-continuous

Covers switched arrangement giving discrete variation of radiation diagram.

W02-B06C [2005]

Automatic directional control antenna systems

(W02-B06, W06-A02A1)

Covers use of either mechanical movement or electronic beam steering (with W02-B06A or W02-B06B codes as necessary) to automatically adjust directional characteristics to optimize communication with a particular station, e.g. based on maximum signal strength or minimum BER (W02-G03J codes are also assigned to highlight this aspect, e.g. W02-G03J1A or W02-G03J5A). Prior to 2005, this topic was indicated by the assignment of W06-A02A1 ('Automatic direction finding') in addition to W02-B06 codes. From 2005, W06-A02A1 is no longer assigned unless separate direction finding aspects are emphasized. Directional diversity systems are also assigned W02-C03A4 codes and BDMA or SDMA systems are also assigned W02-K10 (from 2017). MIMO systems are covered by W02-C03A5 codes. Antenna set-up, i.e. installation, based on optimum reception is not included, being covered by W02-B08A5A. For use of antenna beam direction control in '5G' mobile networks search with W02-C03C1L.

Angle of arrival, direction of arrival, pilot signal, RSSI, signal scanning

W02-B06E [2006]

Variable polarisation antenna

This code is assigned alone or with W02-B06A or W02-B06B codes as appropriate. Novel antenna polarizers are covered by W02-B03C codes.

W02-B07

Supports; Housings

W02-B07A [1992]

Supports

W02-B07A1 [1992]

Fixed e.g. tower, mast, pole, base

W02-B07A1A [2002]

Antenna masts and towers

This code is intended for supporting masts and towers, usually dedicated to the purpose of mounting antennas. For arrangement intended to conceal masts, or make them less conspicuous, search with W02-B08P8G.

W02-B07A1C [2002]

Antenna mounting hardware

This code is intended for mounting hardware such as stub masts, clamps, etc., normally designed for fixing an antenna to an existing structure.

W02-B07A3 [2002]

PCB and surface mount antennas

These codes are intended to cover antennas produced using printed circuit techniques and those intended for surface mounting **on** a PCB. Microstrip antennas are covered by W02-B02A, and those fabricated as a PCB **without** a parallel groundplane by W02-B07A3A. Antennas structurally combined with active components are also assigned W02-B08C3, which would be assigned for an antenna formed on the circuit board of a radio transceiver, for example (W02-G02 also). See V04 codes also for PCB details.

Etched circuit board, conductor, laminate, foil

W02-B07A3A [2002]

PCB antennas

This code covers antennas produced using PCB techniques, and is introduced to better distinguish between true 'waveguide' antennas such as those in microstrip form, which are covered by W02-B02A, and those fabricated as a PCB without a parallel groundplane, although both codes could be assigned for a PCB antenna operating in a genuine 'waveguide' mode. Surface mounted antennas are assigned W02-B07A3C, which takes precedence over this code. PCB antennas are also assigned V04-Q06.

Printed antenna

W02-B07A3C [2002]

Surface mount antenna

This code is intended for an antenna designed to be surface mounted on a PCB, and takes precedence over W02-B07A3A, the code for antennas actually fabricated using PCB techniques.

W02-B07A5 [1992]

Collapsible

From 1997 this code has been restricted to collapsible **mountings** for antennas only, and not antennas which are themselves collapsible (now covered by W02-B08K). Prior to 1997, W02-B07A5 was used for all aspects.

W02-B07A7 [1992]

Vibration damping, stabilising

W02-B07B [1992]

De-icing arrangement

W02-B07C [1992]

Radome; Protective cover

W02-B07C1 [1992]

Forming part of vehicle

Includes e.g. the radome cover as used on an aircraft nose or on a missile. See also the appropriate codes in W06 and W07.

W02-B07D [1992]

Vehicle antenna mount

This code and its subdivisions are used only for novel mounting aspects of the antenna, i.e. generally for mechanical details, and not simply to indicate that an antenna is used on a vehicle. Vehicle applications of antennas are indicated by W02-B08F codes which can be assigned for any antenna aspect and hence they can be used with W02-B07D codes as appropriate to indicate the type of vehicle on which the antenna mounting is employed. (Codes indicating electrical aspects of the vehicles concerned are also assigned, such as W06 or X22 codes for aircraft and ships, or land vehicles respectively). Details of the actual antenna will also be coded as usual in the appropriate W02-B section when useful information can be added.

W02-B07D1 [1992]

Whip

W02-B07D3 [1992]

Waveguide

W02-B07D5 [1992]

Slot

W02-B07D9 [1992]

Microstrip

W02-B08 [1992]

General details

W02-B08A [1992]

Measuring; testing

(W02-B09)

W02-B08A codes cover monitoring/testing of antenna performance in a general sense, measurement of specific antenna parameters, and antenna set-up and alignment. 'Electrical instrument' (S01) codes are also assigned as appropriate for testing and measuring aspects, especially S01-G08A5.

W02-B08A1 [1992]

Measuring of antenna parameters per se

(W02-B09)

W02-B08A1A [1997]

Polar diagrams

W02-B08A1C [1997]

VSWR

W02-B08A1E [1997]

Gain

W02-B08A1X [1997]

Other antenna parameter measurements

W02-B08A5 [1997]

Antenna set-up and alignment

Covers arrangements for set-up and alignment of antennas and antenna systems. W03-A16A is also assigned for satellite TV receiving antenna set-up aspects. Adjustment of antenna parameters such as directional characteristics during normal operation is not included, and is covered by W02-B06 codes.

W02-B08A5A [2005]

Antenna set-up based on optimum reception

Covers mechanical or electronic adjustment of antenna characteristics based on maximum signal strength or analogous indication during set-up.

Calibration

W02-B08A5C [2005]

Antenna set-up based on geographical position

This code covers arrangements for antenna set-up and alignment based on known position, e.g. using compasses or inclinometer (also assigned S02-B codes), or GPS information (W06-A03A5E is also assigned).

W02-B08A9 [1992]

Other antenna test or measurement aspects

(W02-B09)

Includes non-electrical tests.

W02-B08B [1992]

Isolation, overvoltage protection arrangements

W02-B08B1 [1992]

Lightning protection

See X13-C03 for lightning arrestors.

W02-B08B3 [1992-2009]

Isolation between adjacent antennas*

*This code is now discontinued and from 2010 arrangements for improving isolation between adjacent antennas are covered by W02-B08P6. W02-B08B3 remains valid and searchable for records prior to 2010.

Separation, shield, repeater, receiver, desensitizing

W02-B08B5 [1997]

Protection against radiation

Covers arrangements to reduce irradiation of personnel, and also measures to reduce amount of radiation penetrating head of user of portable telephone (search with W01-C01D codes and W01-C01A4 for telephone applications and with W02-G02A1 for general hand-held transceivers).

W02-B08C [1992]

Active and structurally-associated aerials, mast-head and general RF preamplifiers

From 2006 the title of this code has been expanded to reflect the existing inclusion of amplifiers mounted in close proximity to e.g. a receiver, but external to it, covered by W02-B08C5C as a subdivision of the previously-existing code for mast-head amplifiers (W02-B08C5). Prior to 2006 search W02-B08C* with terms such as 'external amplifier' or 'antenna lead amplifier' for external amplifiers used at the receiver end of an antenna cable.

W02-B08C1 [1992]

Active aerials

W02-B08C3 [1997]

Aerials structurally associated with active components

This code is intended for arrangements having part of e.g. a receiver structurally associated with the antenna, such as a low-noise block for satellite TV reception (also coded in W03-A16A).

W02-B08C5 [1992]

Mast-head and general RF preamplifiers

From 2006 this code has been expanded in scope to include RF preamplifiers in general, e.g. connected into an antenna cable at the receiver end, as well as amplifiers used at the antenna. RF amplifiers within communications receivers are covered by W02-G03A3.

Booster, preamplifier, LNA, low-noise amplifier

W02-B08C5A [2006]

Mast-head amplifiers

Covers amplifiers mounted in close proximity to an antenna. Amplifiers used at the receiver end of an antenna cable are covered by W02-B08C5C.

W02-B08C5C [2006]

General RF preamplifiers

Covers amplifiers mounted in close proximity to a receiver, but external to it. Amplifiers used at the antenna end of an antenna cable, i.e. mast-head amplifiers, are covered by W02-B08C5A.

W02-B08D [1992]

Connections for antenna

From 1997, this code includes antenna switching, previously coded in W02-B08X. See also appropriate codes in U21 and V03 (electronic and electromechanical switches respectively) and in V04 for plugs and sockets, especially V04-M30G.

W02-B08D1 [1992]

Coaxial cable

See also V04-M03.

W02-B08D3 [1997]

Involving inductive, capacitive, or optical coupling (W02-B08D, W02-B08E)

Prior to 1997 couplings of this type were coded under W02-B08D or W02-B08E. This code includes the use of optical fiber feed arrangements for antennas equipped with the necessary devices and circuitry to convert between optical and electric signals or vice-versa.

W02-B08D5 [1997]

Antenna switching arrangements

(W02-B08X)

W02-B08E [1992]

Impedance matching and tuning

See also the appropriate codes for tuning and impedance matching in U25. From 1997 inductive and capacitive couplings are covered by W02-B08D3.

From 1992 to 1997 these were coded under W02-B08D and W02-B08E.

W02-B08E1 [1997]

Impedance matching

See U25-D05 for lumped constant networks, and W02-A02C for distributed component aspects.

W02-B08E5 [1997]

Antenna tuning

W02-B08F [1992]

Antenna applications for vehicles

Previously coded as W02-B07, under supports and housings. From 1992 the novel mounting aspects of the antenna will be assigned the appropriate W02-B07D code for antenna type, and W02-B08F for the specific application. For antenna application only, use the appropriate W02-B08F code. From 2002, the title of this code has been expanded to emphasise the fact that the applications covered here are to antennas intended to be used on vehicles.

W02-B08F1 [1992]

Land vehicles; Automobiles

W02-B08F1A [1992]

Glass-mounted antenna

See X22-X02A3 also and X22-J02A, X25-B01C1C for claimed demister.

W02-B08F1B [1992]

Roof/body mounted

See X22-X02A1 also.

W02-B08F2 [1992]

Marine vehicles e.g. ship

See W06-C01B7 also.

W02-B08F5 [1992]

Aeroplane

See W06-B01B7 also.

W02-B08F6 [2006]

Missile or other projectile

Includes antennas on missiles, rockets, shells and the like, e.g. for guidance, target-seeking, or proximity fuzes. W06 and W07 codes are also assigned as appropriate.

W02-B08F7 [1992]

Space vehicle

See W06-B03C also.

W02-B08K [1997]

Collapsible antenna

(W02-B07A5)

Collapsible antenna supports are covered by W02-B07A5, which was assigned for all categories prior to 1997.

W02-B08K1 [1997]

Motor driven

W02-B08L [1997]

Antenna manufacture

(W02-B08X, W02-B09)

W02-B08L1 [2014]

Antenna design and modeling

Where testing is involved W02-B08A codes are also assigned. Computer-aided design (CAD) aspects are also assigned T01-J15A codes.

Simulation

W02-B08M [2002]

Antenna materials

This code is intended for **novel** materials with applications to antennas. It is assigned with other W02-B codes as appropriate. Antennas using materials with special properties, such as metamaterials, are covered by W02-B08Q codes, with W02-B08M codes also assigned if the materials are novel.

W02-B08P [2002]

Antenna improvements

These codes are used to highlight some specific stated improvement in an antenna design. They are assigned in conjunction with other W02-B codes as appropriate.

W02-B08P1 [2002]

Increased gain

W02-B08P3 [2002]

Increased bandwidth

Antenna or antenna systems with multi-band characteristics are covered by W02-B08R1 codes.

W02-B08P5 [2002]

Improved directivity, scattering reduction, and cross-polarisation immunity

Antenna systems specifically designed for multi-directional or multiple polarisation radiation are covered by W02-B08R codes. Prior to 2002, W02-B04A was assigned for these topics when antennas using reflectors or refractors were concerned. From 2002, this topic is indicated by assignment of a relevant W02-B04 code with a W02-B08P5 code for those antenna types.

W02-B08P5A [2002]

Improved directivity

W02-B08P5C [2002]

Improved cross-polarisation immunity

W02-B08P5E [2002]

Reduced scattering and edge effects

W02-B08P6 [2010]

Improved isolation between adjacent antennas (W02-B08B3)

This code covers arrangements for reducing unwanted interaction between antennas and improving isolation between them. Arrays of antennas designed to operate together are covered by W02-B05 codes.

Blocking, cancellation, desensitizing, phase, screen, separation, shield, receiver, repeater

W02-B08P7 [2002]

Improved VSWR or impedance matching

See W02-B08E1 for impedance matching arrangements for antennas.

W02-B08P8 [2002]

Improved non-electrical properties

These codes are used to highlight some specific stated improvement in an antenna which is not **directly** linked to its RF performance.

W02-B08P8A [2002]

Improved mechanical strength

W02-B08P8C [2002]

Improved durability

W02-B08P8E [2002]

Improved weather resistance

W02-B08P8G [2002]

Improved appearance

This codes is used to highlight aesthetic aspects of antenna design, including concealment or blending in with surroundings.

W02-B08P8J [2005]

Reduced-size antennas

W02-B08P8L [2005]

Reduced-weight antennas

Includes use of lighter materials, novel aspects of which are covered in W02-B08M also.

W02-B08P9 [2002]

Other improvements to antenna performance

W02-B08Q [2012]

Antennas using materials with special properties

This code covers the use of materials with special-properties, such as those not relying on normal ohmic conductivity or those exhibiting a negative refractive index in terms of EM wave propagation. Where materials themselves are novel W02-B08M (general code for antenna materials) is also assigned.

W02-B08Q1 [2012]

Antennas using metamaterials

Includes use of composite RH and LH materials.

W02-B08Q5 [2012]

Antennas using superconductors

Waveguide devices using superconductive materials are assigned W02-A08J. Novel superconductors in general are covered by U14-F codes and X12-D06 codes.

W02-B08Q9 [2012]

Antennas using other materials with special properties

W02-B08R [2002]

Antenna or antenna systems with multi-band, multi-directional, or multiple polarisation characteristics

Individual antennas for which these characteristics are inherent, e.g. wide bandwidth in the case of disccone antennas (W02-B01C5), are not routinely assigned W02-B08R codes.

W02-B08R1 [2002]

Antenna or antenna systems with multi-band or wideband characteristics

From 2005 the title of this code is expanded to better reflect previous inclusion of wideband antennas, and is subdivided to differentiate between continuous wideband coverage and multi-band operation, e.g. in harmonic modes, in several possibly narrow, frequency bands.

W02-B08R1A [2005]

Antenna or antenna systems with multi-band characteristics

This code is intended to cover antennas operating in several frequency bands, harmonically-related or otherwise, the width of the bands not being the distinguishing aspect. Antennas operating over a continuous wide frequency range are covered by W02-B08R1C.

W02-B08R1C [2005]

Antenna or antenna systems with wideband characteristics

This code is intended to cover wideband antennas providing continuous coverage over a relatively wide frequency range. Antennas operating in several discrete frequency segments are covered by W02-B08R1A.

W02-B08R3 [2002]

Antenna or antenna systems with multi-directional characteristics

W02-B08R5 [2002]

Antenna or antenna systems with multiple polarisation characteristics

Antenna **arrays** with multiple polarisation radiating characteristics were coded in W02-B05B8 prior to 2002.

W02-B08X [1992]

Other general antenna details

W02-B09

Other antenna types

Bird repellant, plasma antenna, submerged antenna, subterranean antenna, underground antenna, underwater antenna, warning light

W02-B10 [2002]

Antenna for non-communications application (W02-B09)

This code is intended to be used with any other W02-B code to indicate that an antenna is being used to launch or intercept RF energy for a purpose other than communications. For example, it is assigned for an antenna coupling RF energy into a discharge space in plasma processing apparatus (also assigned V05-F04L, V05-F05C1 codes, and other V05-F codes as appropriate). In general, codes relating to the specific application should also be included in a search, such as S05-B codes for surgery or X25-B02B codes for microwave heating. Note that any transmission and reception of radio signals is regarded as communication, so that applications such as radar, transponder systems, telemetry and remote control are **not** assigned W02-B10.

Applicator, diathermy, emitter, ISM, microwave heating, process chamber, rectenna, rectifying antenna, RF heating, surgery

W02-B12 [2005]

Antenna or antenna systems using existing structure or living body as radiator or radiation enhancer

W02-B12A [2005]

Using existing metallic structure or conductor system

This code covers the use of conductors whose primary function is not that of an aerial, e.g. use of power conductors, or a resonant slot antenna formed in the roof of a vehicle (W02-B02C, W02-B08F1, W02-B12A and X22-X02A1).

W02-B12C [2005]

Using living body, or part of body

This code includes arrangements for improving radiation in a hand-held transceiver such as a mobile phone (W01-C01D3C also assigned) by arranging for the user's body to serve as a ground plane, or similar, in conjunction with a monopole antenna.

W02-C

Transmission systems (general)

W02-C01

Line systems

Note: telephone systems are covered by W01-C and are coded in W02-C01 also only for common features e.g. equalising, echo suppression, and 'classical' transmission line measurements.

W02-C01A

Using power lines or wave guides

W02-C01A1 [1992]

Using waveguides

Waveguides per se are in W02-A

W02-C01A3 [1992]

Using power line

See also under application e.g. W05-D06P for remote control aspects, X12-H03 for power line carrier systems and W01-A06C6 for data communication network aspects.

Intercom, local area network, remote measurement, PLCC

W02-C01A9 [1992]

Other power line or waveguide systems

W02-C01B

Transmission control; Equalising

Transmit-receive switching, level control, amplitude-frequency compensation, phase frequency compensation, modem, passive network, transversal filter, switched capacitor filter

W02-C01B1 [1992]

Transmission control

Includes setting of transmission level, i.e. power control, and control of transmission direction. Systems aspects of power control in radio communication are covered by W02-C03E3.

W02-C01B2 [1992]

Equalising

W02-C01B2A [1992]

Equalising system

W02-C01B2B [1992]

Apparatus, i.e. equaliser per se

See U22-G03E3C for digital signal processing aspects of equalising.

W02-C01B2C [1992]

Training

Training signal transmission

W02-C01B9 [1992]

Other transmission control or equalising

W02-C01C

Reducing echo, cross-talk or interference

Double-talk detector, replica signal generator, decoupling

W02-C01C1 [1992]

Echo, singing reduction

W02-C01C1A [1992]

Using filters

W02-C01C1B [1992]

Echo canceller

This code takes precedence over W02-C01C1A for arrangements using filters in an echo-canceller using a replica of the original signal.

W02-C01C1X [1992]

Other echo reduction aspects

W02-C01C2 [1992]

Reducing cross-talk

See W02-C01C3B for correction of external interference.

W02-C01C2A [1992]

Compensating

W02-C01C2X [1992]

Other cross-talk reduction

W02-C01C3 [1992]

Reducing interference

Shielding

W02-C01C3A [1992]

Caused by currents induced in cable sheath or armour

W02-C01C3B	[1992]
Caused by unbalanced current in normally balanced line	
Crosstalk compensation is in W02-C01C2A.	
W02-C01C3X	[1992]
Other line interference reduction	
W02-C01D	
Monitoring; Testing	
See S01 also for measurement of specific electrical parameters.	
W02-C01D1	[1992]
Fault location	
W02-C01D3	[1992]
Standby systems and redundancy networks	
W02-C01D3A	[1992]
With automatic switching to powered-up backup equipment e.g. hot-standby system	
W02-C01D5	[1992]
Measurement of transmission line parameters	
Used when emphasis is on actual line parameters. (For telephone subscriber loop testing see W01-C02A5). Includes RLGC values etc.	
<i>Attenuation, phase shift, characteristic impedance, return loss, noise/signal-to-noise ratio measurement, frequency response</i>	
W02-C01D9	[1992]
Other line measurement	
W02-C01E	[1992]
Repeater circuits	
(W02-C01X)	
Radio repeaters are coded in W02-G05C.	
<i>Regenerator</i>	
W02-C01E1	[1992]
Power supply details	
(W01-C01X)	
Includes remote power feeding arrangements.	
<i>Remote power feed</i>	
W02-C01E5	[1992]
Amplifier details	
(W01-C01X)	
See also U24-G codes.	
<i>Line amplifier</i>	

W02-C01E9	[1992]
Other line repeater aspects	
(W01-C01X)	
W02-C01F	[2005]
Line hybrids, transformers and impedance matching	
V02-F codes are also assigned for novel details of transformers and inductors for communications purposes.	
W02-C01F1	[2005]
Line hybrids and transformers	
Line hybrids specifically for telephone equipment are covered in W01-C08B, and are not assigned this code.	
W02-C01F5	[2005]
Impedance matching	
Impedance matching in general is covered by U25-D05 for lumped-constant circuits and by W02-A02C for distributed-constant circuits.	
W02-C01X	
Other line communication aspects	
W02-C02	
Near-field systems	
Includes transmission over deliberately restricted area using predominately magnetic or electric fields, but not conventional radio systems of very low power. W02-C02A or W02-C02B are assigned to indicate system type and W02-C02G codes are assigned to indicate application. Near-field data interfaces are covered from 2010 by W01-A07H2N with W02-C02 codes only assigned for novel near-field aspects.	
<i>NFC</i>	
W02-C02A	[1992]
Radiating/leaky cable	
W02-C02B	[1992]
Inductive loop systems	
W02-C02G	[1992]
Application	
Used in conjunction with W02-C02A or W02-C02B.	
W02-C02G1	[1992]
In tunnel or mine	

W02-C02G3 [1992]

Entertainment, educational, and hearing aid systems

From 2002 the title of this code is expanded to recognise the use of W02-C02G3A for general applications of near-field systems to hearing aids.

Auditorium

W02-C02G3A [1992]

For operation with hearing aids

See also W04-Y, especially W04-Y03C5.

Across-counter communication aid, hearing-aid loop system

W02-C02G5 [1992]

For (selective) calling system

Also assigned W05-A05C codes, but note that conventional radio-based paging is **not** included here (see W02-C03 codes with W05-A05C codes).

W02-C02G7 [1997]

For smart card data transfer

(W02-C02G9)

See T04-K02 also and T05-H02C5C (card-freed services) as appropriate.

W02-C02G9 [1992]

Other near field system applications

W02-C02X [1992]

Other near field systems

W02-C03

Radio systems

Prior to 1992 codes in this section were chiefly used to denote 'systems' aspects of radio communication. From 1992, all aspects of radio communications (within the scope of W02) have been coded here, including apparatus which is also assigned W02-G codes.

From 2002, inventions relating to pure **applications** of radio communications in the field of alarm signalling and remote control or remote monitoring, are **not** assigned W02-C03 codes. For these applications the relevant 'transmission medium' codes from class W05 should be used in searching (e.g. W05-B05 or W05-D06 codes). Inventions in these fields for which there is some novelty in the radio communications sense will continue to be assigned W02-C03 and W02-G codes as appropriate.

W02-C03A

Diversity systems

Diversity aspects of data transmission are covered by W01-A01A, and also assigned W02-C03A codes for significant radio aspects. Radio receiver circuits to counter multipath effects are coded in W02-G03B6 codes also, e.g. W02-G03B6A for rake receiver configurations (from 2002). From 2006 hybrid diversity schemes, (e.g. MIMO and the like), are covered by W02-C03A5.

In general in the following codes, those denoted 'System' relate to a diversity radio system operating method, possibly involving signalling and control aspects in a general sense, or the application of diversity at a network level, **without any novel apparatus being involved**. Codes entitled 'Apparatus' relate to novel circuitry, methods, or software at the **equipment level**, whether involving antennas, receivers or transmitters or some combination of these.

Antenna combiner/switching circuit, phase shifter, phase stripping circuit, fading/noise/interference detector, linked AGC system, dual-antenna mobile installation

W02-C03A1 [1992]

Space diversity

W02-C03A1A [1992]

Space diversity system

W02-C03A1B [1992]

Space diversity apparatus

W02-C03A2 [1992]

Time diversity

W02-C03A2A [1992]

Time diversity system

W02-C03A2B [1992]

Time diversity apparatus

Rake receivers are covered by W02-G03B6A, with codes assigned to highlight spread spectrum aspects as necessary, e.g. W02-K05A7 for CDMA.

W02-C03A3 [1992]

Frequency diversity

W02-C03A3A [1992]

Frequency diversity system

W02-C03A3B [1992]

Frequency diversity apparatus

W02-C03A4 [1992]

Polarisation, direction diversity

Includes directional diversity aspects of BDMA and SDMA, which are covered by W02-K10 (from 2017) with antenna control details assigned W02-B06C.

W02-C03A4A [1992]

Polarisation or directional diversity system

W02-C03A4B [1992]

Polarisation or directional diversity apparatus

W02-C03A5 [2006]

Hybrid diversity schemes

Includes combined space and frequency diversity and systems, e.g. of MIMO and similar type, making use of propagation effects such as multipath to improve reliability, channel capacity, and the like. Rake receivers are covered by W02-G03B6A.

V-Blast, Alamouti, MIMO, precoding, vector

W02-C03A5A [2017]

Massive or large-scale MIMO systems

Covers use of a large number of antennas in a MIMO diversity scheme. For relevance to 5G cellular communications search with W02-C03C1L. Automatic antenna direction control is covered by W02-B06C and BDMA/SDMA systems (from 2017) by W02-K10.

Access point, AP, Argos, base station, beam forming, beam tracking, eNodeB, full-dimension MIMO, hyper MIMO, large-scale antenna systems, millimeter wave, mmWave, MU-MIMO, pilot, very large MIMO

W02-C03A5P [2017]

Precoding aspects of hybrid diversity

This code covers precoding in the sense of equalization. (Equalization in general is covered by W02-C03E1 codes). Coding for error correction and detection is covered by W01-A01 codes.

Channel state information, codebook, CSI, linear, matrix, nonlinear, vector

W02-C03A5S [2017]

Algorithms and software aspects of hybrid diversity

Covers algorithms and software aspects of hybrid diversity systems, especially of MIMO type. T01-S codes are also assigned as necessary.

W02-C03A9 [1992]

Other radio diversity schemes

W02-C03B

Relay systems

Covers terrestrial and satellite systems. Satellite TV transmission is covered by W02-F06A, and **not** coded here except for novel 'radio relay' aspects. Repeaters per se are covered by W02-G05C.

Frequency translation, on-frequency system, passive reflector, TDMA satellite communication

W02-C03B1 [1992]

Artificial satellite and airborne radio relay system

Covers use of satellites and 'atmospheric' relay systems using aircraft, balloons and the like for which W02-C03B1F is assigned in conjunction with other codes as appropriate for system and apparatus details. Satellite and airborne relay telephone systems are regarded as cellular types and thus W02-C03C1 codes are assigned in addition to W02-C03B1 codes.

W02-C03B1A [1992]

Artificial satellite and airborne radio relay system/operating method

W02-C03B1B [1992]

Satellite and airborne radio relay station details

Covers novel details, including constructional details when linked to the radio function, of satellites and also aircraft, balloons etc., for which W02-C03B1F is also assigned. The following codes may also be required: W02-B codes (especially W02-B08F5 and W02-B08F7) for antenna system details; W02-G codes (especially W02-G05C) for radio equipment; W06-B codes for details of airborne or space vehicles.

W02-C03B1C [1992]

Ground station

Search with W02-G02A codes for mobile or portable terminal aspects.

Earth station, very small aperture terminal, VSAT, SAT

W02-C03B1D [1992]

Multiple access

Search with W02-K codes to define access method. e.g. W02-K01A for FDMA, W02-K02D for TDMA, W02-K05 codes for spread-spectrum multiple access.

Time division, TDMA, frequency division

W02-C03B1F [2005]

Airborne relay

This code is used with other W02-C03B1 codes as appropriate to highlight the use of an atmospheric radio relay system, i.e. one using balloons, high-altitude aircraft, etc.

W02-C03B2 [1992]

Terrestrial relay system

(H04B-007/14-195)

W02-C03B2A [1992]

Terrestrial radio relay system/operating method

W02-C03B2B [1992]

Terrestrial radio relay apparatus

This code covers all radio-related aspects of repeaters used in terrestrial radio relay systems. Other codes are also assigned as appropriate, e.g. W02-B codes for repeater antennas, or W02-G05C plus other W02-G codes for actual novelty in radio circuitry. Equipment for extending the range or providing 'fill-in' coverage in a mobile phone system is also assigned W02-C03C1B (i.e. it is coded as a base station). Repeater for extending coverage in a radio broadcast system are also assigned W02-D05 codes, e.g. W02-D05C1 for DAB and W02-F09 is also assigned for terrestrial TV relay stations.

Repeater

W02-C03C [1987]

Mobile radio, including cellular systems

(W02-C03X)

For mobile radio telephone system use with W01-B05A codes. For mobile telephones per se, (including 'non-RF' details not assigned W02-C03C codes), see W01-C01D codes. From 1997, all mobile **telephone** and system-related details have been regarded as cellular, unless specifically indicated as being otherwise, such as 'call-point' or other cordless types, which are covered by W02-C03C3 codes. Prior to 1997, W02-C03C3 codes were used as a 'general' or 'unspecified' area for mobile telephones not clearly of cellular type.

W02-C03C1 [1987]

Cellular

(W02-C03X)

Application to telephone systems is indicated by assignment of W01-B05A1A for systems (with W02-C03C1A) or base stations (with W02-C03C1B), and by W01-C01D3 codes for subscriber telephones themselves (with W02-C03C1C). Analogous cellular aspects for inventions with emphasis on wireless data networks are also assigned W02-C03C1 codes with W01-A06C4 codes and other W01-A06 codes as appropriate. From 2012 W01-E codes have been introduced to cover aspects of wireless systems, normally operating on a cellular model, that may be equally applicable to data networks and mobile phone networks. These codes cover topics such as roaming and registration, (previously indicated by assignment of W01-B05A1R and W01-B05A1N respectively in the case of mobile phone networks), and should be included in searches to provide more detail on specific cellular radio topics. Since 2002, non-TDMA access schemes, or systems not using that multiple access scheme alone, have been assigned W02-C03C1G, with other W02-C03C1 codes as appropriate. To discriminate these aspects, when the novelty lies in the multiple access technique used, W02-K codes are assigned as well. Thus for CDMA and W-CDMA W02-K05A7 is assigned (e.g. for UMTS), and for use of OFDM (e.g. as the access scheme for '4G' telephones), W02-K07C is used. Does not include 'call-point' cordless telephone systems, which are covered by W02-C03C3 codes. Satellite telephone systems are regarded as cellular types and thus W02-C03C1 codes are assigned in addition to W02-C03B1 codes.

CA, carrier aggregation, cell, frequency re-use, radiotelephone, zone

W02-C03C1A [1992]

Cellular radio system/operating/method

This code is normally assigned along with W01-B05A1A to indicate layout or design of a cellular telephone system, the arrangement of cells and base stations, or novel methods of operating the network involving call set-up procedures, signalling, paging, and the like. This code is also applied for all communication between the network node and the user equipment. For example, beam management procedures such as beam sweeping, beam reporting, and beam failure recovery are covered here along with W02-C03C1L. Also includes control and shared data channels for 4G and 5G networks. Appropriate codes for 3G, 4G and 5G are also assigned to highlight the type of system.

Synchronization Signals, P-SS, S-SS, RACH, PDSCCH, PDCCH, PUSCH, PUCCH, Beam Sweeping, Beam reporting, Beam failure recovery, Beam scheduling

W02-C03C1B [1992]

Base station apparatus

W02-C03C1C [1992]

Mobile apparatus

General and non-RF aspects of cellular telephones (which are not assigned W02-C03C1 codes) are covered by W01-C01 codes only, especially W01-C01D3 codes.

Mobile radiotelephone

W02-C03C1D [1992]

Cellular radio hand-off

Received signal strength indicators (RSSI) and signal quality measurements in radio receivers in general are covered by W02-G03J codes, which are also assigned for hand-off aspects as appropriate. Soft hand-off in CDMA systems is indicated by additional assignment of W02-K05A7, and since 2002, by W02-C03C1G. Hand-off for non-cellular mobile radio is covered by W02-C03C3D. From 2012 W01-E01 codes are also assigned for mobility-related aspects of wireless data networks and mobile phone networks such as roaming and registration, e.g. W01-E01C5 for transfer of registration information.

Hand-over, reselect, transfer

W02-C03C1E [1992]

Mobile location determination by the network

This code is intended for the determination of location for the purpose of operating the mobile radio system, and does not cover the provision of position information by a navigation receiver built into a mobile station for the benefit of the user only. It does not cover the provision of position information as a 'subscriber service' (e.g. using an unrelated system such as GPS), except when cellular system location register information is employed, in which case W02-C03C1J ('Cellular radio applications') is also assigned. From 2012 W01-E01 codes are also assigned for mobility-related aspects of cellular wireless data networks and mobile phone networks, such as location register details in W01-E01C1 (see W01-B05A1Q prior to 2012). For mobile location determination in non-cellular systems see W02-C03C3F.

W02-C03C1F [2017]

Distributed antenna system

This code covers systems in which multiple remote units are used as access points or base stations in a cellular or similar system, usually to provide coverage in localized areas not well-served by normal wireless infrastructure, such as within buildings, tunnels, or other areas underground. Use of optical fiber links such as 'radio-over-fiber' between a hub and remote units is indicated by co-assignment of W02-C04B1R.

Active, BDA, bidirectional amplifier, DAS, head end, hub, hybrid, passive, radio access unit, RAU, radio interface unit, RIU, radio-over-fiber

W02-C03C1G [2002]

Radio system or apparatus details of third generation or analogous mobile phone system

From 2012 the title of this code has been changed to clarify the way it is used. W02-C03C1G is assigned with any other cellular (W02-C03C1) code as appropriate, for inventions involving the use of non-TDMA multi-access techniques, especially CDMA. For example, novel aspects of a 3G mobile phone system are represented by W02-C03C1A and W02-C03C1G, a novel 3G base station by W02-C03C1B and W02-C03C1G, and a novel 3G mobile station by W02-C03C1C and W02-C03C1G. Novel details of the spread spectrum aspect are also assigned W02-K05 codes, e.g. W02-K05A7, as appropriate. Systems based on other multiple access schemes are also covered here with access codes assigned as appropriate, but please note that from 2014 'Fourth generation' mobile phone systems (i.e. '4G' systems) are covered by W02-C03C1H.

3G, 3GPP

W02-C03C1H [2014]

Radio system or apparatus details of fourth generation or analogous mobile phone system

This code is assigned with any other cellular (W02-C03C1) code as appropriate, for inventions concerned with 'Fourth generation' (i.e. '4G') mobile phone systems. For example, novel radio-based aspects of a 4G mobile phone system are represented by W02-C03C1A and W02-C03C1H, a novel 4G base station by W02-C03C1B and W02-C03C1H, and a novel 4G mobile station by W02-C03C1C and W02-C03C1H. Novel details of the multiple access aspect are also assigned W02-K codes as appropriate, e.g. W02-K07C for OFDM.

Long term evolution, LTE, WiMax

W02-C03C1J [2002]

Cellular radio applications

This code is generally used without other W02-C03C1 codes, and is intended for inventions making use of the cellular system, while not involving novel cellular aspects. It is used only when the particular application cannot be coded elsewhere, and for cases specific to e.g. alarms and remote monitoring, relevant W05-B or W05-D codes are used instead.

W02-C03C1K [2017]
Hierarchical cellular network aspects
Covers systems and details of cellular networks organized on a hierarchical basis, e.g. with conventional large cells and smaller cells. Includes the use of local millimeter wave access points to separately deliver high rate data streams, e.g. as proposed for 5G for which W02-C03C1L is also assigned. Distributed antenna systems are covered by W02-C03C1F and are not assigned W02-C03C1K unless specific relevance to hierarchical cellular systems is involved. Hand-off between cells operating at different levels is also assigned W02-C03C1D.

Femtocell, macrocell, microcell, millimeter wave cell, mmWave cell, picocell, small cell

W02-C03C1L [2016]
Radio system or apparatus details of fifth generation or analogous mobile phone system
This code is assigned with any other cellular (W02-C03C1) code as appropriate, for inventions concerned with 'Fifth generation' (i.e. '5G') mobile phone systems. For example, novel radio-based aspects of a 5G mobile phone system are represented by W02-C03C1A and W02-C03C1L, a novel 5G base station by W02-C03C1B and W02-C03C1L, and a novel 5G mobile station by W02-C03C1C and W02-C03C1L. Novel details of the multiple access aspect are also assigned W02-K codes as appropriate, e.g. W02-K10 (from 2017) for BDMA.
BDMA, beam-division multiple access, SDMA, space-division multiple access, spatial-division

W02-C03C1M [2022]
Radio system or apparatus details of sixth-generation (6G) or analogous mobile phone system
This code is assigned as a tag with other codes as appropriate for inventions relating to sixth-generation (6G) communications technology.
6G

W02-C03C3 [1992]
Private mobile radio, MCA
Prior to 1997, W02-C03C3 codes were used (with W01-B05A or W01-C01D codes as appropriate) to indicate radio telephone systems which were not clearly cellular in nature. From 1997, all radio telephones are regarded as cellular (and thus assigned W02-C03C1 codes for RF aspects) unless recognisable as non-cellular type, such as 'call-point', or other cordless telephone system.
Multi-channel access, push-to-talk (PTT) system, CT2, CT3, DECT, PHS

W02-C03C3A [1992]
Private mobile radio system/operating method

W02-C03C3B [1992]
Base station details
W02-C03C3C [1992]
Mobile station details
W02-C03C3D [1997]
Mobile radio hand-off
Covers arrangements to transfer communication with mobile unit to another base station. Such arrangements for cellular mobile radio are covered by W02-C03C1D. Allocation of channels in trunked radio communication is covered by W02-C03C3G, and only coded in W02-C03C3D also if inter-base station transfer is involved.

W02-C03C3E [1992]
Characterised by mobile radio access method
Search with W02-K codes to define access method, e.g. W02-K01 codes for FDMA, W02-K02 codes for TDMA, W02-K05 codes for spread spectrum multiple access. Prior to 1997, W02-C03C3E was used to represent general aspects of trunked radio systems (now covered by W02-C03C3G) but will now only be used as well for specific access-related inventions in this category.

W02-C03C3F [1997]
Mobile location determination
Includes use of existing navigation systems, such as GPS, (for which W06-A03A5 codes are also assigned), in conjunction with the mobile radio system. For mobile location determination in cellular systems, see W02-C03C1E.

W02-C03C3G [1997]
Trunked radio system
Prior to 1997, this aspect was chiefly indicated by W02-C03C3E. See W02-C03B2 codes also for land-based radio relay systems.

W02-C03C3H [2002]
Direct mode
This code is intended for mobile radio communication conducted directly between mobile stations, rather than via a base station, although the base station may be involved in setting up the link. When applicable to trunked radio systems W02-C03C3G is also assigned.

W02-C03D [1992]
Point-to-point radio link
(W02-C03X)

W02-C03D1 [1992]
Point-to-point radio link system/operation method
(W02-C03X)

W02-C03D2	[1992]
Point-to-point radio link apparatus (W02-C03X)	
W02-C03D5	[1997]
Characterised by access method Search with W02-K codes to define access method. e.g. W02-K01 codes for FDMA, W02-K02 codes for TDMA, W02-K05 codes for spread-spectrum multiple access.	
W02-C03E	[1992]
General circuit details (W02-C03X)	
W02-C03E1	[1992]
Radio system equalising (W02-C03X)	
W02-C03E1A	[1992]
Radio system equalising method (W02-C03X)	
W02-C03E1B	[1992]
Radio system equalising apparatus (W02-C03X) See U22-G03E3C for digital signal processing aspects of equalising.	
W02-C03E2	[1992]
Radio system echo cancelling (W02-C03X)	
W02-C03E2A	[1992]
Radio system echo cancelling method (W02-C03X)	
W02-C03E2B	[1992]
Radio system echo cancelling apparatus (W02-C03X)	
W02-C03E3	[1992]
Power control (W02-C03X) Includes 'systems' aspects of power control e.g. based on signal transmitted from base station to mobile unit. Transmitter power control circuits per se are covered by W02-G01C codes.	
W02-C03E3A	[2002]
Novel algorithms for power control Includes software aspects of power control for which T01-S codes should also be searched.	

W02-C03E4	[1997]
Doppler shift compensation (W02-C03E9) Covers methods and equipment, such as receiver circuitry, for compensation of Doppler effects in e.g. mobile radio, communication with space vehicle, etc.	
W02-C03E5	[1997]
Simulation systems for radio communication (W02-C03E9, W02-C05A) Includes modelling and planning of radio links. See also T01-J15A codes for CAD aspects, e.g. T01-J15A4, and W02-C05A for system testing aspects. Search with W02-H01J1 for radio communication simulation during network design to minimise interference. <i>Path loss, attenuation, rain, fade, margin, signal-to-noise ratio, target</i>	
W02-C03E7	[2006-2009]
Resource allocation* *This code is discontinued from 2010 and the subject matter transferred to W02-C03G1. It included channel allocation and similar aspects of radio communication management. When interference avoidance is the aim W02-H01J5 is also assigned.	
W02-C03E9	[1992]
Other general radio circuit details (W02-C03X)	
W02-C03G	[2010]
Resource allocation and cognitive radio systems This code is intended to bring together the ideas of resource allocation in radio (wireless) networks and cognitive radio. When interference avoidance is the aim W02-H01J5 is also assigned with this code or its subdivisions.	
W02-C03G1	[2010]
Resource allocation, carrier aggregation and dual connectivity From 2021, this code has sub-codes which cover resource allocation along with carrier aggregation and dual connectivity in 4G and 5G networks.	
W02-C03G1A	[2021]
General resource allocation This code covers general resource allocation in a radio system. See also W01-A06E1L for resource allocation related to data networks.	

W02-C03G1C [2021]

Carrier Aggregation

Includes carrier aggregation for 4G and 5G systems for which W02-C03C1H or W02-C03C1L are also assigned.
CA, Supplementary uplink, Bandwidth Parts (BWP)

W02-C03G1E [2021]

Dual Connectivity

Appropriate codes for 4G and 5G i.e. W02-C03C1H and W02-C03C1L are also assigned to highlight the type of system.
DC

W02-C03G5 [2010]

Cognitive radio systems

This code covers cognitive radio systems, i.e. those making use of locally-unoccupied frequency allocations. Prior to 2010 this topic was chiefly covered by W01-A06F1A when wireless data networks were involved, which will continue to be assigned for channel occupancy sensing aspects.
Channel occupancy, Mitola radio, opportunistic network, primary user, white space

W02-C03H [2021]

Unlicensed radio network

This code is used to denote radio systems which use available unlicensed frequency bands such as 2.4GHz or 5-6GHz for communication.
LTE-U, NR-U

W02-C03X

Other radio systems

Ionospheric/tropospheric scatter communication

W02-C04

Light and infra-red systems

Covers free-space and optical fiber communication systems, but note that optical fibers and purely optical components per se are in V07. Electro-optical sources and detectors, and circuitry directly connected to them, are assigned codes in U12 also.

The following subject matter is not coded in W02-C04 unless of general application also, or unless specific novel details represented by W02-C04 codes are involved: General digital optical communication (W01-A07E), Optical fiber data network (W01-A06C1), TV optical remote control (W03-A02C), General optical remote control (W05-D06A3 or W05-D06C with W05-D08C), Optical 'radar' systems (W06-A06).

W02-C04A [1992]

Characterised by apparatus

W02-C04A1 [1992]

Transmitter circuits and apparatus

W02-C04A1A [1992]

Modulator

See also V07-K codes for optical modulators in general and V08 codes for laser source modulators.

W02-C04A1B [1992]

Amplifier, output stage

Includes source driving circuits.

W02-C04A1C [1992]

Power control

W02-C04A1D [1992]

Source

Semiconductor lasers are also assigned U12-A01B codes and V08-A04A codes.

W02-C04A1X [1992]

Other optical transmitter details

W02-C04A3 [1992]

Receiver circuits and apparatus

W02-C04A3A [1992]

Demodulator

W02-C04A3B [1992]

Amplifier, input stage

Includes circuit for photodiode and the like, also assigned U12-A02B4.

W02-C04A3C [1992]

AGC

See U24-C01 codes also.

W02-C04A3D [1992]

Optical detector

See U12 for photodiode details.

W02-C04A3X [1992]

Other optical receiver details

W02-C04A4 [1997]

Transceiver

Systems and circuitry specific to transmitters or receivers only are covered by W02-C04A1 or W02-C04A3 codes.

W02-C04A5 [1992]

Repeater circuits

W02-C04A5A	[1997]
Optical amplifier arrangements	
Prior to 1997, see W02-C04A1B, W02-C04A5, and W02-C04B1A. Optical amplifiers per se are covered by V07-K01C codes.	
W02-C04A6	[2006]
Optical multiplexing and switching devices	
This code covers novel aspects of optical switches and multiplexers for communications purposes, the core technology area for these topics being covered by V07 codes. Novel switching devices and systems for communications purposes are also assigned W01-B02 or W01-A06G5 codes, and novel multiplexers are covered by W02-C04B4B and W02-K04.	
W02-C04A7	[1992]
Equalising, noise and distortion eliminating, diversity	
From 1997, this code is subdivided to include noise reduction circuits, previously covered by W02-C04C7. See W02-C04B7 for inherently non-dispersive systems, such as transmission using solitons.	
W02-C04A7A	[1997]
Equaliser	
Prior to 2002, this code was used with W02-C04A7 for dispersion compensation, which is now covered by W02-C04A7J.	
W02-C04A7C	[1997]
Noise reduction circuits	
(W02-C04C7)	
W02-C04A7E	[1997]
Distortion reduction arrangement	
Includes arrangements to reduce effects due to nonlinearities, such as four-wave mixing.	
W02-C04A7G	[1997]
Diversity and polarisation control arrangements	
Includes polarisation diversity aspects. Control of polarisation in general (for communications and analogous purpose) is covered by V07-K03 and V07-F02B for gratings, filters and polarizers.	
W02-C04A7J	[2002]
Dispersion compensation	
(W02-C04A7, W02-C04A7A)	
This code is intended to cover apparatus or methods for the compensation of dispersion arising from e.g. optical fiber characteristics. (Previously covered in W02-C04A7 and W02-C04A7A). V07-K codes are also assigned as appropriate. Optical transmission systems using signals with an inherent resistance to dispersion, e.g. solitons, are covered by W02-C04B7.	

W02-C04A8	[1997]
Optical alignment system	
This code mainly relates to free-space communication apparatus (W02-C02B2 codes also assigned) and covers arrangements to optimise alignment of optical systems at transmitting or receiving stations. W06-A02C codes are also assigned as appropriate for systems detecting angle of incidence of incoming light signals.	
W02-C04A8A	[1997]
Tracking system	
Covers dynamic arrangements for maintaining alignment. Analogous systems for radio antennas are covered by W02-B06C.	
W02-C04A9	[1992]
Other optical communication apparatus	
W02-C04B	[1992]
Characterised by system type	
W02-C04B codes are assigned to indicate system type, either alone or with W02-C04A codes.	
W02-C04B1	[1992]
Fiber optic	
W02-C04B1A	[1992]
With coherent light i.e. laser source	
Novel laser sources are assigned W02-C04A1D in conjunction with appropriate U12-A01B codes and V08-A codes.	
W02-C04B1R	[2017]
Radio-over-fiber	
Covers systems in which radio frequency signals are directly modulated onto an optical carrier wave for transmission from a remote site over optical fibers. For use of this technology in distributed antenna systems for cellular communications search with W02-C03C1F.	
<i>DAS, distributed antenna system, remote unit</i>	
W02-C04B2	[1992]
Free space	
W02-C04B2A	[1992]
With coherent light i.e. laser source	
W02-C04B3	[1992]
Mobile	
W02-C04B4	[1992]
Multiplex optical communication systems	

W02-C04B4A [1992]

With multiplexed baseband

See W02-K codes also.

W02-C04B4B [1992]

With optical multiplexing

Includes WDM, also coded in W01-A03E1 when data transmission aspects are significant. See W02-K04 and V07 codes, e.g. V07-K04, also for novel aspects of optical multiplexing.

W02-C04B7 [1992]

Anti-dispersive

Includes transmission using solitons.

W02-C04B9 [1992]

Other optical communication system

W02-C04C [1992]

General details

W02-C04C1 [1992]

Testing of optical communication apparatus/system

See also the appropriate codes in V07-J.

W02-C04C1A [1992]

Testing of apparatus

W02-C04C1C [1992]

Testing of system

W02-C04C7* [1992-1996]

Noise reduction circuits

*This code is now discontinued and the subject matter transferred to W02-C04A7C. W02-C04C7 remains valid and searchable for records prior to 1997.

W02-C05

Monitoring; Testing

See S01 also for measurement of specific electrical parameters. Includes monitoring/testing in general, except for measurements specific to line communication (W02-C01D). Since 1992 testing of optical communications is not included in W02-C05, and has been covered by W02-C04C1 codes.

Test equipment, spectrum analyser, RF power, harmonic radiation, signal-to-noise ratio, noise figure, field strength, propagation loss

W02-C05A [1992]

Testing of transmission system

W02-C05B [1992]

Testing of apparatus

For equipment test, search together with appropriate code e.g. W02-C05B and W02-G01 codes, for transmitter testing.

W02-C06 [1987]

PCM transmission systems (general)

(W02-C09)

See W02-F07 codes for pulse code modulation TV systems, which are **not** included here.

Pulse code modulation, pulse amplitude modulation, voice coding, telephony

W02-C06A [1997]

Novel PCM communication systems

This code is intended for communication systems in general using PCM, for which there is not a more specific code elsewhere.

W02-C06C [1997]

Novel coding scheme

For further details of coding systems, and for coder/decoders per se, see W04-V05G codes. Speech codecs and coding methods specifically for telephone communication are covered by W01-C01C7.

Coding in general is covered by U21-A05 codes, and for video signals, by W02-F07 (prior to 200101) and W04-P01A codes.

W02-C07 [1987]

Ultrasonic/sonic systems (including hydrophones)

(W02-C09)

Sonar systems are in W06-A05 as required. For transducers see also V06-B03 and other V06 codes as appropriate.

Underwater communication, diver communication system, passive sonar system, free space sonic/ultrasonic system

W02-C07A [1997]

Sonic or ultrasonic communication

This code is intended for actual communication systems, i.e. intentional transmission of information from one point to another. Passive arrangements such as hydrophones are covered by W02-C07C.

W02-C07C [1997]

Hydrophones

See V06 codes for actual transducer details, e.g. V06-B03. Sonar transducers are covered in W06-A05C7.

W02-C09

Other transmission system

Includes communication via other media, e.g. ground.

W02-D

Sound broadcast distribution systems

Codes in this group relate to the broadcast system as a whole and to studio / transmitter aspects, and are not assigned for receiver details. Broadcast radio receivers are covered by W03-B codes. For radio broadcast studio equipment see also W04-G08.

Broadcast sound studio, sound mixing, outside broadcast equipment

W02-D01 [1992]

Wired broadcast system

Line, wired system, line amplifier

W02-D02 [2011]

Stereophonic and multiple audio channels sound broadcasting

This code is assigned for digital stereophonic broadcasting when this is a significant aspect, e.g. with W02-D05C codes for digital radio broadcasting. Analog FM and AM stereophonic broadcasting is covered by W02-E codes.

W02-D04 [2010]

Monitoring; Testing

(W02-C05; W02-D)

Includes testing equipment and methods for complete sound broadcast systems (including those covered by W02-E codes) or broadcast systems in general. Monitoring of sound broadcast systems for audience research purposes is covered from 2010 by W02-D04B (formerly W02-D08). Note that testing and monitoring of audio recording equipment and (sound) broadcast radio receivers is not included and is covered by W04-J codes and W03-B10A codes respectively. Testing and monitoring of television systems for broadcasting and other purposes and of interactive broadcasting systems is covered by W02-F04 codes.

W02-D04A [2010]

Testing

W02-D04A1 [2010]

Signal testing

Includes checking of signal quality.

Bandwidth, bit rate, coverage, distortion, error, harmonic content, modulation depth, service area, sidebands, spectral regrowth, spurious content, THD

W02-D04A5 [2010]

Testing of apparatus

These codes cover the testing of equipment forming part of a sound broadcast system.

Switching centre

W02-D04A5A [2010]

Testing of apparatus in broadcast studio

Testing of audio processing related aspects such as sound mixing is also assigned W04-G codes.

Control desk, console, talkback

W02-D04A5B [2010]

Testing of apparatus at transmitter or repeater site

W02-G01 or W02-G05 codes are also assigned when radio equipment is involved.

Antenna, cooling, enclosure, generator, power amplifier, power supply, tower

W02-D04A5X [2010]

Other sound broadcast apparatus testing

W02-D04B [2010]

Audience research system

(W02-D08)

Analogous systems for TV broadcast audience monitoring are covered by W02-F04B. Systems analyzing listening habits for the purpose of building a profile used to select or suggest content in interactive broadcasting are not included and are covered by W02-F10Q codes.

Tuned frequency, selected channel monitoring system, listener data acquisition

W02-D04C [2010]

Station output monitoring

(W02-C05 ; W02-D)

Covers arrangements to enable verification of scheduled transmission. Analogous systems for TV station output monitoring are covered by W02-F04C.

FCC, monitor, log

W02-D04C1 [2010]

Monitoring programme output

(W02-C05 ; W02-D)

Includes checking adherence to schedule, timing, etc., and monitoring of automatic recorded programme transmission.

W02-D04C5 [2010]

Checking transmission of commercial message

(W02-C05 ; W02-D)

Sponsor, advertisement, commercial break

W02-D04X [2010]

Other sound broadcast system monitoring

W02-D05 [1992]

Radio broadcast system

W02-G codes are also assigned as appropriate for novel equipment, e.g. W02-G01 codes for transmitters and W02-G05 codes for repeaters. Novel antennas for radio broadcasting are also assigned W02-B codes. Broadcast radio **receivers** are not included and are covered by W03-B codes.

Radio network

W02-D05A [1992]

Satellite

W02-D05C [1997]

Digital broadcast system

For broadcasting (not necessarily for entertainment purposes) in cellular telephone or data networks see W01-B05A1M and W01-A06E1A respectively.

W02-D05C1 [1997]

Involving multiplex transmission

Includes OFDM systems. Prior to 1997, see W02-K01, W02-K09 in addition to W02-D05. From 1997, W02-K07C is assigned in addition to W02-D05C1.

DAB, packet

W02-D05C5 [2002]

Internet broadcasting

(T01-H07C5E, W01-A06B7, W02-D, W02-F10E)

See T01-N01D1A also. Interactive broadcasting aspects are covered by W02-F10E codes.

W02-D07 [2011]

Additional information transmitted with broadcast signals

These codes are assigned to highlight the transmission of additional information with a sound (e.g. radio) broadcast signal. Other codes relating to the additional information itself are also assigned as necessary. The transmission of additional information using analog FM or AM stereophonic broadcasting is covered by W02-E01 codes.

W02-D07A [2011]

Emergency sound broadcasting

Codes indicating 'disaster-related' alarms in W05-B08 are also assigned as appropriate. Emergency television broadcasting is covered by W02-F05D. Reception of emergency broadcast messages in radio receivers is covered by W03-B08C7 and in TV receivers by W03-A18A5J.

Adverse weather, avalanche, bush fire, earthquake, eruption, flooding, forest fire, hurricane, landslide, landslip, mudslide, terrorist attack, tidal wave, tornado, tsunami, typhoon, volcano

W02-D07C [2011]

Traffic and public transport information

T07-G01 is also assigned for systems providing information to drivers designed to warn of, or reduce, traffic congestion.

W02-D07E [2011]

Electronic program guide (EPG) systems

Includes details of programming and also 'now playing' information. Broadcast radio receiver aspects are covered by W03-B08C5. Analog broadcast systems providing additional information on program content are covered by W02-E01B1. EPG systems for TV broadcasting are covered by W02-F10E5 and TV set aspects by W03-A13J.

W02-D07X [2011]

Other additional information in broadcast

W02-D08* [1997-2009]

Audience monitoring

(W02-C05, W02-D)

*This code is discontinued from 2010 and the subject matter transferred to W02-D04B. W02-D08 was used with W02-D01 or W02-D05 codes as appropriate. (Prior to 1997, W02-C05 was used with the relevant W02-D code.) Analogous arrangements for TV audience research are covered by W02-F04B.

W02-D09 [2022]

Other sound broadcast systems

Includes FM radio transmitters and repeaters (i.e. radio equipment) for which W02-G01 codes and W02-G05C are respectively assigned also. Includes mounting aspects of FM radio transmitting devices.

W02-E

Analog stereophonic broadcast systems

From 2011 codes in this group are only assigned for inventions specific to analog stereophonic sound broadcasting. Prior to 2011 W02-E codes were assigned for some inventions involving digital stereophonic broadcasting but from 2011 stereophonic broadcasting of digital or unspecified type is covered by W02-D02. TV stereophonic sound transmission is covered by W02-F06B only. See W03-A and W03-B codes for receiver aspects.

AM, FM multiplex systems, pilot tone, modulator, encoder

W02-E01 [1992]

Transmitting additional information

Includes use of additional subcarriers in a multiplexed analog stereophonic signal for providing subsidiary information channels. Transmission of additional information for digital or unspecified sound broadcasting is covered from 2011 by W02-D07 codes.

Subcarrier authorisation, SCA

W02-E01A [1992]

Carrying separate programme

Includes 'storecast' background music.

W02-E01B [1992]

Carrying separate information e.g. RDS

See W03-B codes for receiver details - W02-E01B codes are only used for novel aspects of the system as a whole, and the transmitting station per se (usually with W02-G01 codes).

From 1997, W03-B08 is assigned for all aspects of RDS-type receivers.

CCIR 634

W02-E01B1 [1992]

Relating to broadcast station

Includes station identification and radio broadcast program guides. Broadcast radio receiver aspects of program guides are covered by W03-B01C. EPG systems for TV broadcasting are covered by W02-F10E5 and TV set aspects by W03-A13J.

Programme identification, PI, alternative frequency, AF

W02-E01B5 [1992]

Unrelated to broadcast station

Includes road traffic information (e.g. ARI), financial information, and paging signal transmission (with W05-A05C codes).

W02-F

Television systems

TV receivers are covered in W03, studio equipment, cameras etc. in W04.

W02-F01

Closed circuit

The definition of 'closed circuit' intended here is that images are transmitted, usually to a single location, for viewing by humans, i.e. camera systems providing a video signal for image analysis only are not included, being covered by e.g. T04-D07 codes. Novel aspects of video cameras are also assigned W04-M01 codes.

W02-F01A [1992]

Closed circuit television for surveillance and security

See also W05-B01C5 for automatically-actuated alarm systems.

W02-F01A1 [1992]

Entry-phone with CCTV

See also W01-C04A1 for entry-phone.

W02-F01A5 [1997]

Combined with alarm or surveillance system

See also T01 and T04 image analysis codes and W05-B codes, e.g. W05-B01C5 codes for intruder detection, W05-B02 codes for fire detection and monitoring aspects.

W02-F01A9 [1992]

Other security CCTV systems

W02-F01B [1992]

Process control

W02-F01C [1992]

Component inspection during manufacture

Systems involving pattern recognition only, without a monitor display for an operator, are assigned T04-D codes and **not** covered here.

W02-F01D [1992]

Calibrated system for measuring dimensions

See also S02-A03 codes.

W02-F01E [1997]

Vehicle external-view CCTV system

(W02-F01X)

See also under application, e.g. X22-E09 for land vehicle, W06-B01B1 for aircraft.

W02-F01F [1992]

CCTV over non-wire (or fiber) link e.g. radio link

Includes near-field and low-power systems also.

W02-F01M [2006]

Medical CCTV systems

This code covers the use of CCTV systems and equipment with medical apparatus, normally for diagnosis, for which S05 codes are also assigned such as S05-D04B for endoscopes.

W02-F01X [1992]

Other closed circuit TV systems

W02-F02

Color

This code is only used for novel systems, e.g. modified PAL, NTSC etc., and relates to analogue color TV systems only.

W02-F03

Cable and stereoscopic TV systems

W02-F03A [1987]

Cable

W02-F03A codes are assigned for 'system' inventions, including cable hardware. W03-A codes are assigned for receiver details.

Community antenna TV (CATV), masthead amplifier TV

W02-F03A1 [1992]

Coaxial cable network

See X12-D05 for coaxial cable per se.

Cable installation

W02-F03A3 [1992]

Optical fiber network

W02-F03A5 [1992]

Head-end details, control aspects

W02-F03A7 [1997]

Microwave distribution system

(W02-F03A9)

Includes 'microwave cable' TV system providing local distribution of signals, usually in GHz frequency range.

Masthead

W02-F03A9 [1992]

Other cable TV aspects

Includes hardware aspects such as connectors (see V04 codes also), cable installations and fittings (see W01-D codes also) and repeaters (also assigned W02-C01E and W02-C04A5 codes as appropriate)

W02-F03B [1987]

Stereoscopic

Includes broadcast and industrial systems. Stereoscopic TV receivers are in W03-A12, signal generation is in W04-M09.

Three-dimensional TV

W02-F03B1 [1992]

Broadcast

W02-F03B3 [1992]

Industrial

W02-F03B9 [1992]

Other stereoscopic TV

Includes medical applications of stereoscopic TV - see S05 codes also.

W02-F04

Monitoring; Testing

Includes testing equipment and methods for whole system, or any component part in conjunction with that code, and also audience research systems. Note that monitoring and testing of sound broadcast systems and equipment is covered from 2010 by W02-D04 codes, and that video recording equipment monitoring/testing is covered by W04-J codes only.

Switching centre

W02-F04A [1992]

Testing

Production line test equipment, vectorscope, test pattern generator

W02-F04A1 [1992]

Signal testing

Covers measurements on analog or digital video signals. Measurement and testing of equipment used in video systems is covered by W02-F04A5 codes.

Artifact, BER, bit error rate, black level, color saturation, DC offset, differential gain, differential phase, hue, IRE unit, link quality, link testing, perceptual evaluation of video quality, PEVQ, picture quality, PSNR, SNR, SSIM, structural similarity, video quality

W02-F04A5 [1992]

Testing of apparatus

W02-F04A5A [1992]

In TV studio

W02-F04A5B [1992]

At transmitter or repeater

See also W02-G01 or W02-G05 codes.

W02-F04A5C [1992-2009]

In receiver*

*This code is now discontinued and from 2010 all aspects of TV receiver testing, including production line testing and internal self-monitoring are covered by W03-A18A codes. W02-F04A5C was assigned prior to 2010 for these aspects in addition to the W03 codes.

W02-F04A5X [1992]

Other TV or video apparatus testing

W02-F04B [1992]

Audience research system

This code covers arrangements for analyzing user opinions and/or determining viewing figures for audience research purposes. When equipment installed at the viewer location is involved W03-A18R is also assigned. Systems analyzing viewing habits for the purpose of building a profile used to select or suggest content in interactive broadcasting are not included and are covered by W02-F10Q codes. Analogous systems for audience research in broadcasting other than TV are covered by W02-D04B.

Selected channel monitoring system, viewing figure data acquisition

W02-F04C [1997]

Station output monitoring

(W02-F04X)

Covers arrangements to enable verification of scheduled transmission. Includes analogous arrangements for cable TV and similar distribution systems.

FCC, monitor, log

W02-F04C1 [1997]

Monitoring programme output

(W02-F04X)

Includes checking adherence to schedule, timing, etc., and monitoring of automatic recorded programme transmission.

W02-F04C5 [1997]

Checking transmission of commercial message

(W02-F04X)

Sponsor, advertisement, commercial break

W02-F04X [1992]

Other TV system monitoring

W02-F05

Secrecy, subscription, teletext

W02-F05A [1987]

Secrecy (scrambling), subscription

From 9701, interactive broadcasting, formerly covered in W02-F05A3C, is transferred to W02-F10 codes.

W02-F05A1 [1992]

Secrecy

(W02-F05A, W02-L)

See W02-F10N1 codes for scrambling and coding aspects of interactive broadcasting, which take precedence over W02-F05A1 codes.

Synchronising signal suppression, black-white inversion

W02-F05A1A [1992]

Video/audio scrambling system, jamming signal insertion

W02-F05A1B [1992]

Video/audio descrambling system

TV receiver aspects of descrambling are not included, being covered by W03-A16C3A.

W02-F05A3 [1992]

Subscription

From 1997, two-way aspects of subscription TV are covered in W02-F10 codes, especially W02-F10A.

W02-F05A3A* [1992-1996]

Billing system

*This code is now discontinued and from 1997 billing aspects of subscription TV are covered by W02-F10A codes and W02-F10N5. (These codes are assigned even in cases of non-interactive systems). W02-F05A3A is no longer assigned but remains valid for records prior to 1997.

W02-F05A3C* [1992-1996]

Two-way working

*This code is now discontinued and from 1997 subject matter previously coded here is transferred to W02-F10 codes, under the general heading of interactive broadcasting. W02-F05A3C remains valid and searchable, for two-way subscription TV and analogous arrangements, for records prior to 1997.

W02-F05A9 [1992]

Other TV secrecy and subscription aspects

W02-F05B [1987]

Teletext, screen text systems

Teletext TV receiver decoder is in W03-A10 only.

Character multiplex, videotext, off-air system, data base access, horizontal/vertical blanking interval data insertion, framing code, multiplex

W02-F05B1 [1992]

Telephone line-based system

(See also W01-C05B1) Includes e.g. CAPTAIN system.

W02-F05B5 [1992]

Transmitted as additional information with television signal

Includes teletext and analogous non-VBI systems as used in e.g. DVB, in which case W02-F07M1 is also assigned.

Burst-and-random error correction system for teletext (BEST)

W02-F05B9 [1992]

Other screen text systems

W02-F05C [1992]

Other additional (non-picture) information

Includes transmission of information for station ID or VPS, ghost control reference signals, URLs and the like. See W04-E04C5 codes for recording equipment aspects of off-air programming and W03-A04G for TV receiver ghost-cancelling circuitry. Teletext transmission systems for digital and analog TV broadcasting are covered in W02-F05B5.

Video programming system, GCR

W02-F05D [2011]

Transmission of emergency TV broadcast messages

Codes indicating 'disaster-related' alarms in W05-B08 are also assigned as appropriate. Emergency sound radio broadcasting is covered by W02-D07A. Reception of emergency broadcast messages in TV receivers is covered by W03-A18A5J.

Adverse weather, avalanche, bush fire, earthquake, eruption, flooding, forest fire, hurricane, landslide, landslip, mudslide, terrorist attack, tidal wave, tornado, tsunami, typhoon, volcano

W02-F06 [1987]

Satellite TV; MAC systems; High definition TV; Stereophonic/bilingual sound

(W02-F09)

Radio relay systems for communications purposes are assigned W02-C03B codes.

W02-F06A [1992]

Satellite TV

Radio relay systems for communication purposes are coded in W02-C03B codes.

Direct broadcast by satellite (DBS)

W02-F06B [1992]

Stereophonic and multichannel sound TV

W02-F06B1 [1992]

Involving companding

Includes NICAM system.

W02-F06B3 [2006]

Surround sound TV

W02-F06B5 [1992]

For carrying separate sound channel

Includes e.g. bilingual broadcast.

Second audio programme, SAP

W02-F06C [1992]

High definition TV transmission systems

Covers non-compatible and compatible systems such as IDTV, EDTV, HDTV etc.

W02-F06C1 [1992]

Involving time-multiplexed transmission of TV signal components

Includes MAC system and variants.

W02-F06C3 [1992]

Involving distinct transmission of motion information

W02-F06C7 [1992]

Involving sub-sampling

W02-F06C8 [1992]

Increased definition

Includes compatible 'side panel' systems modifying e.g. NTSC or PAL (see W02-F02 also) including 'letterbox' format.

W02-F07* [1987-2001]

Bandwidth/bit-rate reduction, PCM systems

(W02-F09)

*This code is now discontinued from 2002, as are the W02-F07 subdivision codes up to W02-F07K. These discontinued codes are replaced by the single code W02-F07M – 'Digital image transmission'. W04-P01A codes are still assigned as before, and may be used to highlight the type of coding. (Prior to 2002, the W02-F07 codes were used for methods and complete systems for PCM TV).

See T01-J10D for computer-based image coding and compression, and U21-A codes for coding in general. (Bandwidth reduction for facsimile and analogous systems is covered by S06-K07A4D).

Compression, encoding, narrow band TV, block coding, predictive coding, motion detection

W02-F07A* [1992-1997]

Movement detection system

*This code is now discontinued and from 1997 its subject matter is covered by W04-P01A1.

W02-F07B* [1992-2001]

Transform coding

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A3 codes.

W02-F07C* [1992-2001]

Predictive coding

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A5 codes.

W02-F07C1* [1992-2001]

Motion detection and compensation

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A5 codes.

Interframe, difference, differential

W02-F07C1A* [1997-2001]

Motion detection

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A5A.

W02-F07C1C* [1997-2001]

Motion compensation

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A5C.

W02-F07D* [1992-2001]

Subsampling

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A7.

Multiple sub-Nyquist sampling encoding, MUSE

W02-F07E* [1997-2001]

Hybrid coding

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A4 codes.

W02-F07E1* [1997-2001]

Combined transform and predictive coding

(W02-F07B, W02-F07C)

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A4 codes, which include MPEG system coding and variants.

W02-F07E5* [1997-2001]

Motion detection and compensation

(W02-F07B, W02-F07C1)

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A4 codes.

W02-F07E5A* [1997-2001]

Motion detection system

(W02-F07B, W02-F07C1)

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A4A.

W02-F07E5C* [1997-2001]

Motion compensation system

(W02-F07B, W02-F07C)

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A4C.

W02-F07K* [1997-2001]

Coding based on fractals

*This code is now discontinued and from 2002 its subject matter is covered by W04-P01A8.

W02-F07M [2002]

Digital image transmission

This code is intended to cover digital image transmission from a systems viewpoint, novel aspects of image coding are covered by W04-P01A codes.

W02-F07M1 [2005]

Digital video broadcasting

Includes DVB and similar systems. TV receivers for signals in this format are covered by W03-A11G. Includes non-interactive broadcasting of video via the internet, e.g. by streaming. Interactive broadcasting via the internet in general is covered by W02-F10E3.

W02-F07M1A [2008]

Mobile digital video broadcasting

This code is intended for transmission of digital TV broadcasts at a deliberately-reduced data rate, e.g. for handheld receivers with reduced processing and display capabilities.

DVB-H

W02-F07M5 [2005]

Digital video for non-broadcasting applications

Includes digital video transmission for conferencing, surveillance, equipment interconnection and the like.

W02-F08 [1992]

Two-way television systems

(W02-F09)

W02-F08A [1992]

TV conference system

(W02-F09)

W01-C05B1 or other W01-C codes are also assigned if telephone communication is involved.

W02-F08A1 [1992]

System

(W02-F09)

W02-F08A3 [1992]

Apparatus

(W02-F09)

W02-F08B [1992]

Video telephone

(W02-F09)

W02-F08B1 [1992]

System

(W02-F09)

Also assigned W01-C05B1 codes.

W02-F08B3 [1992]

Apparatus

(W02-F09)

Subscriber apparatus is also coded in W01-C01G4.

W02-F08X [1992]

Other two-way TV systems

(W02-F09)

Two-way TV systems.

W02-F09

Other television systems

Includes TV transmitters and repeaters (i.e. radio equipment) for which W02-G01 codes and W02-G05C are respectively assigned also. Also includes mounting aspects of television transmitting devices.

W02-F10 [1997]

Interactive broadcast systems

(W02-F05A3C)

Codes in this section cover subject matter chiefly coded, prior to 1997, in W02-F05A3, and include video, audio/video, sound-only, and information systems provided for access by entertainment equipment, usually of 'subscription' type. W02-F10 codes are used to represent 'head-end' and overall systems aspects. See W03-A16C codes for equipment based at a subscriber location.

W02-F10A [1997]

Video-on-demand, video-on-request and video-based systems

(W02-F05A3C)

Covers systems predominately of a video nature. Systems involving selection of predominately non-video programme material are covered by W02-F10C.

From 2002 the title of this code has been expanded to better reflect its content, and to separate actual video-on-demand systems from those in which some interactive facility is available without the provision for causing the downstream transmission of a different programme.

The title of this code has been further expanded to allow the inclusion of video-on-request systems, covered from 2006 in W02-F10A1E.

VOD, pay-per-view

W02-F10A1 [2002]

Video-on-demand system

(W02-F05A3C)

W02-F10A1A [2002]

Full video-on-demand system

(W02-F05A3C)

W02-F10A1C [2002]

Near video-on-demand system

(W02-F05A3C)

NVOD

W02-F10A1E [2006]

Video-on-request system

Covers systems in which video programming is delivered for later viewing, e.g. taking advantage of unused network capacity overnight.

W02-F10A1G [2007]

Video-based systems with different-view facility

Covers interactive video-based systems including the facility to select a different viewing angle. Multiple camera systems for generating different views of a scene are covered by W04-M01V.

W02-F10A5 [2002]

TV broadcasting with interactive aspects

(W02-F05A3C)

This code is intended for largely standard TV broadcasting or video distribution with limited interactivity, e.g. the facility to respond to questionnaires, cast votes, etc. Systems enabling fuller control over programme content are covered by W02-F10A1 codes.

W02-F10C [1997]

Audio-on-demand system
(W02-F05A3C)

The title of this code was amended in 2005 to reflect its normal use for audio entertainment. Includes remote access of entertainment library system, e.g. of 'pay-per-play' type.

W02-F10A codes take precedence for interactive systems in which audio is transmitted as a normal accompaniment to video signals in interactive TV.

W02-F10E [1997]

For access to information system, programme guide systems, and internet

Database systems in general are covered by T01-J05B codes.

In 2002 the title of this code was expanded to reflect its use for internet aspects including WWW access provided as part of an interactive broadcast system and internet broadcasting itself of an interactive nature, and also programme guide systems. For internet aspects see T01-N codes also.

W02-F10E1 [2002]

For access to internet

(T01-H07C5E, W01-A06B7, W02-F10E)

This code is intended for internet access provided as a facility of interactive broadcasting.

W02-F10E3 [2002]

Interactive internet broadcasting

(T01-H07C5E, W01-A06B7, W02-F10E)

This code is intended for interactive broadcasting using the internet itself. Non-interactive internet radio is covered by W02-D05C5 and non-interactive transmission of video via the internet is included in W02-F07M1.

W02-F10E5 [2002]

Programme guide systems

(T01-H07C5E, W01-A06B7, W02-F10E)

TV receiver aspects of interactive programme guides are covered by W03-A16C5E and of programme guides in general by W03-A13J.

EPG

W02-F10F [2005]

Archival storage of content primarily submitted by user

Includes storage and retrieval of images accessed by digital camera via a communication link. (Digital camera details are covered by W04-M01B1 codes). Also covers storage of video footage and other information.

W02-F10G [1997]

For game playing, virtual reality, or karaoke
(W02-F05A3C, W04-X02C)

Video games in general are covered by W04-X02C. For virtual reality aspects, see also W04-W07E codes. Karaoke systems are also coded in W04-X03A3.

W02-F10H [2002]

For access to multimedia systems

(W02-F10X, W04-K10)

Audio/video aspects of multimedia systems in general are also assigned W04-K10.

W02-F10J [1997]

For access to financial network

(W02-F05A3C)

Includes monetary transaction and interactive shopping, also assigned T01-N01A1 or T01-N01A2 codes as appropriate for applications of computing.

W02-F10K [1997]

Storage systems and servers

(W02-F05A3C, W04-K05)

This code covers file servers and similar arrangements for general storage of programme material, and to enable playback operation simulating e.g. VTR functions, such as rewind, fast-forward, etc. Multiple recording unit arrangements are also assigned W04-K05A codes.

W02-F10N [1997]

Security aspects and access control

(W02-F05A1, W02-F05A3C)

W02-F10N1 [1997]

Scrambling, coding and copy marking aspects

(W02-F05A1, W02-F05A3C)

From 2009 the title of this code has been expanded to reflect previous inclusion of copy marking. W02-F10N1 codes take precedence over W02-F05A1 codes which cover secrecy and scrambling for non-interactive video systems. See W02-L05 for audio scrambling systems in general. Data encryption in general is covered by W01-A05A codes.

W02-F10N1A [2009]

Broadcast signal scrambling and coding

Covers scrambling and coding (i.e. encryption, especially of video signals) to prevent unauthorised viewing. Arrangements to prevent or restrict the making of copies are covered by W02-F10N1C. Coding for compression is not included, being covered by W04-P01A codes.

W02-F10N1C [2009]

Broadcast signal copy restriction and watermarking

Covers arrangements to prevent or restrict the making of copies. Signal processing involving scrambling and coding (especially of video signals) to prevent unauthorised viewing or listening is covered by W02-F10N1A. Signal processing aspects of copy restriction and watermarking within recording equipment are covered by W04-F01L codes or W04-G01L codes.

Digital rights management, DRM

W02-F10N3 [1997]

Access control

(W02-F05A1, W02-F05A3C)

Includes use of smart cards to authorise decoding (see W03-A16C3C also for subscriber-end aspects), and control of access from server. See W02-F10N7 also for arrangements temporarily increasing access rights.

W02-F10N5 [1997]

Billing arrangements

(W02-F05A3A)

Aspects of financial transactions **using** an entertainment network, for purposes unrelated to billing for the service itself, are covered by W02-F10J.

W02-F10N5A [2005]

According to user-determined level of commercial message provision

Overriding of systems which prevent the recording of commercial messages is covered in W04-E04C5E.

W02-F10N7 [1997]

Temporarily increasing access rights and request transmission

(W02-F05A1, W02-F05A3C)

Covers systems enabling 'impulse' decision to e.g. view programme, and associated communications aspects. See W01-C05B5A also where telephone-based link is involved.

W02-F10Q [2005]

User profiling; Content recommendation; Selective insertion of commercial messages

From 2011 the title of this code has been expanded to allow inclusion of user profiling and 'recommendation' or 'suggester' systems which offer content based on a user's profile. W02-F10Q codes relate to systems and equipment at the 'content distribution end' of the broadcast system and do not cover self-contained analogous systems wholly based at the viewer or listener end which are part of e.g. a TV receiver and are not supplied by the content provider. Arrangements for analyzing user opinions and/or determining viewing figures for audience research purposes, rather than tailoring content, are covered by W02-F04B (TV broadcasting) and W02-D04B (sound broadcasting).

W02-F10Q1 [2011]

User profiling

This code covers the building of a user profile e.g. to be used to determine preferences in terms of content.

W02-F10Q1A [2011]

Learning aspects

This code covers novel aspects of monitoring user behaviour in terms of content that has been selected and includes automatic detection of patterns in viewing or listening habits.

W02-F10Q3 [2011]

Content recommendation

Covers 'recommendation' or 'suggester' systems for offering content based on the determined profile. Selective insertion of commercial messages is **not** included and is covered by W02-F10Q5.

W02-F10Q5 [2011]

Selective insertion of commercial messages

Covers equipment, methods and systems for selective insertion of commercial messages (CMs) presumed to be of interest based on the user profile or geographical region. Offering of content other than CMs is **not** included and is covered by W02-F10Q3.

W02-F10X [1997]

Other interactive broadcasting aspects

(W02-F05A3C)

W02-G

Radio transmission system details and equipment

Broadcast radio and TV receivers are in W03, sound studio equipment is in W04 and W02-D/E. Codes from the radio systems section (W02-C03) which denote apparatus are also assigned as appropriate.

W02-G01

Transmitters

Includes transmitters (for radio and TV) per se and those forming part of e.g. transceiver, where this aspect is the significant part of the disclosure.

W02-G01A [1992]

Oscillator and frequency conversion

W02-G01A1 [1992]

Oscillator

Includes oscillator circuits per se (see U23-A codes also).

W02-G01A3 [1992]

Frequency control

Include frequency control aspects such as PLL synthesisers (also assigned U23-D01B codes).

W02-G01A5 [1992]

Frequency translation

Includes frequency mixing. See U23-J codes for frequency changing and U23-B codes for frequency multiplying.

W02-G01B [1992]

Amplifier, output stage

Includes buffer amplifiers, driver stages, and output stages, e.g. power amplifiers.

W02-G01C [1992]

Power control, protection

W02-G01C1 [1992]

Power control

Overall systems aspects of power control are covered by W02-C03E3.

Output/level control

W02-G01C5 [1992]

Power limiting, protection

See S01-D05B5 for systems involving reflected power measurement, and U24-G03C for amplifier protection in general.

VSWR power limiting, thermal

W02-G01D [1992]

Modulator

See U23 codes for modulator circuits in general.

AM, FM, SSB, DSB, balanced modulator

W02-G01E [1992]

Tuning, matching, impedance networks

From 2012 the title of this code has been expanded to reflect the existing coverage of any impedance network forming part of transmitter RF amplifier input or output circuitry, such as filters, directional couplers, splitters and combiners. For lumped constant impedance networks U25 codes are also assigned as appropriate and for distributed constant circuits W02-A codes.

W02-G01H [1992]

Construction and cooling

W02-G01K [2002]

Transmitters with digital architecture

This code is intended for radio transmitters employing a digital architecture within the signal path, i.e. using DSP. See corresponding codes for transceivers and receivers also (W02-G02K and W02-G03K codes respectively).

W02-G01X [1992]

Other radio transmitter aspects

W02-G02

Transceivers

Covers fixed and mobile radio transceivers and also relevant RF aspects of e.g. cordless and cellular telephones where appropriate. (Non-RF aspects of mobile phones are not assigned W02-G02 codes and are covered by W01-C01D codes and other W01-C01 codes as necessary). Details specific to radio transmitters are covered by W02-G01 codes and to radio receivers (of non-broadcast or unspecified type) by W02-G03 codes. For transceivers other than radio type codes relating to the communications medium should be considered, such as W02-C04A4 for optical transceivers.

Radiotelephone, transmitter-receiver, two-way radio

W02-G02A [1992]

Portable and mobile transceiver

W02-G02A1 [1992]

Personal radio transceiver e.g. hand-held walkie-talkie

W02-G02A2 [1992]

Mobile radio transceiver

Covers transceivers installed in vehicles and generally of a higher power than normal hand-held walkie-talkie units.

W02-G02A3 [1992]

Selective calling e.g. answer-back pager

See also W05-A05C codes for paging details.

W02-G02A5 [1992]

Characterised by operation

See W02-G02C3A for novel transmit-receive switching.

W02-G02A5A [1992]

Push-to-talk

PTT

W02-G02A5B [1992]

Duplex

Includes aspects such as duplexers, for which filter codes are also assigned as appropriate (e.g. W02-A05K7 in the case of distributed constant types).

W02-G02A5C [1997]

Voice-operated switching

(W02-G02C, W04-V04A1)

Prior to 1997 see W02-G02C. See also W04-V04A1 which covers applications of speech recognition and speech/noise discrimination systems.

VOX

W02-G02A5X [1992]

Other radio transceiver operation

W02-G02A9 [1992]

Other radio transceiver details

W02-G02B [1992]

Base station

W02-G02C [1992]

Control and interfacing

Includes general processor control, see appropriate T01 code also. From 1997 voice actuated control is coded under W02-G02A5C.

W02-G02C1 [1997]

Controls per se

See also V01-A03 codes for potentiometers, and U21 or V03 codes respectively for electronic and electromechanical switches.

W02-G02C3 [1997]

General control circuitry

W02-G02C3A [1997]

Transmit-receive switching

Portable and mobile transceiver operating modes are covered by W02-G02A5 codes.

W02-G02C5 [1997]

Testing, monitoring

W02-G02C7 [1997]

Interfacing

Includes circuitry such as bus and network interface aspects, and connectors (also assigned V04 codes, especially V04-M30G).

W02-G02C9 [1997]

Other radio transceiver control

W02-G02H [1992]

Construction

W02-G02K [2002]

Transceivers with digital architecture

This code is intended for radio transceivers employing a digital architecture within the signal path, i.e. using DSP. See corresponding codes for transmitters and receivers also (W02-G01K and W02-G03K codes respectively).

W02-G03

Receivers

Used for receivers of 'professional' i.e. communications type and for application to receivers in general, or where application not disclosed. Broadcast radios are covered by W03-B codes, and not coded here except when used in conjunction with W02-G03B codes for noise/interference suppression or (from 2005) with W02-G03J codes for RSSI aspects. Since 2002, W02-G03K codes have been assigned for receivers with digital architecture.

W02-G03A

Tuners

The W02-G03A codes chiefly cover superheterodyne receivers, TRF types being assigned W02-G03A9. Since 2002 W02-G03A8 codes have been assigned for direct conversion and low-IF receivers.

Preset, step, continuous, variable capacitor, varicap diode, variable inductor, permeability, ganged, tracking, peaking

W02-G03A1 [1992]

Tuned circuits, input filters, and attenuators

Search with appropriate codes in U25 for lumped-constant tuned circuits and filters, and W02-A03 or W02-A05 for distributed-constant elements. The title of this code has been expanded from 2002 to allow the inclusion of attenuators, previously coded as W02-G03A9. See U25-D07 codes for lumped constant attenuators and W02-A04C codes for distributed constant types.

W02-G03A3	[1992]
RF amplifier	
Novel RF amplifier details are also assigned U24-G01D and other relevant amplifier codes. From 2006, RF AGC is covered by W02-G03D3, previously coded as W02-G03A3 and W02-G03D.	
W02-G03A5	[1992]
Mixer	
Mixer circuits in general are covered by U23-J codes.	
W02-G03A5A	[2006]
Image rejection mixer	
For application to low-IF receivers search with W02-G03A8C. Prior to 2006 image rejection mixers were represented (in W02) by W02-G03A5 and W02-G03B4A (receiver image signal suppression in general). From 2006 W02-G03B4A will only be assigned for specific novelty in the image rejection aspect.	
W02-G03A7	[1992]
Local oscillator	
Includes frequency translation aspects e.g. multipliers, also assigned U23-B codes.	
W02-G03A7A	[1992]
Frequency control	
Includes frequency synthesisers of general application to radio equipment, if specific purpose not disclosed. See U23-D01B codes for details of PLL implementations, and U23-F01 codes for 'direct' synthesisers. For AFC circuits, search with U25-J05.	
<i>AFC</i>	
W02-G03A8	[2002]
Direct conversion and low IF receivers	
These codes are used, in conjunction with other W02-G03 codes as necessary, to represent receivers of homodyne, synchrodyne, 'zero-IF', or 'low-IF' type. Arrangements for suppression of offsets at the output of the mixer are also assigned W02-G03B4G. Direct digital conversion (DDC) in digital architecture communications receivers is not included here, being covered by W02-G03K5. Direct conversion TV receivers are covered by W03-A01B6 codes and direct conversion broadcast receivers by W03-B01A6 codes.	
W02-G03A8A	[2002]
Zero-IF direct conversion receivers	
This code is intended for direct conversion schemes in which the baseband information is centered on zero frequency.	

W02-G03A8C	[2002]
Low IF receivers	
This code is intended for direct conversion schemes in which the baseband information is centered on a low frequency, e.g. of the same order as the baseband bandwidth itself.	
W02-G03A9	[1992]
Other tuner circuitry, including non-superheterodyne tuners	
<i>TRF, superregenerative receiver</i>	
W02-G03B	
Noise/interference suppression	
Noise suppression at source is covered by W02-H codes.	
W02-G03B1	[1987]
Squelch/muting arrangements	
Search with W04-V04A1 for arrangements lifting squelch only on detection of valid speech signal. Muting of amplifiers in general is covered by U24-C05C.	
<i>Squelch, tone squelch, muting, inter-station, carrier-operated, noise-operated, noise filter, noise amplifier, comparator, squelch gate</i>	
W02-G03B2	[1997]
Noise reduction by variation of RF/IF passband	
(W02-G03B9)	
Noise reduction by control of signal bandwidth at baseband is covered by W02-G03B8.	
W02-G03B2A	[1997]
Based on bandwidth modification	
(W02-G03B9)	
Includes use of highpass, lowpass, or other input filter (coded in W02-G03A1 also) and also reduction of IF bandwidth (also coded in W02-G03C1). 'IF-shift' techniques are covered by W02-G03B2C. FM threshold extension is covered by W02-G03B7.	
W02-G03B2C	[1997]
Based on change in centre-frequency	
(W02-G03B9)	
Covers arrangements with emphasis on changing centre frequency of passband, rather than changing its width, such as 'IF-shift' techniques (also assigned W02-G03C codes when appropriate).	
W02-G03B3	[1992]
Thermal noise reduction	
For RF amplifier noise reduction aspects search with W02-G03A3 also. Amplifier noise reduction in general is covered by U24-G03D1.	
Search with V04-T03 codes for arrangements involving cooling of circuitry.	

W02-G03B3A [1997]

Based on circuit configuration

W02-G03B3C [1997]

Based on low-noise components

Covers choice of devices with low noise figure. Search with codes relating to semiconductor devices per se, e.g. U12-D codes for bipolar transistors and FETs, and U14-F02 codes for superconductive elements.

W02-G03B4 [1992]

Reducing internal unwanted signals

W02-G03B4A [1992]

Reducing image response

W02-G03B4C [1992]

Reducing spurious signals

Includes reduction in level of oscillator harmonics in dual-conversion receiver, and avoidance of instability (also assigned U24-G01D and U24-G03L when involving HF amplifiers). Also includes arrangements reducing noise due to e.g. CPU clock oscillator harmonics by spread-spectrum techniques, also assigned W02-H01 and W02-K05A1 codes.

W02-G03B4E [1992]

Reducing effects due to device transfer characteristic

Includes effects due to non-linear or non-square law characteristic e.g. cross-modulation, inter-modulation. For further details of amplifier or mixer circuit improvements to increase strong-signal handling, search with W02-G03A3 and W02-G03A5 respectively. Such arrangements for high frequency (small-signal) amplifiers in general are assigned U24-G01D and U24-G03D5 codes.
RF amplifier, mixer, overload, blocking, desensitising

W02-G03B4G [2002]

Reducing offset effects

This code relates to the reduction of offsets arising from limitations in receiver performance, especially DC offsets due to e.g. LO leakage in a direct conversion receiver, for which W02-G03A8A is also assigned. Correction of offsets, e.g. by AFC, arising from mistuning are **not** included, and are covered by W02-G03A7A and e.g. U25-J05.

W02-G03B5 [1987]

Impulse noise suppression, noise blanker

Automatic noise limiter, peak limiter, noise silencer, blanking signal generator, wideband noise receiver, pulse stretching

W02-G03B6 [1992]

Multipath reception compensation

Prior to 1997 this code included television receiver ghost signal canceller, also assigned W03-A04G. Since 1997 this topic is **not** included in W02-G03B6 unless wider applications are also stated.

W02-G03B6A [2002]

Rake receiver

Search with W02-K05 codes for spread spectrum aspects, especially W02-K05A7 for CDMA. Time diversity radio reception equipment is covered by W02-C03A2B which from 2002 will not be routinely assigned for rake receiver configurations.

Delay, finger

W02-G03B7 [1992]

Threshold extension, frequency compressive feedback

Frequency demodulators are coded in U23-L also. Noise reduction by baseband bandwidth reduction is covered by W02-G03B8, and RF/IF bandwidth reduction in W02-G03B2A.

W02-G03B8 [1992]

Noise reduction by demodulated baseband bandwidth control

See also U25-F05A codes. Includes dynamic variation of e.g. audio passband dependent on signal strength. Arrangements involving variation of RF or IF passband are covered by W02-G03B2 codes.

Variable de-emphasis

W02-G03B9 [1987]

Other noise reduction and S/N ratio improving circuits

Includes use of non-linear element such as magnetostatic wave device to improve signal-to-noise ratio (also code in W02-A06E as a distributed constant element, and in V06-V).

W02-G03C [1992]

IF system

(W02-G03X)

From 2006, W02-G03C5 is introduced to separately highlight IF amplifiers, and IF AGC is covered by W02-G03D5 (previously coded as W02-G03C and W02-G03D).

W02-G03C1 [1997]

IF filter

For specific analogue filter types search with codes in e.g. V06-V, U14-G, U25-B, U25-E, or W02-A05 codes. Digital filters are covered in U22-G01 codes. Includes 'IF-shift' techniques (also coded in general in W02-G03B2C).

W02-G03C5	[2006]
IF amplifier	
Novel IF amplifier details are also assigned U24-G01D and other relevant amplifier codes. From 2006, IF AGC is covered by W02-G03D5, previously coded as W02-G03C and W02-G03D.	
W02-G03D	[1992]
AGC	
(W02-G03X)	
Also assigned U24-C01 codes. Prior to 2006 this code was used with W02-G03A3 for RF AGC and W02-G03C for IF AGC. These topics are now covered solely by the subdivision codes below.	
W02-G03D1	[2006]
Novel AGC characteristic	
Covers delayed AGC, or other specific characteristic. See U24-C01C1 for signal processing aspects to obtain a particular AGC characteristic.	
W02-G03D3	[2006]
RF AGC	
Prior to 2006 this topic was covered by W02-G03A3 and W02-G03D.	
W02-G03D5	[2006]
IF AGC	
Prior to 2006 this topic was covered by W02-G03C and W02-G03D.	
W02-G03D9	[2006]
Other communications receiver AGC aspects	
W02-G03E	[1992]
Demodulator	
(W02-G03X)	
See U23 codes for demodulators also.	
W02-G03F	[1992]
Audio amplifier	
(W02-G03X)	
See U24-G and W03-C codes for audio amplifiers in general.	
W02-G03H	[1992]
Construction	
(W02-G03X)	

W02-G03J	[1997]
Received signal strength indicator	
(W02-G03E, W02-G03X)	
Includes arrangements to display signal strength (e.g. 'S-meter') and also to provide a signal for control of an associated transmitter (see W02-G01C1 also).	
Since 2005 W02-G03J codes have also been assigned for RSSI aspects of TV and radio receivers, with W03-A and W03-B codes as appropriate.	
RSSI	
W02-G03J1	[1997]
Based on signal level per se	
(W02-G03E, W02-G03X)	
Implies use of signal rectifier to generate level-responsive output. Signal level detection purely as part of a receiver AGC system is covered in W02-G03D, but use of existing AGC voltage or current to provide level indication is included. Signal rectifiers in general are covered by U24-C03 codes.	
W02-G03J1A	[2002]
Application of signal strength measurement	
(W02-G03E, W02-G03X)	
This code is intended for applications of RSSI measurements which are already available. From 2002 novel RSSI measurement circuits are covered by W02-G03J1C.	
W02-G03J1C	[2002]
Novel signal strength measurement arrangements	
(W02-G03E, W02-G03X)	
This code is intended for novel arrangements or circuits for RSSI measurement. From 2002 applications of RSSI measurement are covered by W02-G03J1A.	
W02-G03J3	[2002]
Compensation arrangements for RSSI and BER measurements	
(W02-G03E, W02-G03X)	
This codes is intended for arrangements to compensate for the effects of external factors, such as temperature, on signal strength and signal-to-noise ratio measurements in radio receivers.	
W02-G03J5	[1997]
Based on signal-to-noise ratio or BER	
(W02-G03E, W02-G03X)	
Includes arrangements to measure S/N ratio by detection of noise accompanying signal, and measurement of bit error rate, or similar, which is also coded in W01-A01C.	

W02-G03J5A [2002]

Application of signal-to-noise ratio or BER measurement

(W02-G03E, W02-G03X)

This code is intended for applications of measurements which are already available. From 2002 novel BER measurement arrangements are covered by W02-G03J5C.

W02-G03J5C [2002]

Novel signal-to-noise ratio or BER measurement

(W02-G03E, W02-G03X)

This code is intended for novel arrangements or circuits for BER or signal-to-noise ratio measurement. From 2002 applications of these measurements are covered by W02-G03J5A.

W02-G03J7 [2021]

Based on power level per se

Includes arrangements to measure the received power
RSRP, SS RSRP, CSI RSRP

W02-G03J7A [2021]

Applications of power level measurement

W02-G03J7C [2021]

Novel power measurement

W02-G03K [2002]

Digital and hybrid receiver architecture

This code is assigned for receivers - of signals with analogue or digital modulation - which are implemented using DSP techniques in whole or in part. The codes are used in conjunction with other W02-G03 codes as necessary where there are direct equivalents in analogue receivers, in particular for RF amplifiers, oscillators, IF stages and demodulators. Corresponding digital techniques for broadcast radio receivers are covered by W03-B07 codes and for TV receivers by W03-A11K codes.

W02-G03K1 [2002]

Characterised by usage of DSP

These codes are used to distinguish between different levels of DSP being applied to the signal path in the receiver. As such, they do not normally represent novel digital processing aspects, which are conveyed by use of other W02-G03K codes. DSP in general is covered by T01-J08A2, T01-J08B and U22-G codes depending on specific aspects.

W02-G03K1A [2002]

With baseband digital signal processing only

This code covers receivers with a digital signal processing path **after** the conversion to baseband.

W02-G03K1C [2002]

With baseband and IF digital signal processing only

This code covers receivers with DSP in IF, demodulator, and baseband stages.

W02-G03K1E [2002]

With digitising of RF spectrum

This code covers receivers with digitising of the whole signal processing path, except for the possible use of analog RF amplifiers.

W02-G03K1X [2002]

Other use of DSP

W02-G03K3 [2002]

AD conversion

Novel aspects of AD converters and AD conversion are covered by U21-A03 codes.

W02-G03K5 [2002]

Digital mixing and direct digital conversion

W02-G03K6 [2002]

Filtering

Novel digital filters are also assigned U22-G01 codes and T01-J08B when the emphasis is on computing aspects.

W02-G03K7 [2006]

Transform implementation

DSP-based transform implementation is covered by U22-G03E1A and computer data processing aspects in general by T01-J04B1.

Fourier, Hilbert, Walsh

W02-G03K8 [2006]

DA conversion

Novel aspects of DA converters and DA conversion are covered by U21-A02 codes.

W02-G03K9 [2002]

Other digital receiver aspects

W02-G03P [2017]

Radio receiver power supply and power management

Covers novel details of power supplies and also power management for battery saving and the like in portable equipment.

W02-G03P1 [2017]

Radio receiver power supply

Covers novel aspects of power supplies for communications-type radio receivers. Novel details of power supplies are covered in U24, such as U24-D codes for power converters and U24-E codes for voltage regulation.

W02-G03P5 [2017]

Radio receiver power management

Covers power management to reduce drain on the supply, e.g. for battery saving and the like in portable equipment by modifying circuit operation or disabling circuitry when idle. U24-H04 and U24-K are also assigned as necessary for power management techniques and modifying PSU operation.

W02-G03X

Other communications radio receiver aspects

W02-G04

Bandwidth reduction; Signal predistortion

Used for RF and other systems, including e.g. audio compander arrangements for recording and communications. (See U24-C02 codes for companders/amplitude limiters in general).

Speech processing, dynamic range limiter, automatic level control, non-linearity correction, feed-forward

W02-G04A [1992]

Bandwidth reduction

W02-G04A1 [1992]

Time compression or expansion

W02-G04A9 [1992]

Other bandwidth reduction

W02-G04B [1992]

Signal predistortion

See U24-G03B1 also for feedforward amplifier circuits.

W02-G04B1 [1992]

Volume compression or expansion

PAPR, peak-to-average power ratio

W02-G04B9 [1992]

Other signal predistortion

W02-G04C [1992]

Single-side band

Includes vestigial sideband transmission.
SSB, DSB, VSB

W02-G05 [1992]

Transponder, responder, repeater

(W02-G09)

From 2008 transponders and interrogation systems for RFID application are respectively covered by W02-G05A and W02-G05B and in W06-A04B codes only when there is some RF novelty. T04-K codes, e.g. T04-K03B, can be assigned for any aspect, including memory storage and the like. Transponder-based telemetry or telecontrol is covered by W05-D08G and other W05-D codes as appropriate. Satellite 'transponders', i.e. 'repeaters', are coded in W02-G05C.

W02-G05A [1992]

Transponder

(W02-G09)

From 1997, the scope of this code is expanded to cover all aspects of transponders per se. Interrogation equipment and system details are covered in W02-G05B. Search with application codes also, e.g. T04-K01 for smart cards, T05-G02B1A for workpiece tags, W05-B01A2C for antitheft tags, W05-D06A1 codes with W05-D08G for telemetry systems, and W06-A04B codes for identification systems.

W02-G05B [1992]

Interrogation system

(W02-G09)

From 1997, transponders per se are covered by W02-G05A. This code is intended to represent all other aspects of transponder systems as a whole.

W02-G05C [1992]

Satellite transponder, terrestrial repeaters

(W02-G09)

To discriminate between satellite and terrestrial repeaters, search with W02-C03B codes for radio relay systems. Details of satellites per se, other than 'internal' details of telecomms equipment carried on space vehicles, are covered by W06-B03 codes.

Duplex, circulator, isolation, filtering

W02-G05X [1992]

Other transponder or repeater details

(W02-G09)

W02-G06 [1992]

Construction; Equipment rack; Casing

(W02-G09)

This code is used for radio equipment construction in general only.

W02-G08 [1992]

Standby systems and redundancy networks
(W02-G09)
Fail-safe communications

W02-G08A [1992]

With automatic switching to powered-up backup equipment e.g. hot-standby system
(W02-G09)

W02-G09

Other radio equipment details

W02-H

Noise suppression at source

See W02-G03B codes for radio receiver circuits. W02-H codes are normally assigned together with codes for the apparatus in which noise is being suppressed.
Feedthrough filter, composite LC component, ferrite bead

W02-H01 [1992]

RFI suppression at source
IC engine ignition interference suppression, motor commutation, parasitic oscillation prevention

W02-H01A [2002]

RFI suppression of non-communications equipment
This code is intended to cater for the suppression of radiated RF energy from equipment whose primary function is not that of communication, e.g. electric motors, IC engine ignition systems, microwave ovens.

W02-H01C [2002]

RFI suppression in communications equipment
This code is intended to cater for the suppression of radiated RF energy from communications equipment, e.g. transmitters, receivers, etc.

W02-H01C1 [2002]

Suppression or avoidance of interference within communications equipment
This code is intended to cater for the suppression of interference generated by one part of communications equipment with another part of the same equipment, or a group of similar units assembled together, e.g. prevention **at the transmitter**, of interference with an associated receiver. Arrangements for avoiding interference by modifying the operation of the equipment, including software changes only, are also assigned W02-H01G (or a subdivision).
Self-interference

W02-H01C5 [2002]

Suppression of interference caused to separate communications systems
This code is intended to cater for the suppression of radiated RF energy from equipment, especially transmitters, which could interfere with other communication systems, e.g. reducing harmonic radiation.

W02-H01E [2002]

Suppression or avoidance of interference based on constructional features
Covers screening, siting of modules, etc. and thus V04-S, V04-T or V04-U codes are normally assigned also, as well as constructional details codes specific to the equipment involved.

W02-H01G [2002]

Suppression or avoidance of interference based on circuitry or operation
This code is intended to focus on aspects of circuit design or equipment operation (including software modifications) resulting in a reduction in the level or effect of unwanted radiated RF energy from equipment, or parts of equipment.

W02-H01G1 [2002]

Suppression or avoidance of interference based on reduction in harmonic energy

W02-H01G3 [2002]

Suppression or avoidance of interference based on energy dispersal
These codes are intended for arrangements reducing the effect of a potentially interfering signal by dispersing its energy, usually over a range of frequencies.

W02-H01G3A [2002]

Based on use of FM
Novel frequency modulators are assigned U23-H if intended for analogue signals, U23-P01 and W01-A09A2 with W01-A09E1 if modulated by digital data.

W02-H01G3C [2002]

Based on use of frequency hopping
Frequency hopping in general is covered by W02-K05A6, which is **not** assigned here unless specific novel aspects are to be conveyed, or more general applications are cited.

W02-H01G3E	[2002]
Based on direct sequence spectral spreading	
Direct sequence spread spectrum systems in general, such as CDMA, are covered by W02-K05A7, which is not assigned here unless specific novel aspects are to be conveyed, or more general applications are cited.	
W02-H01G5	[2007]
Interference avoidance based on selection of operating frequency	
This code involves avoidance of interference by changing frequency, e.g. selecting an alternative second local oscillator, clock, or PWM audio amplifier switching frequency depending on the channel selected in a radio receiver. Avoidance of interference based on frequency allocation in radio networks is covered by W02-H01J5.	
W02-H01J	[2002]
Interference avoidance in radio systems based on frequency allocation and network operation or planning	
This code is intended for prophylactic measures, e.g. at the network planning phase or during normal operation, to reduce the likelihood of interference between communications systems. Simulation systems for radio communication are assigned W02-C03E5 also.	
W02-H01J1	[2005]
Interference avoidance at radio network planning stage	
Includes use of CAD (see W02-C03E5 and T01-J15A4 also). Interference avoidance as a normal part of network operation is covered by W02-H01J5.	
W02-H01J5	[2005]
Interference avoidance based on frequency allocation and network operation	
This code is intended to cover interference avoidance during normal network operation, and may involve channel allocation which is also assigned W02-C03G1 (W02-C03E7 prior to 2010) and interference avoidance aspects of cognitive radio systems which are also assigned W02-C03G5. Avoidance of interference at a network design stage is covered by W02-H01J1, and avoidance of interference by changing frequency, e.g. of a clock signal, in equipment is covered by W02-H01G5.	
W02-H01J9	[2005]
Other aspects of interference avoidance based on frequency allocation and network operation	
W02-H03	[1992]
Supply line noise suppression e.g. mains filter	

W02-J*	[1980-2009]
Facsimile	
*This code is now discontinued, see S06-D to K. Includes analogous systems for still picture information. See also under application e.g. S06-C02B for electronic color separation systems. Note that digital cameras are not included, and are covered by W04-M01B1 codes. <i>Copy, print, scan, sheet, image, document, line, satellite weather picture system</i>	
W02-J01*	[1980-2009]
Scanning arrangements	
*This code is now discontinued, see S06-D. Includes optical system, lens etc. and scanning drive (See also V07-K05), but not read/write components such as sensors, print heads, and light sources. <i>Beam, laser, expose, slit, optical magnifications</i>	
W02-J01A*	[1992-2009]
Optics e.g. lenses and mirrors	
*This code is now discontinued, see S06-D03. <i>Polygonal</i>	
W02-J01B*	[1992-2009]
Scanning drive system	
*This code is now discontinued, see S06-D04. <i>Raster</i>	
W02-J01C*	[1992-2009]
Synchronising, position detection and adjustment	
*This code is now discontinued, see S06-D04A. Includes control and error compensation of scanning velocity and position.	
W02-J01X*	[1992-2009]
Other scanning arrangements	
*This code is now discontinued, see S06-D. Includes scanner construction.	
W02-J02*	[1980-2009]
Recording and reproducing arrangements	
*This code is now discontinued, see S06 codes. Covers methods and recording and reproducing components per se.	
W02-J02A*	[1987-2009]
Recording i.e. line image sensor, CCD etc.	
*This code is now discontinued, see S06-D. See also U14-H01B for thin film image sensor, U13-A01 and U13-A02 for circuitry and CCD. <i>Reader, monolithic</i>	

W02-J02A1* [1992-2009]

Sensors

*This code is now discontinued, see S06-D05.

Photoelectric detector, thin film image sensor, multi-element array

W02-J02A1A* [1992-2009]

Integral reading circuitry

*This code is now discontinued, see S06-D05A.

W02-J02B* [1987-2009]

Reproducing i.e. printing

*This code is now discontinued, see S06 codes.

Dot matrix, pressure sensitive, magnetic printing

W02-J02B1* [1987-2009]

Thermal

*This code is now discontinued, see S06-H.

Head, resistive elements, thermal transfer ink ribbon

W02-J02B2* [1987-2009]

Optical

*This code is now discontinued, see S06-E. See also V07-K01 codes for optical modulator per se.

Light valve, shutter, modulator

W02-J02B2A* [1992-2009]

LED

*This code is now discontinued, see S06-E03A2.

Array

W02-J02B2B* [1992-2009]

Laser

*This code is now discontinued, see S06-E03A3.

W02-J02B2X* [1992-2009]

Other optical printing

*This code is now discontinued, see S06-E03.

W02-J02B3* [1992-2009]

Ink jet

*This code is now discontinued, see S06-G.

W02-J02B5* [1992-2009]

Integral drive circuitry for printhead

*This code is now discontinued, see S06-G03.

W02-J03* [1980-2009]

Picture signal circuits, bandwidth reduction, blanking, transmission control

*This code is now discontinued, see S06-K07.

W02-J03A* [1987-2009]

Control circuits, monitoring circuits

*This code is now discontinued, see S06-K07. Used for general picture signal processing and control, including electronic magnification and blanking. Also includes color processing. For picture processing see also T01-J10B codes.

Drive circuits

W02-J03A1* [1992-2009]

Image acquisition

*This code is now discontinued, see S06-K07A4.

Scan, read, shading compensation

W02-J03A1A* [1992-2009]

Compensating for sensor characteristics

*This code is now discontinued, see S06-K07A4A.

Shading compensation

W02-J03A2* [1992-2009]

Image and data processing

*This code is now discontinued, see S06-K07A4.

Picture signal amplifier, halftone screening, edge enhancement, noise or error suppression

W02-J03A2A* [1992-2009]

Changing magnification

*This code is now discontinued, see S06-K04A4B.

W02-J03A2B* [1992-2009]

Composing and electronic layout control

*This code is now discontinued, see S06-K04A4B.

W02-J03A3* [1992-2009]

Image output

*This code is now discontinued, see S06-K04A4C.

Write, print, display

W02-J03A4* [1992-2009]

User interface i.e. control input, displays

*This code is now discontinued, see S06-K07A1.

Operator warning device, mode setting

W02-J03A5* [1992-2009]

Monitoring

*This code is now discontinued, see S06-K07B. Includes self-testing, error correcting and resetting, maintenance.

Fault indication

W02-J03A7*	[1992-2009]
Control of operation	
*This code is now discontinued, see S06-K07A. Includes general control system details and external control e.g. by personal computer. Use with corresponding interface code.	
<i>Mode control, non-image memory, start up, standby</i>	
W02-J03A7A*	[1992-2009]
Copy sheet counting	
*This code is now discontinued, see S06-K07A5.	
W02-J03A9*	[1992-2009]
Other facsimile circuits	
*This code is now discontinued, see S06-K07.	
W02-J03B*	[1987-2009]
Bandwidth reduction, encoding e.g. MH, run-length etc.	
*This code is now discontinued, see S06-K07A4D. See U21-A05 codes for coding in general, W04-P01A codes for TV signal compression, and W02-G04A codes for bandwidth reduction in general.	
W02-J03B1*	[1992-2009]
Encoding	
*This code is now discontinued, see S06-K07A4D.	
<i>Compression, data reduction, white block skipping</i>	
W02-J03B2*	[1992-2009]
Decoding	
*This code is now discontinued, see S06-K07A4D.	
<i>Regenerate</i>	
W02-J03C*	[1987-2009]
Transmission details	
*This code is now discontinued, see S06-K07C. Includes input-output arrangements, telephone interface and secrecy systems (with W02-L). Search W01-C05B1 and W01-C01H for telephone aspects also. For ISDN aspects see W01-C05B7. For LAN aspects see W01-A06 codes.	
<i>Synchronising, privacy, transmission standards (e.g. G2, G3, G4 etc.)</i>	
W02-J03C1*	[1992-2009]
Signal processing, preparing data for transmission, modulation, and coding	
*This code is now discontinued, see S06-K07C3.	
<i>Scrambling</i>	

W02-J03C2*	[1992-2009]
Determining and setting type of transmission link, mode, and priority	
*This code is discontinued, see S06-K07C4. Includes detecting type of receiving station (e.g. G3, G4).	
<i>Autodialer, modem</i>	
W02-J03C3*	[1992-2009]
Monitoring, error checking	
*This code is now discontinued, see S06-K07C6.	
W02-J03C4*	[2006-2009]
Remote control/monitoring of a facsimile	
*This code is now discontinued, see S06-K07C6. E.g. monitoring from host over network, etc.	
W02-J03C5*	[1992-2009]
Reception details	
*This code is now discontinued, see S06-K07C5.	
<i>Automatic answering</i>	
W02-J03C6*	[1992-2009]
Secrecy	
*This code is now discontinued, see S06-K07C7. Encoding transmission date, password, data encryption.	
<i>password, data encryption</i>	
W02-J03C6A*	[1992-2009]
Scrambling of signals, etc.	
*This code is now discontinued, see S06-K07C8.	
W02-J03C6B*	[1992-2009]
Document handling	
*This code is now discontinued, see S06-K07A3/K07C9. Includes sealing of received documents in envelopes.	
W02-J03C7*	[1992-2009]
Interface with telephone	
*This code is now discontinued, see S06-K07C2A. Also includes combined facsimile-telephone. See W01-C01P4. Also W01-C05B3H.	
W02-J03C8*	[1997-2009]
Interface with computer	
*This code is now discontinued, see S06-K07C2D. See also T01-C03B.	
W02-J03C9*	[1992-2009]
Other transmission details	
*This code is now discontinued, see S06-K07C. Includes interface to other independent device e.g. copier, but not composite.	
<i>Multimedia</i>	

W02-J03D* [1992-2009]

Image memory

*This code is now discontinued, see S06-K07A4. Refers to image memory only, but not external memory e.g. computer memory. See also T01-J10A2 for image memory management.

Stores

W02-J04* [1980-2009]

Color systems

*This code is now discontinued, see S06-K01. Used for any aspect of color system, with other codes as appropriate.

W02-J05* [1980-2009]

Constructional details

*This code is now discontinued, see S06-K03.

Housing, casing, cooling/ventilating arrangements, transport system drive, cutter

W02-J05A* [1980-2009]

Sheet feeding

*This code is now discontinued, see S06-K02. Includes original document and recording/copy sheets. Also includes page turning mechanism.

Paper roll, paper tray, document holder

W02-J05B* [1980-2009]

Finishing apparatus

*This code is now discontinued, see S06-K05. Includes stapling, binding, laminating, and cutting, etc. of output sheets.

W02-J05C* [1980-2009]

Connectors, physical aspects of circuits

*This code is now discontinued, see S06-K03F.

W02-J05D* [1980-2009]

Recycling systems

*This code is now discontinued, see S06-K04. See also X25-W04 for electrical aspects of recycling system in general.

W02-J06* [1980-2009]

Power supplies

*This code is now discontinued, see S06-K03/K07A2. Includes mains and battery supplies for all types of units including portable systems. Also includes protection circuits. See U24-D, U24-E, U24-F and U24-X codes.

W02-J07* [1980-2009]

Combined unit with facsimile, copier, and/or printer functions

*This code is now discontinued, see S06-K99F1.

W02-J08* [1992-2009]

Facsimile communication systems

*This code is now discontinued, see S06-K07C.

W02-J08A* [1992-2009]

Store and forward exchange

*This code is now discontinued, see S06-K07C2B.

W02-J08C* [1992-2009]

ISDN interface

*This code is now discontinued, see S06-K07C2C. See also W01-C05B7 codes for general aspects of ISDN.

W02-J09* [1980-2009]

Other facsimile details

*This code is now discontinued, see S06-K. Includes sheet marking and stamping.

Multiple facsimile system, exchange, coin freed

W02-J10* [1992-2009]

Analogous systems

*This code is now discontinued, see S06-K99G. For medical stimuable sheet phosphor systems see also S05-D02A5C. For electronic blackboard (previously coded in W02-J09) see also W04-W05.

Radiation imaging

W02-J11* [2006-2009]

Prevention of illegal photocopy transmission/reception

*This code is now discontinued, see S06-K07A3. See S06-A14F for prevention of illegal photocopying.

W02-K

Multiplex systems

For multiplex data transmission see W01-A03 also, multiplex telemetry/telecontrol is in W05-D02.

W02-K01

Frequency division multiplex

FDM, carrier generator, baseband signal, modulator, telephony transmission, group, supergroup

W02-K01A [1992]

For satellite system

Includes SCPC (single channel per carrier). (See also W02-C03B1D).

W02-K01C	[1997]
Frequency division duplex	
For mobile radio aspects use with W02-C03C codes or W02-G02A5B.	
<i>FDD</i>	
W02-K02	
Time division multiplex	
<i>TDM, frame, burst</i>	
W02-K02A	
Synchronising	
<i>Synchronisation, word detection</i>	
W02-K02A1	[1992]
Framing, aligning, multiframe	
W02-K02A3	[1992]
Pulse stuffing	
W02-K02A9	[1992]
Other	
W02-K02B	
Calling signals; Branching; Monitoring	
<i>Testing, error detection, addressing</i>	
W02-K02B1	[1992]
Calling signals	
W02-K02B3	[1992]
Branching	
W02-K02B5	[1992]
Monitoring	
W02-K02B5A	[1992]
Error detection	
W02-K02B5B	[1992]
Testing	
W02-K02B5X	[1992]
Other	
W02-K02C	[1997]
Time division duplex	
For mobile radio aspects use with W02-C03C codes or W02-G02A5B.	
<i>TDD</i>	

W02-K02D	[1992]
Satellite TDMA system	
See W02-C03B for transmission system details.	
W02-K02E	[1992]
Statistical multiplexing	
(W02-K02X)	
W02-K02X	
Other	
W02-K03	[1992]
Packet switching (general)	
Includes e.g. voice packet systems. For data transmission system see W01-A03B codes, and W01-A06G2.	
W02-K04	[1992]
Optical multiplex system	
(W02-K09)	
Includes wavelength-division multiplexing, see W02-C04B4B also.	
W02-K05	[1987]
Spread-spectrum, frequency hopping, time hopping and UWB systems	
(W02-K09)	
W02-K05A codes define system type while W02-K05B codes indicate novelty at the system level, or in apparatus. From 2005 W02-K05A9 codes are introduced for ultra-wideband and time hopping systems. Where the use of spread spectrum technique is inherent to a particular technology (e.g. Bluetooth or 3G mobile phones), W02-K05 codes are only assigned when the novelty lies in the SS aspect. Novel details of radio systems are also assigned W02-C03 codes and novel radio equipment is also assigned W02-G codes.	
<i>Pseudo-random, synchronisation, frequency step, synthesiser control, radio system, data transmission, power line carrier communication</i>	
W02-K05A	[1992]
Systems type	
W02-K05A1	[1992]
Non-deliberate interference immunity system; Increased reliability	
W02-K05A5	[1992]
System providing secrecy or anti-jamming capability	
Note secret transmission per se is coded in W02-L05.	

W02-K05A6	[1997]
Frequency hopping spread spectrum	
W02-K05A7	[1997]
Direct sequence spread spectrum	
Includes CDMA. Prior to 1997 see W02-K08 with W02-K05 codes as appropriate.	
W02-K05A8	[1997]
Hybrid spread spectrum system	
Covers e.g. combined frequency hopping and CDMA system.	
W02-K05A9	[2005]
Ultra wideband and time-hopping systems	
This code is used with other W02-K05 codes as appropriate, e.g. with W02-K05B7 for synchronising aspects of UWB communication. Wireless data interfaces between two points using this technology are covered by W01-A07H2K and network communication by W01-A06C4K.	
W02-K05A9A	[2005]
Carrier-free impulse communication	
W02-K05A9C	[2005]
Carrier-based impulse communication	
Includes spectrally-filtered systems.	
W02-K05B	[1992]
System or apparatus details	
W02-K05B1	[1992]
Operating method/system	
W02-K05B3	[1992]
Apparatus	
W02-K05B5	[1992]
Pseudonoise code details for direct sequence, frequency hopping codes and time hopping codes	
Covers details of noise-like codes used in CDMA, frequency hopping and time hopping communication systems. W02-K05A codes are also assigned to differentiate system type, e.g. W02-K05A9A for hopping codes used in a carrier-free impulse communication system.	
W02-K05B7	[1992]
Synchronising	
W02-K05B9	[1992]
Other spread-spectrum system details	

W02-K06	[1992]
Time assigned speech interpolation (TASI)	
(W02-K09)	
See also W04-V04A1 for application of speech recognition systems to detection of voice presence in speech interpolation multiplexing systems.	
<i>DSI</i>	
W02-K07	[1992]
Hybrid and orthogonal multiplex systems	
(W02-K01, W02-K02, W02-K09)	
From 1997, the scope of this code is widened to include orthogonal multiplexing, previously coded in W02-K09.	
W02-K07A	[1997]
Mixed FDM-TDM system	
W02-K07C	[1997]
Orthogonal frequency division multiplexing	
(W02-K01, W02-K09)	
This code covers the use of OFDM for communication e.g. in a 5G system for which W02-C03C1L is also assigned. See also W02-C03D5 for access methods, e.g. OFDMA is denoted by W02-K07C along with W02-C03D5 code. Pre-1997 this topic was covered by W02-D05, W02-K01 and W02-K09. Receivers for DAB are covered in W03-B codes.	
<i>OFDM, CP-OFDM, DFT-S-OFDM, SC-FDMA</i>	
W02-K07E	[1997]
Orthogonal multiplexing	
(W02-K09)	
Search with W02-C03B1 codes, especially W02-C03B1D, for satellite communication aspects of orthogonal multiplexing.	
W02-K07X	[1997]
Other hybrid multiplexing systems	
Hybrid spread-spectrum systems are not covered here - see W02-K05A8.	
W02-K08	[1992]
Code division multiplexing	
Prior to 1997 this code was used for all aspects of CDMA, which is now transferred to W02-K05A7. From 1997 W02-K08 will be assigned for code division multiplexing not specific to spread spectrum communication.	

W02-K09

Other multiplexing

Prior to 2017 this code included beam division and spatial division multiple access (i.e. BDMA and SDMA), e.g. as used at a cellular base station (W02-C03C1B also with W02-C03C1H or W02-C03C1L for '4G' or '5G' respectively) but from 2017 this topic is covered by W02-K10. Prior to 1997 this code included orthogonal multiplexing which is now coded under W02-K07.

W02-K10 [2017]

Beam division multiple access: Space division multiple access

Covers BDMA and SDMA, especially in radio communications. For application to millimeter wave data transmission in 5G cellular systems search with W02-C03C1L. Directional diversity is covered by W02-C03A4 and MIMO systems by W02-C03A5 codes. For antenna beam control aspects see W02-B06 codes. Prior to 2017 BDMA and SDMA were covered by W02-K09.

BDMA, SDMA

W02-L

Secret communication; Jamming and anti-jamming; Eavesdropping and anti-eavesdropping

Note secret data transmission is covered in W01-A05. For digitised speech/video (e.g. with bit order rearrangement) search with W01-A05 codes. See W02-F05A codes for video systems.

Secrecy, privacy, anti-eavesdropping system, telephone 'wire-tap' detection

W02-L01 [1992]

Jamming and anti-jamming

Jamming/anti-jamming for radar is covered by W06-A04E1 codes only and for GPS by W06-A03A5M only.

W02-L01A [2005]

Jamming

W02-L01C [2005]

Anti-jamming

W02-L05 [1992]

Scrambling

Scrambled audio/video communication

W02-L07 [2005]

Eavesdropping on communications and anti-eavesdropping

This code covers the interception of communications using any medium, bugging of conversations using hidden microphones, laser reflection from windows etc., and also countermeasures to these techniques. For systems specific to telephone communications (wired or wireless) see W01-C08F1 codes.

W02-L07A [2005]

Eavesdropping

Covers systems, methods and equipment for intercepting communications and also use of covert listening devices.

W02-L07C [2005]

Anti-eavesdropping

Covers arrangements to detect or prevent interception of communications by a third party, other than purely by scrambling or encryption, which in general is covered by W02-L05, and also detection of listening devices, e.g. by 'sweeping' for bugs and similar techniques.

W03: TV and Broadcast Radio Receivers

This class covers general audio/video equipment for entertainment purposes, including interconnection aspects, and radio receivers of broadcast type.

Prior to 2007 displays for non-TV receiver applications and associated signal processing circuitry were not coded in W03-A ('TV receivers') being covered under T04 (for computer monitors), or W05 (general display details). From 2007, due to the increasing convergence of TV and general purpose displays all relevant aspects of video displays will be coded in W03, including:

signal processing (W03-A04 and W03-A05 codes);
synchronizing (W03-A06 codes);
power supplies (W03-A07 codes);
display aspects (W03-A08 codes);
constructional details (W03-A09 codes);
stereoscopic aspects (W03-A12 codes); and
audio details (W03-A15 codes).

Please note that W03 only covers displays capable of presenting video information. For displays of a general nature (e.g. segment displays), or where there is no particular emphasis on displaying video information (e.g. public information displays) see W05-E codes (W05-E05G for details of construction).

Where a novel display is for a specified non-TV receiver application, W03-A21 (Video display for non-TV receiver application) is also applied along with relevant application codes from other classes (e.g. T04).

Novel module and manufacturing details of liquid crystal, plasma, electroluminescent and field transmission displays for general applications, as well as display driving and interfacing circuitry are not coded in W03. (See U14 and V05 for these topics).

Radio receivers of communications or unspecified type are covered by W02-G03 codes, but note that in addition to appropriate W03 codes, the topic of broadcast TV or radio receiver noise reduction is assigned W02-G03B codes, and from 2005, received signal strength indicating circuits and their applications are also assigned W02-G03J codes. Audio and video recording equipment is covered in class W04.

W03-A

TV receivers

Since 2002 W03-A11K codes have been assigned for TV receivers with digital architecture. From 2005, TV receivers for digital signals (e.g. DVB-T) are covered by W03-A11G, and set-top boxes by W03-A16E codes. Video signal processing for applications other than TV receivers is covered in W04.

W03-A01

Tuners; Tuning displays

RF amplifier/mixer, local oscillator, tuning band - switching, preset, step, continuous, variable capacitance, tracking, tuning scale, channel number digital display, on-screen display

W03-A01A [1987]

Satellite TV/cable TV converter

Search with W03-A01B codes for specific tuner details.

W03-A01A1 [1992]

Satellite converter

For other aspects of satellite TV reception see W03-A16A.
DBS, LNA, LNB, low noise amplifier, low noise block, down converter

W03-A01A5 [1992]

Cable TV converter

Prior to 1992 search W03-A01A and W02-F03A (W02-F03A no longer assigned). This code covers RF/IF tuner circuitry. For general (including non-RF) aspects of cable converters and all other ancillary aspects of home installation see W03-A16C codes.

CATV, subscription, wide-band, super-band, set-top box

W03-A01B [1992]

Tuner circuitry and construction

W03-A01B codes are used to describe actual tuner circuitry in conjunction with W03-A01A codes or alone for standard TV tuners, as appropriate. Communications receiver tuners are covered by W02-G03A codes.

Superheterodyne, single-conversion, double-conversion, homodyne

W03-A01B1 [1992]

Tuned circuits, input filters

Includes input attenuators. See U25 codes for details of lumped constant circuits. Waveguide technology filters and resonators are covered by W02-A codes.

Inductor, capacitor, varicap, varactor diode, block filter

W03-A01B3 [1992]

RF amplifier

Novel RF amplifier details are also assigned U24-G01D and other relevant amplifier codes. From 2006, RF AGC is covered by W03-A03A3, previously coded as W03-A01B3 and W03-A03A. Amplifiers external to the receiver itself are covered by W02-B08C5 codes.

FET, MOSFET, MESFET, IGFET, dual-gate, bipolar, transistor

W03-A01B5 [1992]

Mixer

Novel mixer details are also assigned U23-J01 codes.

FET, MOSFET, IGFET, dual-gate, bipolar, transistor, diode, ring

W03-A01B5A [2006]

Image rejection mixer

Prior to 2006 this topic was represented by W03-A01B5 and W02-G03B4A (receiver image signal suppression in general). From 2006 W02-G03B4A will only be assigned for specific novelty in the image rejection aspect.

W03-A01B6 [2002]

Direct conversion and low-IF receivers

These codes are used, in conjunction with other W03-A01B codes as necessary, to represent receivers of homodyne, synchrodyne, 'zero-IF', or 'low-IF' type. Arrangements for suppression of offsets at the output of the mixer are also assigned W02-G03B4G. Direct digital conversion (DDC) in digital architecture TV receivers is not included here, being covered by W03-A11K5. Direct conversion communications receivers are covered by W02-G03A8 codes and broadcast receivers of this type by W03-B01A6 codes.

Homodyne, synchrodyne, zero-IF

W03-A01B6A [2006]

Zero-IF receivers

This code is intended for direct conversion schemes in which the baseband information is centred on zero frequency.

W03-A01B6C [2006]

Low-IF receivers

This code is intended for direct conversion schemes in which the baseband information is centred on a low frequency, e.g. of the same order as the baseband bandwidth itself.

W03-A01B7 [1992]

Local oscillator

Novel oscillator circuits are also assigned U23-A codes. Control of oscillator frequency is covered by W03-A02 codes.

W03-A01B8 [1997]

Tuner constructional details

(W03-A01B9, W03-A09A5)

Covers construction of tuner per se, general internal constructional details of receiver being covered by W03-A09A5, which was previously assigned in addition to W03-A01B9 to indicate the construction aspect. Since 1997, W03-A09A5 has only be added for details affecting the design of the receiver, such as mountings, etc.

Shield, screen, housing, PCB, circuit board

W03-A01B9 [1992]

Other tuner details

Includes testing and alignment (with W03-A18A codes) and diversity arrangements involving tuner or aerial circuitry - see also W02-C03A codes and W03-G08 if receiver is vehicle-mounted.

Trimming

W03-A01C [1992]

Tuning display

Includes on-screen display of e.g. channel number. See W03-A10C1 for character generator circuits and W03-A13G for on-screen display systems in general.

OSD, scale, dial

W03-A01D [2008]

Multiple tuner aspects

This code is assigned with other W03-A codes as appropriate and is intended to highlight the use of two or more tuners in a TV receiver, set-top box, and the like. For novel tuner circuitry W03-A01B codes are also assigned and for novel frequency or channel control aspects W03-A02A or W03-A02B codes. For use in connection with PIP or POP display W03-A13B is also assigned.

Dual

W03-A02

**Automatic frequency control; Band scanning;
Remote control**

W03-A02A [1992]

AFC and synthesis control

AFC circuits are also coded in U25-J05. PLL synthesisers are also assigned U23-D01B codes. 'Direct' type synthesisers are covered by U23-F03 codes.

Automatic frequency control, automatic fine tuning, AFT, frequency synthesiser

W03-A02B [1992]

Bandscanning, channel switching and channel number storage

Band scanning is also assigned U25-J01 codes and step tuning U25-H03 codes.

Seek, search, sweep, stop, store, preset, priority, local, station

W03-A02B1 [1997]

Channel storage

Search with U25-H03A for setting up presettable channels, or U25-J01A1 where bandscanning is involved.

W03-A02B1A [1997]

Based on stations received off-air

Search with U25-J01 codes for bandscanning aspects, e.g. U25-J01A1 for storing channels while scanning.

W03-A02B1C [1997]

Based on channel listing

Includes in-built memory and channel-guide systems. For channel presetting based on location, W03-A02B1E takes precedence.

W03-A02B1E [1997]

Based on receiver location

For automatic arrangements search with codes for navigation systems, e.g. W06-A03A5E for use of GPS. Memory systems with pre-loaded station information without regard for receiver location, are covered by W03-A02B1C.

W03-A02B1G [2006]

User control of channel storage

Includes re-ordering stored channels, deleting channels, forming 'favorites' lists and the like. For security aspects, e.g. parental control, PIN control etc. search with W03-A18A6 and W03-A18A7.

W03-A02B3 [2007]

Channel switching arrangements

This code covers arrangements for changing the channel to which a TV set is tuned, either under user control or automatically.

Auto-zap, zapping, channel surfing

W03-A02C [1992]

Remote control

Remote control for recording apparatus is coded in W04-E04A, for audio/video equipment in general in W03-G05A codes, and for general or unspecified applications in W05-D codes. For TV remote control by 'Universal' or 'Learning' type controller search W03-A02C codes with W03-G05A1A. For general TV receiver control aspects see W03-A18A.

Ultrasonic, optical, IR, transducer, LED, photodiode, APD

W03-A02C1 [1997]

Remote control unit

Covers details of portable controller. Overall system aspects and circuitry within the receiver itself are covered by W03-A02C5.

W03-A02C1A [1997]

Novel circuitry and components

Includes IR LEDs and drive circuits, etc. (see U12-A codes also for aspects relating to LEDs) together with coding aspects.

W03-A02C1C [1997]

Construction and layout

(W03-A02C, W03-A09A)

Includes shape, style and format of control keys etc., and also protective covers and stands (also coded in W03-A09C).

W03-A02C5 [1997]

Remote control system

Includes circuitry and components internal to the receiver and overall system aspects.

W03-A02C5A [1997]

Involving on-screen display

(W03-A02C, W03-A13G)

Includes application of GUI techniques to control of TV receivers and video displays, such as manipulation of a cursor, menu navigation and virtual keyboard aspects. For use of remote controller in connection with other interactive systems making use of a TV set search with W03-A16C5 codes also. OSD in general is coded in W03-A13G.

W03-A02C5C [1997]

Remote control location system

Covers transponder-type arrangements providing e.g. audible tone as aid to locating remote unit, in response to signal transmitted from TV set itself.

W03-A02C5E [2005]

Combined with additional features

This code covers the provision of features beyond the basic remote control function and generally refers to extra facilities being provided to the user on the remote control handset. Examples include a dedicated display, e.g. for indicating control functions, viewing alternative channel or electronic programme guide (for which W03-A13J is also assigned), or the provision of a separate loudspeaker or headphone socket (also assigned W03-A15 codes).

W03-A02C5G [2006]

Receiver-based remote control circuitry, components and construction

This code is assigned with other codes as appropriate, e.g. W03-A09A5 for internal receiver constructional aspects, W02-C04A3 codes for IR receiver circuitry, U12-A01A codes for LEDs or U12-A02B2A for photodiodes.

W03-A02C5J [2011]

Image recognition-based remote control

This code covers the use of image recognition technology as part of a remote control system for TV sets and video displays. It includes recognition of gestures, movement of hands or head, etc. to derive control information. For use in conjunction with virtual keyboards or other on-screen display aspects W03-A02C5A is also assigned. Image-based recognition of individual users, e.g. for parental control or selecting a 'favorites' list, is covered by W03-A18A6. Novel aspects of image recognition are covered by T01-J10B2A and applications are also assigned T04-D07 codes.

W03-A02C5L [2011]

Voice recognition-based remote control

This code covers the use of voice recognition to provide a 'remote control' facility, with or without a remote control handset unit being used, in which spoken commands are used to control the functions of a TV set or video display. The general 'speech recognition application' code, W04-V04A5 is also assigned (with other W04-V codes in case of novel aspects). Voice-based recognition of individual users, e.g. for parental control or selecting a 'favorites' list, is covered by W03-A18A6.

W03-A03

IF amplifiers; Automatic gain control; Sound and vision detectors

W03-A03A [1992]

TV receiver AGC

Prior to 2006 this code was used with W03-A01B3 for RF AGC and W03-A03B for IF AGC. These topics are now covered solely by the subdivisions below.

Keyed-AGC, synchronizing signal, burst, level control

W03-A03A1 [2006]

Novel AGC characteristic

Covers delayed AGC, or other specific characteristic. See U24-C01C1 for signal processing aspects to obtain a particular AGC characteristic

W03-A03A3 [2006]

RF AGC

Prior to 2006 this topic was covered by W03-A01B3 and W03-A03A.

W03-A03A5 [2006]

IF AGC

Prior to 2006 this topic was covered by W03-A03A and W03-A03B.

W03-A03A9 [2006]

Other TV receiver AGC aspects

W03-A03B [1992]

TV receiver IF system

From 2006, W03-A03B5 is introduced to separately highlight IF amplifiers, and IF AGC is covered by W03-A03A5 (previously coded as W03-A03A and W03-A03B).

Integrated circuit, multistage, cascade, interstage coupling, sound, picture, vision, video, trap circuit, IF-based ghost suppression circuit

W03-A03B1 [1992]

IF filter

For specific filter types, see appropriate codes in e.g. V06-V and U14-G for electromechanical filters, U25-E for analogue lumped constant types, and U22-G01 codes for digital filters.

SAW, surface acoustic wave, ceramic, LC, tuned circuit, passband, ripple

W03-A03B5 [2006]

IF amplifier

Novel IF amplifier details are also assigned U24-G01D and other relevant amplifier codes.

W03-A03C [1992]

Sound and vision detectors

Demodulation circuits in general are coded in U23.

W03-A03C1 [1992]

Sound detector

For stereophonic decoder search with W03-A12B1. (Also coded in U23-P05).

Intercarrier sound, FM discriminator

W03-A03C5 [1992]

Vision detector

For stereoscopic receiver aspects search with W03-A12A.
FM, AM, picture, video

W03-A04

Video signal processing

Includes general processing for black/white signals and where nature of signals is unimportant. See W04-P codes for general non-receiver application, and W04-F codes for processing specific to video recording.

W03-A04A [1992]

Gamma control

Gamma control/correction in general is coded in W04-P01E1.

W03-A04B [1992]

Bandwidth control

Control of bandwidth in general is covered by U25-F codes which are also assigned as appropriate.

W03-A04B1 [1992]

Peaking, aperture correction

Aperture correction in general is coded in W04-P01E5.
Response, accentuate, HF

W03-A04C [1992]

Clamping circuits, DC restoration

Clamping circuits of general application are coded in U24-C02A5 also. (Prior to 1992 search W03-A04 and U24-C02A for TV receiver clamp circuits.)

W03-A04D [1992]

Contrast and brightness control

Includes automatic arrangements and circuitry responding to manual control or remote control operation.

W03-A04D1 [1997]

Based on display drive aspects

Includes CRT beam current limiting when combined with W03-A08A8A.

W03-A04D5 [1997]

Based on ambient lighting

Prior to 1997, see U24-C01C and W03-A04D.

W03-A04F* [1992-2005]

Display interface circuit

*This code is now discontinued. From 2006 this topic is covered by W03-A08S codes.

W03-A04G [1992]

Ghost suppression and equalising

The title of this code has been expanded to reflect the previous inclusion of equalising circuits, even when ghost suppression has not been explicitly mentioned. Prior to 1997, ghost cancelling was also coded in W02-G03B6, which covers compensation for multipath reception in general. From 1997, W03-A04G only has been used for this topic in TV receivers. See also U22-G01 codes for digital filters, especially U22-G01A5 codes which relate to adaptive types and U22-G03E3C for application of DSP to equalising in general. Transmission of ghost control reference signals (GCR) is covered by W02-F05C.

Reflection, pulse, delay, transversal filter

W03-A04H [1992]

Noise reduction

For details relevant to the radio receiving aspect W02-G03B codes are also assigned.

W03-A04H1 [1997]

Reducing noise generated outside receiver

Covers suppression within the receiver of external interference such as impulse noise (also coded in W02-G03B5) and interference to terrestrial digital TV signals from analogue transmissions, or vice-versa. Ghost signal suppression is covered by W03-A04G.

W03-A04H5 [1997]

Reducing noise generated in receiver

Includes arrangements to reduce noise and aberrations on picture, except that arising from luminance/chrominance separation, which is covered by W03-A05B5.

W03-A05

Color signal processing

W03-A05 codes covers demodulators, luminance-chrominance separation, etc., chiefly for analogue color TV. (Color modulators/encoders are covered by W04-Q05).

W03-A05A [1992]

Color synchronization

W03-A05A1 [1992]

Color subcarrier recovery

W03-A05A3 [1992]

Separation of color burst signal

W03-A05B [1992]

Luminance-chrominance separation

Luma, chroma, Y-C

W03-A05B1 [1992]

Using comb filter, using digital filter

Comb filters per se are covered by U22-G01B5 (digital) and U25-A03 (analogue).

Delay, line, period

W03-A05B5 [1992]

Suppressing interference

Includes suppression of cross-color, 'hanging dots' interference, etc. Reduction in the visible effect of radio interference is covered by W03-A04H1.

W03-A05B7 [1992]

Adaptive luminance-chrominance separation

Includes movement-responsive control of separation. W03-A11C, which covers detection of picture motion content in general, is also assigned where this aspect is significant.

Scene, change, HF, interframe

W03-A05C [1992]

Control circuit details

Covers automatic and manually/remotely adjustable control.

W03-A05C1 [1992]

Automatic chroma control

W03-A05C3 [1992]

Color killer circuit

W03-A05C5 [1992]

White balance control

W03-A05C7 [1992]

Hue and intensity control

W03-A05D [1992]

Demodulation circuits

NTSC, PAL, SECAM, MAC

W03-A05D1 [1992]

With recognition of standard

See also W03-A11 codes for multistandard receiver details, especially W03-A11B codes for standard recognition.

W03-A05E [1992]

Matrix circuit

W03-A05F* [1992-2005]

Display interface circuit

*This code is now discontinued. From 2006 this topic is covered by W03-A08S codes.

W03-A05X [1992]

Other color signal processing

Includes clamping/DC restoration specifically for color video when W03-A04C is also applied, and noise reduction (other than that due to luminance-chrominance separation) with W03-A04H codes.

Dithering

W03-A06

Synchronizing

Separation circuit, vertical/horizontal signal separation, clock recovery, deflection/blanking generator control

W03-A06A [1992]

Extracting synchronizing information

Covers separation of synchronizing signal information from composite video signal. Separation of horizontal and vertical synchronizing information from extracted 'sync' pulses is covered by W03-A06C.

W03-A06A1 [1992]

Detecting presence of signals

W03-A06A5 [1992]

Recognising type of signals

See W03-A11B codes also for multistandard receiver aspects.

W03-A06C [1992]

Separation of vertical and horizontal information

Also coded in U22-D05 if of general application to pulse circuitry. Prior to 1992 search U22-D05 with W03-A06.

Vertical, horizontal, frame, field, line

W03-A06E [1992]

Synchronizing signal distribution and control of other equipment

Covers use of synchronizing signals within receiver.

W03-A07

Power supplies

See U24 for (low power) power supplies in general.

W03-A07A [1992]

Mains or battery power supply

Transformer, rectifier, smoothing, filter, voltage regulator, converter, AC-DC

W03-A07A1	[1992]
Standby arrangements, timed disconnection	
W03-A07C	[1992]
EHT power supply	
Includes discharge protection circuits. Also coded in W03-A08A1C. See also V02-F02A for flyback transformers.	
<i>Rectifier, voltage multiplier, tripler, ultor, final anode</i>	
W03-A08	
Display arrangements	
W03-A08 codes cover display aspects of TV receivers and (since 2007) video displays in general. The following codes are assigned to indicate application of the particular display device to TV sets and video displays only : W03-A08A codes, W03-A08B, W03-A08C, W03-A08D, W03-A08G and W03-A08J. Novel details of these display devices are covered in the respective codes for the particular technology, in either V05 or U14 class.	
W03-A08A	
Cathode ray tube display	
CRTs per se are assigned V05-D codes, especially V05-D01B codes.	
W03-A08A1	
Deflection circuits	
W03-A08A1A	[1992]
Deflection signal generator and control	
Prior to 1997, this code included picture width and height control which is now transferred to W03-A08A1F. See U22-C codes also for details of sawtooth waveform generators.	
<i>Line oscillator, frame oscillator, horizontal, vertical</i>	
W03-A08A1B	[1992]
Deflection yoke	
Also coded in V02-F01A and V05-D06B1A (and V05-D01B codes depending on tube type).	
<i>Coil, winding, core, connections</i>	
W03-A08A1C	[1992]
Deflection system with power supply	
Also coded in W03-A07C. Includes line output transformer (also coded in V02-F02A).	
W03-A08A1D	[1992]
Distortion and linearity correction	
Includes pincushion distortion correction.	
<i>S-correction, capacitor, coil, barrel, ringing</i>	

W03-A08A1E	[1992]
Centering of picture on screen	
W03-A08A1F	[1997]
Controlling picture width or height	
(W03-A08A1A)	
See W03-A08A1A prior to 1997.	
W03-A08A1G	[1992]
Deflection with non-uniform speed	
Includes velocity modulation systems.	
W03-A08A1H	[1992]
Progressive scanning	
Covers non-interlaced systems. For HDTV receiver aspects search with W03-A11 codes.	
W03-A08A1J	[1992]
Non-raster scanning	
Covers scanning systems not following normal sequential raster pattern, such as fractal scanning. Progressive scanning is covered by W03-A08A1H.	
<i>Peano</i>	
W03-A08A1X	[1992]
Other deflection system details	
W03-A08A3	[1992]
Focusing arrangement	
(W03-A08A9)	
Includes coils (also coded in V02-D), power supply aspects, focus potentiometer, etc.	
W03-A08A3A	[1997]
Dynamic focusing	
See U22-D01A codes also for pulse-shaping aspects.	
W03-A08A3C	[1997]
Focusing system components	
Includes high-voltage potentiometers, bias resistor networks, etc. which are covered in V01-A codes, e.g. V01-A03D2 for preset variable resistors.	
W03-A08A4	[1992]
Degaussing arrangements	
(W03-A08A9)	
For demagnetising in general see V02-D, which is also assigned here.	
W03-A08A4A	[1992]
Degaussing coil	
(W03-A08A9)	

W03-A08A4C [1992]

Control circuitry

(W03-A08A9)

Includes automatic control aspects, e.g. causing current decay by PTC resistance (also coded in V01-A02A7C where the resistance element per se is novel).

W03-A08A5 [1992]

Convergence and beam control

(W03-A08A9)

Beam landing error, misconvergence

W03-A08A5A [1992]

Components e.g. magnets, coils

(W03-A08A9)

W03-A08A5C [1992]

Automatic control

(W03-A08A9)

W03-A08A5E [1992]

Beam index control

(W03-A08A9)

Includes circuitry and electro-optical or other detection system.

W03-A08A6 [1992]

Radiated field suppression

(W03-A08A9)

Covers suppression of magnetic, electromagnetic, or electric fields for EMC or health and safety considerations. See W03-A09 codes also for constructional aspects. Compensation for effects of external magnetic fields is covered by W03-A08A4 for de-magnetising and by W03-A08A1D for distortion correction in deflection circuits.

W03-A08A7 [1992]

Blanking circuits

Beam cut-off, bias, grid

W03-A08A7A [1992]

Responsive to scan failure

(W03-A08A9)

Includes arrangements to protect screen from damage.

Spot killer

W03-A08A7C [1992]

Blanking selective part of screen area

(W03-A08A9, W03-A11)

See W03-A11B1A also for control of display area in multi-standard receiver.

Aspect ratio, widescreen, letterbox, HDTV, IDTV, EDTV, border, edge

W03-A08A8 [1992]

Tube drive circuitry

(W03-A08A9)

Includes cathode drive circuits, and also matrix drive circuitry. See U24-G codes for amplifiers in general.

W03-A08A8A [1992]

Limiting excess beam current

(W03-A08A9)

Also coded in U24-C02A when based on limiting excessive brightness level of video. (See also W03-A04D1)

ABL

W03-A08A8C [1997]

Drive circuitry for matrix-type tube

Covers matrix drive with deflection type tube arrangements. Cathode ray tubes of this type are covered by V05-D01B3C. Interface arrangements for matrix displays other than CRTs are covered by W03-A08S5.

MDWD

W03-A08A9

Other CRT display aspects

W03-A08B [1987]

Liquid crystal display

(W03-A08X)

This code is used to denote the use of an LCD in a TV set or video display, and includes novel LCDs (full details of which are covered by U14-K01 codes). W03-A08B is assigned for drive circuitry integral with the LCD (in U14, U14-K01A3 is assigned for this), external circuitry forming part of the TV set or video display is assigned W03-A08B3. Backlighting components and arrangements are covered by W03-A08B1 and control of backlighting by W03-A08B3. From 2007 backlighting and analogous arrangements are also assigned X26-U04A codes (formerly W05-E05B codes and X26-U04).

W03-A08B1 [1997]

Module and constructional details

This code covers module aspects and constructional details associated with the incorporation of the display device itself, including backlighting light sources, filters, diffusers, etc. Control of backlighting is not included being covered by W03-A08B3. From 2007 backlighting and analogous arrangements are also coded in X26-U04A and other X26 codes depending on novelty.

Back lighting, CCFL, lamp, display module connector

W03-A08B3 [1997]

Drive circuitry

This code is intended for drive circuitry forming part of the TV set or video display, i.e. it does not include circuitry that is part of the LCD which is coded as W03-A08B. Drive circuitry for backlighting sources is also included.

Matrix drive circuitry, scan signal generator, lamp drive, inverter

W03-A08C [1997]

Display using LEDs

This code is used to denote the use of inorganic or organic light emitting diodes in a TV set or video display, either as an array of individually-encapsulated LEDs for a large-scale display or as an integrated circuit. LEDs themselves are covered by U12-A01A codes. Note that in the case of 'LED' displays, 'light emitting diode' displays **are** covered here but 'light emitting device' displays not using LEDs are regarded as being electroluminescent displays and are therefore covered by W03-A08J instead. The use of LEDs for backlighting of liquid crystal displays is **not** regarded as an 'LED display' and is covered by W03-A08B1 for module and constructional aspects and by W03-A08B3 for drive circuitry and control aspects.

W03-A08D [1992]

Plasma display

Plasma displays themselves are covered by V05-A01 codes.

W03-A08E [1987]

Optical aspects, incl. head-mounted display

Note that optical elements covered by W03-A08E codes are **not** part of display devices themselves, such as CRTs, FEDs, LCDs, OLEDs, or PDPs, but are separate elements used with the display device. Projection TV in general is covered by W04-Q01 codes and only coded in W03 when relevance to receivers is disclosed, such as in a self-contained projection receiver, or for video circuitry details, e.g. light valve driving.

Anti-reflection coating, lens, color filter, projection display, stereoscopic display shutter control, polarisation control

W03-A08E1 [1997]

Filters

This code includes color-separation filters, polarising filters, antiglare filters and the like which are separate from the display device itself. Thus a color-separation filter within an LCD for example cannot be assigned this code, and being regarded as an aspect of the display itself, would be coded as W03-A08B only. Display filters of general or unspecified application are covered by W05-E05A.

W03-A08E3 [1997]

Lens systems

W03-A08E5 [1997]

Mirror

W03-A08E7 [1997]

Head-mounted displays and electronic shutter arrangements for 3D displays

From 2013 this code is subdivided to distinguish video head-mounted displays (now covered by W03-A08E7A) from shutter arrangements for use with stereoscopic displays (now covered by W03-A08E7C).

W03-A08E7A [2013]

Head-mounted display

This code covers head-mounted displays for presenting visual information to the user from video signals. Head-mounted displays using retinal-projection are also assigned W04-Q01L. Application to augmented reality or virtual reality systems is indicated by assignment of W04-W07E1A. Head-mounted displays in general, including those not capable of presenting video, are covered by W05-E07.

W03-A08E7C [2013]

Shutter arrangement for stereoscopic display

This code covers arrangements in the form of spectacles with e.g. electro-optical shutters to alternately transmit or block light from a display to left and right eyes of the viewer. W03-A12A, the general code for stereoscopic or '3D' TV receivers and video displays is also assigned and novel aspects of electro-optical shutters are covered by V07-K01A.

3D glasses

W03-A08E7E

[2013]

Spectacles using filters for stereoscopic display

This code covers arrangements in the form of **passive** spectacles with e.g. different colour filters or different polarization for each eye to produce a stereoscopic display effect. W03-A12A, the general code for stereoscopic or '3D' TV receivers and video displays is also assigned. Electro-optical shutters to alternately transmit or block light from a display to left and right eyes of the viewer are **not** included and are covered by W03-A08E7C.

Anaglyph, 3D glasses, blue filter, green filter, red filter

W03-A08E8

[2014]

Parallax and different-view displays

This code covers optical and electro-optical aspects of displays in which parallax or similar effects are used to enable different images to be perceived depending on the viewer's position. For autostereoscopic displays (i.e. those not requiring the wearing of spectacles with LC shutters, polarized filters, etc.) W03-A12A is also assigned. Where the object is privacy, e.g. deliberately creating a narrow viewing angle so that someone sitting next to the user of a portable device cannot view displayed content, W03-A08L is also assigned.

Confidential, diffraction, diffuser, grating, overlay, refraction, restricted view

W03-A08F

[1992]

Optomechanical and electro-optical scanning display

Light beam scanning is covered by V07-K05.

W03-A08F1

[1992]

With laser light source

For details of lasers per se see V08 codes. Projection TV with laser light source is coded in W04-Q01B1.

W03-A08G

[2002]

Field emission display

(W03-A08X)

This code is intended for non-CRT field emission display arrangements for TV receivers. CRT TV displays using field emission are covered by W03-A08A codes. Novel aspects of field emission displays are covered by V05-D01C3 and other V05-D codes as appropriate.

FED

W03-A08J

[2002]

Electroluminescent display

(W03-A08X)

Novel aspects of electroluminescent displays are covered by U14-J codes. Note that 'LED displays', in the sense of 'light emitting diode displays' are **not** included here and are covered by W03-A08C. When 'LED' refers to 'light emitting devices' which are **not** LEDs, W03-A08J is assigned.

EL

W03-A08L

[2013]

Display arrangements preventing direct recording by camera and display privacy

This code covers arrangements to prevent direct off-screen recording of still or moving images using e.g. a digital camera, camera phone or camcorder or to perform watermarking on images recorded, and also arrangements to maintain confidentiality or privacy of displayed information, e.g. by deliberately restricting viewing angle. Arrangements using infra red light within an LCD backlighting system are also covered in W03-A08B codes. The use of similar techniques for projection displays is not included and is covered by W04-Q01J5. Copy protection involving signal processing is covered by W04-F01L1.

Camera blinding, flooding, IR, over-expose, secrecy

W03-A08S

[2006]

Display interfacing

Covers circuitry for interfacing between the receiver and displays that may be integral with it or external. This topic was previously covered in W03-A04F for general interfacing aspects and in W03-A05F for interfacing and display driving specifically related to color video signals. Other W03-A04 or W03-A05 codes are assigned in addition to W03-A08S codes as necessary.

W03-A08S1

[2006]

Digital display interfacing

This code covers aspects specific to the digital nature of the display, such as digitizing and signalling the type of display or resolution. Specific details relating to matrix display driving are covered by W03-A08S5.

DisplayID, EDID, extended display identification data, E-EDID, enhanced EDID

W03-A08S5

[2006]

Matrix drive details

(W03-A08X)

For driving e.g. LCD, plasma displays with native resolution. Color matrix circuits for converting color-difference signals into color drive signals are not coded here, being covered by W03-A05E instead.

W03-A08X

Other TV receiver display aspects

Includes display arrangements using discharge tubes forming a matrix, etc. From 2002 electroluminescent displays for TV receivers are assigned W03-A08J. Also includes touchscreens which are also assigned T04-F02A2 and W03-A13G when OSD aspects are significant.

W03-A09

Constructional details

Constructional details of electronic equipment in general are covered by V04-S and V04-T codes.

W03-A09A [1992]

Receiver constructional details

W03-A09A1 [1992]

Cabinet

W03-A09A5 [1992]

Internal construction

Cooling

W03-A09C [1992]

Stands and supports

Includes stands for flat-screen TVs, furniture aspects such as stacks for audio/video equipment (see W03-G codes also for general application) and mounting brackets for walls, etc.

W03-A10 [1983]

Teletext and related systems

(W03-A20)

Teletext transmission system aspects are covered by W02-F05B codes. Non-television text equipment (e.g. receiving text information over telephone line) is **not** coded here, unless interfacing equipment such as a modulator is being used to insert the text in e.g. the field blanking interval (in which case W03-A18C would be assigned also). For non VBI-based systems used in digital TV search along with W03-A11G.

Character multiplex

W03-A10A [1992]

Decoder

Framing code detector

W03-A10A1 [1992]

Error protection

Ghost-cancelling circuits are covered by W03-A04G.

Burst-and-random error correction system for teletext, BEST

W03-A10C [1992]

Character generator

Character generators for computer peripheral CRT VDUs are covered by T04-H01A1.

W03-A10C1* [1992-2005]

For other on screen display

*This code is now discontinued. From 2006 it is assumed that all character generators are for a range of purposes, including teletext type systems, on screen menus and interactive information provision such as Internet TV.

W03-A10C5 [2006]

Character sets and fonts

Includes use of particular character sets for different languages. Character set encoding is also covered in U21-A05D1.

Cyrillic, Kanji, Kana, Hangul, Arabic, shift JIS

W03-A10E* [1992-2011]

Memory aspects

*This code is now discontinued and from 2012 this subject matter will be covered by W03-A11M5. W03-A10E remains valid and searchable for records prior to 2012 when it was assigned for the use of memory to increase apparent speed of retrieval or other purposes in text and subtitle display arrangements. Prior to 2012 memory circuits for OSD and PIP applications were covered by W03-A13A (now W03-A11M3) and for digital/high definition receivers by W03-A11M.

Buffer, page memory

W03-A10G [1997]

'Closed caption' and subtitle systems

(W03-A10X, W03-A13G)

Search with S05-K for 'closed caption' systems.

W03-A10J [1997]

Processing additional information signals

Includes use of VPS data and extraction circuitry (only) for ghost-control reference signals. See W03-A04G for all aspects of ghost signal suppression in receivers.

W03-A10X [1992]

Other text system details

Includes the use of text-to-speech conversion (also assigned W04-V04C1) to provide an audible version of text-based information.

W03-A11	[1987]
High-definition, multi-standard, and digital architecture receiver	
(W03-A20)	
HDTV transmission systems are covered by W02-F06C codes. Codes in this section are used with W03-A05 codes for color demodulation, and with W03-A08 codes for display aspects.	
From 2002 W03-A11K codes have been assigned for digital architecture TV receivers, i.e. those using DSP. Prior to 2002 this aspect was covered by W03-A11X.	
<i>HDTV, IDTV, EDTV, MUSE, dual-standard, video signal interpolation</i>	
W03-A11A	[1992]
Receiver standards-conversion circuit	
TV standards conversion equipment for studio/broadcast use is covered by W04-N05A, and for recording equipment by W04-F01H3.	
W03-A11A1	[2005]
Transcoding	
Covers conversion of standard of received digital TV signals including changing the coding format used.	
W03-A11A5	[2010]
TV display upscaling and resolution improvement	
This code covers arrangements for upscaling a signal to improve resolution, e.g. to provide a 100 Hz field rate from an original 50 Hz rate in the received signal, or to increase the effective number of pixels. Upscaling for video recording and reproducing equipment is covered by W04-F01H3C.	
<i>Flicker reduction, interpolation, pixel displacement, pixel shaping</i>	
W03-A11B	[1992]
Standard recognition circuits and switching	
Includes recognition based on color signal characteristic (see W03-A05D1 also), synchronizing signal type (see W03-A06A5 also) or e.g. bandwidth of received signal. From 2006 novel standard recognition circuits are covered by W03-A11B5.	
W03-A11B1	[1992]
Automatically switching receiver circuitry	
Covers control aspects to select appropriate demodulator, or other signal processing stage. Includes use of standard recognition circuits in switching receiver circuitry.	

W03-A11B1A	[1992]
Controlling display area or scanning format	
See W03-A08A7C for arrangements to selectively blank e.g. border area of CRT display. For similar system using physical masking of screen see W03-A08X.	
<i>Progressive scan, interlaced, non-interlaced, aspect ratio, letterbox, pan-and-scan, 4:3, 16:9</i>	
W03-A11B5	[2006]
Novel standard recognition circuits	
W03-A11C	[1992]
Picture signal motion detector	
This code is not used routinely for decoding predictively encoded video data. Covers novel methods and circuitry for determining motion content of picture, e.g. in adaptive circuitry such as luminance - chrominance separator (also coded in W03-A05B7) as well as in predictive decoding. Motion detector circuits in general are coded in W04-P01A1.	
<i>Inter-frame, correlation, difference, H</i>	
W03-A11D	[1992]
Decoder	
Includes decoder for digital TV, e.g. DVB-T signals. Descrambling of encrypted signals is not included and is covered by W03-A16C3A. Decoders/demodulators for 'standard' analogue color TV signals are covered by W03-A05D codes.	
<i>DVB, ATSC</i>	
W03-A11D1	[2007]
Error detection and correction	
See W01-A01B codes for general error correction in data transmission systems, which were previously assigned with W03-A11D to indicate this topic.	
W03-A11G	[2005]
TV receiver for digital broadcasts and digital multimedia broadcast receiver	
From 2011 the title of this code is expanded to reflect the previous inclusion of receivers for digital multimedia broadcast (DMB - now covered by W03-A11G5) as well as receivers of digital TV signals such as DVB-T, irrespective of analogue or digital receiver architecture. Set-top box receivers are also assigned W03-A16E. Digital TV receiver architecture details (for analogue or digital signals) are covered by W03-A11K codes.	
W03-A11G1	[2006]
Combined with analogue receiver	

W03-A11G5 [2011]

Digital multimedia broadcast receiver

For receivers built-into mobile phones search with W01-C01D3C and W01-C01P6G.

DMB

W03-A11K [2002]

Digital and hybrid TV receiver architecture

(W03-A11X)

This code is assigned for receivers - of signals with analogue or digital modulation - which are implemented using DSP techniques in whole or in part. The codes are used in conjunction with other W03-A codes as necessary where there are direct equivalents in analogue receivers, in particular for RF amplifiers, oscillators, IF stages and demodulators. Corresponding digital techniques for communications and broadcast radio receivers are covered by W02-G03K and W03-B07 codes.

W03-A11K1 [2002]

Characterised by usage of DSP

(W03-A11X)

These codes are used to distinguish between different levels of DSP being applied to the signal path in the receiver. As such, they do not normally represent novel digital processing aspects, which are conveyed by use of other W03-A11K codes. DSP in general is covered by T01-J08A2, T01-J08B and U22-G codes depending on specific aspects.

W03-A11K1A [2002]

With baseband digital signal processing only

(W03-A11X)

This code covers receivers with a digital signal processing path **after** the conversion to baseband.

W03-A11K1C [2002]

With baseband and IF digital signal processing only

(W03-A11X)

This code covers receivers with DSP in IF, demodulator, and baseband stages.

W03-A11K1E [2002]

With digitising of RF spectrum

(W03-A11X)

This code covers receivers with digitising of the whole signal processing path, except for the possible use of analogue RF amplifiers.

W03-A11K1X [2002]

Other use of DSP in digital TV receivers

(W03-A11X)

W03-A11K3 [2002]

AD conversion

Novel aspects of AD converters and AD conversion are covered by U21-A03 codes.

W03-A11K5 [2002]

Digital mixing and direct digital conversion

(W03-A11X)

DDC

W03-A11K6 [2002]

Filtering

(W03-A11X)

Novel digital filters are also assigned U22-G01 codes, and T01-J08B when the emphasis is on computing aspects.

W03-A11K7 [2006]

Transform implementation

DSP-based transform implementation is covered by U22-G03E1A and computer data processing aspects in general by T01-J04B1.

W03-A11K8 [2006]

DA conversion

Novel aspects of DA converters and DA conversion are covered by U21-A02 codes.

W03-A11K9 [2002]

Other digital TV receiver aspects

(W03-A11X)

W03-A11M [2005]

TV receiver memory

From 2012 the scope of this code is expanded to enable it to be used as a single reference for 'TV receiver memory' in the sense of memory for images or text. Subdivisions have been introduced to cover the use of memory in video decoding (W03-A11M1), for onscreen display and related topics (W03-A11M3), for text and subtitle display (W03-A11M5) and novel memory itself (W03-A11M7). Prior to 2012 memory circuitry used in TV receivers for applications such as PIP and OSD was covered by W03-A13A, and for teletext by W03-A10E. For memory circuits used for general video applications see W04-P01C codes. For memory circuits used in dynamic recording of video signals (e.g. as a buffer) see W04-F01M codes. Memory used for storing operational settings such as stored channels or for general receiver control aspects is not included, being covered respectively by W03-A02B1 codes and W03-A18A codes.

W03-A11M1 [2012]
TV receiver memory used in decoders and other signal processing

This code covers the use of memory in a TV receiver in connection with video decoding or other signal processing, such as upscaling, standards conversion, noise reduction etc. Codes for these topics are also assigned as necessary

W03-A11M3 [2012]
TV receiver memory for on-screen display and image manipulation

This code replaces W03-A13A and covers the use of memory in a TV receiver in 'image manipulation' applications as covered by W03-A13 codes, such as picture-in-picture, freeze-frame, zoom etc. and also on-screen display (OSD). Where the use of memory is specific to a particular type of image manipulation the corresponding W03-A13 code is also assigned, e.g. W03-A13B for PIP.

W03-A11M5 [2012]
TV receiver memory for text display and subtitles

This code replaces W03-A10E and covers the use of memory in a TV receiver in text or subtitle applications as covered by W03-A10 codes, such as teletext, MHEG text, or closed caption display. W03-A10 codes are also assigned as necessary to provide more information, e.g. W03-A10G is also assigned for inventions specific to the presentation of closed caption information.

Buffer, page memory

W03-A11M7 [2012]
Novel memory and memory circuits for TV receivers

This code covers novel memory and memory circuits and as such is likely to be assigned for inventions which are also assigned U14-A codes for memories and/or T01-H01 codes for use of memory in a computing context. W03-A11M7 is intended to indicate application to TV receivers (when specific) for novel memories or memory circuits.

W03-A11M9 [2012]
Other TV receiver memory aspects

W03-A11X [1992]
Other HDTV/dual standard details

Includes multiple analogue standard reception. Receivers for both digital and analogue reception are coded in W03-A11G1.

W03-A12 [1987]
Stereoscopic, stereophonic, and multichannel sound receiver
(W03-A20)

W03-A12A [1992]
Stereoscopic and three-dimensional display TV receiver

Covers all aspects of stereoscopic and autostereoscopic TV receivers, such as decoding circuitry and display aspects (see W03-A08 codes also, e.g. W03-A08E7C for LC shutter spectacles) including 3-dimensional displays. For autostereoscopic displays and displays which can present different programme images when viewed from different angles based on optical gratings, grids and the like placed in front of a display panel search with W03-A08E8 (from 2014).

Left, right, image, shutter synchronization

W03-A12B [1992]
Stereophonic and multichannel sound TV receiver
Left, right, bilingual sound, separate/second audio programme, SAP, NICAM

W03-A12B1 [1992]
Stereophonic decoder

See W03-A03C1 also. (Coded in U23-P05 also).

W03-A12B1A [1997]
With separate sound channel

Covers arrangements enabling output of audio signals in different language. TV transmission systems of this type are covered by W02-F06B5.

Separate audio programme, SAP, bilingual

W03-A12B3 [2005]
Surround sound aspects

This code is used with W03-A12B1 or W03-A12B5 as appropriate. General aspects of surround sound systems are covered by W04-R01C5.

W03-A12B5 [1992]
Audio aspects

Includes amplifiers, loudspeaker systems, etc. Search with W03-A15 codes.

W03-A13 [1987]
Picture-in-picture, image manipulation, EPG and OSD
(W03-A20)

From 2012 the title of this code has been changed to reflect the transfer of memory circuits to W03-A11M codes (from W03-A13A). W03-A13 codes cover special display modes under control of the viewer, including picture-in-picture, freeze frame, zooming and image manipulation. Special effect generation for general video applications, including its use in TV studio equipment, is covered by W04-N05C codes. On-screen display forming part of teletext information is covered by W03-A10 codes (see note for W03-A13G).

W03-A13A* [1992-2011]

Memory circuitry and control

*This code is now discontinued and from 2012 this subject matter will be covered by W03-A11M3. W03-A13A remains valid and searchable for records between 1992 and 2011 when it was assigned for memory aspects of functions described by W03-A13 codes only, such as PIP or OSD applications, and included novel memory itself and memory addressing. Memory circuits and applications specific to digital and high definition TV receivers, such as memory used in standards conversion or decoding, are covered by W03-A11M1 from 2012. Memory circuits specifically for VBI and digital text reception (e.g. to increase apparent retrieval rate) are coded in W03-A11M5 from 2012. Frame stores for general video applications are covered by W04-P01C codes and the use of memory in video recording signal processing by W04-F01M codes.

W03-A13B [1992]

Picture-in-picture display function

Includes picture-outside-picture arrangements. For display of inset picture of different aspect ratio and/or standard, search with W03-A11B1A. Picture inlay for TV special effects in general is covered by W04-N05C5.

PIP, POP

W03-A13B1 [1992]

Displaying external video source in sub-image

See W03-A18C also for peripheral connection aspects.

Peripheral, CCTV, monitor, security, video, intercom, door-phone, entry

W03-A13C [1992]

Still-picture display facility

Includes 'freeze-frame' facility. For use to hold picture during low S-N conditions search with W02-G03B1.

Hold, action, video, squelch

W03-A13E [1997]

Zoom facility and image manipulation

The title of this code has been expanded to reflect the previous inclusion of image manipulation, for which W03-A13X was also assigned as appropriate and W04-N05C codes for inventions of wider application. The code has also been subdivided to separate image zooming and manipulation when the distinction can be made. Image manipulation in general, and for TV studio special effects, is covered by W04-N05C3 codes and in T01-J10B3A when computer processing aspects are emphasised.

W03-A13E1 [2005]

Zoom facility

Covers zooming to enlarge displayed image, or a portion of it. Other special effects such as re-positioning, rotating, and altering the shape of the picture are covered by W03-A13E5.

W03-A13E5 [2005]

Image manipulation

Covers use of special effects such as resizing, re-positioning and altering shape of picture. Zooming is covered by W03-A13E1. Prior to 2005 image manipulation was covered by W03-A13E and/or W03-A13X as appropriate, depending on novel aspects.

W03-A13G [1992]

General on-screen display

From 2006 character generation aspects are covered by W03-A10C codes. Includes OSD aspects of touch screens (also assigned W03-A08X and T04-F02A2).

Digit, pattern, ramp, monitoring, self-test

W03-A13J [2002]

Electronic programme guide systems

(W03-A13G, W03-A16C5E)

This code is regarded as the main one for EPG aspects in receivers and set top boxes. See W03-A13G also for specific OSD aspects of programme guide systems in TV receivers (this code was used more generally for this topic prior to 2002). Interactive aspects of guide systems will continue to be assigned W03-A16C5E as appropriate. Systems or 'head-end' aspects are covered by W02-F10E5. Display of program guide information in radio receivers is covered by W03-B01C.

W03-A13X [1992]

Other special display mode aspects

W03-A15 [1992]

Audio system aspects

(W03-A20)

Includes loudspeakers, audio amplifier, and connection to e.g. external Hi-Fi system (with W03-A18C). Search with W03-G05C5A for cordless headphone arrangements. (Prior to 1997, see W03-A15, W03-A18C, and W03-G05).

W03-A15A [1992]

Audio amplifiers, volume and tone control

(W03-A20)

W03-A15C [1992]

Loudspeakers and loudspeaker enclosures

(W03-A20)

See also V06-A codes for loudspeakers per se, and V06-G/W04-S01 codes for enclosures of general application. (Prior to 1992, W04-S was assigned even for self-contained enclosure aspects). From 2005, wireless loudspeaker systems are also assigned W03-G05C5C.

W03-A16 [1992]

Ancillary equipment for cable, satellite or subscription TV

(W03-A20)

This code mainly covers equipment external to actual receiver e.g. decoders or converters. (Converter RF circuitry is covered by W03-A01 codes). Search with W02-F03A or W02-F05A codes for wider cable/subscription aspects.

W03-A16A [1992]

Satellite TV

(W03-A20)

Search with W02-B codes for aerial aspects, and W03-A16C3 codes for security and decoding. Satellite TV transmission systems are covered by W02-F06A.

W03-A16C [1992]

Cable, subscription, and interactive TV

(W03-A20)

Systems aspects of cable, interactive and satellite TV (i.e. broadcast infrastructure) are covered by W02-F codes.

W03-A16C1 [1997]

Cable TV receiver

The title of this code has been changed to better reflect its coverage. From 2005, cable TV set-top box aspects are highlighted by co-assignment of W03-A16E. Prior to 2005, W03-A16C1 was used more generally for set-top box details.

W03-A16C3 [1997]

Security and decoding aspects

See also W02-F05A1 codes for secrecy/scrambling aspects of TV systems in general.

W03-A16C3A [1997]

Descrambling circuitry

Also coded in W02-F05A1B.

W03-A16C3C [1997]

Access control, including card systems

Includes smart cards used to authorise decoding of encrypted broadcast. Access control details relating to e.g. cable head-end are covered by W02-F05A1 codes and W02-F10N3.

W03-A16C5 [1997]

Interactive TV aspects

Covers details of (subscriber) systems interacting with rest of two-way network, e.g. to request a programme, carry out a transaction, etc.

W03-A16C5A [1997]

For video-on-demand system

Includes pay-per-view systems for temporarily increasing access rights, and arrangements enabling viewer to influence sequence of events within programme. For systems involving selection of predominantly non-video programme material W03-A16C5C takes precedence.

W03-A16C5C [1997]

For audio-on-demand system

The title of this code has been changed to reflect its actual coverage of audio-based on-demand receiving systems. As before, it includes remote access of entertainment library systems, e.g. of 'pay-per-play' type, using an interactive TV installation or other equipment as an interface.

W03-A16C5E [1997]

For access to information system

This code covers interactive aspects of programme guide systems in receivers, which from 2002 are covered for all aspects by W03-A13J. Prior to 2002, W03-A16C5E was also used for aspects of internet access (now W03-A16C5K).

W03-A16C5G [1997]

For game playing, virtual reality, or karaoke

In 2006 the title of this code was amended to reflect its coverage (since 1997) of virtual reality and karaoke interactive broadcast reception in addition to game playing. Video games in general are covered by W04-X02C and virtual reality in general is covered by T01-J40 codes and W04-W07E codes).

W03-A16C5H [2005]

For access to multimedia system

W03-A16C5J [1997]

For access to financial network

Includes use of TV receiver for online banking or purchasing goods, including 'TV commerce'. Systems involving use of the internet are also assigned W03-A16C5K.

W03-A16C5K [2002]

For access to internet and receiving internet broadcasts, including 'Smart TV'

(T01-H07C5E, W01-A06B7, W03-A16C5E)

This code covers arrangements for internet access as a facility of an interactive broadcast system, and also reception of content on an interactive basis over the internet, such as internet TV, which is also assigned W03-A16C5A.

IPTV, streaming

W03-A16C5X [1997]

For interfacing interactive broadcast terminals with other systems

W03-A16E [2005]

Set top box

(W03-A16C1)

This code is used with others as necessary to highlight specific applications, e.g. with W03-A11G for a set-top box DVB receiver, with W03-A16A for a satellite TV receiver, and with W03-A16C1 for a cable TV receiver.

W03-A16E1 [2005]

Personal video recorder

Covers personal video recorder aspects that relate to receiver, e.g. programming recording using programme guide. This code is used in conjunction with W04 codes, e.g. W04-B14C3 for hard disk recorders, and other W03 codes to denote novel aspects as appropriate.

PVR, TIVO, ReplayTV, SonicBlue, Digital Video Recorder, DVR

W03-A16G [2006]

Local storage of commercial messages

Production of and arrangements for displaying commercial messages for TV are also covered in W05-E03C. Local storage of AV content in home networks is covered by W03-G05C1A (from 2013) which can also be assigned with W03-A16G when locally-stored TV commercials are accessible over a home network.

W03-A18 [1992]

General control and peripheral connection systems

(W03-A20)

W03-A18A [1992]

General aspects of receiver control and monitoring

(W03-A20)

Includes self-checking systems. For microprocessor control aspects, see T01-J08A. Arrangements specific to remote control, not involving overall control aspects, are assigned W03-A02C codes only.

Function display, time programming

W03-A18A1 [1992]

Testing/monitoring with external equipment

(W03-A20)

This code covers any aspect of testing or monitoring of TV receivers or video displays using external equipment, including production line testing or testing subsequently for e.g. fault-finding or repair. Self-testing or self-monitoring arrangements are covered by W03-A18A2.

W03-A18A2 [2006]

Self-testing, monitoring and calibration of TV receiver

This code covers control aspects within the receiver itself for test and diagnosis and also internal calibration.

Testing or monitoring of TV receivers and video displays using **external** equipment is covered by W03-A18A1.

W03-A18A3 [1997]

Preventing viewing below minimum distance; Locating viewer

See also S03-C, W06-A02, W06-A05, and W06-A06 codes for detection system details. From 2010 the scope of this code is enlarged to include determination of viewer direction or location. Arrangements for orienting a receiver or display based on this determination are also assigned W03-A18A9. Viewer or user identification is covered by W03-A18A6.

W03-A18A5 [1997]

Time programming, channel control and programme guide control

Covers use of programme guide to present suitable channels for viewing to user. Note that the 'time programming' referred to for this code, W03-A18A5A and W03-A18A5C relates to programming of the TV receiver itself, e.g. to switch-on and tune to a desired channel at a particular time, and not programming of recording, which is covered by W04-E04C codes in conjunction with the appropriate W04-B, W04-C and/or W04-F codes.

W03-A18A5A [2002]

Time programming with manual input

W03-A18A5C	[2002]
Time programming, channel and programme guide control with learning function	
This code covers automatic time programming arrangements based on learned user preferences, e.g. through monitoring of manual time programming operations or manual channel selection. For analogous arrangements for programming of video recorders see W04-E04C7 along with other relevant W04 recording equipment codes.	
<i>Suggester</i>	
W03-A18A5G	[2006]
Detecting commercial messages	
Includes arrangements to change channels when commercials are detected. Video recorder-based systems for preventing recording of commercial messages are covered by W04-E04C5C, and for overriding of this feature by W04-E04C5E.	
W03-A18A5J	[2007]
Detecting emergency broadcast messages	
Includes arrangements to change channels or switch on TV receiver when emergency broadcast messages are detected. See W02-F05D for transmission of emergency TV broadcasts and W05-B08 codes which are assigned for all aspects of emergency broadcasts and disaster warning alarms. Emergency broadcast radio receivers are covered by W03-B08C7.	
<i>Adverse weather, avalanche, bush fire, earthquake, eruption, flooding, forest fire, hurricane, landslide, landslip, mudslide, terrorist attack, tidal wave, tornado, tsunami, typhoon, volcano.</i>	
W03-A18A6	[2005]
Identifying user	
Covers arrangements to control presented programme content or settings, e.g. brightness, volume, according to individual user. Use in conjunction with W03-A18A7 for arrangements to identify child user and prevent access to certain programming content. Recognition based on biometrics such as fingerprint, palm-print, and similar parameters is also assigned T04-D07F codes, and that based on voice recognition by W04-V04A3. Recognition of user gestures or spoken commands for remote control purposes is not included and is covered by W03-A02C5J and W03-A02C5L respectively.	
W03-A18A7	[1997]
Security and child-lock systems	
<i>V-chip</i>	

W03-A18A8	[2005]
Program control aspects, software updating methods	
T01-F codes (computer program control) are also assigned as necessary.	
W03-A18A8A	[2010]
Software updating	
This code covers arrangements for downloading or otherwise inputting data to modify the program controlling operation of a TV receiver or analogous equipment.	
<i>OTA, over the air</i>	
W03-A18A9	[1997]
Other TV receiver general control	
W03-A18C	[1992]
Peripheral connection system	
(W03-A20)	
Includes SCART socket per se and details of interconnection with any external equipment.	
<i>Euroconnector, peritelevision, HDMI, interface, RGB, direct video, baseband</i>	
W03-A18C1	[2005]
Interfacing hardware	
Includes cables, connectors, and other hardware aspects.	
W03-A18C5	[2005]
Interfacing with other systems	
W03-A18C5A	[2005]
Interfacing with stand-alone systems	
W03-A18C5C	[2005]
Interfacing with local network	
W03-G05C1 (for general AV bus systems) is also assigned as necessary, and significant network aspects are also covered by W01-A06 codes, especially W01-A06B5A.	
W03-A18R	[2007]
Audience research aspects	
Search in conjunction with W03-A18A6 for monitoring viewing of a particular user. Previously coded in W03-A18A1 for devices separate to subscriber equipment itself, along with W02-F04B for system aspects of audience research.	

W03-A19 [2006]

Manufacturing, recycling and packaging of TV receiver

See W03-G10 codes for manufacture, recycling and packaging of general audio/video equipment.

W03-A19A [2006]

Manufacturing TV receiver

Includes assembly of component parts into TV receiver. Manufacture of displays and other TV receiver components is covered in V05, U14 etc. as appropriate, along with relevant W03 codes.

W03-A19C [2006]

Recycling TV receiver

Recycling of CRTs themselves is not included, being covered by V05-L05D1B and V05-L07E6 (these codes relating especially to tube manufacture).

Scrapping

W03-A19G [2006]

Packaging TV receiver

Carton, packing

W03-A20

Other TV receiver details

Includes antenna details.

Input isolation

W03-A21 [2007]

Video display for non-TV receiver application

This code is only assigned in conjunction with other W03-A codes used to indicate novel aspects of video displays that are **analogous** to TV receivers but are intended for other applications. For example, a display for radar equipment (also W06-A04C) with a novel gamma control circuit would be assigned W03-A04A and W03-A21. Note that video displays that are suitable for other applications **and** for TV receivers are **not** assigned W03-A21.

W03-B

Broadcast radio receivers

Communications receivers and general receiver circuitry are covered by W02-G03 codes, TV receivers by W03-A codes. Where noise reduction aspects of broadcast receivers are involved, W02-G03B codes are **also** assigned.

From 2002, W03-B06 codes are introduced for receivers of digital broadcasts, and W03-B07 codes for digital and hybrid broadcast receiver architecture.

W03-B01

Tuners; Tuning displays

RF amplifier, mixer, local oscillator, synthesiser tuning, step tuning, continuous tuning, variable capacitance, permeability, tracking, pushbutton tuner, tuning scale, digital display

W03-B01A [1992]

RF tuner circuitry and construction

W03-B01A1 [1992]

Tuned circuits, input filters

See U25.

W03-B01A3 [1992]

RF amplifier

Novel RF amplifier details are also assigned U24-G01D and other relevant amplifier codes. From 2006, RF AGC is covered by W03-B02A3, previously coded as W03-B01A3 and W03-B02A. Amplifiers external to the receiver itself are covered by W02-B08C5 codes.

W03-B01A5 [1992]

Mixer

Novel mixer details are also assigned U23-J01 codes.

W03-B01A5A [2006]

Image rejection mixer

Prior to 2006 this topic was represented by W03-B01A5 and W02-G03B4A (receiver image signal suppression in general). From 2006 W02-G03B4A will only be assigned for specific novelty in the image rejection aspect.

W03-B01A6 [2002]

Direct conversion and low-IF receivers

In 2006, the title of this code was amended to better describe the inclusion of 'low-IF' receivers as well as 'direct conversion' types. The subdivisions of this code are used, in conjunction with other W03-B01A codes as necessary, to represent receivers of homodyne, synchrodyne, 'zero-IF', or 'low-IF' type. Arrangements for suppression of offsets at the output of the mixer are also assigned W02-G03B4G. Direct digital conversion (DDC) in digital architecture broadcast receivers is not included here, being covered by W03-B07E. Direct conversion communications receivers are covered by W02-G03A8 codes and TV receivers of this type by W03-A01B6 codes.

W03-B01A6A [2006]

Zero-IF receivers

This code is intended for direct conversion schemes in which the baseband information is centred on zero frequency.

W03-B01A6C [2006]

Low-IF receivers

This code is intended for direct conversion schemes in which the baseband information is centred on a low frequency, e.g. of the same order as the baseband bandwidth itself.

W03-B01A7 [1992]

Local oscillator

See U23-A codes also for oscillator circuits.

W03-B01A8 [1997]

Tuner constructional details

(W03-B01A9, W03-B05B)

Covers construction of tuner per se, general internal constructional details of receiver being covered by W03-B05B, which was previously assigned in addition to W03-B01A9 to indicate the construction aspect. From 1997, W03-B05B has only been used for details affecting the design of the receiver, such as mountings, etc.

W03-B01A9 [1992]

Other broadcast radio receiver tuner circuitry

Includes non-superheterodyne tuners.

TRF, homodyne

W03-B01B [1992]

Band scanning, synthesiser tuning, AFC

See also U25-J01 codes for band scanning, U25-J05 for AFC, U23-D01B codes for PLL synthesisers, and U23-F01 codes for 'direct types'.

W03-B01B1 [1997]

Channel-storing arrangements

W03-B01B1A [1997]

Based on stations receivable off-air

Signal strength, level

W03-B01B1C [1997]

Based on channel listing

Includes use of information derived from RDS signals (search with W03-B08 for this aspect). Prior to 1997 see W03-B01B and W03-B02C5.

Alternative frequency, AF, program identification, PI

W03-B01B1E [1997]

Based on determined location

Covers use of position information, e.g. input manually, or derived from navigation system data. Search with W06-A03A5 codes for use of GPS.

W03-B01B1G [2006]

User control of channel storage

Includes re-ordering stored channels, deleting channels, forming 'favorites' lists and the like.

W03-B01B3 [2007]

Channel switching arrangements

W03-B01B5 [1997]

Frequency control system per se

W03-B01C [1992]

Tuning and related displays

Includes scales, illumination etc., and digital read-out of received frequency. The use only of the tuning display to present other information is also included, e.g. for RDS or radio text (also assigned W03-B08 codes) or for DAB program guide (EPG) aspects (also assigned W03-B06). From 2011 novel aspects of broadcast radio receiver program guide reception and data handling are covered by W03-B08C5. (For EPG in TV receivers see W03-A13J).

W03-B01D [2008]

Multiple tuner aspects

This code is assigned with other W03-B codes as appropriate and is intended to highlight the use of two or more tuners in a broadcast radio receiver. For novel tuner circuitry W03-B01A codes are also assigned, and for novel frequency or channel control aspects, W03-B01B codes.

Dual

W03-B02

IF amplifiers; Detectors; Stereo decoders

W03-B02A [1992]

Automatic gain control

Prior to 2006 this code was used with W03-B01A3 for RF AGC and W03-B02B for IF AGC. These topics are now covered solely by the subdivisions below.

IF, RF, AGC

W03-B02A1 [2006]

Novel AGC characteristic

Covers delayed AGC, or other specific characteristic. See U24-C01C1 for signal processing aspects to obtain a particular AGC characteristic.

W03-B02A3 [2006]

RF AGC

Prior to 2006 this topic was covered by W03-B01A3 and W03-B02A.

W03-B02A5 [2006]

IF AGC

Prior to 2006 this topic was covered by W03-B02A and W03-B02B.

W03-B02A9 [2006]

Other broadcast radio receiver AGC aspects

W03-B02B [1992]

Broadcast receiver IF system

From 2006, W03-B02B5 is introduced to separately highlight IF amplifiers, and IF AGC is covered by W03-B02A5 (previously coded as W03-B02A and W03-B02B).

W03-B02B1 [1992]

IF filter

See U25 codes for LC and active filters. Crystal, SAW, and ceramic filters are also coded in V06 (and U14-G for SAW devices).

W03-B02B5 [2006]

IF amplifier

Novel IF amplifier details are also assigned U24-G01D and other relevant amplifier codes. From 2006, IF AGC is covered by W03-B02A5, previously coded as W03-B02A and W03-B02B.

W03-B02C [1992]

Demodulators, decoders

W03-B02C1 [1992]

AM/FM demodulators

See U23 codes for demodulator circuits also.

W03-B02C3 [1992]

Stereophonic decoders and stereo separation control

From 2006, the title of this code is expanded to distinguish novel stereo decoders and automatic control of separation, e.g. by blending, whether performed within the decoder or in a subsequent stage. Where noise reduction is involved W02-G03B codes are also assigned.

Phase-lock loop, PLL, pilot tone detector, matrix circuit

W03-B02C3A [1992]

Automatic stereo switching and stereo separation control

This code covers switching between stereo and mono modes, e.g. in response to low signal strength, and automatic control of separation, e.g. by blending, whether performed within the decoder or in a subsequent stage including audio amplifiers. Receiver noise reduction aspects are also assigned W02-G03B codes, e.g. W02-G03B8.

Separation control, mixing

W03-B02C3C [2006]

Novel stereophonic decoder

U23-P05 is also assigned.

W03-B02C5 [1992]

Decoder for additional information

Includes decoder e.g. for RDS signals, which is also assigned W03-B08 (assigned for all aspects of RDS and similar-system receivers). Prior to 1997, W03-B02C5 codes were used for inventions involving RDS-type decoders and their use in a broad sense. From 1997 only inventions strictly relating to the decoder per se and its operation have been coded in W03-B02C5. In all other cases, W03-B08 is assigned, together with other W03-B codes as appropriate.

Radio data system, station ID, traffic information, ARI, radio teletext

W03-B02C5A* [1992-2005]

With storage function

*This code is now discontinued. From 2006 this code is no longer assigned, the subject matter being transferred to W03-B08A1. W03-B02C5A remains valid for records prior to 2006, when it was assigned for arrangements to store received bulletins and the like, whether the storage facility was part of the decoder or external to it, additional codes in W04 being also applied depending on storage technology, such as W04-B12 codes for magnetic tape based storage, and W04-G01B codes for storage of audio information in e.g. RAM.

W03-B03

Car radios

Used in conjunction with other W03-B codes for specific features. For aerial preamplifiers search with W02-B08C5. (Previously coded in W02-B09, W03-B01 and W03-B03). In-car entertainment systems are covered by W03-G08 and systems including car radios in which the radio is not itself linked with the novel aspect are not assigned W03-B03.

Traffic information detector, diversity receiver, antitheft system

W03-B03A [1992]

Antitheft arrangements

Includes mechanical aspects such as removable fascias, W03-B05 codes (for constructional details) being assigned as necessary.

W03-B03A1 [1992]

Electronic

Includes radio forming part of vehicle alarm system which is also coded in X22-D and W05-B01 codes. Also coded in X22-X03 for general antitheft measures. For 'password' aspects search with T01-J08A and T01-J12C.

W03-B04 [1992]

Audio amplifier and audio circuitry

This code covers audio stages of a broadcast radio receiver and includes details of audio amplifiers and associated circuitry, such as volume and tone controls, auxiliary inputs, and muting arrangements when used with W02-G03B1. Novel amplifier muting circuits are also coded in U24-C05C and gain control in general by U24-C codes. Audio amplifiers in general are covered by W03-C01 codes, and amplifiers in general by U24-G codes. These codes are also assigned as appropriate along with other W03-C codes such as W03-C03C for volume control and W03-C05 codes for tone control and equalizers.

W03-B05 [1992]

Constructional details

(W03-B09)

Constructional details of electronic equipment in general are covered by V04-S and V04-T codes.

W03-B05A [1992]

Casing, housing, mounting kit

(W03-B09)

Cabinet, sleeve, escutcheon, bracket, support

W03-B05B [1992]

Internal construction

(W03-B09)

Includes e.g. PCB or component mounting, etc.

W03-B06 [2002]

Receiver for digital broadcasts

(W02-K07C, W03-B09)

These codes are intended for broadcast receivers of digital radio signal formats such as DAB, DRM, and analogous systems. Systems aspects of DAB are covered by W02-D05C1 and W02-K07C for the OFDM aspect. Receivers employing digital architecture – for analogue or digital broadcast reception – are covered by W03-B07 codes, which may be assigned as well for digital broadcast receivers with digital architecture.

Digital audio broadcast, digital radio mondiale, digital AM, QAM

W03-B06A [2002]

Satellite radio broadcast receiver

(W03-A16A, W03-B09)

Prior to 2002, satellite receivers were assigned W03-A16A as well as W03-B09. W03-A16A will continue to be used for satellite radio reception from 'TV' satellites, but from 2002 will not be used for 'pure' radio satellite reception. Systems aspects of satellite radio are covered by W02-D05A and satellite TV by W02-F06A.

W03-B06C [2002]

Internet broadcast receiver

(T01-H07C5E, W01-A06B7, W03-B09)

This code is intended for 'internet radio' receiving arrangements, which may be part of a receiver, accessory equipment, or wholly contained within a PC as hardware or software.

W03-B06E [2012]

Terrestrial digital broadcast radio receiver

This code covers receivers of digital radio broadcasts from terrestrial transmitters, such as digital audio broadcast (DAB) or digital radio mondiale (DRM) receivers. Note that 'DRM' in the sense of 'digital rights management' is not included and is covered by W03-B06J. Prior to 2012 W03-B06 was assigned for terrestrial digital radio broadcast receivers. Receivers for digital satellite radio are covered by W03-B06A.

W03-B06E1 [2012]

Terrestrial digital broadcast radio receiver with analog reception capability

This code covers receivers of digital radio broadcasts from terrestrial transmitters, such as DAB or DRM, which are also capable of receiving analog broadcasts, e.g. in AM or FM bands. TV receivers capable of receiving analog and digital broadcasts are covered by W03-A11G1.

W03-B06J [2012]

Digital rights management, copy protection and access control

This code covers digital rights management aspects of digital sound broadcast receivers, including copy protection and access-restriction. Note that when these topics arise in interactive systems, e.g. 'audio on demand', W03-A16C3 codes take precedence and are assigned instead of W03-B06J (with W03-A16C5C in the case of audio-based systems).

W03-B07 [2002]

Digital and hybrid broadcast receiver architecture (W03-B09)

This code is assigned for receivers - of signals with analogue or digital modulation - which are implemented using DSP techniques in whole or in part. The codes are used in conjunction with other W03-B codes as necessary where there are direct equivalents in analogue receivers, in particular for RF amplifiers, oscillators, IF stages and demodulators. Corresponding digital techniques for communications and TV receivers are covered by W02-G03K and W03-A11K codes. Receivers for digital broadcasts, such as DAB, are covered by W03-B06 codes, and may also be assigned W03-B07 codes if the receiver itself employs a digital, or part digital, architecture.

W03-B07A [2002]

Characterised by usage of DSP

(W03-B09)

These codes are used to distinguish between different levels of DSP being applied to the signal path in the receiver. As such, they do not normally represent novel digital processing aspects, which are conveyed by use of other W03-B07 codes. DSP in general is covered by T01-J08A2, T01-J08B and U22-G codes depending on specific aspects.

W03-B07A1 [2002]

With baseband digital signal processing only

(W03-B09)

This code covers receivers with a digital signal processing path **after** the conversion to baseband.

W03-B07A3 [2002]

With baseband and IF digital signal processing only

(W03-B09)

This code covers receivers with DSP in IF, demodulator, and baseband stages.

W03-B07A5 [2002]

With digitising of RF spectrum

(W03-B09)

This code covers receivers with digitising of the whole signal processing path, except for the possible use of analogue RF amplifiers.

W03-B07A9 [2002]

Other use of DSP in digital broadcast radio receivers

(W03-B09)

W03-B07C [2002]

AD conversion

Novel aspects of AD converters and AD conversion are covered by U21-A03 codes.

W03-B07E [2002]

Digital mixing and direct digital conversion

(W03-B09)

DDC

W03-B07G [2002]

Filtering

(W03-B09)

Novel digital filters are also assigned U22-G01 codes, and T01-J08B when the emphasis is on computing aspects.

W03-B07J [2006]

Transform implementation

(W03-B09)

DSP-based transform implementation is covered by U22-G03E1A and computer data processing aspects in general by T01-J04B1.

W03-B07L [2006]

DA conversion

(W03-B09)

Novel aspects of DA converters and DA conversion are covered by U21-A02 codes.

W03-B07X [2002]

Other digital broadcast radio receiver aspects

(W03-B09)

W03-B08 [1997]

Receiving additional information

(W03-B02C5, W03-B09)

From 2011, the title of this code has been changed and its scope expanded to include arrangements for receiving 'additional information' such as text and electronic program guide (EPG) information transmitted with digital audio broadcast (DAB) signals, RDS information and emergency broadcast messages. Between 1997 and 2010 this code was used for all aspects of receivers for RDS and similar text-based systems with W03-B02C5 codes being assigned for inventions involving RDS-type decoders. Before 1997 W03-B02C5 was assigned in a broader sense to indicate receivers for RDS and similar systems. In all cases other W03-B codes are also assigned as appropriate.

W03-B08A [2006]

Storage for additional information and programme content

(W03-B02C5A)

This code, which replaced W03-B02C5A in 2006, is intended for buffer storage of either additional information (as defined above) for subsequent replay, or programme content, e.g. content missed by the reproduction of a traffic message, or due to channel changing. W03-B08A1 and W03-B08A5 indicate what is stored while W03-B08A7 is assigned when the storage arrangement itself is novel. The storage of messages or content may occur within the broadcast receiver, or within external equipment which is connected to it. For both of the specific subdivisions below, W04 codes are also assigned as appropriate for the technology used to store the information. Full-scale recording within a receiver - e.g. of an extended section of a broadcast program - is not included, and is regarded as a 'radio-recorder' combination and covered by W03-B codes, W03-G03A and W04 codes as appropriate.

W03-B08A1 [2006]

Storage for additional information

(W03-B02C5, W03-B09)

Covers arrangements for storing traffic bulletins (e.g. TMC announcements, emergency broadcasts, or other information) in text, audio or other form, for replay as desired.

W03-B08A5 [2006]

Storage for programme content

(W03-B02C5, W03-B09)

Covers arrangements for storing a limited amount of program content. Includes arrangement for storing e.g. the part of a radio program interrupted by a traffic announcement in RDS or similar systems, so that listening can resume from the time of the interruption. The content stored may be a radio programme received by the broadcast receiver itself, or external sources such as a CD or DVD player, a TV receiver, etc.

W03-B08A7 [2011]

Novel aspects of storage and memory

(W03-B02C5, W03-B09)

Covers novel arrangements such as memory circuits etc.

W03-B08C [2011]

Characterised by type of additional information

These codes are assigned to indicate the type of additional information as it is actually received. W03-B08C8 is assigned to denote the conversion of the information into another form.

W03-B08C1 [2011]

Visual information

Program guide reception is covered by W03-B08C5 which takes precedence over W03-B08C1 codes as EPG information is assumed to be in the form of text and/or graphics unless other codes indicate another method of presenting it. Prior to 2011 W03-B01C was used to denote EPG presentation but from 2011 will only be assigned for novel display-related aspects.

W03-B08C1A [2011]

Text

W03-B08C1C [2011]

Visual information

This code covers the reception of still or moving images only as 'additional information' transmitted with a radio broadcast. Reception of normal TV signals is covered by W03-A codes and is not included here.

W03-B08C3 [2011]

Audio information

Includes reception of additional information in the form of spoken announcements.

W03-B08C4 [2012]

Weather information

This code covers reception of meteorological information. When disaster warning or emergency aspects are involved W03-B08C7 ('Emergency broadcasts') is also assigned.

W03-B08C5 [2011]

Program guide systems (EPG) and content descriptions

This code covers program guide information and also 'now playing' information describing e.g. a musical piece being played, or other associated information. This code takes precedence over W03-B08C1A, i.e. the information is assumed to be in text form unless other codes indicate another method of presenting it. EPG aspects of DAB receivers are indicated by assignment of W03-B06 also.

W03-B08C6 [2012]

Transport-related information

This code covers reception of information related to transport, including road traffic information concerning congestion.

W03-B08C7 [2011]

Emergency broadcasts

Codes indicating 'disaster-related' alarms in W05-B08 are also assigned as appropriate. Reception of emergency broadcast messages in TV receivers is covered by W03-A18A5J.

Adverse weather, avalanche, bush fire, earthquake, eruption, flooding, forest fire, hurricane, landslide, landslip, mudslide, terrorist attack, tidal wave, tornado, tsunami, typhoon, volcano.

W03-B08C8 [2011]

Transforming information type

This code is used with other W03-B08C codes indicating the original form of additional information and denotes its conversion into another form, e.g. from text to audible form or vice versa. W04-V04A6 and W04-V04C1 are also respectively assigned for speech-to-text or text-to-speech conversion when necessary.

W03-B08C9 [2011]

Other information type

W03-B09

Other broadcast radio receiver aspects

This code was used for digital receivers prior to 2002, now assigned W03-B07 codes, and for testing, control and interfacing aspects until 2010, which are now assigned W03-B10 codes.

Power supply

W03-B10 [2010]

Broadcast radio receiver testing, control and interfacing

(W02-C05B ; W03-B)

These codes cover testing of broadcast radio receivers and also control in a general sense, rather than control of a specific parameter as part of normal receiver operation.

W03-B10A [2010]

Broadcast radio receiver testing

(W02-C05B ; W03-B)

Testing of a specific part of a broadcast receiver is indicated by co-assignment of the appropriate W03-B code. Testing of broadcast radio **systems** is covered by W02-D04 codes.

W03-B10A1 [2010]

Broadcast radio receiver self-testing

(W02-C05B; W03-B)

Includes monitoring arrangements for detecting e.g. low battery or fault condition.

W03-B10A5 [2010]

Broadcast radio receiver testing using external equipment

(W02-C05B ; W03-B)

Includes monitoring and testing using external test equipment, e.g. for production line testing or repair.

W03-B10C [2010]

Broadcast radio receiver control

(W03-B09)

This code covers control of broadcast radio receivers in a general sense, and not control of a specific parameter as part of normal receiver operation, such as automatic frequency control (W03-B01B5) or automatic gain control (W03-B02A).

W03-B10E [2010]

Broadcast radio receiver interfacing

(W03-B09)

This code covers arrangements for interfacing with broadcast radio receivers including hardware and software aspects. Interfacing with TV receivers is covered by W03-A18C codes and with AV equipment in general by W03-G05C codes.

W03-B10R [2012]

Broadcast radio receiver audience research details

Broadcast system aspects of audience research are covered by W02-D04B. TV receiver audience research aspects are covered by W03-A18R.

W03-B10X [2010]

Other broadcast radio receiver control and interfacing aspects

(W03-B09)

W03-C	
Audio amplifiers; Tone and volume control; Balancing	
<i>Monaural, stereophonic amplifier, preamplifier power amplifier, output stage</i>	
W03-C01	[1992]
Audio amplifier per se	
See U24-G codes for circuitry details.	
W03-C01A	[1992]
Preamplifier	
Also coded in U24-G01C.	
W03-C01C	[1992]
Power amplifier	
Also coded in U24-G01B1.	
W03-C01C1	[2005]
Amplifier integrated with loudspeaker(s)	
For wireless loudspeaker systems W03-G05C5C is also assigned.	
<i>Powered speaker</i>	
W03-C01G	[2005]
Digital amplifier	
Covers amplifiers generally of class-D type, for which U24-G01B1 and U24-G02E are assigned also.	
W03-C01G1	[2005]
Digital input	
W03-C01G3	[2005]
Digital input and output	
W03-C03	[1992]
Volume and balance control	
W03-C03A	[1992]
Balance control	
See W04-R01C codes also for stereophonic systems.	
W03-C03C	[2005]
Volume control	
U24-C codes are also assigned for novel aspects of automatic and manual gain control.	
AGC	

W03-C05	[1992]
Tone controls and equalisers	
See U25-F05 and U24-C05D codes for further circuit details.	
<i>Fader</i>	
W03-C05A	[1992]
Tone controls	
W03-C05C	[1992]
Analogue equalizer circuits	
This code includes analogue graphic equalizers. Prior to 1992, audio equalizing was also routinely coded in W04-G, which is now only assigned for general applications.	
W03-C05E	[2005]
Digital EQ	
U22-G codes are also assigned for details of digital filters and DSP.	
W03-C05E1	[2005]
Adaptive EQ	
Includes sensing and matching character of speakers. Adaptive digital filters are also assigned U22-G01A5 codes.	
W03-C07	[1992]
Constructional details	
See V04-S and V04T codes also.	
W03-C09	[1992]
Other audio amplifier details	
W03-G	[1992]
General aspects of audio-video equipment	
(W03-X)	
Codes in this section are used for general aspects only, and not for instances for which a single specific code exists elsewhere (e.g. in W03 or W04).	
W03-G01	[1992]
Constructional details	
(W03-X)	
W03-G01A	[1992]
Constructional details of equipment per se	
(W03-X)	
W03-G01A1	[1992]
Internal construction	
(W03-X)	

W03-G01A5	[1992]
Casings/housings	
(W03-X)	
<i>Front panel, marking, legend</i>	
W03-G01C	[1992]
Mountings, supports, stands	
(W03-X)	
W03-G02	[1992]
Power supplies	
(W03-X)	
See U24 codes also as appropriate.	
W03-G02A	[2005]
Battery power supply	
W03-G02A1	[2005]
Battery per se	
Novel details of batteries are covered by X16 codes.	
W03-G02A3	[2005]
Battery supply circuitry	
W03-G02A5	[2005]
Battery charging	
W03-G02C	[2005]
Mains power supply	
W03-G03	[1992]
Combination equipment	
(W03-X)	
W03-G03A	[1992]
Contained in one housing	
(W03-X)	
<i>Radio-cassette player, radio-TV receiver, clock-radio</i>	
W03-G03A1	[2006]
Media centre PC and related equipment	
This code is assigned for multimedia PC systems designed to perform the functions of several AV equipment units, e.g. TV set, CD/DVD recorder/player, radio receiver, etc. See also T01 codes for specific computing aspects, such as multimedia computer systems in T01-J30 codes.	
W03-G03C	[1992]
Mountable in rack, interlocking apparatus	
(W03-X)	
<i>Stacked combination hi-fi system</i>	

W03-G03H	[2007]
Home theatre equipment	
Covers home theatre applications. Novel details of audio processing circuitry, surround sound and interfacing are assigned e.g. W03-C, W04-R and W03-G05C codes respectively.	
W03-G04	[2006]
Portable AV equipment	
W03-G05	[1992]
Remote control, general control, general displays and interconnection	
(W03-X)	
From 2006 the title and scope of this code is expanded to include control and display aspects of AV equipment in general, these topics being respectively covered in W03-G05E and W03-G05G codes.	
W03-G05A	[1992]
Remote control for audio video apparatus	
(W03-X)	
Remote control specific to TV receivers is covered by W03-A02C codes, and for recording equipment by W04-E04A. W05-D codes cover remote control in general.	
W03-G05A1	[1997]
Coding and transmission format	
W03-G05A1A	[1997]
Universal type remote controller	
Includes 'learning' types.	
W03-G05A5	[1997]
Combined with additional features	
Includes combination with e.g. telephone (see W01-C codes also, e.g. W01-C05B5A, or W01-C01P codes), and remote audio or video display facility. Includes provision of dedicated display, e.g. for indicating control functions.	
W03-G05A6	[2006]
In conjunction with on-screen display	
This code includes the application of GUI techniques to control of AV equipment in general. When specific to remote control of a TV set W03-A02C5A is assigned instead.	
W03-G05A7	[1997]
Locator system	
Covers 'transponder' arrangement producing e.g. audible tone in response to signal emitted from main equipment.	

W03-G05A8	[2009]
AV equipment remote control repeaters and extenders	
This code covers arrangements for extending the range of remote control signals transmitted to AV equipment such as 'remote control extenders', usually based on repeaters. Novel aspects of repeaters are also assigned codes depending on technology, e.g. W02-C04A5 for optical repeaters and W02-G05C for radio types. Similar arrangements for remote control applications other than AV equipment are covered by W05-D08R. <i>Free-space, IR, relay, RF, room</i>	
W03-G05C	[1997]
Interconnection of audio/video equipment	
See also appropriate codes for communication system, e.g. W01-A06 codes for networks. <i>HAVI, Home Audio Video Interface, HDMI</i>	
W03-G05C1	[1997]
AV home network	
Novel network aspects are also assigned W01-A06 codes. <i>DLNA, HANA, Universal Plug and Play, UPnP</i>	
W03-G05C1A	[2013]
Networked media storage	
Covers centralised storage of e.g. audio or video content that can be accessed over a home AV network. Novel recording equipment aspects are covered in T03 and W04 as appropriate. Remote servers for content storage in on-demand broadcast systems are not included and are covered by W02-F10K. <i>Home AV server, network drive</i>	
W03-G05C1C	[2013]
Network communication aspects	
Covers novel aspects of communication between AV equipment units over a home network. Novel aspects of network communication are also assigned W01-A06 codes. Home automation (HA) networks for control of heating, lighting and domestic appliances are covered by W05-D07A but that code may be assigned with W03-G05C1 when both AV equipment and other equipment in the home are connected to the same network.	
W03-G05C3	[2012]
High definition multimedia interface (HDMI)	
This code covers interfacing using high definition multimedia interface (HDMI) standard and is subdivided into novel aspects of HDMI (W03-G05C5A), such as circuitry, cables or connectors, and inventions where the use of HDMI is significant (W03-G05C5C).	

W03-G05C3A	[2012]
Novel aspects of HDMI	
This code covers novel aspects of HDMI, such as circuitry, cables or connectors. Specific details of the novelty are indicated by assignment of additional codes, e.g. W03-G07A for a novel HDMI cable.	
W03-G05C3C	[2012]
Applications of HDMI	
This code covers inventions where the use of HDMI is significant. It is not assigned in cases where a number of other types of interface are equally applicable.	
W03-G05C5	[1997]
'Dedicated link' systems	
W03-G05C5A	[1997]
Cordless headphones	
W03-G05C5C	[2005]
Wireless speaker systems	
W03-G05E	[2006]
General AV equipment control	
This code covers control systems of general application to AV equipment, but not remote control, which is covered by W03-G05A codes.	
W03-G05E1	[2006]
Menu-based AV equipment control	
W03-G05G	[2006]
General AV equipment operation display	
These codes are intended for display aspects applicable to AV equipment in general. For display aspects specific to TV sets and recording equipment see W03-A and W04-J03 codes respectively.	
W03-G05G1	[2006]
Dedicated display for AV equipment	
Dedicated displays forming part of recording and playback equipment are covered by W04-J03A.	
W03-G05G5	[2006]
On-screen display for AV equipment	
OSD generated within a TV set is covered by W03-A13G and within recording equipment by W04-J03C.	
W03-G06	[2006]
AV equipment requiring operation with PC	
Includes sound, TV and video recording/editing cards installed in a PC or external devices with e.g. USB interface which operate using a PC processor. See also T01 for computing aspects.	

W03-G07 [1992]
Connectors, leads, plugs, sockets, components in general

W03-G07A [1992]
Leads and cables, connectors
(W03-X)

W03-G07C [1992]
Components in general
(W03-X)

W03-G08 [1992]
AV equipment used in a vehicle
(W03-X)
The title of this code has been changed to better reflect its actual use. W03-G08 includes in-car entertainment systems, for which X22-J13 is also assigned, and AV equipment used in any other kind of vehicle for which other codes are also assigned as appropriate, such as W06-B01C7 for aircraft in-flight entertainment. Specific W03 and W04 codes are also assigned depending on equipment type. Note that car radios with no other aspect are not included here and are covered by W03-B03 codes.

W03-G09 [1992]
Other general audio-video equipment aspects
(W03-X)
Prior to 2006 this code included recycling and packaging aspects. This topic is now covered in W03-G10.

W03-G10 [2006]
Manufacturing, recycling and packaging of AV equipment
(W03-X)
Covers all general audio-video equipment, including recording equipment (see W04 for other aspects). Manufacturing, recycling and packaging specifically for TV receivers is covered in W03-A19. For manufacturing, recycling and packaging aspects of general electrical equipment see V04-X01 codes.

W03-G10A [2006]
Manufacturing AV equipment

W03-G10C [2006]
Recycling AV equipment

W03-G10G [2006]
Packaging for AV equipment

W03-X
Other audio and video equipment details

W04: Audio/Visual Recording and Systems

Prior to 2002 this class covered all aspects of audio/visual recording and reproduction (covered chiefly by W04-A to W04-L codes). Signal processing aspects were generally coded in W04 only while details of record carriers and head-carrier drive systems were coded in both T03 (Data recording) and W04. From 2002, with the exception of mechanical recording methods (W04-A), W04 will only cover applications, formatting, signal processing and constructional aspects specific to audio/visual recording. All carrier and mechanical aspects of recording and reproduction are coded in T03 only. Accordingly from 2002 a large number of codes in W04-B, W04-C, W04-D, W04-E, and W04-L have been discontinued. Additionally, from 2006 a number of general aspects of audio-video equipment are covered in W03-G, such as manufacturing, recycling and packaging in W03-G10 and portable equipment in W03-G04. As well as the above, W04 covers the following material:-

- (1) General audio signal processing and sound mixing (W04-G codes)
- (2) Video cameras, TV studio and special effects equipment (W04-M/N codes)
- (3) General video signal processing (W04-P codes)
- (4) Projection TV and analogous systems (W04-Q codes)
- (5) Stereophonic systems, loudspeaker enclosures, public address (W04-R/S/T codes)
- (6) Electronic musical instruments (W04-U codes)
- (7) Sound analysis, synthesis, speech coding, audio coding, and antiphase sound cancelling (W04-V codes)
- (8) Educational and sports equipment, games, amusements (W04-W/X codes)
- (9) Audio and video aspects of multimedia
- (10) Hearing aids (W04-Y codes)

From 1997 W04-E20 codes were introduced to highlight recording equipment operating mode. These codes are intended to be used in conjunction with any other W04 codes relating to recording, to indicate aspects such as time lapse, reverse playback, etc.

W04-A

Recording using mechanical methods

Gramophone

W04-A01

Record carriers; Cleaning

Brush, fluid, liquid, cleaning pad, anti-static 'gun', groove, vinyl

W04-A02

Heads; Record carrier positioning

See V06-B01 also for head details.

Pick-up, cartridge, magnetic, moving coil, piezoelectric, stylus, diamond, turntable, mat, motor drive, speed selector/control, autochanger

W04-A03

Head positioning, i.e. tone arms

Parallel, tangential, radial, tracking, cueing arm, raising, lowering, track selection

W04-A09

Other mechanical recording aspects

Includes integral 'loudspeaker' cone for pre-recorded message reproduction in e.g. toy or warning device.

W04-B

Recording using magnetic record carriers

Prior to 2002 record carrier materials and carrier manufacture were **not** included, and were assigned T03-A codes only. From 2002 **only** applications, formatting, and signal processing aspects of audio/visual magnetic recording are included in W04-B.

Equalising

W04-B01

Recording formats; Re-recording

For recording format, emphasis is on physical disposition of tracks, see W04-F01 and W04-G01 for signal transformation aspects.

W04-B01A

[1992]

Recording formats

Channel, helical, slant, slope, parallel, guard band, track

W04-B01C*

[1992-2005]

Re-recording, anti-copying

*This code is now discontinued. Since 2006 hardware aspects of anti-copying have been covered in T03-H07 while signal processing aspects are covered in W04-F01L.

W04-B01C1*

[1992-2005]

Preventing re-recording of signal

*This code is now discontinued.

W04-B01C1A*

[1992-2005]

By signal modification or additional recorded data

*This code is now discontinued.

Guard

W04-B01C3* [1992-2004]

Re-recording

*This code is now discontinued and since 2005 all duplication for production of pre-recorded tapes or disks is covered in T03-B07B. See W04-H05A for dubbing.

Copy

W04-B02* [1980-2001]

Audio/video heads and head cleaning

*This code is now discontinued and since 2002 this subject matter is assigned T03-A03 and T03-A04 codes only. The codes W04-B02A and W04-B02C remain valid and fully searchable for records prior to 2002.

Core, gap, thin-film, ferromagnetic, ferrite, glass, coil

W04-B02A* [1992-2001]

Audio/video head

*This code is now discontinued and since 2002 magnetic heads have been assigned T03-A03 codes only, and head manufacture has been covered by T03-A04A codes.

W04-B02C* [1992-2001]

Cleaning and demagnetisation of heads

*This code is now discontinued. Prior to 2002, search with T03-A04B codes to discriminate particular aspects e.g. T03-A04B1 for demagnetising (also coded in V02-D); T03-A04B3B and T03-N03 for cleaning cassette.

W04-B03* [1980-2001]

Head positioning

*This code is now discontinued and since 2002 the subject matter previously coded here has been covered by T03-A05 codes only. The codes in this sub-group remain valid and fully searchable for records prior to 2002.

Drive, motor, angle, step, track selecting/aligning

W04-B03A* [1980-2001]

For disks or drums

*This code is now discontinued.

W04-B03B* [1980-2001]

For tape

*This code is now discontinued. Prior to 2002 synchronisation with tape movement was indicated by co-assignment of W04-E10.

W04-B03B1* [1992-2001]

For helical scan

*This code is now discontinued. Prior to 1992, this topic was indicated by assignment of W04-E01A with W04-B03B. From 2002, T03-A05D codes alone are assigned for helical scan head positioning, including details of the head drum itself.

Rotating drum

W04-B03B1A* [1992-2001]

Dynamic adjustment of head position

*This code is now discontinued. Prior to 2002 T03-A05A1 codes were also assigned for this topic which includes speed control, track following, alignment, and also adjusting elements themselves. (See V06-M06D for piezoelectric elements). Since 2002 T03-A05A1 codes have been assigned exclusively for this subject matter.

Tracking, bimorph

W04-B03B1C* [1992-2001]

Head rotary drive per se

*This code is now discontinued, but prior to 2002 it included the motor itself and drive components.

W04-B04* [1980-2001]

Record carrier positioning

*This code is now discontinued and from 2002 the subject matter previously coded in this sub-group is covered by T03 codes only. W04-B04 codes remain valid and fully searchable for records prior to 2002.

Cassette, cartridge, load, eject, motor, drive

W04-B04A* [1980-2001]

For disks or drums

*This code is now discontinued and from 2002 this subject matter is covered by T03-F codes only. W04-B04A remains valid and fully searchable for records prior to 2002 and included housings in which the carrier is driven during normal operation. W04-E02A codes were also assigned for this topic between 1992 and 2001.

W04-B04B* [1980-2001]

For tape

*This code is now discontinued and since 2002 this subject matter has been coded in T03-E only. The codes W04-B04B1 to W04-B04B7A remain valid and fully searchable for records prior to 2002. For synchronization with head movement, W04-E10 was also assigned.

W04-B04B1* [1992-2001]

Tape containers

*This code is now discontinued. For cassettes it was assigned with W04-E02B1 codes and T03-H01B codes but since 2002 only T03-H01B codes have been used to denote this subject matter.

W04-B04B3*	[1992-2001]
Tape drive system	
*This code is now discontinued. Tape drive systems were also assigned T03-E codes which are now used alone for this topic.	
W04-B04B3A*	[1992-2001]
Tape drive components	
*This code is now discontinued.	
W04-B04B3C*	[1992-2001]
Tape speed control	
*This code is now discontinued. Prior to 2002, combined head/tape speed control was also assigned W04-B03B1A and W04-E10.	
W04-B04B5*	[1992-2001]
Tape drive mode control	
*This code is now discontinued.	
W04-B04B5A*	[1992-2001]
Automatic control of operating mode*	
*This code is now discontinued and from 2002 this subject matter is coded in T03-E05A or its subdivisions only.	
<i>Autostop, blank, space, gap, leader</i>	
W04-B04B5C*	[1992-2001]
Manual control of operating mode	
*This code is now discontinued and since 2002 this subject matter, which includes switches, operating keys etc., is covered by T03-E05B alone.	
W04-B04B6*	[1992-2001]
Tape cassette loading and changing	
*This code is now discontinued and since 2002 this subject matter has been covered by T03-E01B or its subdivisions only.	
W04-B04B7*	[1992-2001]
Tape looping and threading	
*This code is now discontinued and since 2002 this subject matter has been covered by T03-E01C only.	
W04-B04B7A*	[1992-2001]
Looping/threading for helical-scan tape	
*This code is now discontinued and since 2002 this subject matter has been covered by T03-E01C1 and T03-N02.	

W04-B10	[1987]
Video tape recorder	
Prior to 1992, this code was only used for VTR details which were not completely covered by other W04-B codes. Since 1992 W04-B10 codes have been applied to all aspects of VTRs, and are intended to provide broad groupings of subject matter. Other W04 codes should be used in conjunction to provide more detail.	
W04-B10A	[1992]
Heads, head and tape transport	
Includes recording formats, for which W04-B01A is also assigned. (Prior to 2002 all W04-B01 to W04-B04 codes were assigned with W04-B10A). Since 2002 this code has been used in conjunction with T03-A and T03-E codes to denote the VTR application for inventions relating to heads, head movement, and tape transport.	
W04-B10B	[1992]
Signal processing	
For full details of signal processing see W04-F codes also. (for audio signal processing aspects, search with W04-G01 codes).	
W04-B10C	[1992]
Control, power supplies, interfacing	
For remote control or control or programming search with W04-E04 codes. For editing and indexing aspects search with W04-H codes, and for testing/monitoring, W04-J codes).	
W04-B10D	[1992]
Construction	
Also assigned W04-L05 codes.	
W04-B10G	[1992]
Digital video tape recorder	
<i>DVTR</i>	
W04-B10K	[1992]
Dual cassette deck VTR	
W04-B12	[1992]
Audio tape recorder	
Codes in this section are assigned for all aspects of audio tape recorders, in conjunction with other W04 codes as appropriate.	
W04-B12A	[1992]
Heads, head and tape transport	
Includes recording formats (i.e. scope of this code is that of W04-B01 to W04-B04 codes).	

W04-B12B	[1992]
Signal processing	
W04-B12C	[1992]
Control, power supplies, interfacing	
For remote control or programming see W04-E04 codes also. For editing and indexing aspects search with W04-H codes and for testing monitoring, W04-J codes.	
W04-B12D	[1992]
Construction	
Also assigned W04-L05 codes.	
W04-B12G	[1992]
Digital audio tape recorder	
<i>DAT, R-DAT</i>	
W04-B12H	[1992]
Miniature audio tape recorder	
Includes 'personal stereo' type of equipment - with or without recording facility.	
W04-B12J	[1992]
Dictation recorder	
W04-B12K	[1992]
Dual cassette-deck audio tape recorder	
W04-B14	[1992]
Magnetic audio and video disk equipment	
From 1997 the scope of this code is expanded to encompass magnetic disk systems for audio recording also, and hard disk systems for both audio and video.	
W04-B14A	[1992]
Flexible disk system	
For use within electronic still picture camera see also W04-M01B1A. Digital cameras using hard disks for picture storage are assigned W04-B14C3.	
W04-B14B*	[1992-2004]
Playback unit for recorded disk	
*This code is now discontinued and since 2005 systems for playback of flexible disks used for storing pictures from digital cameras are covered in W04-B14A.	
W04-B14C	[1997]
Hard disk system	
Hard disk systems purely for computer data storage are covered in T03 only, e.g. T03-A08A1C or T03-A08A5. For hard disk system storing information in an on-demand entertainment system, see W04-K05A and W02-F10K also. For editing aspects, search with W04-H05 codes.	

W04-B14C1	[1997]
Audio hard disk system	
W04-B14C3	[1997]
Video hard disk system	
W04-B16	[1992]
Cassette library system	
Also coded in T03-N03 and T03-Q01.	
<hr/> W04-C	
Recording using optical methods	
W04-C10 codes are assigned as appropriate to indicate equipment type.	
From 2002 only applications, formatting, and signal processing aspects of audio/visual optical recording are included in W04-C. From 2002, optical record carriers and head/record carrier drive arrangements are assigned T03-B codes only . Magneto-optical recording is not included and is covered by W04-D codes.	
<i>Disk, compact, digital, laser</i>	
W04-C01*	[1980-2001]
Record carriers	
*This code is now discontinued and since 2002 this subject matter has been covered in T03-B01 only. W04-C01A to W04-C01E remain valid and fully searchable for records prior to 2002.	
<i>WORM, DRAW</i>	
W04-C01A*	[1992-2001]
Record carrier substrate	
*This code is now discontinued.	
<i>Mould, transparent resin, PMMA</i>	
W04-C01B*	[1992-2001]
Light-sensitive layers	
*This code is now discontinued.	
<i>Photochromic, ablation, deformation, interaction, phase transition, combination, reversible, multilevel, segregation</i>	
W04-C01C*	[1992-2001]
Protective and (anti-) reflective layers	
*This code is now discontinued.	
W04-C01E*	[1992-2001]
Record carrier manufacture	
*This code is now discontinued.	

W04-C01F* [1992-2006]

Physical recording format aspects

*This code is now discontinued. Since 2007 this topic can be searched using T03-B01F codes in conjunction with T03-B01D1A, T03-B01D3A or T03-B01D5A as appropriate. See W04-C05 for signal aspects of recording formats.

W04-C02* [1980-2001]

Heads

*This code is now discontinued. From 2002 this subject matter is covered by T03-B02B codes only. W04-C02 and its subdivisions remain valid and fully searchable for records prior to 2002.

W04-C02A* [1992-2001]

Light source and photodetector

*This code is now discontinued.

W04-C02A1* [1992-2001]

Light source

*This code is now discontinued. Prior to 2002 it included semiconductor lasers, full details of which are highlighted by U12-A01B codes and corresponding codes in V08, which also includes other laser types.

W04-C02A5* [1992-2001]

Photodetector

*This code is now discontinued. Prior to 2002 it included photodetectors for reading from a carrier and for focus detection. U12-A02B codes, e.g. U12-A02B2A for APD and other types of photodiode, are assigned for this topic.

W04-C02B* [1992-2001]

Lens and optical system

*This code is now discontinued.

Objective, beam splitter, polarizer

W04-C02C* [1992-2001]

Head cleaning

*This code is now discontinued and this topic, including use of dummy cleaning carriers, is covered by T03-B02B8 only.

W04-C03* [1980-2001]

Head positioning (incl. focusing)

*This code is now discontinued and from 2002 this subject matter is now covered by T03-B02A codes only. The codes W04-C03A to W04-C03H remain valid and fully searchable for records prior to 2002 when W04-C10 codes enabled a distinction to be made between head positioning for disks, tapes, etc.

W04-C03A* [1992-2001]

For focusing

*This code is now discontinued.

Focus detection, servo, objective positioning, voice coil motor, VCM

W04-C03B* [1992-2001]

For track selection and alignment

*This code is now discontinued. Prior to 2002 it included topics such as linear motors (see V06-M codes also), and track access/tracking servo systems.

W04-C03D* [1992-2001]

Control circuit for light source

*This code is now discontinued and from 2002 is covered by T03-B02A7 only. Laser diode bias control is also assigned U12-A01B4 and corresponding codes in V08.

W04-C03H* [1997-2001]

Head positioning for double-sided disk

*This code is now discontinued but prior to 2002 it included dual-head systems and arrangements for moving a single head to the other side of a disk.

W04-C04* [1980-2001]

Record carrier positioning

*This code is now discontinued. From 2002 – 2004 this subject matter was assigned T03-B03 codes, while since 2005 T03-B10 codes have been used, in all cases T03-E and T03-F codes being also assigned as appropriate. The codes W04-C04A to W04-C04B remain valid and fully searchable for records prior to 2002.

Turntable, loading device, drive, motor

W04-C04A* [1992-2001]

Record carrier container

*This code is now discontinued but prior to 2002 it covered containers in which carriers are driven, for which W04-E02 codes were also assigned to indicate further details. Storage containers are covered by W04-L01 codes.

W04-C04B* [1992-2001]

Record carrier drive

*This code is now discontinued. Prior to 2002 it was assigned with W04-E02 codes for further details, e.g. W04-E02A5 codes for disk changing.

W04-C05 [1992]

Signal recording format and methods

From 2002 this code is only used for recording formats and methods specific to audio/video. General optical recording formats and methods are coded in T03-B05. Covers arrangement of data only, physical aspects such as hard sectoring of data, are covered by T03-B01F from 2007. Prior to 2007 this topic was coded in W04-C01F.

W04-C06 [1992]

Reading and writing circuitry

From 2002 this code is only used for reading and writing circuitry with aspects relevant to audio/video recording. General optical reading and writing circuitry is coded in T03-B06.

This code is used with W04-F or W04-G01 codes if audio/video processing is significant.

W04-C10 [1992]

Optical recorder/player

Codes in this section are applied for **any** aspect of optical recording/playing equipment.

W04-C10A [1992]

Disk

CD, CDi, interactive

W04-C10A1 [1992]

Audio e.g. 'CD player'

W04-C10A1K [2005]

Dual deck optical disk player/recorder

W04-C10A2* [2002-2004]

Multilayer, e.g. 'DVD player'

*This code is now discontinued. From 2002 to 2004 it was used to denote multilayer optical disk player/recorders used for non-specified audio/video/data storage. Since 2005 this topic has been covered in T03-B10A1, and for storage of audio/video information along with additional data formats, in W04-C10A3A. Prior to 2002 digital versatile disk or digital video disk player/recorders were coded in W04-C10A3.

W04-C10A3 [1992]

Optical video players and recorders

Includes e.g. DVD, Blu-ray disk equipment.

W04-C10A3A [2005]

Combined with additional data formats

Covers provision of computer program data and surround sound tracks in disk used primarily for storing video information.

W04-C10A5 [1992]

Jukebox system

See W04-C04C and W04-E02A5 codes for disk feeding aspects.

W04-C10B [1992]

Tape

W04-C10C [1992]

Card

W04-D

Magneto-optical and other recording methods

From 2002 only audio/visual applications of magneto-optical and other types of recording are included in W04-D. Head, head positioning and carrier positioning aspects are coded **only** in T03-C and T03-D.

Includes capacitive recording and combination methods. For magneto-optical recording W04-D20 codes are assigned in the case of equipment. Record carriers and head/carrier drive systems are assigned T03-C and T03-D codes also.

W04-D01* [1983-2001]

Record carriers

*This code is now discontinued and since 2002 this subject matter now being coded in T03-C and T03-D01A. W04-D01 codes remain valid and fully searchable for records prior to 2002, and covered mainly capacitive record carriers, now assigned T03-C01 codes only.

PVC, carbon, conductive, dielectric, lubricant

W04-D01A* [1987-2001]

For 'combination' recording e.g. magneto-optical

*This code is now discontinued and the subject matter covered by T03-D01A codes.

Photomagnetic, Kerr effect, substrate, film, light-sensitive layer, reflective/antireflective layer, magnetic layer, reference layer, rare earth material, amorphous, protective coating

W04-D01A1* [1992-2001]

Carrier manufacture

*This code is now discontinued. Since 2002 this topic has been covered by T03-D01A8 codes only.

W04-D02* [1983-2001]

Heads

*This code is now discontinued, the subject matter now being coded in T03-C, and in T03-D01C (for optical heads) and T03-D01F1 (for magnetic heads) when magneto-optical recording is involved. W04-D02 remains valid and fully searchable for records prior to 2002.

Stylus, diamond, shank, lens, objective, beam splitter, polarizer, laser, photodetector, magnet, bias, erase

W04-D03* [1983-2001]

Head positioning

*This code is now discontinued and since 2002 this subject matter has been coded in T03-C, T03-D01D and T03-D01F1A. W04-D03 remains valid and fully searchable for records prior to 2002.

Prior to 2002, for magneto-optical recording this code included focusing (now only assigned T03-D01D1 codes) and track selection/alignment (now only assigned T03-D01D3 and T03-D01D5 codes).

Track selection, kick-pulse, linear motor, voice coil motor, VCM, focusing

W04-D04* [1983-2001]

Record carrier positioning

*This code is now discontinued and since 2002 this subject matter has been coded in T03-C and T03-D01B, T03-E and T03-F. W04-D04 remains valid and fully searchable for records prior to 2002, when W04-E02 codes were also assigned to provide a more detailed breakdown of subject matter.

Turntable, drive, carriage, load, motor

W04-D10 [1987]

Hard-copy video arrangements

See S06 codes also for non-standard video applications. Includes photographic methods and use of e.g. line printer. (See also S06-B codes, e.g. S06-B04A, and S06-D to K codes respectively).

Photographic reproduction, optical system, thermal/ink jet/impact/optical printer, electronic still-picture camera hard copy unit

W04-D20 [1992]

Magneto-optical recorder/player

W04-D20 codes are used with other codes in W04 as appropriate.

W04-D20A [1992]

Magneto-optical disk recorder/player

Includes mini-disk recorder/players

W04-D20B [1992]

Magneto-optical tape recorder/player

W04-E [1983]

Recording in general

From 2002 head positioning, carrier positioning and head record carrier motion synchronisation aspects of audio/visual recording are no longer coded in W04-E, the subject matter being covered in T03-E, T03-F, T03-G, T03-H and T03-J. Consequently the title of this code has been amended.

W04-E01* [1983-2001]

Head positioning

*This code is now discontinued, the subject matter now being coded in T03-G only. The codes W04-E01A to W04-E01C remain valid and fully searchable for records prior to 2002.

These codes were assigned for generally applicable cases. See appropriate codes in W04-B, W04-C or W04-D which took precedence.

W04-E01A* [1983-2001]

Helical scan

*This code is now discontinued.

Drum, cylinder

W04-E01B* [1983-2001]

For longitudinally scanned tape

*This code is now discontinued.

W04-E01C* [1983-2001]

For disks

*This code is now discontinued.

W04-E02* [1983-2001]

Record carrier positioning

*This code is now discontinued and from 2002 this subject matter is covered by T03-E, T03-F and T03-H codes only. W04-E02 codes remain valid and fully searchable for records prior to 2002.

For motor and other position transducer aspects see V06 codes. Includes housings in which carriers are driven during normal operation.

W04-E02A* [1983-2001]

For disks

*This code is now discontinued.

W04-E02A1* [1992-2001]

Disk cassettes per se

*This code is now discontinued.

W04-E02A1A* [1992-2001]

Disk cassette manufacture

*This code is now discontinued.

W04-E02A1C* [1992-2001]

Disk cassette construction

*This code is now discontinued.

W04-E02A3* [1992-2001]

Disk driving arrangement

*This code is now discontinued and from 2002 T03-F02 (and T03-N01) codes are assigned for this topic.

W04-E02A3A* [1992-2001]

Disk drive components

*This code is now discontinued. Prior to 2002 it included motors (see V06-M codes also), turntables, spindle brakes, etc.

W04-E02A3C* [1992-2001]

Disk drive speed control

*This code is now discontinued. Motor control circuits are also assigned V06-N codes.

W04-E02A5* [1992-2001]

Disk changing systems

*This code is now discontinued and from 2002 the subject matter is covered by T03-F01 and T03-N01 codes (previously assigned as well as W04-E02A5). For general aspects of optical disk 'jukebox' systems, see W04-C10A5. See also T03-Q codes for library systems in general.

W04-E02A5A* [1992-2001]

Single feeding of manually-loaded disk

*This code is now discontinued.

W04-E02A5C* [1992-2001]

Selecting from simultaneously-loaded disks

*This code is now discontinued but previously included carousel-type arrangements enabling initial loading of several disks for playing sequentially or in a selected order. Arrangements to feed one disk at a time into recording/playing equipment from a library of carriers were covered by W04-E02A5E.

W04-E02A5E* [1992-2001]

Automatic feeding from library of disks

*This code is now discontinued and the subject matter covered by T03-Q05 codes and in T03-F01F5 (and T03-N01).

W04-E02B* [1983-2001]

For tape

*This code is now discontinued.

Reel, spool

W04-E02B1* [1983-2001]

Cassettes

*This code is now discontinued. Prior to 2002 the code was assigned only for cassettes themselves, not all cassette recording related aspects. For magnetic tape cassettes W04-B04B1 was also assigned. These topics are now covered by T03-H01B codes (or T03-H01C for loop-type cassette) and T03-N03.

Housing, casing, mould plastics, audio/video cassette, protective cover

W04-E02B1A* [1992-2001]

Cassette manufacture

*This code is now discontinued and the subject matter is now coded in T03-H01B8 codes alone.

W04-E02B1C* [1992-2001]

Cassette constructional details

*This code is now discontinued.

W04-E02B1E* [1992-2001]

Cassette for helical-scan tape

*This code is now discontinued but was previously only assigned for cassettes where the helical-scan aspect impacts on the design to a significant extent. T03-N02 is assigned for all aspects of helical scan equipment and carrier cases.

VHS, VTR, DAT, protective cover

W04-E02B3* [1983-2001]

Drive

*This code is now discontinued. W04-B04B3 codes were assigned in preference for magnetic tape recorders.

Control, capstan, roller, pulley, belt, gear

W04-E02B5* [1983-2001]

Operating mode control

*This code is now discontinued.

Select, switch, function, play, record, position, fast forward, rewind, pause, stop, autostop

W04-E02B5A* [1992-2001]

Automatic control

*This code is now discontinued. For magnetic tape recorders, W04-B04B5A was assigned from 1992.

W04-E02B5C* [1992-2001]

Manual control

*This code is now discontinued. For magnetic tape recorders W04-B04B5C was assigned between 1992 and 2001.

W04-E02B5E*	[1992-1996]
Special reproduction mode	
*This code is now discontinued but was used for topics such as arrangements for replay at differing speeds. Since 1997, that subject matter has been covered by W04-E20 codes, applicable to all recorder types (rather than just tape recorders). W04-E02B5E remains valid and searchable for records between 1992 and 1996.	
W04-E02B7*	[1983-2001]
Helical scan	
*This code is now discontinued.	
<i>Head drum, guide, rotating cylinder, tape looping</i>	
W04-E03*	[1983-2001]
Record carriers	
*This code is now discontinued and from 2002 this subject matter is now covered by codes in T03-H only. The codes in this subgroup remain valid and fully searchable for records prior to 2002 and covered general aspects of record carriers.	
<i>Disk, compact, tape, manufacture, clean</i>	
W04-E03A*	[1997-2001]
Labels and authentication marks	
*This code is now discontinued.	
W04-E03A1*	[1997-2001]
Labels	
*This code is now discontinued but prior to 2002 it included labels applied to the carrier itself and to housings such as a cassette case or jewel box.	
W04-E03A5*	[1997-2001]
Authentication markings for record carrier	
*This code is now discontinued but covered both human-readable and machine-readable markings, such as bar coding (see T04-A and T04-C codes also). Identification of counterfeit audio or video recordings by added signals is included in W04-G01L3 and W04-F01L3 respectively.	
<i>Code, serial number, hologram, pressing plant</i>	
W04-E04	[1987]
Remote control, time programming	
See S04-C for timer aspects. Prior to 2002 see W04-B04B5 and T03-E05 codes also for tape recorder operating mode control. From 2002 W04-B04B5 is no longer used.	

W04-E04A	[1992]
Remote control	
For general aspects of audio/video remote control see W03-G05A codes, and for remote control specific to TV receivers, W03-A02C codes. Remote control in general is covered by W05-D codes.	
W04-E04C	[1992]
Time programming	
Time programming devices in general are covered by S04-C, e.g. S04-C02.	
W04-E04C1	[1992]
Programming from record carriers or programming codes	
Includes input of timer information by e.g. bar code reading, (reading of bar codes is also coded in T04-A03B1), and 'universal' programming devices learning function of normal remote control unit (from 1997, also assigned W03-G05A1A). From 2005 use of electronic programme guides and GUIs is covered in W04-E04C8.	
<i>Video Plus</i>	
W04-E04C5	[1992]
Programming and control based on off-air signals	
For signal processing aspects, such as extraction of control signals, use with W04-F01K. Prior to 1997, this code was used for arrangements to prevent recording of commercial messages in conjunction with W04-J05. From 1997 this topic is wholly covered by W04-E04C5C.	
W04-E04C5A	[1997]
Involving transmitted programme identification	
Includes systems such as VPS. Transmission of such signals is covered by W02-F05C.	
W04-E04C5C	[1997]
Preventing recording of commercial messages	
(W04-E04C5, W04-J05)	
This code covers arrangements, usually relating to the recorder itself only, for pausing recording when a commercial message is being transmitted and continuing recording once the programme resumes.	
<i>Blank screen, cue</i>	
W04-E04C5E	[2005]
Overriding prevention of recording of commercial messages	
See W02-F10N for variation of subscription fees based on choice of whether or not to receive commercial messages.	
<i>Blank screen, cue</i>	

W04-E04C7 [2002]

With learning function

This code covers automatic time programming arrangements based on learned user preferences, e.g. through monitoring of manual time programming operations or manual channel selection. For analogous arrangements for channel selection in TV receivers see W03-A18A5C.

W04-E04C7A [2006]

Determining recording priority

Deciding between conflicting time programming settings, searching for repeat showings etc.

W04-E04C8 [2005]

Using programme guides

Includes use of EPG data transmitted with TV signal or interfacing with PC receiving programme guide information from e.g. Internet.

W04-E10* [1992-2001]

Head-record carrier motion synchronisation

*This code is now discontinued. Since 2002 this subject matter has been covered by T03-A05, T03-E, T03-F, T03-G and T03-J03 codes only. W04-E10 remains valid and fully searchable for records prior to 2002

Tape track, magnetic, speed, rotating VTR/DAT head, drum, position, scan, motor pulse synchronisation, phase, servo drive, dynamic tracking arrangement

W04-E20 [1997]

Recorder operation mode

The codes in this section, which replace W04-E02B5E used with tape equipment only, are assigned together with other W04 codes to indicate operating mode for any recorder type. W04-E20A and W04-E20C codes include arrangements with differing recording and reproduction speeds.

W04-E20J is assigned as appropriate when recording is involved, and W04-E20R for reverse operation (normal forward operation being otherwise assumed).

W04-E20A [1997]

High speed

W04-E20C [1997]

Slow speed, time-lapse, freeze-frame

W04-E20C1 [1997]

Slow speed

W04-E20C3 [1997]

Time-lapse

W04-E20C5 [1997]

Freeze frame and still picture

Use with W04-E20R for recording of still pictures. Electronic still picture cameras only capable of still-picture recording are not included here – see W04-M01B1 codes.

W04-E20E [1997]

Search mode

For arrangements linked to the use of indexing signals or carrier travel, see W04-H codes.

W04-E20G [2007]

Erasing

(W04-E20X)

W04-E20J [1997]

Recording

This code is assigned with other W04-E20 codes as appropriate, e.g. with W04-E20A for high-speed recording.

W04-E20K [2007]

Multiple viewing angle and foveation aspects

(W04-E20X)

Covers general aspects of multiple-viewing angle systems. Multi-view displays are covered in W03-A12A and/or W04-Q01S while encoding systems are covered in W04-P01A2.

W04-E20M [2002]

Simultaneous playing and recording

Covers arrangements to allow playback of one section of carrier while recording onto another section, e.g. to allow playing from start of recorded programme before recording is finished.

W04-E20P [2008]

Playlist management

This code covers the creation and selection of playlists, either manually or automatically. Indexing aspects are covered by W04-H01C codes. Automatic selection of playlists based on sensed emotional or mental state is also assigned S05-D01X (and other S05-D codes as appropriate). For determination of such states based on voice analysis, W04-V04A4 is also assigned and if based on image analysis T04-D07F codes are also assigned.

Favorite, top-rated, star-rated, daytime, evening, weekend, jazz, classical, rock, pop, tempo, rhythm

W04-E20R [1997]

Reverse mode

Covers e.g. reverse playback.

W04-E20S [2005]

Changing recording quality

Covers arrangements to allow switching from SP to LP mode during recording and automatic adjusting of recording quality to fit programme within available capacity of recording medium.

W04-E20T [2005]

Multiple operation modes

This code is used for inventions concerned with several modes of operation with no particular emphasis on any given one.

Trick play

W04-E20V [2005]

Time shift recording

Covers arrangements to allow viewer to select recording from start of current programme even when this programme is part-way through by use of buffer to continuously record a given channel or set of channels. For arrangements to allow pausing of programme while viewing and then continue recording programme from pause point search in conjunction with W04-E20M.

W04-E20X [1997]

Other recording equipment mode

W04-E30 [2013]

General audio and video (AV) recording and playing equipment

These codes are intended to indicate equipment for audio or video recording and playing in general, including 'media players' which are also covered by T01-J30C. The codes do not take account of storage technology (e.g. hard disk, solid-state memory etc.) and are not applied for specific equipment that is covered elsewhere in W04.

W04-E30A [2013]

General AV recording and playing equipment characterised by content

W04-E30A1 [2013]

Multimedia and media players and recorders

This code takes precedence over W04-E30A3 and W04-E30A5. Prior to 2013 this topic was chiefly covered by W04-P01C8 when solid-state storage was involved. Media players in a computer context are also covered by T01-J30C and AV equipment in general requiring operation with a PC is also covered by W03-G06.

W04-E30A3 [2013]

Audio players and recorders

Prior to 2013 this topic was chiefly covered by W04-G01B8 when solid-state storage was involved and that code can also be assigned for novel aspects specific to recording in solid-state memory. This code is assigned for 'MP3 players'.

W04-E30A5 [2013]

Video players and recorders

Prior to 2013 this topic was chiefly covered by W04-P01C8 and that code can also be assigned for novel aspects specific to recording in solid-state memory.

W04-E30A5A [2013]

Digital photo frames and viewers

This code is assumed to refer to portable equipment so W04-E30C1A is not also assigned.

W04-E30C [2013]

General AV recording and playing equipment characterised by form

W04-E30C1 [2013]

Self-contained AV recording and playing equipment

Includes players and recorders as separate equipment.

W04-E30C1A [2013]

Portable AV recording and playing equipment

Portable AV equipment in general is covered by W03-G04.

W04-E30C5 [2013]

General AV recording and playing equipment incorporated in other equipment

Includes players and recorders incorporated into a PC, mobile phone, or similar equipment. AV equipment in general combined with other equipment in a single housing is assigned W03-G03A.

W04-F

General video signal recording

This code is used merely to highlight video recording or reproduction in a general sense. It relates to recording and reproduction using dynamic methods such as tape, disk, etc. but excluding static storage in e.g. flash memory which is covered by W04-P01C codes (except in the case of dynamic video recorders/players in which solid-state memory is also used for signal processing, this being covered by W04-F01M codes). W04-F can be used alone or with other codes. Its subdivision codes (all W04-F01 and W04-F02 codes) are applied for novel signal processing details either alone or with technology-specific codes such as W04-B, W04-C or W04-D codes as necessary.

Signal processing for dynamic recording in general or recording and reproduction of non-audio or non-video information is covered by T03-P codes.

Video, tape, disk, drum, colour, digital, frame, field

W04-F01

Video signal processing for recording

Frequency band translation, AM/FM recording, compression, noise reduction

W04-F01A [1992]

Signal transformation, frequency changing, demodulation

Includes e.g. 'colour-under' system.

W04-F01A1 [1992]

Signal transformation and frequency changing

Folding

W04-F01A1A [1992]

Modulation and demodulation aspects

See U23 codes for novel demodulator circuits.

W04-F01A5 [1992]

Dynamic range control, amplitude compression, AGC

Compression by coding is covered by W04-F01F codes. See also U24-C01 and U24-C02 codes for AGC and compression respectively.

W04-F01B [1992]

Equalising and peaking circuits

See W04-B for equalising specific to magnetic recording.

W04-F01B1 [1992]

Peaking, crispening

Crispening for general video processing is covered by W04-P01E3.

W04-F01C [1992]

Synchronising signal processing

W04-F01D [1992]

Signal processing specific to colour video

(W02-F06)

W04-F01D1 [1992]

Luminance/chrominance separation

Luma-chroma, Y-C, comb filter, digital filter

W04-F01D3 [1992]

Colour synchronising

Signal processing of TV synchronising information in general is covered by W04-F01C.

Colour burst, subcarrier

W04-F01E [1992]

Noise reduction

W04-F01E1 [1992]

Head switching noise suppression

W04-F01F [1992]

Signal coding and compression

Covers compression as part of signal coding. Compression of dynamic range without coding is covered by W04-F01A5. Prior to 1997, video coding aspects specifically for recording were covered by W04-F01F codes only, but from 1997 codes are also be assigned from the general W04-P01A section to indicate the nature of the coding involved.

W04-F01F1* [1992-2006]

Movement-responsive compression

*This code is now discontinued. Since 2007 all predictive motion-based coding systems have been covered in W04-P01A codes.

W04-F01F5 [1997]

Error detection and correction

See T03-P01A for error detection in recording in general.

W04-F01H [1992]

Multistandard and HDTV signal processing

(W02-F06, W04-F01)

W04-F01H1 [1992]

Recognition of standard, automatic switching

W04-F01H3 [1992]

Standards conversion

(W04-F01, W04-N)

Standards conversion in video recording is **not** assigned the general code W04-N05A. Prior to 1992 search W04-F01 and W04-N.

W04-F01H3A [2005]

Transcoding

This code covers the conversion of one form of video coding to another, e.g. MPEG-2 to MPEG-4, or changing the sample rate without changing the type of coding, during the recording or reproduction of video signals. Transcoding of video in general is covered by W04-N05A1.

W04-F01H3C [2010]

Upscaling of video signals

This code covers upscaling, especially of reproduced video, to provide e.g. improved resolution on an HD display device. Codes for recording and reproducing equipment are also assigned as appropriate, e.g. W04-C10A3 for DVD video players.

W04-F01H5 [1992]

HDTV signal processing

W04-F01K [1992]

Signal processing for additional picture information

Includes arrangements to enable recording of data contained in blanking periods, e.g. teletext signals (prior to 1992 see W02-F05B and W04-F01), or in connection with VPS data. Also covers recording of other supplementary signals received off-air. All aspects of control of recorder by off-air signals are coded in W04-E04C5.

Closed caption, region code

W04-F01L [1992]

Copy restriction, copy marking and scrambling

From 1997 the title of this code is expanded to reflect the inclusion of arrangements to enable identification of copy recordings (now assigned W04-F01L3).

W04-F01L1 [1997]

Signal processing to prevent or restrict recording or viewing

Includes arrangements either preventing copying completely, or producing unacceptable quality copy. For signal processing aspects specific to magnetic recording W04-B01C1A is also assigned. Similar inventions for audio recording are assigned W04-G01L1, but W04-F01L1 takes precedence for combined audio and video recording.

W04-F01L3 [1997]

Signal processing to indicate occurrence of copying

Includes arrangement to insert a signal, in general not visibly affecting reproduction, but enabling subsequent identification of copy or recording source. Similar systems for audio recording are coded in W04-G01L3, but W04-F01L3 takes precedence for combined recording of audio and video information. Distinguishing legitimate from illegitimate copies based on other marking methods is covered by T03-H02A1C.

Watermarking

W04-F01M [1992]

Processing involving memory

(W04-F01, W04-P01C)

This code is used for circuits employing memories as part of the recording signal processing system, and is **not** used for frame stores per se or frame store processing system of general application as covered by W04-P01C codes.

Freeze-frame, still picture

W04-F01M1 [1997]

For storing still picture

See also W04-D10 for use of memory in video hard copy systems. Electronic still picture cameras using memory card storage are not included here - see W04-M01B1C and W04-P01C5.

W04-F01M5 [1997]

In connection with signal processing

Search with other W04-F codes as appropriate, e.g. with W04-F01F for coding involving use of memory circuitry, or W04-F02B for timebase error correction.

W04-F01P [2006]

Multiple channel recording

Covers simultaneous recording of separate video streams. For simultaneous recording of multiple camera outputs search in conjunction with W04-M01V.

W04-F01X [1992]

Other recording signal processing

W04-F02

Drop-out and time-base error compensation

W04-F02A [1992]

Drop-out compensation

Noise reduction for video recording other than due to drop-out is covered by W04-F01E codes, error correction is covered by W04-F01F5.

Correct, error, concealment

W04-F02B [1992]

Timebase error compensation

For skew correction in general see T03-A06H.

Phase, TBC

W04-G

Audio signal processing; Mixing and studio equipment

W03-C and W03-G codes are used as appropriate to convey additional information regarding audio equipment.

W04-G01 [1987]

General audio recording and audio processing for recording

W04-G01A [1992]

For dynamic recording

This code is used for signal processing irrespective for record media, (see T03-P codes also).

W04-G01B [1992]

For static recording

Covers recording in solid-state memory.

W04-G01B3 [1992]

Signal processing aspects

W04-G01B5 [1992]

Memory addressing and control

W04-G01B7 [1992]

Static recording applications

This code is used merely to highlight the use of static recording and is generally assigned when no significant details are given of the audio recording or playback device used. Solid-state audio recorders and players with novel details described are covered by W04-G01B8.

W04-G01B8 [2002]

Solid state digital audio player/recorder

This code is assigned for novel details of solid-state audio recorders and players. Applications of such devices without any significant novel details being described are covered by W04-G01B7.

MP3 player

W04-G01B9 [1992]

Other static recording aspects

W04-G01D [1992]

Noise and distortion reduction

W04-G01F [1992]

Audio signal coding and decoding

Includes sampling, digitising, etc. See W04-V05G for speech coding for non-recording applications, and U21-A codes for coding in general. See also W04-V10 for general audio coding.

W04-G01F1 [1992]

Error detection and correction

Also coded in T03-P01A.

Bit error rate, BER, Reed-Solomon, cross interleave

W04-G01L [1997]

Copy restriction, copy marking and scrambling

W04-G01L1 [1997]

Signal processing to prevent or restrict recording or listening

Includes arrangements either preventing copying completely, or producing unacceptable quality copy. For signal processing aspects specific to magnetic recording W04-B01C1A is also assigned. Similar inventions for video recording are assigned W04-F01L1, which takes precedence for combined audio and video recording.

W04-G01L3 [1997]

Signal processing to identify occurrence of copying

Includes arrangement to insert a signal, in general not audibly affecting reproduction, but enabling subsequent identification of copy or recording source. Similar inventions relating to video recording are coded in W04-F01L3, which takes precedence for combined recording of audio and video information. Distinguishing legitimate from illegitimate copies based on other marking methods is covered by T03-H02A1C.

W04-G01M [2005]

Multiple channel recording

W04-G01M1 [2005]

Stereo and surround sound recording

W04-G01M3 [2005]

Recording of separate audio track

Covers arrangements to record alternative language versions of soundtrack.

W04-G01M5 [2005]

Multitrack recording

W04-G03 [1992]

Audio noise reduction

For audio recording noise reduction see W04-G01D.

W04-G03A	[1992]
Improving signal-to-noise ratio	
W04-G03C	[1992]
Reducing acoustic feedback	
Use with W04-S05 codes for public address application. <i>Howl-round, howling, Larsen effect, squealing</i>	
W04-G04	[1992]
Audio signal dynamic range and frequency control, other effects	
W04-G04A	[2005]
Audio signal dynamic range control	
Includes AGC, compression, expansion, limiting and companding schemes. See also U24 codes. Note that audio signal compression in the sense of coding is not included, being covered by W04-V05G codes or speech and W04-V10 codes for audio signals in general.	
W04-G04E	[2005]
Frequency enhancement and addition of harmonics	
Includes exciters, enhancers, bass expanders etc. See W04-U03E for delay-based effects, e.g. reverberation, flanging, phasing.	
W04-G05	[1992]
Sound mixing and switching	
<i>Blending, mixing console, multichannel sound system</i>	
W04-G05A	[1992]
Control aspects	
Includes circuitry and control elements per se, e.g. slider potentiometers.	
W04-G05B	[1992]
Interfacing	
Includes connection to MIDI systems. For musical instrument aspects see W04-U05 also.	
W04-G05C	[1992]
Mixer circuitry	
For amplifier circuitry see U24-G01C and other U24-G codes as appropriate.	
W04-G05E	[2007]
Switching and routing of audio sources	

W04-G08	[2006]
Sound recording studio equipment	
Use in conjunction with W03-C, W04-U03E, W04-S and other W04-G codes as necessary. Includes all professional audio equipment for use in recording or audio broadcast studio.	
<hr/>	
W04-H	
Editing; Indexing	
Except for audio/video signal processing aspects, also coded in T03-J, T03-K codes.	
W04-H01	[1992]
Index signal recording and detection	
W04-H01A	[1992]
Time code system	
<i>SMPTE</i>	
W04-H01C	[1997]
Indexing information relating to recorded contents	
Includes 'table of contents' information, recorded separately or interleaved with main recorded information, but usually by same recording process in either case. For records prior to 2002 labels providing such information in human-readable form are covered by W04-E03A1. From 2002 these are covered by T03-H02A1A only.	
<i>Metadata</i>	
W04-H01C1	[1997]
User-recordable contents index information	
Includes 'user table of contents' information, and thus implies use of recordable, rather than 'read-only' carriers.	
<i>UTOC</i>	
W04-H01C5	[2006]
Automatic content indexing	
Includes thumbnail indexing, and use of EPG data to generate searchable indexing information.	
W04-H01C8	[2006]
Differentiating between different data types	
<i>Music photo video (MPV)</i>	
W04-H01E	[2006]
Error management information	
W04-H03	[1992]
Measuring travel of carrier	
See also T03-J05 codes.	

W04-H05 [1992]

Editing, dubbing, splicing tape

W04-H05A [1992]

Dubbing

W04-H05A1 [2007]

User controlled dubbing

W04-H05A5 [2007]

Automatic dubbing

Includes automated back-up and archival operations.

W04-H05C [1992]

Splicing

W04-H05E [1997]

Editing

W04-H05E1 [2006]

User controlled editing

W04-H05E5 [2006]

Automatic editing

W04-J

Monitoring/testing recording equipment

W04-J01 [1992]

Theft alarms, security system, access control

See W05-B01 codes also for theft alarms.

Antitheft, disconnection-detector

W04-J01A [2005]

Access control

Includes child lock systems, user authentication and user interfacing aspects of region control.

W04-J01C [2005]

Theft alarms

W04-J03 [1992]

Recording equipment operation displays

W04-J03A [1997]

Dedicated display

W04-J03C [1997]

On-screen display

For such arrangements in TV receivers see W03-A13G.

Includes menus etc. on digital camera display.

OSD

W04-J05 [1992]

Recording equipment controls and circuits (general)

Automatic level control, gain control, intensity control, feedback, compensate, correct, jog wheel

W04-J07 [1992]

Recording equipment testing

Codes in this section are used together with the appropriate code for the function being tested.

W04-J07A [1992]

Testing during manufacture

Includes testing complete and partially complete equipment.

Production line testing

W04-J07C [1992]

Post-manufacture equipment testing and monitoring

Includes self-testing apparatus.

Signal-to-noise ratio, distortion, head alignment, in-built testing circuit

W04-K

Synchronising, co-operation with other equipment, and interfacing

The title of this code has been changed to reflect the fact that audio/video recording and reproduction aspects of multimedia systems (coded in W04-K05 until 1997, and in W04-K10 between 1997 and 2004) are no longer included. Computing aspects of multimedia are covered by T01-J30 codes. Codes in this group are used with the appropriate code for the type of recording equipment involved or alone if the type is not specified. To indicate co-operation of W04 equipment with other types of equipment or systems in a general sense W04-K itself may be assigned (i.e. without subdivision).

W04-K01

Synchronisation between recording units

Includes synchronisation of e.g. photographic and audio equipment and also general arrangements with the emphasis on timing to enable recording or playback equipment to work together.

'Blip' detector for slide projector, re-recording synchronisation, synchronous dubbing

W04-K05 [1987]

Recording equipment systems

Includes use of several recording/playback units e.g. for picture file, and recording equipment used as a 'functional block' in a larger system. Prior to 1997, this code included audio/video recording and reproduction aspects of multimedia systems.

Combination recording, home entertainment system, animated objects control, video game, simulator

W04-K05A [1997]

Multiple recording equipment systems

Includes audio/video file server arrangements, e.g. for on-demand entertainment systems (see W02-F10K also).

W04-K05C [1997]

Recording/reproducing unit as 'functional block'

This code covers arrangements involving interconnection of a recording equipment with some other system, e.g. self-contained VTR used to store surveillance camera image (with W04-B10C and W02-F01A5 or W05-B01C5 codes).

W04-K06 [1992]

Modulator/demodulator

Includes arrangements to interface recording equipment with e.g. TV receiver (for VTR search with W04-B10C).

W04-K07 [1992]

Interfacing arrangements e.g. cables, plugs, etc.

See V04 codes for plug and connector details.

W04-K08 [2002]

Interfacing with PC

Includes arrangements to allow control of recording equipment by PC or downloading of recorded material.

W04-K10* [1997-2004]

Audio/video aspects of multimedia

*This code is now discontinued. Prior to 2005 it was used to indicate audio/video aspects only of multimedia, but due to the ubiquity of that term the code was discontinued. Since 2005 audio and video aspects of personal computers have been assigned the relevant W04 code in conjunction with T01 codes. (Multimedia computer systems are covered by T01-J30 codes).

W04-L

Recording housings

From 2002 this group no longer includes containers for record carriers. Constructional details specific to audio/video recording equipment are still coded in W04-L05 but any non-specific constructional aspects are coded in T03-L05 only.

For records prior to 2002 codes in this section cover housings for storing record carriers, and housings and constructional details of audio/video recording equipment. Corresponding codes in the T03-L section are also applied, (additional information may be gained by use of T03-N codes where W04-L codes are not specific).

W04-L01* [1987-2001]

For record carriers

*This code is now discontinued and from 2002 this subject matter is assigned T03-L01 codes only. W04-L01 codes remain valid and fully searchable for records prior to 2002. W04-L01 covered cassette boxes, racks, record cases, etc., but **not** casings in which carriers are driven during the recording or playback process.

W04-L01A* [1992-2001]

Record carrier container

*This code is now discontinued but prior to 2002 covered containers for individual carriers. Storage racks were covered by W04-L01C codes.

W04-L01A1* [1992-2001]

For disks

*This code is now discontinued.
CD, compact disk case

W04-L01A3* [1992-2001]

For tape

*This code is now discontinued.
Cassette case, spool/reel box

W04-L01C* [1992-2001]

Storage racks, boxes, cases

*This code is now discontinued. It covered racks and similar structures used for storage only, from which a carrier is removed **with** its individual container. (Individual containers were covered by W04-L01A codes). This code was also used for display arrangements in retail stores.

W04-L01C1* [1992-2001]

For disks

*This code is now discontinued.
Floppy disk box, file box, record case

W04-L01C3* [1992-2001]

For tape

*This code is now discontinued.

Cassette rack

W04-L05 [1987]

Housings and constructional details of recording equipment

W04-L05A [1987]

Cabinets, casings, stands

See V04-S codes for casings in general.

W04-L05B [1987]

Construction e.g. mounting of PCBs, components

See V04-T codes for these details for electronic equipment in general.

W04-M

Video and synchronising signal generators

W04-M01

Video cameras

Electrical aspects of photographic cameras are covered by S06-B codes. Features common to both photographic and video cameras are coded in both sections. Novel imaging and camera aspects of endoscopes are included here. See also S05-D codes and W02-F01M for this topic.

Imager, image pick-up, electronic imaging

W04-M01A

Camera tube arrangements

Image pick-up tubes per se are coded in V05-D codes only, but details such as tube/coil assemblies are included.

Tube biasing, power supplies, deflection signal generators, deflection coil, focusing, astigmatism correction, screening, vidicon, plumbicon, image-orthicon camera

W04-M01B

Solid state pick-up device arrangements

CCD Camera

W04-M01B1 [1987]

Digital camera

This code is used for solid-state video cameras used predominantly for recording single frames in e.g. RAM, hard disk or optical disk. W04-M01B1 codes are used for **any** aspect of the camera. For still-picture recording facility in camera designed primarily for video recording see W04-E20C together with W04-M01B and W04-M01K.

Shutter release control, disk drive control, disk loading/unloading system, interface for hard copy

W04-M01B1A [1992]

Dynamic recording type

W04-B14 and W04-C10A3 codes are also assigned for recording on magnetic and optical disks respectively.

W04-M01B1C [1992]

Static recording type

Includes camera storing image in solid state memory.

Digital still-picture camera, digital camera

W04-M01B1E [2005]

Video recording aspects

W04-M01B1S [2013]

Digital single lens reflex camera

This code is assigned for **all** aspects of digital SLR cameras. For specific novel optical details search with W04-M01C codes as appropriate, e.g. W04-M01C5 for mirror arrangements.

DSLR

W04-M01B5 [1992]

Solid state image pick-up element

Covers image pick-up per se which is also assigned U13-A codes.

W04-M01B5A [1992]

Reading methods

Covers methods of read-out and operation circuitry integral with the pick-up element. For 'electronic-shutter' arrangements based on e.g. limiting charge accumulation time, search with W04-M01D5C. (Electro-optical shutters separate from the image sensor and based on e.g. liquid crystal devices are not included and are covered by W04-M01C7A from 2014).

Shift register

W04-M01B7 [1992]

External circuitry

Covers drive circuitry external to pickup per se. Includes circuitry linked to CCD.

W04-M01B8 [2009]

Image sensor movement arrangements

This code and its subdivisions cover devices imparting mechanical movement to the image sensor for focusing or other purposes. Similar arrangements acting on optical system components are covered by W04-M01C1 codes or W04-M01C9 as appropriate. Details of actuators and the like are indicated by assignment of V06 codes.

Displacement

W04-M01B8A [2009]

Image sensor movement for enhancing imaging

This code covers arrangements for imparting mechanical movement to the image sensor for enhanced imaging, such as resolution improvement (previously treated as optomechanical scanning by assignment of W04-M01E5) or as an anti-shake measure with W04-M01D7.

Dithering

W04-M01B8B [2009]

Image sensor movement for focusing

This code covers arrangements for imparting mechanical movement to the image sensor for focusing purposes, e.g. where the lens system is fixed. Arrangements for moving lenses for focusing are covered by W04-M01C1B. Manual focusing is indicated by assignment of W04-M01D1 and automatic focusing with W04-M01D5D.

W04-M01B8C [2009]

Image sensor movement for cleaning

This code covers arrangements for imparting mechanical movement to the image sensor for cleaning purposes, e.g. the use of ultrasonic vibration to remove dust from a sensor window.

Particle, speck, foreign body, detachable lens.

W04-M01B8X [2009]

Other image sensor movement

W04-M01C [1987]

(Auto)focusing, zooming, lenses for TV camera, shutters, filters

Single lens reflex (SLR), optical system, beam splitter, iris, aperture

W04-M01C1 [1992]

Lens system

Search with W04-M01G1B for constructional details of lens systems.

W04-M01C1A [1992]

Novel lens details

Covers novel aspects only of single lenses and lens groups such as zoom lenses. Search with W04-M01B5 for lens or lens array integral with image pick-up element which from 2018 is also specifically covered by W04-M01C1G. Since 2011 the use of variable lenses, including those with electrically-controlled variable parameters has been indicated by W04-M01C1E. If the variable lens is novel W04-M01C1A is also assigned. Note that 'lens systems', 'lens barrels' and 'lens tubes' without any novelty in lenses themselves are not included and are covered by W04-M01C1 with W04-M01G1B for constructional details such as lens mounting arrangements.

Abbe number, aberration, concave, convex, chromatic, coating, focal length, glass, material composition, plano-concave, plano-convex, plastics, power, refractive power, V number

W04-M01C1B [1992]

Motor drive for focusing

See V06-M codes for details of motors or actuators themselves, and V06-N codes for novel drive circuitry for motor control. This code is used with W04-M01D5D (focus control) for control of focus involving novel motor drive aspects, or position feedback, only, for all other aspects of automatic focusing, W04-M01D5D is used alone. W04-M01C1B is assigned with W04-M01D1 codes for manual control of focus. From 2009, focusing by movement of the image sensor alone is not included, being covered by W04-M01B8B.

Stepper, piezoelectric, shift, HF content, hill-climbing, servo, automatic

W04-M01C1C [1992]

Motor drive for zooming

See V06-M codes for details of motor per se, and V06-N codes for novel drive circuitry for motor control. This code is used with W04-M01D5E (magnification control) for control involving novel motor drive aspects, or position feedback, only, for all other aspects of magnification control, W04-M01D5E is used alone.

Stepper, shift, automatic

W04-M01C1D [2014]

Detachable/interchangeable lens

This code covers lens units that can be removed from or fitted to a camera body. For interfacing and electrical connection details W04-M01D8A is also assigned.

Interchangeable, long focus lens, long lens, telephoto

W04-M01C1E [2011]

Variable lenses

This code covers the use of lenses with variable properties, e.g. where the lens is physically deformed to change its refractive power. If the variable lens is novel W04-M01C1A is also assigned. (V07 codes are also assigned for lenses with electrically-controlled variable parameters). W04-M01C1E does not cover lens systems in which magnification or focus is changed by changing the distance between lenses or between a lens and an image sensor.

Liquid crystal lens, ring electrodes, variable optical power lens element

W04-M01C1G [2018]

Lens or lens system integral with image sensor

This code covers lenses or lens systems that are integral with an image sensor. When novel lenses are involved W04-M01C1A is also assigned. Optical elements that are part of an integrated circuit image sensor are also assigned U13-A01F.

Micro lens, wafer level optics

W04-M01C3 [1992]

Filters

Neutral density

W04-M01C3A [1992]

For colour separation

Covers RGB matrix-type filters.

W04-M01C3C [1992]

For removing specific wavelengths

This code covers filters designed to block transmission of specific wavelengths, e.g. optical high-pass filters such as IR-cut filters. Video cameras intended for imaging in the infrared spectrum are covered by W04-M01E1 codes.

W04-M01C3D [2011]

Neutral density filter

This code covers filters designed to reduce the intensity of light, normally independent of wavelength, e.g. to allow use of different exposure settings.

ND filter, optical all-pass

W04-M01C3E [1992]

Integral with pick-up device

W04-M01C3G [2011]

Polarizing filter

This code covers filters designed to block or reduce the intensity of light with a particular polarization, e.g. to reduce the effect of reflections.

W04-M01C5 [1992]

Beam splitter, mirror

Includes beam splitter or movable mirror for viewfinder of SLR camera.

W04-M01C6 [1992]

Connection with external optical system

Includes connection with e.g. endoscope, which is also coded in S05-D04.

Coupler, fiber-optic, beam splitter

W04-M01C7 [1992]

Electro-optical shutter, (electro)mechanical shutter and shutter drive

This code includes electromechanical or electro-optical shutters and from 2014 it is subdivided to distinguish these from motors and actuators for driving an electromechanical shutter which are specifically covered by W04-M01C7E. See V02-E02 for electromagnetic actuation and V06-M codes for motors. Electro-optical shutters are covered by W04-M01C7A. Electronic control of shutters is not included and is covered by W04-M01D5C. Electronic shutter action using controlled read-out of solid state imager is not included and is covered by W04-M01B5A and W04-M01D5C.

W04-M01C7A [2014]

Electro-optical shutter

This code covers electro-optical shutter arrangements without moving parts, e.g. using liquid crystal devices. (Note that U14 or V07 codes are not assigned for this topic). 'Electronic shutter' arrangements based solely on controlling the image sensor itself, e.g. by limiting charge accumulation time, are not included and are covered by W04-M01B5A and W04-M01D5C.

LC, light valve

W04-M01C7C [2014]

(Electro)mechanical shutter

This code covers novelty in the shutter itself. Novel aspects of motors or actuators driving the shutter are covered by W04-M01C7E.

Blade, curtain, focal plane, leaf

W04-M01C7E [2014]

(Electro)mechanical shutter drive

See also V02-E02 for electromagnetic actuators and V06-M codes for motors.

Solenoid

W04-M01C8	[1992]
Electro-optical iris diaphragm, (electro)mechanical iris diaphragm, and iris drive	
This code includes mechanical, electromechanical or electro-optical iris diaphragms and from 2014 it is subdivided to distinguish these from motors and actuators for driving an electromechanical iris which are specifically covered by W04-M01C8E. See V02-E02 for electromagnetic actuation and V06-M codes for motors. Electro-optical iris diaphragms are covered by W04-M01C8A. Electronic control of irises is not included and is covered by W04-M01D5C.	
W04-M01C8A	[2014]
Electro-optical iris diaphragm	
This code covers electro-optical iris diaphragm arrangements without moving parts, e.g. using liquid crystal devices. The general code for electro-optical area modulation, V07-K01A2, is also assigned. <i>LC, light valve</i>	
W04-M01C8C	[2014]
(Electro)mechanical aperture/iris	
This code covers novelty in the iris diaphragm itself. Novel aspects of motors or actuators driving the iris are covered by W04-M01C8E. <i>Aperture, stop</i>	
W04-M01C8E	[2014]
(Electro)mechanical aperture/iris drive	
See also V02-E02 for electromagnetic actuators and V06-M codes for motors. <i>Solenoid</i>	
W04-M01C9	[1992]
Other optical aspects of video cameras	
Includes white balance reference plate, optical arrangements compensating camera shake (with W04-M01D7), lens cap, and arrangements for cleaning the optical system including 'windscreen wiper' devices and ultrasonic vibration devices for dust removal. From 2009 ultrasonic and other vibration devices acting on the image sensor itself are covered by W04-M01B8 codes. Prior to 2009 W04-M01C9 was assigned for any aspect of correcting for optical system distortions, including those using image processing (with W04-N05C3). From now on W04-M01C9 will only be assigned for systems acting directly on the optical system itself. From 2009 compensation by means of image manipulation processing for optical system geometry distortions, e.g. arising from use of wide-angle lenses, is covered by W04-N05C3E. W04-M01D6 or W04-M01D6A will continue to be assigned also when the processing is performed within the camera, but not when performed subsequently.	

W04-M01D	[1987]
Control circuits, monitoring, displays, viewfinders	
Codes in this section are used for general control circuits and with other codes for specific purposes. Studio aspects for control of several cameras, mixing, etc. are covered by W04-N codes.	
W04-M01D1	[1992]
Operator controls and warning devices	
Covers controls actually operated by user and devices signalling state of camera. Use with W04-M01D3 for warning as part of viewfinder display. <i>Switch, key, knob, setting, display, indicator</i>	
W04-M01D1A	[1992]
Remote control	
When remote control of camera combined with recording equipment is involved, W04-E04A codes are also used, otherwise see W05-D codes when remote control signal transfer aspect is significant.	
W04-M01D1C	[2011]
GUI control aspects of cameras	
This code covers the use of graphic user interfaces for controlling a camera and employing the camera display, including the use of touchscreens. Novel aspects of displays for cameras are covered by W04-M01D3A and of touchscreens by W04-M01D3E.	
W04-M01D2	[1992]
General control and monitoring circuits	
Prior to 1997 this code included generation and distribution of synchronising signals within camera, (also coded in W04-M05). From 1997 see W04-M01D2M.	
W04-M01D2A	[1992]
Light metering	
Photometry in general is covered by S03-A01 codes, which are not assigned here unless broader application is indicated. Thus, methods involving determination of scene brightness from the video signal itself (rather than a separate photosensitive device) would not normally be assigned S03 codes.	

W04-M01D2C [1992]

Range finding and subject location/tracking

Includes rangefinding for setting focus. Focus detection by video signal characteristics (e.g. HF content) is covered by W04-M01D2E. Includes tracking using 'beacon' transmitter, and automatic systems using movement/position detection, which are also coded in e.g. W06-A02C1. Prior to 1997 this code included identification of subject or region of interest by eye-gaze direction determination, when used with S05-D01C5A. From 1997, see W04-M01D2G, which is used alone to represent the gaze-direction aspect. (Similar systems for photographic cameras are covered by S06-B01E). This code also included detection of faces and facial expression but from 2011 this topic is covered by W04-M01D2F instead.

W04-M01D2E [1992]

Focus detection

Covers determination of focusing state by video signal characteristics, such as HF content. Control of optical system is covered by W04-M01D5D.

W04-M01D2F [2011]

Face and facial expression detection

This code covers the detection and identification of faces, parts of faces and facial expression of subjects to be photographed, e.g. to determine a region of interest or to control shutter actuation. Prior to 2011 this topic was covered by W04-M01D2C. Determination of eye gaze direction of the camera user is **not** included and is covered by W04-M01D2G. Facial recognition and detection as an application of image recognition is covered by T04-D07F1 which is also assigned as appropriate.

W04-M01D2G [1997]

Eye-gaze direction determination

This code covers the determination of gaze direction of the camera user for purposes such as control of exposure parameters. Prior to 1997, see W04-M01D2C and S05-D01C5A, which was used to discriminate the eye-gaze aspect. See also W04-M01D3 codes for aspects involving viewfinders, e.g. IR LEDs, dedicated image sensor, special optics, etc. Analogous systems for photographic cameras are covered by S06-B01E. Detection and identification of faces, facial features, or expressions of **subjects** to be photographed is **not** included, and is covered by W04-M01D2F

W04-M01D2J [1992]

Camera condition monitoring and testing

Includes calibration arrangements and self-checking circuits e.g. for low battery state in portable cameras (also assigned S01-G06 and X16-H codes).

W04-M01D2M [1997]

Synchronising signal generation and distribution

Synchronising signal generators and 'studio' aspects are covered by W04-M05, which was assigned for this topic, with W04-M01D2, prior to 1997.

W04-M01D2R [2007]

Controlling use of camera in restricted area

(W04-M01D9)

See W01-C01P6C for camera phones.

W04-M01D2S [2014]

Software version control

This code covers software updating and version control for cameras. Software version management in general is covered by T01-F05F, which is also assigned for camera inventions as necessary

Download, firmware

W04-M01D2X [1992]

Other general control and monitoring circuits for cameras

This code covers control or sensing arrangements for video or still cameras not provided for in the above subdivisions. It includes accelerometers and the like (see e.g. S02-G03 or S02-H also) for use in detection of camera shake or vibration, for which W04-M01D7 is also assigned when part of a compensation system and the use of navigation information from e.g. GPS receivers, for which W06-A03A5 codes are also assigned.

W04-M01D3 [1992]

Viewfinders

For display of menus etc. see W04-J03C.

W04-M01D3A [1992]

Display device

This code is intended to indicate novelty in the actual display device itself, such as an LCD for which U14-K01 codes are assigned to indicate the specific novel aspects. W04-M01D3A is **not** assigned for novelty in the camera or camera circuitry for which W04-M01D3C is used when specific display drive aspects are involved, or W04-M01D3 for more general details. Novel aspects of touchscreens are covered by W04-M01D3E which is assigned with this code when the display itself is also novel.

W04-M01D3C [1992]

Display drive circuitry

Covers matrix addressing, drive circuits, etc.

W04-M01D3E [2011]

Touchscreens for digital or video cameras

This code covers novel aspects of touchscreens for cameras. The use of touchscreens and graphic user interfaces for controlling a camera is covered by W04-M01D1C. When the display device itself is novel W04-M01D3A is also assigned.

W04-M01D4 [1992]

Character/subtitle generators

Subtitle generators for TV studio/video production use are coded in W04-N05C1A.

W04-M01D5 [1992]

Exposure control

Includes evaluation of scene condition information (provided by devices covered by W04-M01D2 codes), and control of function to optimise imaging.

W04-M01D5A [1992]

Evaluation of exposure conditions

W04-M01D5B [1992]

Back-light compensation

W04-M01D5C [1992]

Control of aperture and/or shutter time

For electronic shutter action (simulating mechanical shutter) search with W04-M01B5A.

Iris, stop, diaphragm

W04-M01D5D [1992]

Automatic focus control

Mechanical aspects of focus adjustment are covered by W01-M01C1B for lens movement and W04-M01B8B for image sensor movement. Detection of focus state is covered by W04-M01D2E. Manual setting of focus is covered by W04-M01D1 with W04-M01C1B or W04-M01B8B. For automatic control, W04-M01C1B or W04-M01B8B are not assigned unless significant aspects of actuator driving are involved.

Closed loop, hill-climbing, servo, feedback, optimize

W04-M01D5E [1992]

Zooming and magnification control

This code is normally used alone unless specific aspects of control and interaction with the motor circuit per se are involved.

W04-M01D5H [1997]

Light source control

Search with W04-M01H1 for control of continuous lighting units and W04-M01H5 for control of flash units. Drive circuit for discharge-tube type flash lamps are covered by X26-C01A.

W04-M01D5X [1992]

Other exposure control aspects

W04-M01D6 [1992]

Image processing and function control

Used with W04-P and W04-N codes as appropriate, e.g. W04-P01D1 for white balance control, W04-N05C5E for red-eye removal (see T04-D07F1A for eye detection). From 2009 compensation by means of image manipulation processing for optical system geometry distortions, such as those arising from use of wide-angle lenses, is covered by W04-N05C3E. W04-M01D6 or W04-M01D6A is also assigned when the processing is performed **within** the camera, but **not** when performed subsequently. Prior to 2009 W04-M01C9 was also applied for this topic but from 2010 is only assigned for systems acting directly on the optical system itself.

W04-M01D6A [1997]

Image acquisition aspects

Covers processing associated with e.g. read-out of image sensor, such as compensation for imager characteristics. Use in conjunction with W04-P01H1 (and W04-M01B7) for solid state circuit imager dark current compensation.

W04-M01D6C [2006]

Multi-standard processing

Includes arrangements for changing resolution of still pictures (see also W04-M01B1) and standards conversion (see also W04-N05A).

W04-M01D7 [1992]

Motion compensation

This code covers arrangements for countering the effects of unwanted motion, such as camera shake. See W04-P01 and W04-M01G codes respectively for electronic and (electro-) mechanical movement compensation systems. Compensation involving movement of the image sensor is also assigned W04-M01B8A or W04-M01C9 if achieved optically.

W04-M01D8 [2002]

Video and digital camera interfacing
(W04-M01D9)

This code covers arrangements for interfacing of video and digital cameras with other equipment and systems. From 2014 the code is subdivided to distinguish between interfacing with separate parts of the camera or accessories, e.g. detachable lenses (W04-M01D8A) and interfacing with equipment or systems that are not part of the camera or camera system (W04-M01D8C). Search with W04-K codes for specific aspects of interfacing, e.g. W04-K07 for novel connectors or cables.

W04-M01D8A [2014]

Interfacing with separate part of camera or camera system

This code covers interfacing with separate parts of a camera or accessories that may be detachable from the main camera body, such as lenses (for which W04-M01C1D is also assigned) or electronic flash units (for which W04-M01H5 is also applied).

W04-M01D8C [2014]

Interfacing with separate equipment or system

This code covers novel aspects of interfacing with equipment or systems that do not form part of the camera or camera system. It includes interfacing with equipment such as computers, for which W04-K08 is also assigned and also interfacing with printers, other cameras and data networks.

W04-M01D9 [1992]

Other camera control

W04-M01E [1987]

For IR imaging, optomechanical scanning
(W04-M01X)

Includes 'staring' and scanning types. Non-video night vision systems are covered by W07-G codes, (tubes per se are coded in V05-D03 codes).

W04-M01E1 [1992]

IR imager

FLIR imager, pyroelectric camera, heat sensing camera

W04-M01E1A [1992]

IR-sensitive pick-up device

See also appropriate code for solid-state pick-up element e.g. U14-E01, or U13-A codes.

W04-M01E5 [1992]

Optomechanical scanning systems

See V07-K05 also. Prior to 2009 this code was also used to indicate arrangements for increasing imaging resolution by imparting movement to an image sensor, e.g. to achieve dithering. This topic is now covered by W04-M01B8A.

Galvanometer mirror, polygonal mirror, motor driven scanning

W04-M01E5A [1992]

With single scanning direction

Includes systems with subscanning action provided by motion of subject or imaging platform.

Satellite, missile, push-broom, vehicle, traffic, rail, train

W04-M01E5C [1992]

With main- and sub-scanning

Includes optomechanical/electromechanical arrangements to provide simultaneous line and field scanning.

W04-M01F [1987]

For X-ray and other non-light imaging

(W04-M01X)

Includes medical diagnostic imaging (see S05-D02 or S05-D03 codes also), but **not** systems where the primary means of 'imaging' uses visible radiation. Medical ultrasound systems are **not** routinely covered in W04-M01F.

Image converter, image intensifier

W04-M01F1 [1992]

X-ray imaging

W04-M01F3 [1992]

Nuclear imaging

Gamma camera

W04-M01F5 [1992]

Ultrasonic imaging

W04-M01G [1987]

Constructional details

Includes mounting, tripod, housing etc., and constructional features of cameras per se.

W04-M01G1 [1992]

Camera construction

Cooling, condensation prevention, heating

W04-M01G1A	[1992]
Camera housing	
<i>Casing, cabinet</i>	
W04-M01G1B	[1992]
Internal constructional details	
<i>Card, circuit board, cooling, fan, layout, PCB, screening, shield</i>	
W04-M01G5	[1992]
Carrying case for portable camera	
Includes shoulder straps, etc.	
W04-M01G7	[1992]
Tripods, supports	
Includes collapsible supports and permanent mountings e.g. for surveillance camera (also assigned W02-F01 codes).	
W04-M01G7A	[1997]
Fixed mounting	
W04-M01G7C	[1997]
Movable mounting	
Includes motor-driven positioning system. Search with W04-M01D2C for arrangements tracking a subject by moving the camera.	
W04-M01H	[1992]
Light sources	
(W04-M01X)	
See X26 codes for details of light sources per se and fittings. Includes lighting integral with, or detachable from, portable cameras. TV studio lighting is covered by W04-N01. Prior to 1997, light source control was covered in W04-M01D9, but is now transferred to W04-M01D5H.	
W04-M01H1	[1997]
Continuous illumination	
W04-M01H5	[1997]
Flash light	
Electronic still-picture cameras are assigned W04-M01B1 codes. Recording of single pictures with other types of recording equipment, e.g. VTRs, is covered by W04-E20C5 and W04-B10 codes. See S06-B03 codes for details of photographic camera flash circuits.	
<i>Stroboscope</i>	

W04-M01H5A	[2007]
Pre-light emission/Red eye reduction	
Includes use of separate light source for pre-light emission before main flash to prevent red eye. Light source control aspects are covered in W04-M01D5H. See S06-B03A1 for non-digital camera.	
W04-M01J	[1992]
Camera systems for imaging still pictures	
(W04-M01X)	
Covers the use of video cameras to image static objects such as slides and photographs, e.g. for video slide viewer (also coded in S06-B06B). 'Digital' ('electronic still picture') cameras are covered by W04-M01B1 codes, and telecine machines by W04-M02. Facsimile systems are not included and are covered by S06-D to K codes.	
<i>Document camera, rostrum camera</i>	
W04-M01K	[1992]
Camera-recorder	
(W04-M01X)	
Codes indicating the recording technology used are also assigned when significant, e.g. W04-B10G for DV tape, W04-B14C3 for hard disk, W04-C10A3 for optical disk, or W04-P01C8 for solid-state types. For a video recording facility in a digital camera W04-M01B1E takes precedence.	
W04-M01L	[1992]
Stereoscopic image generating camera system	
Complete stereoscopic TV systems are covered by W02-F03B codes, stereoscopic TV receivers are assigned W03-A12A and other W03-A codes as appropriate. Search with W04-M01V for stereoscopic imaging systems employing two or more video cameras.	
W04-M01M	[2005]
Audio aspects	
Covers all audio aspects of video cameras. Prior to 2005 this topic was included in W04-M01X.	
W04-M01P	[1992]
Power supplies	
W04-M01P1	[1992]
Mains power	
W04-M01P5	[1992]
Battery power supply	
Includes battery per se. See X16 codes also.	
W04-M01P5A	[1992]
Battery charging	

W04-M01S [2005]

Panoramic camera

(W04-M01X)

Use in conjunction with W04-M01C6 for optical arrangements and with W04-M05C5 for 'stitch mode'. For moving platforms see also W04-M01G7C.

W04-M01V [2006]

Multiple camera systems

(W04-M01X)

Search along with W04-F01P and W02-F01A for CCTV security systems recording multiple camera outputs. Search with W04-M01L for stereoscopic imaging systems employing e.g. two video cameras.

W04-M01V1 [2014]

Multiple cameras within same equipment housing

This code covers the use of two or more digital or video cameras or image sensor arrangements that are contained within the same housing and are therefore part of the same equipment, e.g. for stereoscopic imaging with W04-M01L or in a mobile phone with front and rear-facing cameras used at the same time, for which W01-C01D3C and W01-C01P6C are also assigned.

W04-M01V5 [2014]

Multiple cameras in separate housings

This code is assigned for inventions depending on the use of two or more digital or video cameras that are contained within separate housings and therefore are not part of the same equipment. For stereoscopic imaging search with W04-M01L and for multiple-camera aspects of CCTV surveillance systems with W02-F01A5.

W04-M01W [2011]

Internal wiring of camera

This code is intended to highlight **internal** wiring details, including wires, cables and flexible PCB wiring arrangements, but **not** wiring within an integrated circuit. It includes both novel wires and cables (for which X12-D codes are also assigned) and constructional aspects such as the arrangement of wiring for which W04-M01G1B is also assigned. Arrangement of wiring within equipment in general is covered by V04-T01A.

W04-M01X

Other video camera aspects

This code covers aspects of electronic imaging cameras not covered by the above subdivisions, including industrial inspection applications where the use of the camera is significant and linked to the novelty in some way. S02 or S03 codes, (e.g. S02-J04 or S03-E04 codes) are applied for these topics as appropriate. Also included are additional devices built-into a camera, for which codes for the particular device should also be employed when searching.

W04-M02

Telecine

See W04-M01 codes for image pick-up details and S06-B05 codes (cinematography) also.

Film, scan, frame, intermittent, gate, pull, continuous, photograph, cine

W04-M05 [1992]

Synchronising and blanking signal generators

(W04-M09)

TV receiver synchronising circuitry is covered by W03-A06.

W04-M07 [1992]

Video pattern generators

Includes generation of test patterns (see also W02-F04A).

W04-M09

Other video source aspects

W04-N

Video special effects and manipulation, TV studio equipment

Codes in W04-N relate to equipment for use in TV studios or for analogous purposes. W04-N05G codes are used to indicate application but only if this is stated or implied.

Video mixing desk, special effects generator, picture inlay, chromakeying, delay compensation, lighting control desk

W04-N01 [1992]

Studio and outside broadcast equipment

Includes e.g. lighting, camera control consoles (also coded in W04-N05B codes for video mixing and switching aspects, but not cameras per se, (covered by W04-M01 codes), or telecine, (covered by W04-M02)). For video processing see W04-N05 codes which cover such aspects as standards conversion, chroma keying, etc.

TV opaque projection, telop, teleprompter, autocue, intercom, talkback

W04-N05 [1992]

Equipment with video processing function

See also W04-P codes as appropriate for video processing. Where computer data processing is involved, T01-J10 codes are also assigned.

W04-N05A [1992]

Standards conversion equipment

Standards conversion in TV receivers is covered by W03-A11A, in recording equipment by W04-F01H3.

W04-N05A1 [2005]

Transcoding

W04-N05B	[1992]
Video mixing and switching equipment	
Includes equipment for CCTV monitoring. (See also W02-F01 codes. W04-N05G5 is also assigned).	
W04-N05B1	[1992]
Video mixing equipment	
<i>Fade, blend, wipe, merge, combine, channel</i>	
W04-N05B5	[1992]
Video switching equipment	
Where actual switching details are involved, W01-B codes may be assigned also.	
W04-N05C	[1992]
Image generation and manipulation, including special effects equipment	
These codes cover the generation and manipulation of images for special effects or other purposes, such as image correction. Generation of images by video cameras is not included, being covered by W04-M01 codes. Manipulation of images in TV receivers is not included and is covered by W03-A13E codes. For computer-based image processing aspects search with T01-J10 codes.	
W04-N05C1	[1992]
Image generation system	
This code covers the generation of images electronically, e.g. using computer graphics techniques, and not the generation of images of real-world scenes using e.g. a camera.	
W04-N05C1A	[1992]
Subtitle and text generator	
(H04N-005/278)	
<i>Crawling text</i>	
W04-N05C3	[1992]
Image manipulation systems	
This code covers the application of image processing techniques to the manipulation of images, including moving, enlarging/reducing, correcting geometry and image cropping (as represented by W04-N05C3G from 2014). T01-J10 codes for computer-based image processing are also assigned as appropriate.	
W04-N05C3A	[1997]
Moving image, or part of image	
W04-N05C3C	[1997]
Enlarging or reducing image	

W04-N05C3E	[2009]
Correcting image geometry	
This code covers the application of image manipulation processing to the correction of faults in image geometry. Examples include 'keystone' correction in video projectors (with W04-Q01J) and compensation for camera optical system distortions (with W04-M01D6 codes as appropriate if carried out in the camera itself). Prior to 2009 W04-M01C9 ('Other optical aspects of video cameras') was assigned to indicate that optical system defects were being compensated for. From 2009 W04-M01C9 is no longer applied for this topic and would only be assigned for systems acting directly on the optical system itself.	
<i>Screen angle, perpendicular, normal, trapezium, fisheye, wide angle, lens, aberration.</i>	
W04-N05C3G	[2014]
Image cropping	
Covers selection of a desired area of an image and deleting the remainder.	
<i>Border, edge, trim, remove frame</i>	
W04-N05C5	[1992]
Picture inlay or overlay system	
For combining real-world and computer generated images for augmented reality search with W04-W07E1. Picture inlay circuitry for TV receivers is covered by W03-A13 codes.	
<i>Inset, superimpose</i>	
W04-N05C5A	[1992]
By chroma keying	
<i>Colour, blue, background, video switch</i>	
W04-N05C5E	[1997]
Replacing designated part of image	
Includes arrangements e.g. using recognition techniques to detect text in an image, or 'coding' a region of an image in some way, to substitute text in another language, or alternative images. For application to inserting 'domestic' advertisements in e.g. a sporting event broadcast from overseas, search with W05-E03C (TV with advertising) from 2002, W05-E03 prior to that.	

W04-N05C7 [2014]

Image manipulation for stereoscopic or depth imaging

This code covers arrangements for creating stereoscopic or pseudo-stereoscopic images, e.g. from separate still images or video sources, and also for modifying the perceived depth of such images, both previously covered by W04-N05C9. W04-N05C7 is not assigned for normal stereoscopic video cameras, which are covered by W04-M01L, unless image processing to vary the depth characteristic of images produced is also involved.

Blend, merge, offset, parallax

W04-N05C9 [1992]

Other special effect equipment

Prior to 2014 this code included simulation of 3-D images and also modification of the perceived depth of such images, both of which are now covered by W04-N05C7. Stereoscopic video camera arrangements are covered by W04-M01L, stereoscopic TV systems in general by W02-F03B codes and computer graphics aspects of three dimensional image generation are covered by T01-J10C4.

W04-N05G [1992]

Characterised by application

Codes in this section are intended to discriminate between broadcast and video production applications, and those performing analogous functions for use in e.g. industry. The codes are only applied when an application is stated.

W04-N05G1 [1992]

For TV studio or video production facility

W04-N05G3 [2007]

For digital cinematography

W04-N05G5 [1992]

For industrial or commercial application

W04-P

Video signal processing

See W03-A codes for TV receiver details, W04-F codes for application to recording. Where computer data processing of video is involved, T01-J10 codes are also assigned.

Image, camera, television, chrominance, luminance, code, encode, picture, memory

W04-P01 [1987]

Video processing type and applications

For application to video cameras (i.e. circuitry forming part of camera), search with W04-M01D6.

W04-P01A [1987]

Encoding

Includes encoding and decoding apparatus and methods e.g. for compression, bandwidth reduction, etc. See T01-J10D for computer-based image compression and coding, U21-A codes for encoding in general, W04-V05 codes for speech signal encoding, W04-V10 codes for audio coding, and W02-G04 codes for bandwidth reduction in non-video systems.

From 2002 the corresponding W02-F07 codes which covered 'systems' aspects of PCM and narrow band TV have been discontinued and are replaced by the general code W02-F07M 'Digital image transmission'. Thus, W04-P01A codes should be used to discriminate types of coding. Compression of still-picture information, e.g. in facsimile, is covered by S06-K07 codes.

Motion detection, vector quantisation, digitising, fractal, transformation

W04-P01A1 [1992]

Movement detection system

This code is used as a general code for detection and estimation of movement and may thus be used for applications such as automatic alarm actuation. (See also W02-F01, W05-B01C codes). When specific to hybrid or predictive video coding W04-P01A4A and W04-P01A5A are respectively assigned instead of W04-P01A1.

W04-P01A2 [2007]

Multiple video stream encoding, using foveation zones

Includes compression techniques using redundant data across multiple video streams or viewing angles.

W04-P01A3 [1992]

Transform coding

This code is intended for transform video and image coding methods, e.g. JPEG and its variants. Combined transform and predictive coding is covered by W04-P01A4 codes which take precedence over this code.

W04-P01A3A [2005]

Novel transform aspects

DCT, Wavelet

W04-P01A3C [2005]

Quantisation

W04-P01A3E [2005]

Run length, variable length encoding

Entropy coding

W04-P01A3F	[2014]
Converting between variable and fixed rate transform encoding	
This code is intended to highlight fixed and variable rate aspects of transform-based video encoding. Fixed and variable rate aspects of hybrid video encoding are covered by W04-P01A4F, which takes precedence over this code.	
W04-P01A3G	[2012]
Transform coding motion detection and estimation	
Motion detection or estimation for hybrid coding is covered by W04-P01A4A, for purely predictive coding by W04-P01A5A, and for general and non-coding purposes by W04-P01A1.	
W04-P01A3J	[2012]
Transform coding motion compensation	
Motion compensation for hybrid coding is covered by W04-P01A4C and for purely predictive coding by W04-P01A5C.	
W04-P01A4	[1997]
Hybrid coding	
(W04-P01A3, W04-P01A5)	
This code is chiefly intended for combined transform and predictive coding, e.g. MPEG coding, H.263, H.264 and variants. From 2014, all coding for the purposes of broadcasting and streaming is assumed to be of this type unless specific details indicate otherwise.	
<i>AVC, CABAC, HEVC</i>	
W04-P01A4A	[1997]
Hybrid coding motion detection and estimation	
(W04-P01A3, W04-P01A5A)	
Motion detection or estimation for purely predictive coding is covered by W04-P01A5A and for general and non-coding purposes by W04-P01A1.	
W04-P01A4C	[1997]
Motion compensation	
(W04-P01A3, W04-P01A5A)	
Motion compensation for predictive coding is covered by W04-P01A5C (prior to 1997 see W04-P01A5A).	
W04-P01A4E	[2005]
Novel transform aspects	
Novel transform aspects for pure transform coding are covered by W04-P01A3A.	
<i>DCT, MDDT, Mode Dependent Directional Transformation, wavelet</i>	

W04-P01A4F	[2008]
Converting between variable and fixed rate encoding	
This code is intended to highlight fixed and variable rate aspects of video encoding.	
W04-P01A4G	[2005]
Quantisation	
W04-P01A4J	[2005]
Run length, variable length encoding	
<i>Entropy coding</i>	
W04-P01A4L	[2005]
Reducing artefacts	
Reduction of noise and errors in video signals in general is covered by W04-P01F codes.	
W04-P01A4N	[2005]
3-dimensional transforms	
W04-P01A4S	[2005]
Scalability arrangements	
Covers arrangements to allow change in bandwidth according to conditions or capability of receiver.	
W04-P01A5	[1992]
Predictive coding	
W04-P01A5A	[1992]
Motion detection and estimation	
Motion detection or estimation for hybrid coding is covered by W04-P01A4A and for general and non-coding purposes by W04-P01A1.	
W04-P01A5C	[1997]
Motion compensation	
W04-P01A5G	[2011]
Quantization for predictive video coding	
Quantization for hybrid coding is covered by W04-P01A4G which takes precedence over this code.	

W04-P01A6 [2014]

Detecting and correcting errors

This code is intended to highlight inventions concerned with detection and/or correction of errors in video encoding. It includes arrangements for dealing with errors arising from corrupted image data and also problems with recognizing type of coding, start codes, or other ancillary data. Error detection and correction in digital data transmission in general is covered by W01-A01B codes and for digital data in general by U21-A06 codes.

W04-P01A7 [1992]

Subsampling

Involves methods for discarding sampled values, e.g. by considering values of adjacent sample points.

Multiple sub-Nyquist sampling encoding, MUSE, phase alternate sub-Nyquist sampling, PASS, sample dropping, merging

W04-P01A8 [1997]

Coding based on fractals

Covers image coding using algorithms to generate fractal codes

Fractional dimension, graftal, pattern, shape, irregularity

W04-P01B [1987]

For non-visible spectrum imaging

Includes video processing specific to IR, X-ray etc., e.g. in medical systems, (see S05-D codes also, such as S05-D02A).

Digital subtractive imaging, angiography, DSA

W04-P01C [1987]

Frame stores, video memory and solid-state video recorder/player

See W04-N05C codes also for TV special effects application.

W04-P01C1 [1992]

Novel frame stores and video memory This code is assigned for novel aspects of solid-state memories intended to store still images or video. Circuitry for reading from or writing into memories of this type is covered by W04-P01C5. Use of solid-state memory in computer systems is covered by T01-H01B3 codes and novel memories in general are covered by U14-A codes.

W04-P01C5 [1992]

Memory addressing and control

Variable readout control, scan conversion, scan reversal

W04-P01C8 [2005]

Solid state video recorder/player

Includes devices storing and reproducing video and also still pictures, e.g. in an electronic photoframe.

Digital photo frame, digital picture frame.

W04-P01D [1987]

White balance and colour temperature control

W04-P01D1 [1992]

White balance control

W04-P01D3 [1992]

Colour balance and colour temperature control

W04-P01E [1987]

Gamma and aperture correction

Contour

W04-P01E1 [1992]

Gamma control

Correction for unequal amplitude response is covered by W04-P01H1.

W04-P01E3 [1992]

Edge correction, crispening

Peaking, emphasis circuit

W04-P01E5 [1992]

Aperture correction

W04-P01E7 [1992]

Compensating phase shift in signal processing

Includes correction of phase errors in colour separation from single image pick-up device.

W04-P01E8 [1992]

Dynamic range control, amplitude compression

See U24-C02B for amplitude compression in general.

W04-P01F [1992]

Noise reduction, error concealment

(W04-P01X)

Codes in this section are used to indicate arrangements for improving signal-to-noise ratio of a video signal, which may include compensating for noise-introducing defects in, for example, imaging devices. Compensation for imperfect imaging device characteristics in general is covered by W04-P01H codes. Noise reduction in connection with video recording is covered by W04-F01E codes and specifically for received radio signals, by W02-G03B codes.

W04-P01F1	[1992]
Noise reduction (W04-P01X)	
W04-P01F3	[1992]
Error concealment (W04-P01X) Includes interpolation with adjacent pixel values.	
W04-P01H	[1992]
Compensation processing for imager characteristics (W04-P01X) Gamma and aperture correction is covered by W04-P01E codes. See W04-P01F codes for particular noise reduction or error concealment. Specifically, use W04-P01H with W04-P01F3 for systems concealing defective pixels. For video camera application see e.g. W04-M01B7 and W04-M01D6A.	
W04-P01H1	[1992]
Non-uniform amplitude response correction (W04-P01X) Includes correction for dark current and varying sensitivity of imager photosites.	
W04-P01H3	[1992]
Correcting for 'charge-leakage' phenomena (W04-P01X) Includes correction for blooming.	
W04-P01K	[1992]
Clamping circuits (W04-P01X) Covers circuits establishing DC level of video signal. For such circuitry in TV receivers, see W03-A04C and, in general, U24-C02A5.	
W04-P01L	[1992]
Luminance/chrominance separation This code covers processing of color video signals involving the separation of luminance and chrominance components. For application to color TV receivers or color video displays see W03-A05B codes. <i>Luma-chroma, Y-C</i>	
W04-P01N	[1992]
Time shifting (W04-P01X) Includes delay circuits and compensation for delays e.g. to equalise signal paths, for timebase correction etc. (For recording see W04-F02B).	

W04-P01X	[1987]
Other video signal processing	
W04-Q	
Colour coders; TV projection	
W04-Q01	[1987]
Video projectors and projection displays This code and its subdivisions cover displays using projection of video or similar information on a screen. Codes relating to application are also assigned, e.g. for projection TV receivers search with W03 codes, for computer displays search with T04-H03E. Also included are special-purpose projection displays such as head-up displays projecting video information (covered by W04-Q01K) and direct retinal projection displays (covered by W04-Q01L). <i>Projection screen, transmission screen, optical system, laser projection system</i>	
W04-Q01A	[1987]
Using CRT For optical and cooling aspects of tubes see V05-D07C codes also. <i>Colour filter, liquid filter, tube face cooling, alignment/convergence adjustment</i>	
W04-Q01B	[1987]
Using light valve, e.g. LCD, laser sources See V07-K01A2 for area modulation of light in general. <i>Liquid crystal, light source, cooling</i>	
W04-Q01B1	[1992]
With laser light source	
W04-Q01B2	[2007]
With LED light source	
W04-Q01B3	[1997]
Using mirror-array device	
W04-Q01B5	[1992]
Novel light valve Search with W04-Q01B3 for novel mirror-array devices.	
W04-Q01B7	[1992]
Light source Laser aspects are covered by W04-Q01B1. See also appropriate codes in X26 for light sources, reflectors, etc. For light source testing and monitoring search in conjunction with W04-Q01J.	

W04-Q01E	[1992]
Optical system	
Includes lenses and filters, but not light valves, which are covered by W04-Q01B. For systems specific to the type of projection system e.g. using a CRT, see also the appropriate W04-Q01 code. Screens are covered by W04-Q01F.	
W04-Q01E1	[1997]
Lens system	
W04-Q01E1A	[1997]
Focus adjustment	
W04-Q01E1C	[1997]
Novel lens details	
W04-Q01E3	[1997]
Filter	
W04-Q01E3A	[1997]
Colour filter, colour separation filter	
W04-Q01E3C	[1997]
Removing specific wavelength	
Includes IR cut filters.	
W04-Q01E5	[1997]
Reflection systems	
Includes static mirrors and prisms. Optomechanical and electro-reflective scanning systems are covered in W04-Q01-E07S	
W04-Q01E7	[2005]
Beam splitter, polarizer and other optical arrangements	
W04-Q01E7A	[2005]
Beam splitter	
W04-Q01E7C	[2005]
Polarising, diffraction gratings, polarising filters	
Prior to 2007 polarisation filters are covered in W04-Q01E3.	
<i>Quarter wave plate</i>	
W04-Q01E7S	[2007]
Scanning arrangements	
Includes optomechanical and electro-reflective scanning systems	
W04-Q01E7X	[2007]
Other optical elements	

W04-Q01F	[1992]
Screens	
W04-Q01F1	[1992]
Transmission screens	
W04-Q01F3	[1992]
Reflective screens	
W04-Q01F5	[2005]
Volumetric, non-planar projection screens or media	
From 2014 video projectors specifically intended for use with screens of this type are covered by W04-Q01P.	
W04-Q01H	[1992]
Constructional details, cooling	
See V04-S and V04-T03 codes respectively for construction and cooling of electrical equipment in general.	
W04-Q01H1	[1997]
Casing, cabinet, mountings	
W04-Q01H5	[1997]
Internal construction and cooling	
W04-Q01J	[2002]
Projection display circuitry and control systems	
Covers circuitry for controlling the output of a projection display and includes auto-focusing and arrangements to correct distortion of the projected image when the screen is not normal to the projection axis. W04-N05C3E (W04-N05C3 prior to 2009) is also assigned for this topic when compensating pre-distortion of image geometry is used.	
W04-Q01J1	[2005]
Monitoring display output	
Covers use of sensors or CCD.	
W04-Q01J3	[2011]
Video projector remote control	
Remote control for TV receivers is covered by W03-A02C codes and for AV equipment in general by W03-G05A codes.	
W04-Q01J5	[2006]
Copy protection systems	
Includes arrangements for projecting UV or IR light onto screen in order to prevent recording by video camera. Copy protection involving signal processing is covered in W04-F01L1.	

W04-Q01J7	[2011]
Power supplies and power saving	
Novel aspects of power supplies are also assigned U24-D, -E or -F codes as appropriate. Power supplies for TV receivers are covered by W03-A07 codes and for AV equipment in general by W03-G02 codes, which were also assigned with W04-Q01 codes for projector PSU inventions prior to 2011.	
W04-Q01K	[1992]
Head-up display application	
See also under application, e.g. W06-B01B for aircraft, X22-E for automobiles.	
W04-Q01L	[2002]
Direct retinal projection display	
This code is intended for displays which directly project an image onto the retina of the viewer, and thus is likely to be in the form of a head-mounted display. For application to such displays the following codes are also assigned: W03-A08E7A for TV receiver HMD, W04-W07E1A for virtual reality HMD, and W05-E07 for HMD of general application.	
W04-Q01P	[2014]
Panoramic and volumetric projection	
This code covers video and electronic image projectors which form images on non-planar screens, such as adjoining walls of a room or curved or annular screens. Novel screens for use with this kind of projector are covered by W04-Q01F5. Image processing systems to adapt image geometry to the projection screen surface are covered by W04-N05C3E. When applied to virtual reality systems W04-W07E1 is also assigned while for simulators other codes are assigned as necessary, e.g. W06-B04 for aircraft, W06-C04 for ship and W04-W07A and X22-X for land vehicle driving simulators.	
W04-Q01S	[2005]
Stereoscopic and 3-dimensional projection display	
W04-Q05	[1992]
Colour coder	
<i>Modulator, subcarrier generator</i>	
<hr/>	
W04-R	
Stereo- and quadraphonic systems	
<i>Left, right channel, stereophonic, amplifier</i>	
W04-R01	[1992]
System type	

W04-R01A	[1992]
Pseudo-stereophonic	
<i>Frequency separation</i>	
W04-R01C	[1992]
Stereophonic	
W04-R01C1	[1992]
Binaural	
<i>Dummy head, recording, sound source location</i>	
W04-R01C5	[1992]
Surround sound system	
W04-R01E	[1992]
Quadraphonic	
W04-R05	[1992]
Sound field control	
Parametric audio systems are covered in W04-S05P and are not coded here.	
W04-R05A	[1992]
Responsive to e.g. sensed location of listener	
<hr/>	
W04-S	
Loudspeaker enclosures; Public address systems	
W04-S01	[1992]
Loudspeaker enclosures and leads	
W04-S01A	[1992]
Mountings for enclosure	
W04-S01C	[1992]
Connectors, leads	
<i>Plug, socket, wiring</i>	
W04-S01E	[1992]
Enclosure	
<i>Speaker, acoustic, box, housing, cabinet baffle, reflex enclosure, acoustic wadding, port, grille, dust cover</i>	
W04-S01E1	[1992]
Loudspeaker mounting	
Also coded in V06-A and V06-G01.	
W04-S01E5	[1992]
Achieving desired directional effect or frequency response	
Also coded in V06-A and V06-G02.	

W04-S05 [1992]

Public address and stage equipment

Includes analogous equipment used in sound broadcasting and recording apart from mixing desks which are coded in W04-G05.

Loudhailer, PA system, concert, exhibition, conference, monitor loudspeakers, acoustic feedback suppression, phase/frequency shifter

W04-S05A [1992]

Amplifiers, mixing desk

Details of mixing desks are covered by W04-G05 codes.

W04-S05C [1992]

Microphones, stands

Microphones in general are covered by V06-B02.

W04-S05C1 [1992]

Cordless/wireless microphone

W04-S05P [2005]

Parametric audio systems

Covers use of separate ultrasound sources providing highly directional beams that interfere at precise location. Includes non-public address application of parametric audio systems.

W04-T

Circuits for transducers

See also V06-H. This code is used for circuits through which the transducer current flows, e.g. for impedance matching. It is **not** intended for circuitry preceding an amplifier which drives the transducer, for example.

Loudspeaker, microphone, amplify, feedback, impedance matching, crossover network, bridge network, motional feedback, motion pick-up transducer, MFB

W04-T01 [1997]

Impedance matching

Impedance matching in general, using lumped constant circuit elements, is covered by U25-D05.

W04-T03 [1997]

Motional feedback (MFB)

This code is assigned for audio reproduction systems in which the output transducer, e.g. a loudspeaker, is incorporated into a feedback loop so that any non-linearity in its characteristics can be compensated for. Includes use of an additional transducer such as a microphone or accelerometer and also networks to isolate a signal such as back EMF that corresponds to motion of e.g. a diaphragm or voice coil.

W04-T05 [1997]

Frequency selective networks

Includes crossover networks.

W04-U

Electrical musical instruments

W04-U01

Electronic tone generation

See also U23 codes for novel tone-generating circuits, e.g. reading sine wave values from memory, covered by U23-F codes.

Memory-storage, waveform generator, read-out circuit, variable clock, master oscillator, sample, synthesis

W04-U01A [1997]

Tone generators

Includes oscillators used in additive and subtractive synthesisers (see W04-U03C) and waveform generators using acoustic modelling.

W04-U01C [1997]

Memory access

Covers use of stored values (using ROM or RAM) to produce periodic waveforms, e.g. in 'wavetable' synthesis.

W04-U01C1 [1997]

Sampling

(W04-U01, W04-U04D)

See also W04-U03 codes for control aspects and synthesisers, and W04-U04D for input-output aspects.

W04-U02

Electromechanical tone generation; Instruments using pick-ups

W04-U02A [1992]

Instruments using pick-ups

Electric guitar, violin, transducer, string, bridge, fret

W04-U02A1 [1992]

Pick-up per se

See V06 codes for transducer detail.

W04-U02C [1992]

Electromechanical tone or sound generation

Player piano, solenoid actuation, drum, percussion

W04-U03

Controlling tone frequencies; Producing special effects

Level control, tone mixing, waveform shaping

W04-U03A [1992]

Controlling generation or combination of tones

W04-U03C [1992]

Synthesis

Includes use of time varying filters and amplifiers, FM etc.
Additive, subtractive

W04-U03E [1992]

Special effects

Includes delay effects, e.g. reverberation. Also covers novel special effect processing for amplified or recorded acoustic instruments or voice, e.g. in karaoke device.

W04-U04

Other electrophonic instrument details

Includes selection circuits, accompaniment, keyboards, I/O, and construction.

W04-U04A [1992]

Keyboards, pedals, and circuitry

Key switch, electronic switch, stop, voice, pedals

W04-U04C [1992]

Accompaniment systems

Automatic rhythm generator

W04-U04D [1992]

Input/output arrangements

Includes arrangements for interfacing with other equipment. See W04-U05 for MIDI aspect.

W04-U04G [1992]

Constructional details

W04-U04J [1997]

Other electronic musical instruments

Covers non-keyboard instruments with electronic actuators, e.g. guitar synthesizers, electronic drum pads.

W04-U05 [1992]

Musical equipment interfacing standards, MIDI (W04-U09)

Includes general aspects. See also W04-U04D for specific circuitry or operation details for instrument per se, and W04-G05B for sound mixing interface aspects.

W04-U06 [1997]

Sequencers and composition systems

(W04-U07)

Includes transcription systems. Prior to 1997 these were coded under W04-U07.

W04-U07 [1992]

Musical training system

(W04-U09)

Includes practice equipment. From 1992 to 1997 electronic music transcription systems were included. These are now coded under W04-U06.

Practice equipment, keyboard order/position display

W04-U08 [1992]

Sound-to-light conversion equipment

Colour organ

W04-U09

Other electrical music aspects

Includes metronome (see S04-C09 also).

Electric bell, gong, chimes, sound-to-light converter

W04-V

Analysis, synthesis and processing of sound waves

Includes acoustic noise reduction system using antiphase sound, which is covered by W04-V07 codes. Novel aspects of speech recognition or synthesis are respectively assigned W04-V01 and W04-V02. Inventions involving the use of these techniques only, without any novelty being involved, are covered by W04-V04 codes. General audio signal processing aspects, including sound mixing and switching are covered in W04-G.

Digital, speaker, word, code, memory, model, pattern reference, encode, allophonic, formant, phoneme, linear predictive coding (LPC)

W04-V01 [1987]

Novel aspects of analysis or recognition

Parsing, segmentation, speaker-dependent, speaker-independent

W04-V02 [1987]

Novel aspects of synthesis or generation

W04-V04 [1992]

Applications of speech analysis and synthesis

Includes systems where method of analysis or synthesis is not necessarily novel. Previously coded in W04-V (no subdivision) if substantial disclosure of details. From 2002, W04-V04A7 is introduced to specifically cover the analysis of non-speech sound waves.

W04-V04A [1992]

Analysis systems

Voice-input, hands-free

W04-V04A1 [1992]

Determining presence of speech only

Covers systems intended to discriminate speech from e.g. noise or other signals, without recognition of words, phrases, etc.

Automatic telephone dialler, call progress tone detector

W04-V04A3 [2002]

Determining speaker characteristics

From 2014 the title of this code has been changed to reflect the previous inclusion of arrangements for determining the gender of a speaker, now covered by the specific subdivision W04-V04A3C. Inventions described by the original title of this code - i.e. 'Determining identity of speaker' - are now covered by W04-V04A3A.

W04-V04A3A [2014]

Identifying individual

This code covers biometric identification of a speaker based on their unique vocal characteristics and should be searched with other codes for specific applications, e.g. with W01-C01D3C and W01-C01Q8C for control of access to a mobile phone based on recognizing a speaker.

W04-V04A3C [2014]

Discriminating gender of speaker

This code covers discrimination between male and female speakers, e.g. based on fundamental frequencies, without necessarily involving identification of the speaker themselves.

W04-V04A4 [2008]

Determining emotional status of speaker

For determining the emotional status of a speaker by analysing characteristics e.g. volume level, pitch of the speaker's voice, and/or words used by the speaker.

Tremor

W04-V04A5 [2005]

Voice-actuated control of equipment or machines

See also W05-D codes for general applications of remote control using speech recognition.

W04-V04A6 [2005]

Speech-to-text

W04-V04A7 [2002]

Non-speech audio analysis applications

This code covers the analysis and recognition of non-speech (i.e. non-human) sound sources, such as musical sequences, machine noise, and animal sounds, including their analysis to discriminate or identify different species of animals or birds. Application to the testing of machines is indicated by assignment of S02 or S03 codes also, such as S02-J03A for bearings or S03-F02B for determining resistance to wear.

Amphibian, avian, bearing noise, bee, bird, cat, cattle, diagnosis, dog, eagle, elephant, engine noise, fox, horse, insect, Korotkov, mammal, note, pest, pitch, rattle, termite, tuning

W04-V04A8 [2014]

Comparing speech or singing with reference

Covers arrangements for determining the degree of matching of sounds made by an individual with a reference. It includes evaluating the correctness of pronunciation of spoken words in language learning (with W04-W codes) and of pitch, tempo etc. of singing (with W04-U07). Evaluation of pitch and other qualities of musical instruments using analysis of sounds is not included and is covered by W04-V04A7 and W04-U codes.

Accent, expression, intonation, judge, karaoke, performance, score

W04-V04C [1992]

Synthesis systems

W04-V04C1 [2005]

Text-to-speech

W04-V04E [2005]

Novel circuitry for speech analysis or synthesis

Includes novel features of signal processing circuitry, e.g. automatic gain control, noise reduction, used for speech analysis/synthesis applications. Applied in conjunction with U24, W04-G and W04-V05 codes as appropriate to indicate type of novel signal processing.

W04-V05 [1992]

General speech signal processing and representation

Includes details of signal processing applicable to analysis or synthesis and also coding of speech or similar signals.

W04-V05A [1992]

Filtering

W04-V05C [1992]

Correlation

W04-V05E	[1992]
Noise reduction	
W04-V05G	[1992]
Coding systems	
From 2002 see W04-V10 codes for non-speech audio coding. See U21-A codes for coding in general, and W02-C06 for PCM transmission systems in general (including systems without novel coding aspects).	
<i>Quantisation</i>	
W04-V05G1	[1992]
Involving simulation of e.g. vocal tract	
Includes channel vocoder and use of bank of bandpass filters.	
W04-V05G3	[1992]
Predictive coding systems	
<i>Vector</i>	
W04-V05G3A	[1992]
Code excited linear predictive coding	
<i>CELP, sequential optimisation, simultaneous optimisation, excitation codebook, dynamic codebook, long term predictor filter</i>	
W04-V05G5	[1992]
Transform coding systems	
<i>Orthogonal</i>	
W04-V05G6	[2002]
Comfort noise	
This code covers systems introducing so-called comfort noise into a communications channel, e.g. to avoid disturbing silence periods. Systems of this type for use in telephone speech signal processing are assigned W01-C01C7A.	
W04-V05G8	[1992]
Dynamic coding	
W04-V05J	[1997]
Pitch, rate change	
(W04-V05, W04-V09)	
Search with S05-K for systems aiding e.g. hearing-impaired persons, and W04-Y codes where forming part of a hearing aid.	
W04-V05J1	[1997]
Pitch change	
(W04-V05, W04-V09)	

W04-V05J5	[1997]
Rate change	
(W04-V05, W04-V09)	
Prior to 2002 this code was used for sample rate conversion of digital audio signals. From 2002 this topic is covered in W04-V10A.	
W04-V07	[1992]
Noise cancelling systems	
Covers systems using a sensor such as a microphone and suitable signal processing to cancel or reduce the level of unwanted sound. This can be achieved either by means of destructive interference using antiphase sound emitted by e.g. a loudspeaker, or by electronic signal subtraction which from 2019 is covered specifically by W04-V07C1.	
<i>Active noise control, air conditioning, ANC, channel, duct, machine, vehicle</i>	
W04-V07A	[1992]
Installations	
Includes physical detail of e.g. transducer per se, transducer mounting, description of complete installation not involving circuitry or control.	
W04-V07C	[1992]
Control system, circuitry	
This code covers signal processing aspects of sound cancelling systems, normally involving a microphone to sense ambient noise sounds. It includes systems using acoustic cancellation based on antiphase sound waves emitted from a loudspeaker and systems in which electronic cancellation is performed using audio signals alone, which from 2018 are covered by W04-V07C1. See U22-G codes also, e.g. U22-G01A5 for adaptive filters, and U22-G03 codes for details of DSP in general (also assigned codes in T01-J08).	
W04-V07C1	[2019]
Cancellation using electronic signal subtraction	
This code covers arrangements for cancelling or reducing unwanted sounds based on electronic subtraction of corresponding unwanted signals from a wanted audio signal, rather than generation of antiphase sound waves. For application to noise-cancelling headphones search with V06-V04A4.	
W04-V09	[1992]
Other sound signal details	

W04-V10 [2002]

Audio coding

Includes general audio encoding methods and apparatus e.g. for compression, bandwidth reduction etc., chiefly in entertainment applications. Coding methods and apparatus specifically for speech signals, generally involving lower bandwidth, data rate and quality for communications applications, are covered by W04-V05G.

W04-V10A [2002]

Standards conversion

Includes sample rate conversion.

W04-V10C [2002]

Nonuniform coding

Includes floating point and nonuniform companding systems.

W04-V10E [2002]

Predictive coding

Includes differential, adaptive and companded predictive systems.

DPCM, ADM, CVDSM, CPDM, ADPCM, NICAM, time domain

W04-V10G [2002]

Perceptual coding

Covers data reduction methods which use psychoacoustic models to reduce bit rate while retaining acceptable perceived audio quality, e.g. assigning higher quantisation errors to exploit masking properties of human hearing.

W04-V10G1 [2002]

Frequency domain coding

W04-V10G1A [2002]

Subband coding

Covers arrangements to feed input signal into filter bank for analysis and comparison with psychoacoustic model. Includes MPEG-1, Layers I and II, and Precision Adaptive Subband Coding (PASC).

Filter bank

W04-V10G1C [2002]

Transform coding

Covers arrangements using e.g. discrete Fourier Transform (DFT), discrete cosine transform (DCT) and modified discrete cosine transform (MDCT). Includes AC-2 and perceptual audio coding (PAC). Also includes AAC coding used in MPEG2 and MPEG4 standards (also coded in W04-V10G1J).

Adaptive transform coding, ATC, dynamic bit allocation

W04-V10G1G [2002]

Hybrid coding

Covers arrangements using a combination of subband and transform methods. Includes adaptive transform acoustic coding (ATRAC) and MPEG-1 Layer III.

Hybrid filter bank

W04-V10G1J [2002]

Multichannel coding

Covers arrangements to reduce redundancy and irrelevancy of multichannel signals in order to reduce overall bit rate. Includes AC-3, MPEG-2 multichannel coding and AAC (see also W04-V10G1C).

W04-V10G7 [2002]

Reducing artefacts

Coded in conjunction with other W04-V10G codes to indicate type of perceptual coding system. Reduction of noise and other unwanted signals for speech coding is covered by W04-V05E with an appropriate W04-V05G code.

W04-V10G9 [2002]

Other perceptual coding systems

W04-W

Educational equipment (electrical)

Teach, student, tape, visual, monitor, play, learn, train

W04-W01

Question and answer apparatus

Respond, test, correct multiple choice, keyboard, stylus, interactive

W04-W05 [1992]

Educational and conference equipment

Includes e.g. electronic blackboards.

Audio-visual aid, classroom equipment

W04-W05A [1997]

Educational equipment in general

This code is intended for systems and equipment used in a formal educational setting, e.g. a classroom. Electrical aspects of educational equipment used by individuals, e.g. at home, is covered by W04-W09.

W04-W05C [1997]

Conference equipment

Includes electrical aspects of presentation equipment, including speaker aids, such as prompting systems, public address aspects (see W04-S05 codes also) etc.

W04-W07 [1992]
Simulation systems, training and demonstration
See also under application. The following are **not** included:
(1) Flight simulator - W06-B04
(2) Ship simulator - W06-C04
(3) Military training equipment - W07-D codes
(4) Sports training - W04-X01A codes
(5) Musical training - W04-U07

W04-W07A [1992]
Training simulator
Includes land vehicle driving simulators, also coded in X22-X.
Machine/control system operator training, telegraph operator training

W04-W07C [1992]
Demonstration of process or effect
Includes system for demonstrating physical phenomena which is also coded in S01 to S03 according to nature of phenomenon being modelled.
Physics, chemistry, mechanics, electrical, electronic

W04-W07E [1997]
Virtual and augmented reality
See T01-J40 codes for computing aspects of virtual and augmented reality systems. Video-based augmented and virtual reality is covered by W04-W07E1 codes.
AR, VR

W04-W07E1 [1997]
Video aspects
Includes image generation (also coded in T01-J10C) and image displays.

W04-W07E1A [1997]
Head mounted display
See W03-A08E7 for head mounted displays primarily for TV receiver applications, W05-E07 in general, and T04-H03C9 for claimed computer aspects. Displays employing direct retinal projection techniques are also assigned W04-Q01L.
HMD

W04-W07E3 [1997]
Acoustic aspects

W04-W07E5 [1997]
Tactile or mechanical aspects
For example shaking of seat.

W04-W07E9 [1997]
Other aspects of virtual reality

W04-W09
Other educational equipment
This code is intended for electrical aspects of educational equipment used outside a classroom environment, e.g. by individuals at home, and includes language learning aids, individual study aids, electronic dictionaries and e-books, including software enabling reading of e-books

W04-X
Sports, games, toys
Electrical aspects only are included. Non-electrical details are coded by P36 codes.
Leisure, recreation, pastime

W04-X01 [1983]
Sports and leisure
The title of this code has been changed to indicate the existing coverage of leisure activities in addition to organized sports. W04-X01 codes cover sports and leisure activities with some electrical aspect. From 2011 W04-X01K codes are introduced to indicate, where significant, the kind of sport or leisure activity involved and are assigned in addition to existing W04-X01 codes. For example, an alerting device to warn an angler of a fish biting would be assigned W04-X01E and W04-X01H to indicate sports equipment with a warning function and W04-X01K7A to denote fishing.
Fish, line, rod, reel, alarm, ski, pitch, court, lane, race, starter, ball, archery, athletics, ball-games, fencing, fishing, golf, gymnastics, hunting, racing, running, shooting

W04-X01A [1983]
Training equipment

W04-X01A1 [1992]
Performance monitors
This code covers arrangements for general measurement during sports training, such as lap timing, speed, or distance covered, and also measurements on the individual performing the training, such as medical and physiological parameter monitoring, e.g. of pulse rate. For medical monitoring equipment in general and to highlight specific performance measurements, see also S05. See also W01-C01P8 for using software or devices incorporated in a telephone e.g. smartphone, to measure medical parameters. Measurements relating to actual playing of competitive sports are covered by W04-X01C.
Exercise, time, practice, stopwatch, strength testing, ergometer, pedometer

W04-X01A3 [1992]
Simulators
Includes golf swing trainer, and simulation of game playing.

W04-X01A5 [1992]

Fitness training equipment

Includes exercise bikes, rowing machines, treadmills and similar equipment. Analogous equipment for medical purposes, e.g. physiotherapy, is covered by S05-A05.

Brake, Mechanical resistance, Weights, Rehabilitation equipment

W04-X01A5A [2011]

Exercise bicycle

Covers static exercise bicycle. Cycling on or off roads as a sport or leisure activity is covered by W04-X01K3C which is **not** assigned for exercise bicycles.

W04-X01A5C [2011]

Exercise treadmill

Covers static arrangements for 'on-the-spot' running. Running in the sense of athletics, jogging or cross-country running is covered by W04-X01K3A which is **not** assigned for treadmills and the like.

W04-X01A9 [1992]

Other sports training equipment

W04-X01C [1992]

Counting, timing, measuring, scoring

W04-X01C1 [1992]

Counting, timing, measuring, scoring detection

From 2011 this code is subdivided to separately indicate measurement or timing aspects from the 'yes/no' aspects of determining that a point or goal has been scored, or that a foul or fault condition exists.

W04-X01C1A [2011]

Counting, timing, measuring

See also S02 codes for measurement of length or distance and S04 codes and T05-G03 for timing aspects.

Lap, recording, start, finish, measure, photo-finish

W04-X01C1C [2011]

Detection of scoring or fault condition

Includes detection of scoring such as 'goal line' technology in football (soccer) or determining that a ball is out of play in e.g. a tennis match.

VAR

W04-X01C3 [1992]

Scoring, score display

See T04-H and W05-E codes for display details.

W04-X01D [1992]

Locators and guiding systems

Includes arrangements for retrieving lost equipment, and guiding systems for e.g. golf courses.

W04-X01E [1992]

Sports equipment per se

Covers equipment used by players. Includes electrical aspects of fishing rods, bats, skis, trampolines, hunting rifles and paintball guns. For electrical aspects of firearms, see also W07. Includes walking sticks for hiking (see also X27- A02E). General details of sport equipment are coded under P36-A08A.

W04-X01F [1992]

Sports grounds, stadia, courses, installations

Includes bowling alleys and equipment provided by administrators of sports facility e.g. golf carts, buggies, etc.

W04-X01H [1992]

Warning systems, alarms, protection

Includes systems warning of dangerous and non-dangerous conditions. See W05-A codes also for signalling aspects.

W04-X01K [2011]

Type of sport or leisure activity

These codes are assigned, normally in addition to codes indicating novel aspects, to denote the main application of a sports or leisure-based invention with electrical content. If an invention is applicable to a large number of categories, or no application is given, W04-X01K codes are **not** assigned. In the descriptions below the terms 'sport' and 'leisure activity' are used interchangeably.

W04-X01K1 [2011]

Sports using ball, puck, or shuttlecock

W04-X01K1 codes do not include sports involving measuring the distance over which a projectile, e.g. a javelin, is thrown which are covered by W04-X01K3A, or the launching or throwing of projectiles at a target which are covered by W04-X01K5 codes.

Bowling, curling

W04-X01K1A [2011]

Baseball

W04-X01K1C [2011]

Basketball

W04-X01K1E [2011]

Billiards, pool, snooker

W04-X01K1G	[2011]
Cricket	
W04-X01K1J	[2011]
Football (soccer)	
W04-X01K1L	[2011]
Golf	
W04-X01K1N	[2011]
Hockey	
Includes ice hockey.	
W04-X01K1P	[2011]
Racquet sports	
Includes badminton, tennis, squash, etc.	
W04-X01K1R	[2011]
Rugby, American football	
W04-X01K1T	[2011]
Table tennis	
W04-X01K1V	[2011]
Volleyball	
Includes beach volleyball.	
W04-X01K1X	[2011]
Other sports played with ball or similar projectile	
W04-X01K3	[2011]
Athletics, cycling, racing, air and water-based sports	
W04-X01K3A	[2011]
Athletics and running	
Includes running on track, cross-country, or marathons, and sports based on jumping and throwing, e.g. high jump, javelin, shot-put etc. (Darts is not included and is covered by W04-X01K5C).	
W04-X01K3C	[2011]
Cycling	
Electrical aspects of cycles are covered by X22 codes. Static exercise bicycles are not included and are covered by W04-X01A5A.	
<i>Velodrome</i>	
W04-X01K3E	[2011]
Horseracing	

W04-X01K3G	[2011]
Motor racing	
Electrical aspects of vehicles are covered by X22 codes.	
W04-X01K3J	[2011]
Swimming	
Swimming pools per se are not included (see X25-X06) unless the invention concerns some sports aspect, e.g. related to competition or performance measurement.	
W04-X01K3L	[2011]
Watercraft-based racing and water skiing	
Includes rowing, sailing and power boat racing. Electrical aspects of watercraft are covered by W06-C codes. Skiing on snow, or dry slopes, is covered by W04-X01K3P.	
W04-X01K3N	[2011]
Air sports	
Includes flying, gliding, hang gliding, parachuting etc.	
W04-X01K3P	[2012]
Skiing, snowboarding, curling	
(W04-X01K3X)	
Electrical aspects of skis are also assigned W04-X01E and testing of ski binding release force is also assigned S02-F03A and W04-X01H.	
W04-X01K3X	[2011]
Other racing	
W04-X01K4	[2011]
Combat-based sports	
W04-X01K4A	[2011]
Boxing and martial arts	
Wrestling is covered by W04-X01K4G.	
W04-X01K4C	[2011]
Fencing	
<i>Épée, foil, sabre</i>	
W04-X01K4E	[2011]
Paintball, laser-simulated shooting	
Shooting at targets is covered by W04-X01K5E and at animals for hunting by W04-X01K7C.	
W04-X01K4G	[2011]
Wrestling	
Boxing and martial arts are covered by W04-X01K4A.	

W04-X01K4X	[2011]
Other combat-based sports	
W04-X01K5	[2011]
Archery, darts, shooting	
W04-X01K5A	[2011]
Archery	
Covers shooting at targets using longbow, crossbow, etc. Shooting animals for hunting is covered by W04-X01K7C.	
W04-X01K5C	[2011]
Darts	
Prior to 2011 darts was coded as a sport or as a game (in W04-X02B) depending on emphasis. From 2011 W04-X01K5C will be assigned instead for all aspects of darts.	
W04-X01K5E	[2011]
Shooting	
Covers shooting at e.g. paper targets, or 'clay pigeons'. Simulated shooting at 'war game' opponents using e.g. light beams and paintball shooting is covered by W04-X01K4E. Shooting animals for hunting is covered by W04-X01K7C. Electrical aspects of weapons are covered by W07 codes.	
W04-X01K5X	[2011]
Other sports involving launching projectiles at a target	
W04-X01K7	[2011]
Fishing, hunting	
W04-X01K7A	[2011]
Fishing	
Covers fishing for sport or leisure purposes only, e.g. angling. Commercial fishing is covered by X25-N02.	
W04-X01K7C	[2011]
Hunting	
Includes shooting with e.g. rifle or bow and arrow. The use of these weapons to shoot at targets is covered by W04-X01K5E and W04-X01K5A respectively. Electrical aspects of weapons are covered by W07 codes.	
W04-X01K9	[2011]
Other kinds of sport	
W04-X01X	[1992]
Other sports	
Includes animal training.	
<i>Horse, racing, stable, fishing boat, trolling, water ski, tow</i>	

W04-X02	[1983]
Games	
<i>Play, target, ball, number, score</i>	
W04-X02A	[1983]
Arcade games	
Non-electrical aspects are coded in T05-H codes only, (assuming G07 IPC).	
<i>Motor, token, drive, change, arcade game</i>	
W04-X02A1	[1997]
Pinball and pachinko machines	
<i>Launch, solenoid, trap</i>	
W04-X02A3	[1997]
Amusement-with-prizes gambling machine	
<i>Fruit, symbol, reel, token</i>	
W04-X02A5	[2005]
Games with physical interaction	
<i>Grapple, whack-a-mole</i>	
W04-X02A8	[1997]
Arcade security, management, multimachine control	
Includes overall control, and security aspects (see W02-F01A codes for CCTV, W05-B codes for alarms).	
W04-X02B	[1983]
Board and card game equipment; Dice games	
From 2011 W04-X02B7 is introduced for electrical aspects of dice games and is assigned alone or in addition to W04-X02B1 or W04-X02B5 as necessary if the dice aspect is significant. Dice games with an electrical aspect that are played in a casino are also assigned W04-X02E.	
<i>Electronic card dealing, chess, draughts, roulette, 'battleships'</i>	
W04-X02B1	[1997]
Board games	
<i>Checkers, chess, draughts</i>	
W04-X02B5	[1997]
Card game equipment	
Includes dealing equipment.	
W04-X02B7	[2011]
Dice games	
Includes electrical aspects of dice-based games and electronic representations of dice. Board or card games are covered by W02-X02B1 and W04-X02B5 respectively and W04-X02B7 is only assigned as well as those codes when the dice aspect is novel.	

W04-X02C [1983]

Video games

For 'arcade' game aspect search with W04-X02A. For control of visual display units see T04-H and W03 codes also. For manual control arrangements, such as joystick, see T04-F codes and for computer aspects, including networked games, see T01-J and T01-N codes.

Program, image, memory, memory card, screen, arcade game, home video game, console, controller, sound effect generator, software, computer games, online games

W04-X02E [1997]

Casino games and equipment

W04-X02G [1997]

Betting, Lottery equipment and Bingo

W04-X03 [1983]

Amusements, toys

W04-X03A [1992]

Music based entertainment apparatus

See codes relating to recording/playing equipment where this is involved.

W04-X03A1 [1992]

Juke box

Disk, select, play, sequence

W04-X03A3 [1992]

Karaoke

Sing, perform, screen, cue, lyrics, microphone

W04-X03C [1992]

Ornaments, mobiles, household items, novelties

Includes animated ornaments, musical greetings cards, etc. See also X27.

Dancing flower, motor drive, sound responsive, animated dummy, robot

W04-X03E [1992]

Toys

From 2002 W04-X03E8 is applied to indicate use of remote control. For **novel** remote control aspects W05-D codes are also assigned, e.g. W05-D06A1A and W05-D08C for radio control.

Doll, robot, speech synthesiser

W04-X03E1 [1992]

Model vehicles

Car, train, boat, ship, aircraft, sound generator

W04-X03E1A [2002]

Model aircraft

Includes spacecraft.

W04-X03E1B [2002]

Model boat

W04-X03E1C [2002]

Model wheeled vehicle, e.g. car, truck

W04-X03E1D [2002]

Model racing track

Includes arrangements to drive wheeled vehicles on model road track.

W04-X03E1E [2002]

Model train and train set

W04-X03E1M [2002]

Model vehicle used for commercial or industrial purpose

W04-X03E2 [1992]

Outdoor toys and playing equipment

Includes electrical aspects of skateboards, balls, slides, swings, playground equipment etc.

W04-X03E5 [1997]

Dolls, stuffed toys

W04-X03E6 [2002]

Animated toys

Covers moving toys of a non-humanoid or non-vehicle form. Includes robots and virtual pets.

W04-X03E8 [2002]

Remote control

W04-X03E9 [1992]

Other toys

W04-X03G [1992]

Entertainment venues

Screen, stage, special effects, box office, amusement park, merry-go-round, Ferris wheel

W04-X03G1

Theatre, auditorium, concert equipment

W04-X03G3 [1997]

Fairground, theme parks, etc.

W04-X03G4 [2002]

Disco, night club, bar, restaurant, etc.

Includes personal calling arrangements to facilitate human interaction.

W04-X03G5 [1997]

Cinema equipment

For photographic aspects see S06-B codes also.

W04-X03G7 [2005]

Museums, exhibitions

Prior to 2005 electrical equipment for museums was coded in W04-W09.

W04-X03G8 [2005]

Information provision, guiding devices

Apply in conjunction with other W04-X03G codes.

W04-X03X [1992]

Other amusements

Electronic aid, puzzle solving

W04-Y

Hearing aids

Ear, speech, acoustic, adjust, frequency response, receiver, deaf, implant, transducer, auditory, coil, nerve, medical prosthesis, amplifier, level/tone/bandwidth control, filtering, remote control, construction, casing, battery housing

W04-Y01 [1992]

Constructional details

Includes constructional details of aid per se, and ancillary equipment.

W04-Y01A [1992]

Casing, housing

Includes 'hygiene' arrangements, e.g. to prevent accumulation of cerumen.

W04-Y01A1 [1992]

Arrangements to reduce unwanted coupling

Includes design of housing, acoustic tube, etc. to minimise acoustic feedback. Gain control for this purpose is covered by W04-Y03A1A and feedback or noise reduction in DSP-based hearing aids (from 2014) by W04-Y03G7.

W04-Y01B [1992]

Internal details, e.g. PCB mounting.

Includes disposition of components, etc.

W04-Y02 [1992]

Electroacoustic transducers for hearing aids

This code covers novel details of electroacoustic transducers used in hearing aids, such as microphones and earphones. V06 codes are also assigned as necessary to highlight novel details of the transducer.

W04-Y03 [1992]

Circuitry

W04-Y03A [1992]

Audio amplifier

See U24-G codes for further details of amplifier per se.

W04-Y03A1 [1992]

Gain control

See U24-C codes for control of gain in general.

W04-Y03A1A [1992]

Feedback reducing arrangement

For design of e.g. housing to minimise feedback see W04-Y01A1. Feedback reduction in DSP-based hearing aids is covered (from 2014) by W04-Y03G7.

W04-Y03A3 [1992]

Tone and bandwidth control

From 2005 digital signal processing is covered in W04-Y03G. See W03-C05 codes for audio amplifier control other than for hearing aids, and U25-F codes for bandwidth control in general.

W04-Y03C [1992]

Interfacing arrangements

For systems involving near-field link, such as inductive loop, see W02-C02 codes also especially W02-C02G3A.
Couple, induce, transfer

W04-Y03C1 [1992]

With separate part of hearing aid

Equipment to set-up a hearing aid as a programming exercise by e.g. a technician, is not regarded as part of the hearing aid itself, and thus not coded here - see W04-Y03C5.

W04-Y03C1A [1992]

For signal transfer

Includes transcutaneous transfer of audio information for implanted type aid.

W04-Y03C1C [1992]

For remote control

W04-Y03C5	[1992]
With separate apparatus or system	
This code covers interfacing with separate equipment, e.g. for programming, such as setting-up characteristics by technician, rather than by intended wearer, and also arrangements for operation with e.g. TV receiver, telephone, or across-counter communication system. Prior to 2014 it was also used (with W04-Y20) for programming in a general sense but this topic is now covered by W04-Y03P.	
W04-Y03D	[2006]
Self-testing and diagnostic systems	
W04-Y03E	[1992]
Power supply circuitry	
Includes details of battery per se (see X16 codes also).	
W04-Y03G	[2005]
Digital signal processing	
Analogue filtering and tone control is covered in W04-Y03A3.	
W04-Y03G1	[2005]
Frequency domain manipulation	
Includes digital filtering and use of transforms etc. for frequency shifting portions of the audio spectrum.	
W04-Y03G3	[2005]
Spatial localisation	
Includes use of direction finding algorithms to pinpoint location of speaker and amplify relevant frequencies.	
W04-Y03G5	[2005]
Using digital speech processing	
Covers coding input signal as speech and manipulating parameters to enhance intelligibility. Also coded in W04-V as appropriate.	
W04-Y03G7	[2014]
Noise and feedback suppression	
This code covers arrangements in hearing aids using digital signal processing specifically to suppress or reduce internally-generated noise, external noise, or acoustic feedback. Suppression of acoustic feedback by acoustic design of the hearing aid (e.g. the shape of the housing) is covered by W04-Y01A1 and by gain reduction in analog hearing aids is covered by W04-Y03A1A.	
<i>Background noise, cellphone noise, cellular phone noise, digital filter, howling, Larsen effect, multiplex noise, notch filter, pulse noise, TDMA noise, whistling</i>	

W04-Y03P	[2014]
Hearing aid programming and setting-up	
This code covers programming, e.g. setting-up characteristics by a technician. When interfacing aspects are novel W04-Y03C5 is also assigned. Prior to 2014 W04-Y03C5 and W04-Y20 were assigned for programming aspects in general. When audiometry is involved S05-D01D2 is also assigned.	
<i>Compensate, computer, frequency response, hearing test, PC</i>	
W04-Y05	[1992]
Characterised by type	
Codes in this section are applied irrespective of claimed novelty to indicate the type of hearing aid only.	
W04-Y05A	[1992]
External	
W04-Y05A1	[1992]
Carried within auditory meatus	
Includes 'in-the-ear' type hearing aid.	
W04-Y05A3	[1992]
Carried outside auditory meatus	
Includes e.g. 'behind-the-ear' type.	
W04-Y05A5	[1992]
Combined with other apparatus, e.g. spectacles	
Electrical aspects of spectacles are coded in X27-A02D.	
W04-Y05C	[1992]
Implanted	
See S05-F01 also for implanted hearing aids.	
W04-Y05C1	[1992]
With external apparatus e.g. for control	
Includes e.g. inductive link system transferring signals from external unit.	
W04-Y20	[1992]
Other hearing aid details	

W05: Alarms, Signalling, Telemetry and Telecontrol

This class covers the following topics :

- [1] alerting and personal calling (W05-A codes)
- [2] alarms (W05-B codes);
- [3] monitoring and testing of alerting systems and alarms (W05-C codes);
- [4] remote control and remote monitoring (W05-D codes); and
- [5] general displays and advertising (W05-E codes).

Note that inventions are assigned W05-B codes if they relate to alarms with some 'emergency' or 'urgency' aspect. Condition-responsive signalling arrangements e.g. 'status alarms' which indicate non-hazardous conditions such as incorrect posture, need for diaper changing, a fault condition in a machine etc. are **not** regarded as alarms in the sense of W05-B codes and are covered by W05-A codes instead. When alerting specifically involves audible signalling W05-A02 codes are assigned and if specifically visual signalling is involved W05-A03 codes are assigned. If the type of signalling is not disclosed or is unimportant a general W05-A code is assigned.

W05-A

Signalling and personal calling arrangements

Covers signalling and warning systems characterised by either the means of attracting attention or the transmission medium. For personal alarm or alerting device attached to clothing see X27-A02B1 codes as well as appropriate W05 codes.

W05-A01

Using mechanical, hydraulic, pneumatic, or electric transmission

W05-A01A [1997]

Using mechanical, hydraulic, or pneumatic transmission

W05-A01A1 [1997]

Vibration based annunciator

See also W05-A05C1A for pager application. Mechanical ringers specifically for telephones are assigned W01-C01F1F. See also V06 codes for details of vibration transducers per se e.g. V06-L or V06-M codes, especially V06-M10.

Vibration transmitter

W05-A01C [1997]

Using electric transmission

W05-A01C1 [1997]

Telephone line signalling

For annunciator systems combined with telephone equipment see W01-C05A.

W05-A01C3 [1997]

Power line signalling

Use of power lines to transmit control or measurement signals is covered by W05-D06P. See also W02-C01A3 and X12-H03E for power line communication in general.

W05-A02

With audible alerting

From 2002 this code is subdivided to distinguish novel audible alerting devices from systems **using** audible signalling. For cases in which these aspects cannot be determined W05-A02 will continue to be assigned. Codes relating to applications should be considered also, e.g. doorbells in X27-X also, fire or police vehicle siren in X22-B03 and X22-P10.

Tone generator, oscillator, bell, buzzer, recorded speech, synthesised speech, explosive device

W05-A02A [2002]

Novel audible alerting device

This code is intended for novel audible signal generators themselves. Electroacoustic transducers are assigned V06 codes also.

Tone generator, oscillator, bell, buzzer, recorded speech, synthesised speech, explosive device

W05-A02C [2002]

Alerting system using audible indication

This code is intended for systems characterised by the use of audible alerting in which the means of producing the signal is not novel. For example, it may be used to indicate that a warning system employs audible signalling, the means of producing it being unspecified or unimportant.

W05-A03

With visible indication

From 2002 W05-A03E is assigned with W05-A03A or W05-A03X to indicate that the means of visual signalling is itself novel. W05-A03C is also introduced to highlight alerting aspects using a display. Thus, for example, a paging receiver with some novelty in the use of a display would be assigned W05-A03E and W05-A05C1A.

W05-A03A

Using visible light sources

From 2002 W05-A03C is introduced for display devices and takes precedence over this code for active displays, i.e. self-luminous ones which are covered by W05-A03C1. For passive displays in which e.g. backlighting colour or intensity is used as a means of alerting W05-A03A will be assigned with W05-A03C, the backlighting aspect being conveyed by X26-U04A codes also.

Flashing light, lamp

W05-A03C [2002]

Using display devices

(W05-A03X)

This code takes precedence over other W05-A03 codes and is intended for arrangements using displays, e.g. in matrix or seven-segment form. W05-A03A may be assigned as well where the alerting novelty involves backlighting, in which case W05-E05B codes are also used. Novel displays themselves are also assigned W05-A03E, and codes from other classes as appropriate, e.g. U14-K01 codes for LCDs.

Back-lit display

W05-A03C1 [2002]

Using self-luminous display devices

(W05-A03A, W05-A03X)

This code takes precedence over W05-A03A and is intended for arrangements using displays which are light emitting, e.g. those using an array of LEDs or electroluminescent elements, or a 7-segment LED display. Visual alerting using a light source such as one or more LEDs which are not part of a display that can present variable information is covered by W05-A03A.

W05-A03E [2002]

Novel visual indication device

This code is used with other W05-A03 codes as appropriate to indicate that a visual indicator is itself novel.

W05-A03X

Other visible indication aspects

Includes electromagnetically-operated indicators. From 2002 display-based signalling, e.g. matrix or seven-segment type, is covered by W05-A03C.

Flag, semaphore signal, smoke, chemical dye

W05-A04

With audible and visible indication; Order telegraphs

From 2002 this code is subdivided to separate the above topics.

W05-A04A [2002]

Alerting with audible and visible indication

This code is intended for alerting systems in which audible and visible signalling are used **together**. Arrangements in which these modes are employed separately are covered by W05-A02 and W05-A03 codes.

Simultaneous audible/visible signalling

W05-A04C [2002]

Order telegraphs and menu-based signalling

This code is used for signalling systems in which selection from a number of options is transmitted. It includes 'ship's telegraphs', for which W06-C01B codes are assigned, e.g. W06-C01B7, and also arrangements in e.g. a restaurant for transmitting orders. Where a radio link is involved W05-A05A is also assigned, along with W02 codes as necessary, for novel 'RF' details.

W05-A05 [1983]

Electromagnetic transmission; Pagers

These codes relate to the use of an EM transmission medium to convey an alerting signal, rather than the form of the alerting signal once received. To discriminate this aspect other W05-A codes should be used in conjunction with W05-A05 codes if necessary.

W05-A05A [1992]

Using radio transmission

Includes emergency broadcast receivers, for which W02-G03 or W03-B codes are also assigned, depending on receiver type.

W05-A05B [1992]

Using UV or IR transmission

W05-A05C [1992]

Paging

Systems linked to the telephone network are assigned W01-C05A also. Mobile radio systems in general are covered by W02-C03C codes.

Selective calling, ERMES, FLEX®, MBS, POCSAG, RDS, TAP, TDP, TNPP, WCTP

W05-A05C1 [1992]

Apparatus

W05-A05C1A [2002]

Receiver details

Covers details of the pager itself. Used alone or in conjunction with W05-A05C1C for constructional details. See W02-G03 and W02-C03C codes for RF aspects. Vibrators for silent alerting are also assigned W05-A01A1.

W05-A05C1C [2002]

Constructional details

Constructional details of electronic equipment in general are assigned V04-S or V04-T codes, which are used here in addition as appropriate.

W05-A05C1E [2002]

Paging center details

This code may be used with W05-A05C1C for constructional details. See W02 codes for RF aspects.

Transmitters, aerials, control desks

W05-A05C2 [1992]

System/method

This code is intended to cover a complete paging system e.g. from a mobile radio, protocol, or operating system perspective. For novelty in selective calling search with W01-B05A5 and for radio system details with W02-C03C codes.

W05-A05D [1992]

Tone decoder

W05-A05X [1992]

Other EM signalling aspects

W05-A10 [2013]

Condition-responsive alerting in general

(W05-A)

These codes are intended to indicate arrangements for signaling a condition, e.g. to remind a person to do something or to indicate the state of a machine, including malfunctions. They do not cover conditions involving emergencies, hazards to personal safety, etc. which are covered by W05-B alarm codes. W05-A10 codes may be assigned with other W05-A codes indicating audible or visual signaling if this is important or claimed but the codes can be used alone to indicate non-urgent or non-emergency 'alarm' conditions when the means of alerting is not stated or is unimportant. Other codes outside W05 are also assigned as necessary, e.g. W04 codes for use with educational or sports-related inventions.

W05-A10A [2013]

Alerting relating to human activity or human status

Includes alerting to modify human behavior such as reminding a person to do or not do something and alerting a person to non-urgent conditions such as incontinence detection (see also X27-A02A) or the need for changing a baby (see also X27-X01). Inventions concerned with warning related to personal safety are not included and are covered by W05-B07 codes instead. Note that arrangements for avoiding loss or forgetting of personal items are included but that those intended as theft alarms are not assigned W05-A10A and are covered by W05-B01 codes, e.g. W05-B01A5C.

Bed-wetting detector, computer usage warning, diaper alarm, leaving behind alarm, nappy alarm, posture alarm, reminder alarm, workstation alarm

W05-A10C [2013]

Alerting relating to equipment, machine or vehicle operation and status

Includes warning or indicating operational state, such as fault conditions or the need for maintenance or replenishment of consumable items.

Battery indicator, malfunction, mode, overheat, refill, service indicator, temperature, wear indicator

W05-A10X [2013]

Other general condition-responsive alerting

W05-B

Alarms

Since 1997 this code group has been expanded to cover 'disaster' alarms (W05-B08 codes), including alarms indicating failure in utility systems at source, in the distribution system, or at the point of consumption. Otherwise, condition-responsive circuitry relating to e.g. abnormal state of a machine, electrical equipment, etc. is not included and is coded in the appropriate place for the monitored equipment (See T05-E also) but may also be assigned W05-A codes if the signalling or alerting aspect is significant. From 2005, new code subgroups are introduced for personal safety alarms (W05-B07 codes) and general equipment details of alarm systems (W05-B10 codes).

W05-B01

Burglar/intruder alarms; Scaring thieves

Search with X22-D03 also to distinguish inventions relating to vehicle theft alarms. Antitheft systems for vehicles, or other applications, not including alarms are excluded from W05-B01 codes. Includes alarm aspects of weapons detection (from 2011 also specifically covered by W07-F05C), e.g. at an airport or entrance to a building, for which technology-specific codes are assigned as appropriate, e.g. W05-B01A for detection based on electric or magnetic field systems (also covered by S03-C02 codes and S03-C06).

Personnel presence detection, restricted area monitoring, patient/detainee absconding detection

W05-B01A

Electrical/magnetic field disturbance

Includes actuation by sensed variation of capacitance and inductance, and e.g. Doppler radar systems (see W06-A04A2 also).

Cable, electrodes, coil, antenna, interrogation loop, resonant circuit

W05-B01A1 [1992]

Intrusion detection system

Includes interference with field distribution and proximity sensor(see U21-B02C codes for proximity switch circuits). Includes variation in circuit capacitance or inductance.

W05-B01A2 [1992]

Theft detection system using tags

These codes relate to theft detection systems based on sensing the presence of a tag associated with the item to be protected.

W05-B01A2A [1992]

Ferromagnetic tag

Includes systems using non-linear magnetic properties, e.g. to generate harmonics from an applied magnetic field. For novel magnetic materials V02-A01 codes are also assigned.

W05-B01A2B [1992]

Inductive tag

Includes LC resonant circuits, also coded in U25-E05B1, in arrangements in which energy is 'sucked out' by the tuned circuit causing a detectable drop in field strength. Tags including electrical devices to generate harmonics, e.g. a diode, are regarded as simple transponders, and are thus covered by W05-B01A2C.

W05-B01A2C [1992]

RF transponder tag

See W02-G05A for transponder tags per se. Includes simple arrangements to generate harmonics, e.g. using diodes, for which U23-B01 is also assigned to indicate an analogue frequency multiplier. Transponders based on a passive tuned circuit arrangement **without** any active device to modify the interrogating signal are covered by W05-B01A2B.

W05-B01A2E [1997]

Manufacture of theft detection tag.

This code is used with other W05-B01A2 codes to define the type of tag being manufactured.

W05-B01A5 [1997]

Theft detection and human separation alarms based on signal level or response

The title of this code has been expanded from 2002 to better reflect its coverage of alarm systems triggered by signal falling below threshold or non-response in a transponder interrogation system. This may be applied to the detection of child or elderly person wandering off, or the removal of, or separation from, an object of value. Novel RF details are assigned W02-C03 and W02-G codes as appropriate, e.g. W02-G03J1C for novel radio receiver signal strength determining circuitry.

W05-B01A5A [2002]

Detecting separation of child or supervised person

This code is used either alone, or with W05-B01A5B in the case of transponder-based systems, and may be applied to the monitoring of a single person or a group such as children on a school trip, in which case W04-W codes are also assigned.

W05-B01A5B [2002]

Transponder-based systems

This code is normally used with W05-B01A5A or W05-B01A5C, depending on the nature of the protection involved. Transponder-based systems for determining presence or for recognition in general are covered by W06-A04B codes, e.g. W06-A04B5 codes for object and human identification, and W02-G05 codes. From 2002, these W02 and W06 codes are not normally assigned for protection systems of the W05-B01A5 type unless specific 'RF' novelty is involved. Transponder-based remote measurement and control systems are covered by W05-D08G (from 2002 - formerly W05-D04G).

W05-B01A5C [2002]

Protected object theft detection and separation alarms

This code is used either alone, or with W05-B01A5B in the case of transponder-based systems, and concerns monitoring to determine that an item to be protected is within a desired range of an individual or specified point. Analogous systems for protection of a person or a group of people are covered by W05-B01A5A. Tracking systems for locating luggage in an airport or similar are covered by W06-B02A5.

W05-B01B

Mechanical actuation intrusion or theft alarms

The title of this code has been expanded from 2002 to better reflect its coverage of alarms actuated as a consequence of physical action involving contact, e.g. the opening of a door or window, or the lifting of an article which results in the making or breaking of an electrical circuit. The emphasis is on mechanical contact with the sensing arrangement, thus an arrangement involving an optical fiber in which light transmission is modified by e.g. the weight of an intruder, is regarded as fitting into this category. (W05-B01B1 in the case of intruder sensing).

Loop continuity/attitude detection for shoplifting prevention, pressure mats, reed switches, limit switches, lock tampering detection, incorrect keyed-in password/code detection

W05-B01B1 [2002]

Mechanically-actuated intrusion alarms

Covers intruder and burglar alarms.

W05-B01B2 [2002]

Mechanically-actuated theft alarms

Covers theft alarms triggered by lifting of articles, or similar.

W05-B01C [1987]

Optical, ultrasonic actuation

(W05-B01X)

W05-B01C1 [1992]

Ultrasonic actuation

This code has been subdivided from 2002 to cover separately intruder / burglar alarms and theft alarms. The codes include actuation by interference with sonic waves. See W06-A05 codes also for systems analogous to radar.

Ultrasonic transmitter/receiver, Doppler detector

W05-B01C1A [2002]

Ultrasonically-actuated intrusion alarms

Covers intruder and burglar alarms involving ultrasonic sensing.

W05-B01C1B [2002]

Ultrasonically-actuated theft alarms

Covers theft alarms involving ultrasonic sensing.

W05-B01C2 [1992]

Optically actuated alarm

The scope note of this code has been modified from 2002 to cover intruder / burglar alarms and theft alarms. Arrangements involving 'lidar' techniques are also assigned W06-A06 codes while 'light barrier' aspects are also assigned S03-C08 codes.

Light beam, light barrier, optical transmitter/receiver

W05-B01C2A [2002]

Optically-actuated intrusion alarms

Covers intruder and burglar alarms involving optical sensing.

W05-B01C2B [2002]

Optically-actuated theft alarms

Covers theft alarms involving optical sensing.

W05-B01C5 [1992]

Image scanning and comparing system scanner or motion detection; CCTV

W05-B01C5A [1997]

Image scanning and comparing system scanner or motion detection

See also W02-F01A5 for CCTV surveillance, W04-M01G codes for camera mounting details, and T04-D07D codes for pattern recognition aspects. Novel video signal movement detectors in general are coded in W04-P01A1, used computer image processing aspects in T01-J10B2 codes.

CCTV surveillance automatic alarm actuation

W05-B01C5C [1997]

CCTV triggered upon intruder detection by other means

This code covers alarm systems in which the presence of an intruder is sensed by a detection arrangement distinct from the CCTV system, which then actuates it to enable a protected area to be monitored. See also W02-F01A5 for CCTV surveillance aspects.

W05-B01D [1987]

Scaring thief or attacker and personal defensive alarms

From 2002 this code is subdivided to separately cover arrangements for preventing robbery from e.g. banks, and for personal defence of private individuals, e.g. anti-mugging alarms.

W05-B01D1 [2002]

Scaring thief or attacker

This code covers the use of dyes to stain currency, gas or similar for incapacitation, and arrangements for trapping criminals, e.g. in a bank or cash machine lobby. Other codes which may also be assigned include T05-D codes for entry/exit registers, access control and automatic road blocks, T05-L05A for strongboxes, and T05-L03 codes for ATMs. Anti-mugging alarms for public use are covered by W05-B01D5.

Dye, smoke, trigger

W05-B01D5 [2002]

Personal defence alarms

This code includes arrangements for deterring an assailant and attracting attention, normally using acoustic signalling, for which W05-A02 codes are assigned as appropriate. Arrangements for self defence in a military or law enforcement context are covered by W07-F01A.

Siren, whistle, spray

W05-B01E [2005]

Passive acoustic intrusion detection

(W05-B01X)

Covers sensing of intrusion, e.g. using microphones to detect sound produced. Intruder alarms using e.g. reflection of ultrasonic waves are covered by W05-B01C1A. Acoustic detection of glass breakage for alarm purposes is covered by W05-B01G5.

W05-B01G [1997]

Glass breakage detector

(W05-B01B, W05-B01X)

W05-B01G1 [1997]

Based on electrical 'switching' action

W05-B01G5 [1997]

Based on acoustic signal detection and analysis

W04-V04A7 is also assigned for the acoustic signal analysis aspect from 2002. Passive acoustic sensing of intrusion, not specifically for detection of glass breaking sounds, is covered by W05-B01E.

W05-B01X

Other intruder or theft alarm aspects

Includes apparatus for detecting a change in breathing of criminal, and change in physiological parameters of victims, e.g. pulse rate (see also S05-D01 codes).

W05-B02

Fire alarms

Electrical aspects of fire-fighting systems, e.g. using sprinklers or other extinguishing methods, are coded in X25-X.

W05-B02A

Responsive to smoke or gas

For detectors per se search S03 also. Includes detection of inflammable gas as a fire hazard. Alarms indicating failure in gas supply are assigned W05-B08J.

HV generator, shield

W05-B02A1 [1992]

Using light-emitting and receiving device

Includes optical scattering type, see S03-E04C codes also.

Light source, photodetector

W05-B02A3 [1992]

Using ionisation chamber

See S03-E10 for detector details.

W05-B02A5 [1992]

Detecting specific combustion products e.g. gas, produced by the fire

See appropriate S03 codes for gas analysis. Carbon monoxide alarms are covered by W05-B07L1 as a personal safety alarm, e.g. for detecting a malfunctioning heating appliance. When a fire alarm incorporates the sensing of a build-up of carbon monoxide or some other toxic combustion product, W05-B02A5 and W05-B07L1 may be assigned together.

W05-B02B [1992]

Radiation actuation e.g. from fire

(W05-B02X)

Flame detection for controlled combustion, is covered by X27-G02.

Temp. measurement, thermal trip, fire-type discrimination for automatic fire-fighting system

W05-B02B1 [1992]

Infrared radiation detection

IR radiation detector, photodetector, filter

W05-B02B5 [1992]

Ultra-violet flame detection

Photodetector, filter

W05-B02C [1992]

Mechanically actuated alarm

Covers fire alarm actuation by breaking glass, or conductors.

W05-B02D [1992]

Electric actuation of alarm

Covers fire alarm actuation by thermally-responsive switch, or similar.

W05-B02X

Other fire alarm aspects

W05-B03

Alarms responsive to two or more different conditions

Covers alarm sensor inventions, e.g. an IR sensor responsive to body heat for an intruder alarm and to heat radiation from a fire for a fire alarm, and not connection of a common alarm transducer (e.g. a klaxon, bell, or flashing light) to a number of separate sensors.

W05-B04

Alarms responsive to unspecified condition

W05-B05

Alarms with signalling to central station and alarm signal transmission

These codes includes alarms connected (electrically or by e.g. EM transmission) to a police or fire station, i.e. 'central station' alarms. They describe the transmission medium and mode between any alarm sensor and alarm reproducing transducer. Other W05-B codes are assigned as appropriate where alarms of a specific type are involved, e.g. W05-B01 codes for intruder alarms. From 2008, W05-B05A7 is introduced for 'reverse' transmission, i.e. to highlight novel aspects of alarm signalling from a central station to sensors or alarm substations.

W05-B05A [1992]

Alarm signalling mode

These codes define the mode of communication between sensors and central station. From 2008 the title of this code has been changed to reflect the inclusion of 'reverse' transmission, i.e. to highlight novel aspects of alarm signalling from a central station to sensors or alarm substations, for which W05-B05A7 has been introduced.

W05-B05A1 [1992]

With sensor signalling to central station

W05-B05A5 [1992]

With cyclic interrogation or polling from central station

Polling protocol in data networks is covered by W01-A06F1C and centralised control aspects in general by W01-A06E2A.

W05-B05A7 [2008]

With central station signalling to alarm sensors or substations

This code covers 'reverse' transmission, i.e. alarm signalling from a central station to sensors or alarm substations.

W05-B05B [1992]

Transmission medium

These codes define the medium used for communication between sensors and central station. W01 or W02 codes are also assigned as necessary to highlight particular **novel** aspects from a communications viewpoint, but from 2002, W05-B05B codes are used **without** W01 or W02 codes where there is no specific novelty in the communication system or equipment. **Note that from 2002, transmission via the telephone network (landline and radio) is transferred to W05-B05G and that W05-B05B3 is therefore discontinued.**

W05-B05B1 [1992]

Using power transmission lines

Also assigned W02-C01A3 and in X12-H03 for **novel** aspects of power line transmission. (Prior to 2002, these codes were routinely assigned also)

W05-B05B2 [1992]

Using radio transmission system

See appropriate W02-C03 codes for transmission details. From 2002, W02 codes are only assigned for **novel** aspects. Prior to 2002 mobile telephone networks used for alarm signal transmission were coded for the radio aspect, i.e. W05-B05B2 was assigned. From 2002, where radio systems are part of a **telephone network** W05-B05G5 codes take precedence.

W05-B05B3* [1992-2001]

Using telephone transmission

*This code is now discontinued and from 2002 this subject matter is transferred to W05-B05G1. W05-B05B3 remains valid and searchable for records between 1992 and 2001. Prior to 2002, W01-C05A was routinely assigned also for inventions making use of the telephone network for alarm transmission.

W05-B05B4 [1992]

Using optical link

Includes fiber and free-space links.

W05-B05B5 [2002]

Using internet

(W01-A06B7, W05-B05B3, W05-B05B9)

This code covers the **use** of the internet as an alarm signal transmission medium. As such, 'internet' codes in W01-A06B7 are **not** normally used, unless some novel aspect from a data communications viewpoint is involved. Use of other, e.g. private, data transmission network is covered by W05-B05B6, but note that W05-B05B5 takes precedence over W05-B05B6 for systems involving joint use of internet and other data networks.

W05-B05B6 [2006]

Using data network

This code covers the use of data networks as an alarm signal transmission medium, other than internet-based systems which are covered by W05-B05B5 which takes precedence for use of the internet and systems involving joint use of internet and other data networks e.g. a local area network. W01-A06 codes are also assigned for novel data network aspects.

W05-B05B9 [1992]

Other alarm signal transmission medium

W05-B05G [2002]

Using telephone transmission

This code and its subdivisions cover all aspects of telephone network transmission of alarm signals and from 2002 are used for this topic in place of W05-B05B2 or W05-B05B3 as appropriate. The breakdown of the codes is based on that used for telemetry and telecontrol signal transmission medium, as represented by W05-D06G codes. In the event that an invention concerns both alarm signal transmission **and** telemetry or telecontrol aspects, **W05-D06G** codes will be used in preference. From 2002, pure applications of telephone networks to alarm signal transmission are not covered in W01 (e.g. W01-C05A) or W02, these codes now being used only in cases of genuine 'communications' novelty.

W05-B05G1 [2002]

Landline

(W05-B05B3)

W05-B05G5 [2002]

Radio telephone

(W05-B05B4)

W05-B05G5A [2002]

Cordless telephone transmission

(W05-B05B2)

W05-B05G5C [2002]

Cellular telephone transmission

(W05-B05B2)

This code is intended for cellular systems of the 'TDMA' kind, especially GSM. Alarm signal transmission over UMTS or similar networks is assigned W05-B05B5G, which takes precedence.

W05-B05G5G [2002]

UMTS transmission

(W05-B05B2)

This code is intended for alarm signalling over a 'third generation' or similar network, such as '4G', and takes precedence over W05-B05G5C which is intended for use of cellular systems of the 'TDMA' kind, especially GSM. **Novel** multiple access aspects are highlighted by assignment of W02-K05 codes, especially W02-K05A7 for CDMA, and W02-K07C for OFDM.

W05-B05G5J [2002]

WLL transmission

(W05-B05B2)

This code is intended for alarm signalling over a fixed radio telephone link of 'wireless local loop' or similar type. Novel details of the radio system are highlighted by additional assignment of W02-C03D codes for the 'point-to-point' aspect.

W05-B05G5X [2002]

Other telephone network alarm signal transmission

W05-B07 [2005]

Personal safety alarms

(W05-B09)

Anti-mugging and personal defence alarms are covered by W05-B01D5. Alarms warning of abduction or separation from children based on transponders or received signal level are covered by W05-B01A5A.

W05-B07A [2005]

Industrial worker protection alarm

W05-B07C [2005]

Aged or infirm persons protection alarm

Monitoring of patients in hospital is also assigned S05-G02B codes.

W05-B07E [2005]

Driver or pilot protection alarm

X22-E04 is also assigned for road vehicle driver alertness alarms.

W05-B07G [2005]

Protection alarm triggering condition

These codes are assigned with W05-B07A, W05-B07C, W05-B07E or W05-B07X as appropriate to indicate the condition being sensed, which in general involves measurement or observation of some aspect of the individual or their activity.

W05-B07G1 [2005]

Based on body position or attitude

W05-B07G3 [2005]

Based on lack of activity

Includes detection of an alarm condition directly based on lack of movement or indirectly based on non-use of lighting, water supply, toilet etc.

W05-B07G5 [2005]

Based on medical parameter or medical equipment failure

From 2012 the title of this code has been revised to reflect the previous inclusion of alarms related to the malfunctioning of medical equipment in addition to its original main scope of alarms based on a 'medical parameter' meaning a measurement or observation of some aspect of an individual. These two topics are now covered separately by the subdivisions below, the codes being normally assigned with W05-B07C. S05 codes as also assigned appropriate.

W05-B07G5A [2012]

Alarm based on medical parameter

This code covers alarms triggered by a measurement or observation of some aspect of the individual, e.g. by sensing abnormal cardiac rhythms. S05-D codes are also assigned as appropriate for the condition sensed, e.g. S05-D01A1 for an alarm triggered by ECG measurements. Alarms indicating a problem with equipment used to treat a patient are not included and are covered by W05-B07G5C.

W05-B07G5C [2012]

Alarm based on medical equipment failure

This code covers alarms generated by a malfunction in medical equipment that represents a danger or risk to a patient, such as an alarm indicating a problem with infusion apparatus or a ventilator. S05 codes are also assigned as appropriate for the type of equipment, e.g. S05-J01A for an alarm indicating a problem with an infusion device. Alarms which are triggered by a measurement on the patient themselves are not included and are covered by W05-B07G5A.

W05-B07G9 [2005]

Based on other parameter

W05-B07J [2005]

Accidental falling into water alarm

W05-B07J1 [2005]

Swimming pool alarm

X25-X06 is also assigned for electrical aspects of swimming pools.

W05-B07J3 [2005]

Person overboard alarm

See W06-C01B codes also for details of on-board aspects of ship or boat systems.

W05-B07J9 [2005]

Other accidental falling into water alarm

W05-B07K [2006]

Detecting presence of person in hazardous area

Covers alarms indicating the presence of a person in a hazardous area, (other than in water as covered by W05-B07J codes), e.g. a person fallen onto a railway track (see X23-A09A3 also) or a highway (see T07 codes also). Industrial safety systems in general are covered by X25-X12. For specific details of the detection system, see S03-C06 and other S03-C codes as appropriate.

W05-B07L [2005]

Dangerous gas alarms

Covers detection of the presence of explosive, toxic, or other gases hazardous to life. Smoke detectors are covered by W05-B02A codes.

W05-B07L1 [2005]

Sensing poisonous combustion products

This code is intended for detecting the presence of toxic combustion products, e.g. carbon monoxide, or other dangerous gases. Carbon monoxide alarms in association with combustion monitors for gas heaters and the like are also assigned X27-G02, and those for use with a fire alarm system are also assigned W05-B02A5.

W05-B07N	[2011]
Electrical safety alarm	
This code covers alarms warning of electrical hazards, e.g. using a detector to warn an electrician that power lines, switchgear or other electrical equipment is 'live', or failure of safety measures such as residual current circuit breakers or earthing. To denote industrial applications of electrical safety alarms W05-B07A is also assigned and for inventions specific to the electrical supply industry X12 and X13 codes are also assigned as appropriate, e.g. X12-G01D for power line maintenance. W05-B07N is not assigned for mains supply failure alarms which are covered by W05-B08J codes (i.e. as 'Utility-based alarms').	
<i>Earth current, leakage, live, RCCB, residual current circuit breaker.</i>	
W05-B07X	[2005]
Other personal safety alarm	
W05-B08	[1997]
Disaster, terrorist attack and utility failure warning and alarm systems	
In 2005, the title of this code was expanded to better reflect its coverage. S03-C05 is also assigned for novel aspects of geophysical natural disaster prediction and detection. Emergency broadcast radio receivers are assigned W05-A05A, which may be searched in conjunction with W05-B08 codes as appropriate.	
W05-B08A	[1997]
Earthquake alarm	
W05-B08C	[1997]
Adverse weather-related disaster alarm	
Includes flooding, landslide, avalanche.	
W05-B08G	[2005]
Terrorist attack alarm	
Includes systems, manually or automatically actuated, e.g. for warning of an attack in progress.	
W05-B08J	[1997]
Utility-based alarm	
Covers alarms indicating failure of supply interruption of utilities, e.g. due to adverse weather or faults at the point of generation or consumption.	
W05-B08J1	[2005]
Domestic consumer utility alarm	
Covers alarm at domestic customer premises.	

W05-B08J3	[2005]
Industrial consumer utility alarm	
Covers alarm at industrial customer premises.	
W05-B08J5	[2005]
Commercial consumer utility alarm	
Covers alarm installed on commercial premises, e.g. in a shop or hotel.	
W05-B08J7	[2005]
Utility supply producer alarm	
Covers alarms relating to safety issues and the like affecting plant and distribution systems of a utility provider.	
W05-B08X	[2005]
Other disaster or public information warning and alarm systems	
W05-B09	
Other alarm system details	
See general note for W05-B code group.	
W05-B10	[2005]
General details of alarm systems	
(W05-B09)	
Codes in this subgroup cover equipment details of alarm systems. When specific to a particular alarm type, other W05-B codes are assigned as appropriate.	
W05-B10A	[2005]
Alarm switches	
(W05-B09)	
Novel details of electromechanical switches are covered by V03 codes and electronic switches by U21-B codes.	
W05-B10C	[2005]
Alarm constructional details	
(W05-B09)	
Covers external aspects such as housings and internal details such as PCB mounting. See V04-S and V04-T codes for further details.	
W05-B10E	[2005]
Alarm power supplies	
(W05-B09)	
Power supplies in general are covered by U24 codes, (assuming low-power types), which are also assigned as appropriate to indicate novel aspects.	
W05-B10X	[2005]
Other general alarm system details	
(W05-B09)	

W05-C

Monitoring and testing of signalling or alarm systems

This code group relates to monitoring and testing of equipment and systems covered by W05-A and W05-B.

Redundancy, standby supplies

W05-C01 [1992]

Testing of signalling or alarm systems

Includes checking for power disruptions etc.

Fail-safe

W05-C01A [1992]

Sensor fault

Covers apparatus/system for checking that fault lies within sensor itself. Includes self-testing sensors, (with W05-C01C from 2002).

Sensor checking, faulty sensor identification

W05-C01B [1992]

Line fault

Covers apparatus/system for checking if fault lies within line.

Loop continuity checking

W05-C01C [2002]

Self testing systems

Includes arrangements for testing on switch-on or start-up. Self-testing sensors are also assigned W05-C01A.

W05-C01J [2005]

Detection of tampering with alarm systems

Covers sensing of deliberate tampering or unauthorised access to alarm equipment, e.g. through opening of housing.

W05-C02 [1992]

Monitoring of signalling or alarm systems

From 2009, the scope of this code has been extended to include protection against false alarms, previously covered by W05-C05, and new subdivisions are introduced to distinguish this topic from other 'processing' and hardware aspects.

Alarm condition simulation, alarm acceptance

W05-C02A [2009]

Control desk, indicators, displays and other hardware

This code is intended for hardware aspects of alarm monitoring centers and the like.

W05-C02C [2009]

Alarm interpretation, prediction and false alarm discrimination

This code is intended for control aspects, including software, involved with the determination that an alarm condition exists.

W05-C02C1 [2009]

Alarm interpretation and processing

This code covers arrangements for determining that an alarm condition exists, e.g. based on outputs of several sensors, and extracting relevant data such as time, location, etc. When emphasis is on predicting an alarm condition W05-C02C3 is assigned and when emphasis is on disregarding of false alarms W05-C02C5 codes take precedence.

W05-C02C3 [2009]

Alarm prediction

This code covers arrangements for predicting an alarm condition based on e.g. trend in change of measured values from sensors, etc.

W05-C02C5 [2009]

False alarm prevention

(W05-C05)

This code covers arrangements for preventing or reducing the incidence of false alarms, including compensating for noise or other spurious effects.

W05-C02C5A [2009]

False alarm prevention involving sensor features

(W05-C05)

This code covers arrangements which are **part of the alarm sensor** for preventing or reducing false alarms

W05-C02C5C [2009]

False alarm prevention involving features external to sensors

(W05-C05)

This code covers arrangements which are **external to the alarm sensor** for preventing or reducing false alarms, e.g. by corroborating the output from several sensors.

W05-C03 [1992]

Arming/disarming of alarms

This code covers enabling and disabling of alarms by an authorized person, e.g. by use of an input security code. It includes temporary and permanent disabling of EAS tags at point-of-sale, for which W05-B01A2 codes are also assigned as appropriate.

W05-C05* [1992-2008]

False alarm protection

*This code is now discontinued and from 2009 the topic of false alarm prevention is covered by W05-C02C5 codes to place it in the same hierarchy as alarm interpretation and prediction. W05-C05 remains valid and searchable for records prior to 2009.

W05-D

Transmission systems for measurement or control signals

The codes in this group relate to telemetry and telecontrol systems and specifically inventions concerned with actual measurement or control signal transmission. In 2002 the codes were revised to better distinguish between the concepts of transmission medium (represented by W05-D06 codes), application (W05-D07 codes), and function or mode (covered by W05-D08 codes). The W05-D01, W05-D03 and W05-D04 subgroups used pre-2002 are still valid for records from 1980-2001. W05-D codes are intended to be used in combination to represent particular topics. For example, a wireless sensor network can be represented by W05-D06F1 (use of wireless data networks) with W05-D08E (code indicating remote measurement). Similarly, an infrared link used in a home automation system for remote control is coded as W05-D06A3, W05-D07A and W05-D08C. Note that applications of remote control to audio/video (AV) equipment such as TV receiver remote control (W03-A02C codes), recording equipment remote control (W04-E04A), and general audio-video equipment remote control (W03-G05A codes), are not covered by W05-D codes unless of general application also. In 2018 W05-D06E1 codes were introduced to denote use of the internet as a transmission medium for IoT communication. These codes should also be considered for signal transmission aspects of Industry 4.0 systems, for which W05-D07B (for factory automation applications) is also likely to be relevant.

Remote actuation, control, remote operation, remote monitoring, process-variable transmission systems

W05-D01* [1980-2001]

Digital encoders

*This code is now discontinued. From 2002 W05-D01 and its subdivisions are no longer used, the idea of 'absolute' position encoders being conveyed by a new U21 code, U21-A03J5, with other U21-A03J codes being assigned also to specify the technology used. W05-D01 codes remain valid and searchable for records prior to 2002, and were used for rotary or linear encoders giving unique digital representation of position (see U21-A03 codes also) but not systems determining speed or position by counting pulses generated by movement (covered by S02-G01 codes).

W05-D01A* [1980-2001]

Magnetic or inductive

*This code is now discontinued.

Magnet, magnetic field, winding, coil, resolver

W05-D01B* [1980-2001]

Photoelectric

*This code is now discontinued.

Light source, detector, shield, opaque/transparent sections, step-variable transmission, pattern

W05-D01X* [1980-2001]

Other digital encoders

*This code is now discontinued.

Electrode, brush, wiping contact, contact pattern capacitance

W05-D02

Multiplex systems and multiple access

This code covers multiplexing and multiple-access schemes, especially as used in data networks. To highlight novel aspects of such systems, W01-A and W02-K codes are also assigned as appropriate, e.g. W01-A06F1 codes which highlight access control protocols. Within W05-D, novelty in signal format or protocol other than for multiple access purposes is indicated by assignment of W05-D08J. Prior to 2012 W01-B06 was assigned for selection (i.e. switching) aspects of telemetry and telecontrol systems in addition to relevant W05-D02 codes but from 2012 that code is discontinued and the topic is covered by appropriate W05-D02 codes only.

Cyclic sensor interrogation, sequential monitoring

W05-D02A [2002]

Time division

TDM

W05-D02A1 [2002]

TDMA

W05-D02C [2002]

Frequency division

FDM

W05-D02E [2002]

Spread spectrum

Transmission of measurement and control signals via UMTS is assigned W05-D06G5G, and as an inherent SS system is not assigned W05-D02E codes. Spread spectrum communication in general is assigned W02-K05 codes. For transmission systems for measurement or control W02-K05 codes are only assigned for actual novelty in the spread spectrum aspect.

W05-D02E1	[2002]
Hybrid spread spectrum system	
W05-D02E6	[2002]
Frequency hopping spread spectrum	
W05-D02E7	[2002]
Direct sequence spread spectrum	
<i>CDMA, code division multiple access</i>	
W05-D02E9	[2002]
Other spread spectrum type	
W05-D02J	[2007]
Sensor or actuator addressing	
This code involves addressing for a multiplex or multi-access scheme and may be used alone or with other W05-D02 codes defining the scheme.	
W05-D02X	[2002]
Other multiplex and multiple access systems	
<i>Wavelength division multiplexing, WDM</i>	
W05-D03*	[1980-2001]
Electric signal transmission	
*This code is now discontinued. From 2002 W05-D03 and its subdivisions are no longer used, the subject matter being covered by new subgroups for 'Transmission medium' (W05-D06) and 'Function and mode' (W05-D08). W05-D03 codes remain valid and searchable for records between 1980 and 2001. W05-D06 'medium' codes are assigned on the basis that pure applications with no novelty in the communications are not coded in W01 or W02. Prior to 2002, codes from those classes were routinely assigned in addition to W05-D03 codes.	
W05-D03A*	[1980-2001]
Using pulses	
*This code is now discontinued.	
<i>Digital data transmission, pulse modulator/demodulator, pulse code/width/amplitude/repetition rate/position modulation</i>	
W05-D03B*	[1980-2001]
Using frequency, phase, current or voltage magnitude	
*This code is now discontinued. From 2002 analogue measurement or control signal transmission is indicated by W05-D08A.	
<i>Continuous</i>	

W05-D03C*	[1992-2001]
Telephone line	
*This code is now discontinued. From 2002, telephone line transmission for measurement and control signals is covered by W05-D06G1. Prior to 2002 W01-C05B3E or W01-C05B3F were assigned for all aspects of telephone line transmission in telemetry and telecontrol but from 2002 are only assigned for novelty in the telephone system or equipment.	
<i>Modem, public line</i>	
W05-D03D*	[1992-2001]
Power line	
*This code is now discontinued but prior to 2002 was assigned with W02-C01A3 and X12-H03 codes. From 2002, power line transmission for measurement and control signals is covered by W05-D06P.	
<i>Power line carrier communication, PLCC, mains</i>	
W05-D03E*	[1992-2001]
Wired system; Dedicated wiring	
*This code is now discontinued. See W01-A06 codes for networks e.g. LAN, WAN, etc. From 2002, dedicated wired systems for transmission of measurement and control signals are covered by W05-D06R and the use of data networks by W05-D06F.	
W05-D03X*	[1980-2001]
Other electric signal transmission aspects	
*This code is now discontinued but included inductive systems of e.g. rotary transformer type, with W05-D04. and V02 codes assigned as appropriate. From 2002 these aspects are covered by W05-D06T1.	
<i>Dynamo-electric devices, rotating/stationary part transmission using coils</i>	
W05-D04*	[1980-2001]
Using radio link; Non-electric systems	
*This code is now discontinued. From 2002 W05-D04 and its subdivisions are no longer assigned, the subject matter being covered by new subgroups for 'Transmission medium' (W05-D06) and 'Function and mode' (W05-D08). W05-D04 codes remain valid and searchable for records between 1980 and 2001. W05-D06 'medium' codes are assigned on the basis that pure applications with no novelty in the communications aspect are not coded in W01 or W02. Prior to 2002, codes from those classes were routinely assigned in addition to W05-D04 codes.	

W05-D04A*	[1987-2001]
Radio link	
*This code is now discontinued. From 2002 see W05-D06A1A for radio systems or W05-D06G5 codes for radio telephone systems as appropriate.	
<i>Radio-link remote vehicle locking, garage door opening, radio control of models, robot vehicles etc.</i>	
W05-D04A1*	[1987-2001]
Remote control	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D08C (remote control) with W05-D06A1A for general radio systems or W05-D06G5 codes for radio telephone systems as appropriate.	
<i>Telecontrol</i>	
W05-D04A5*	[1980-2001]
Remote monitoring	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D08E (remote monitoring) with W05-D06A1A for general radio systems or W05-D06G5 codes for radio telephone systems as appropriate.	
<i>Telemetry moving object</i>	
W05-D04B*	[1992-2001]
Optical link	
*This code is now discontinued. See W02-C04 codes for optical transmission in general.	
<i>Light, IR, UV</i>	
W05-D04B1*	[1992-2001]
Optical fiber	
*This code is now discontinued. From 2002 this subject matter is transferred to W05-D06C.	
<i>Fiber-optic</i>	
W05-D04B3*	[1992-2001]
Free space transmission	
*This code is now discontinued. From 2002 this subject matter is transferred to W05-D06A3.	
<i>Line-of-sight link</i>	
W05-D04B5*	[1992-2001]
Remote control	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D08C (remote control) with W05-D06A3 for free space optical systems or W05-D06C for optical fiber-based systems as appropriate.	
<i>Telecontrol</i>	

W05-D04B7*	[1992-2001]
Remote monitoring	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D08E (remote monitoring) with W05-D06A3 for free space optical systems or W05-D06C for optical fiber-based systems as appropriate.	
<i>Telemetry</i>	
W05-D04B9*	[1992-2001]
Other optical system details	
*This code is now discontinued.	
W05-D04C*	[1992-2001]
Ultrasonic link	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D06A5.	
<i>Sound transmission, telemetry, telecontrol</i>	
W05-D04D*	[1992-2001]
Pneumatic, hydraulic, mechanical transmission	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D06M.	
W05-D04D1*	[1992-2001]
Mud-pulse telemetry	
*This code is now discontinued. From 2002, this topic is represented by assignment of W05-D06M1. See also X25-E02A1 for well logging.	
W05-D04G*	[1997-2001]
Using transponders	
*This code is now discontinued. It was used with other W05-D04 codes as appropriate. From 2002, this topic is represented by assignment of W05-D08G. RF transponder systems are also assigned W02-G05 codes.	
W05-D05	
Preventing or correcting errors; Monitoring	
W05-D05A	[1992]
Noise suppression/compensation	
Spread spectrum systems with inherent resistance to interference are covered by W05-D02E codes (or W02-K05 codes prior to 2002), and only assigned W05-D05A when this resistance is part of the novelty.	
<i>Filtering, redundancy</i>	
W05-D05A1	[2002]
Based on error detection or correction	
See U21-A06 for digital signal error detection in general and W01-A01B codes for specific application to data transmission.	

W05-D05B [1992]

Security

This code is intended for novel aspects of remote measurement and remote control systems that relate to security in the sense of preventing or detecting unauthorized access, or other tampering with the system such as a remote locking/unlocking system for a vehicle (see W05-D07D and X22-D01A also). It is **not** intended as a code to indicate 'security' as an application and so is only used for specific aspects relating to **improving** the security of the telemetry or telecontrol system itself.

Access restriction, signal coding

W05-D05B1 [2009]

Security based on use of codes

This code is intended for novel aspects of code-based security in remote control or monitoring systems. The term 'code' is intended to encompass the use of encryption and also generated pseudorandom digital words and digital passwords, but signal coding for error correction purposes is not included, being covered by W05-D05A1. For inventions involving the prevention or detection of interception of transmitted coded signals which are not themselves novel, W05-D05B5 codes take precedence.

W05-D05B5 [2009]

Security based on preventing or detecting interception, malicious software, or unauthorized access

From 2012, the scope of this code has been widened to include arrangements for protecting against malicious software and preventing unauthorized access to a remote control or monitoring systems, e.g. via a network, in addition to its previous coverage of methods or apparatus for the detection and/or prevention of interception and retransmission of control or measurement signals, now covered by W05-D05B5A. W05-D05B5 codes take precedence over W05-D05B1 when coded signal interception or modification is to be avoided but both codes may be assigned together if the form of the coded signals themselves is also novel. Inventions relating to factory automation (FA) systems are also assigned W05-D07B.

W05-D05B5A [2012]

Security based on preventing or detecting interception

This code is intended for security arrangements based on the detection and/or prevention of interception and retransmission of control or measurement signals. Where novel communications aspects are involved other telecommunications codes such as W01-A05L5 are also assigned as appropriate. W05-D05B5C takes precedence over this code for arrangements protecting against modification of software, e.g. by viruses, and W05-D05B5E takes precedence for preventing unauthorized access to a network-based control system.

Eavesdropping, intercept, relay attack

W05-D05B5C [2012]

Security based on protecting against malicious software or modification of control programs.

This code is intended for security arrangements based on the detection and/or protection against malicious software, such as viruses, trojans, worms etc., or other unauthorized modification of control programs. T01-N02B3 is also assigned for malicious software protection. W05-D05B5E takes precedence for protection of network-based control systems against unauthorized access.

W05-D05B5E [2012]

Security based on preventing or detecting unauthorized network access

This code is intended for security arrangements based on the detection and/or prevention of unauthorized access to a networked control system. As such it is likely to be assigned with W05-D06E for remote control or measurement systems connected to the internet or W05-D06F for data network-based systems in general. Control of access to data networks in general is covered by W01-A06E1C and firewall aspects are also assigned T01-N02B1D.

W05-D05B9 [2009]

Other security aspects of remote control or remote monitoring systems

W05-D05C [1992]

Testing/monitoring of system

Includes setting up and commissioning. See W02-C01D codes for line system testing, W02-C04C1 codes for optical system testing, and W02-C05 codes for monitoring of transmission systems in general. S01 codes may also be assigned for specific electrical testing.

Fail-safe, sensor/actuator monitoring, continuity testing, loopback

W05-D06 [2002]

Transmission medium

The codes in this subgroup are intended to allow the transmission medium for remote measurement or control signals to be separately highlighted, and replace the codes previously used which related to media in W05-D03 and W05-D04. To specify telemetry, telecontrol, or mode, W05-D08 codes are assigned as well as appropriate. W01 or W02 codes are also assigned as necessary to highlight particular **novel** aspects from a communications viewpoint, but W05-D06 codes are used **without** W01 or W02 where there is no specific novelty in the communication system or equipment. Note that part of the code structure below (W05-D06G codes in particular) is also used to define telephone network signalling for 'central station' type alarms (W05-B05G codes). In the event that an invention concerns both telemetry or telecontrol **and** alarm signal transmission aspects, **W05-D06G** codes will be used in preference.

W05-D06A [2002]

Non-contact transmission media

(W05-D04)

These codes are intended to include 'wireless' or 'cordless' transmission systems, and thus encompass free-space optical, radio, and similar technologies.

W05-D06A1 [2002]

Radio and near-field

Includes RF or near field systems using electric, or more commonly, magnetic field transfer as used for rotary couplings, 'smart card' or 'tag' type coupling where ends of link can be separated by variable (short) distance.

W05-D06A1A [2002]

Radio

(W05-D04A)

This code is mainly intended for dedicated radio systems - transmission over radio telephone networks is covered by W05-D06G5 codes and transmission over wireless data networks is covered by W05-D06F1, **both of which take precedence over this code**. Radio systems in general are covered by W02-C03 codes, and radio equipment by W02-G codes, which are also assigned for **novel** aspects.

W05-D06A1B [2002]

Near-field

(W02-C02, W05-D03X, W05-D04)

Near-field systems in general are covered by W02-C02 codes, which are also assigned for novel aspects. This code is intended for near-field communication **without** a mechanical connection, i.e. it does **not** include capacitive or inductive couplings, e.g. of rotary type, which are covered by W05-D06T codes.

W05-D06A3 [2002]

Free space optical

(W05-D04B3)

This code covers arrangements for transmitting remote control or measurement signals over a free-space optical path, using infrared, visible, or ultraviolet light. Optical fiber and light guide systems involving a mechanical connection are covered by W05-D06C. Novel optical communication system aspects are represented by W02-C04 codes, especially W02-C04B2 codes for free-space transmission, these being also assigned where application to other systems as well as remote control or monitoring are indicated.

IR, UV

W05-D06A5 [2002]

Sonic or ultrasonic link

This code is primarily intended for transmission of remote monitoring or control signals through air or similar gaseous medium. Systems involving sonic or ultrasonic transmission with a mechanical connection - including transmission through water - are covered by W05-D06M codes. Sonic or ultrasonic communication in general is covered by W02-C07 codes.

W05-D06C [2002]

Optical fiber and light guide system

(W05-D04B1)

This code covers arrangements for transmitting remote control or measurement signals over a fiber-optic path, using infrared, visible, or ultraviolet light. Free space optical transmission is covered by W05-D06A3. **Novel** optical communication system aspects are represented by W02-C04 codes, especially W02-C04B1 codes for fiber-based transmission, these being also assigned where application to other systems as well as remote control or monitoring are indicated.

IR, UV

W05-D06E [2002]

Internet-based transmission

(W01-A06B7)

This code covers the use of the internet as a medium for measurement or control signal transmission, including use in 'internet of things' (IoT) applications. From 2018 specific subdivisions for this topic are introduced (W05-D06E1 codes). W01-A06 (data network) codes are not normally assigned for internet-based remote control and monitoring unless some novel aspect from a data communications viewpoint is involved but T01-N codes may also be assigned for significant computing aspects, especially T01-N01F. The use of data networks other than the internet for telemetry and/or telecontrol signal transmission is covered by W05-D06F codes and use of telephone networks by W05-D06G codes.

Web-based control, web-based monitoring

W05-D06E1 [2018]

Internet-based transmission for IoT communication

This code covers the use of the internet as a measurement or control signal transmission medium specifically for 'internet of things' (IoT) applications. Please note that W05-D06E1 codes are assigned for inventions where some aspect of control or measurement signal transmission is significant and not for all aspects of equipment that may be capable of operating in such a system for which codes for the equipment itself should be used. Additional W05-D06 codes are assigned for significant details such as intermediate arrangements for connecting to the internet but please note that use of wireless data networks is indicated by W05-D06E1A and use of cellular communications networks by W05-D06E1C. Search with W05-D07 codes for specific applications, e.g. with W05-D07A for home automation systems using IoT technology or with W05-D07B for use in factory automation including Industry 4.0 applications.

W05-D06E1A [2018]

Wireless network-based transmission for IoT communication

This code represents the use of wireless networks which form a significant part of IoT systems with the exception of cellular radio networks which are represented by W05-D06E1C. The use of wireless data networks in general for carrying remote control and measurement signals is covered by W05-D06F1.

6LoWPAN, BLE, Bluetooth®, LoRaWAN, Thread, wireless LAN, SigFox, WLAN, Z-wave, Zigbee®

W05-D06E1C [2018]

Cellular network-based transmission for IoT communication

This code represents the use of cellular radio networks as wireless wide-area networks (WANs) for handling remote measurement and control signals for IoT purposes. The use of cellular radio networks for non-IoT remote control and monitoring purposes is covered by W05-D06G5 codes.

5G IoT, CIoT, LTE Cat 0, LTE Cat 1, LTE Cat 3, LTE IoT, LTE-M1, massive IoT, narrow band IoT, NB-IoT

W05-D06F [2005]

Data network-based transmission

This code covers the use of data networks as a transmission medium, other than internet-based systems which are covered by W05-D06E. W01-A06 codes are also assigned for novel data network aspects.

CAN, controller area network, EIB, European installation bus, field bus, FlexRay, KNX, LAN, local area network, profibus, VAN, vehicle area network

W05-D06F1 [2016]

Wireless network

Covers use of a wireless (radio) based data network excluding networks used for internet of things applications which are covered by W05-D06E1 codes. Novel details of data networks are covered by W01-A06 codes. This code takes precedence over W05-D06A1A which covers the use of non-network radio communication for remote control or remote measurement. For wireless sensor networks search with W05-D08E. Radio systems in general are covered by W02-C03 codes and radio equipment by W02-G codes, which are also assigned when these aspects are novel.

Bluetooth®, wireless LAN, WLAN, Zigbee®

W05-D06G [2002]

Telephone

(W01-C05B3E, W01-C05B3F)

In addition to the **previously used** codes indicated below, W01-C05B3E or W01-C05B3F were routinely assigned depending on the remote control or remote monitoring aspect. Where some **novel** aspect of the telephone system itself is involved these W01 codes will also be assigned.

W05-D06G1 [2002]

Landline

(W05-D03C)

W05-D06G5 [2002]

Radio telephone

(W01-B05A1, W02-C03)

W05-D06G5A [2002]

Cordless telephone transmission

(W01-B05A1B, W02-C03C3)

W05-D06G5C [2002]

Cellular telephone transmission

(W01-B05A1A, W02-C03C1)

Use of 3G, 4G, 5G or similar non-TDMA mobile telephone systems is covered by W05-D06G5G, which takes precedence over this code. Novel radio system aspects of cellular networks are represented by W02-C03C1 codes. From 2018 cellular 'internet of things' (CIoT) systems are not coded here and are covered by W05-D06E1C.

W05-D06G5G	[2002]
Third, fourth or fifth-generation mobile phone system	
The title of this code is amended (2018) to better reflect its coverage. Novel radio system aspects of cellular networks are represented by W02-C03C1 codes. This code is intended for measurement or control signaling over a 3G, 4G, 5G or similar network, and takes precedence over W05-D06G5C which is intended for use of cellular systems of the 'TDMA' kind, especially GSM. Significant multiple access aspects are highlighted by assignment of W05-D02 codes, novel aspects of these being assigned W02-K codes also, such as W02-K05A7 for CDMA, and W02-K07C for OFDM. Please note that from 2018 cellular 'internet of things' (CIoT) systems are not coded here and are covered by W05-D06E1C.	
W05-D06G5J	[2002]
WLL and fixed access systems	
(W01-B05A1G, W02-C03D)	
This code is intended for measurement or control signalling over a fixed radio telephone link of 'wireless local loop' or similar type. Novel details of the radio system are highlighted by additional assignment of W02-C03D codes for the 'point-to-point' aspect.	
W05-D06G5X	[2002]
Other telephone network measurement or control signal transmission	
W05-D06M	[2002]
Pneumatic, hydraulic, mechanical	
This code covers the transmission of measurement or control signals through water or other liquids. Systems involving sonic or ultrasonic transmission without a mechanical connection, e.g. via the air, are covered by W05-D06A5.	
W05-D06M1	[2002]
Mud pulse telemetry	
W05-D06P	[2002]
Power line communication	
(W05-D03D)	
W05-D06R	[2002]
Dedicated wired system	
(W05-D03E)	
This code is intended for electric signal transmission over wires specifically installed for the purpose. Fiber-optic systems of this type are covered by W05-D06C.	

W05-D06T	[2002]
Inductive or capacitive coupling	
(W05-D03X, W05-D04)	
These codes are intended for mechanically-associated inductive or capacitive coupling, e.g. of rotary type between fixed and moving parts of a machine. Arrangements using near-field transmission without mechanical association, i.e. in a 'cordless' sense, are covered by W05-D06A1B.	
W05-D06T1	[2002]
Inductive coupling	
(W05-D03X, W05-D04)	
Search with V02 codes for specific novel aspects, e.g. V02-F02D for rotary transformers.	
W05-D06T5	[2002]
Capacitive coupling	
(W05-D03X, W05-D04)	
W05-D06X	[2002]
Other medium	
W05-D07	[1992]
Transmission of control or measurement signals for specific systems	
These codes are intended to highlight application and are used with other W05-D codes as appropriate for details of e.g. transmission mode or medium.	
W05-D07A	[1992]
For home automation	
includes home bus systems. See also X27-V for home automation.	
<i>Heating, ventilating, air conditioning, water heater, lighting, intelligent home</i>	
W05-D07B	[1992]
For factory automation	
This code covers transmission of measurement and control signals for factory automation applications. When internet-of-things (IoT) aspects are significant, e.g. in connection with Industry 4.0 data communications, W05-D06E1 codes are also assigned. Control systems-related data communications arrangements in general are also assigned T06-A11. Total factory control in general is covered by T06-A04A2A when based on numerical control and for non-NC systems by T06-A04B7.	
<i>Cyber-physical systems, digital manufacturing, FA, fieldbus, IEC 61158, inventory, process control, process monitoring, production line, smart factory, total factory control</i>	

W05-D07C [1992]

For building control

Includes systems for intelligent buildings.

HVAC, heating, ventilating, air conditioning, environment control, computer, sensor interrogation, alarm

W05-D07D [1992]

For vehicles

This application code is assigned for remote measurement and/or control of any vehicle equipment or systems. Codes relating to the specific type of vehicle and on-board equipment or system should also be searched. See also X21, X22 and X23 for land vehicles and W06 for aircraft, space vehicles or marine craft. Search with W05-D02 codes for multiplex systems and with W05-D06F for data network aspects (e.g. CAN bus).

W05-D07E [1997]

For office automation

See S06 section for printer, facsimile and photocopier.

W05-D07F [1997]

For power generation and distribution

Includes power plant and systems control. See also X12-H codes.

W05-D07G [1997]

For utility meters i.e. electricity, gas, water

See also S01-B01 and X12-H04A for remote reading of electricity meters, and S02-K08A for remote meter reading in general.

W05-D07H [2006]

For earth drilling and well logging

(W05-D07X)

Prior to 2006 this topic was covered by W05-D07X. For mud pulse telemetry W05-D06M1 and W05-D08E are also assigned. See S03-C codes and X25-E02 codes for well logging in general, and class H01 for all aspects of oil and gas production.

W05-D07M [2011]

For medical systems and equipment

S05 codes are also assigned to indicate specific details.

W05-D07N [2018]

For agricultural systems and equipment; Farming

This code covers applications of remote measurement and control to agriculture and farming, including livestock aspects. X25-N codes are also assigned and should be included in searches for specific topics, e.g. X25-N01B for control or monitoring of irrigation and X25-N02A for animal feeding.

Automatic feeder, culture, fertilizing, harvesting, greenhouse, hen-house, milking, soil erosion

W05-D07P [2022]

Scientific analysis systems

Includes control or measurement signalling, for application systems such as weather measuring equipment, pollution level measurement, Chemical reaction or hazardous substance measurement, radiation measurement etc.

Pollution, weather, chemical reactions

W05-D07X [1992]

Other application of telemetry and telecontrol systems

From 2006 oil rig and drilling applications are transferred to W05-D07H.

W05-D08 [2002]

Function and mode

These codes are intended to indicate, irrespective of transmission medium or application (respectively conveyed by use of W05-D06 and W05-D07 codes) the purpose of the system in terms of remote control or remote monitoring. They are also used to flag an analogue system, on the basis that the majority of inventions are likely to relate to switching or digital transmission, signal format and that transponders are involved.

W05-D08A [2002]

Analogue system

W05-D08C [2002]

Remote control

Prior to 2002, see W05-D04A1 for radio-based remote control and W05-D04B5 for optical systems.

W05-D08C1 [2002]

Remote control and monitoring

This code takes precedence over W05-D08E when transmission of telecontrol **and** telemetry signals are involved.

W05-D08E [2002]

Remote monitoring

For systems involving transmission of both telecontrol and telemetry signals, W05-D08C1 takes precedence over W05-D08E. For sensor networks search with W05-D06F codes, e.g. W05-D06F1 is assigned with W05-D08E to denote wireless sensor networks. (Prior to 2016 see W05-D06F and W05-D08E).

W05-D08G

[2002]

Using transponders

(W05-D04G)

RF transponder-based systems in general are assigned W02-G05 codes, which are also used here for **novel** aspects of radio-based systems. Transponder systems for identification purposes are assigned W06-A04B for radio signal systems, W06-A05B for sonar-type systems, and W06-A06B for optical systems.

W05-D08J

[2002]

Novel signal format or protocol

This code is intended to highlight that the nature of signals used in a telemetry or telecontrol system is novel in some way. These aspects could include novelty in waveforms, voltage levels, modulation, protocols or the like, and are further highlighted by the assignment of codes in e.g. U21 or W01 as appropriate where their use conveys additional information. Systems involving multiplex and multiple access schemes are covered by W05-D02 codes, and signal coding for security by W05-D05B1. W05-D08J will not normally be assigned for these cases unless a specific signal format or protocol novelty exists.

W05-D08L

[2005]

'Learning' and 'universal' type remote controllers

(W05-D08X)

Covers remote controls capable of controlling different equipment types, e.g. after 'training' in signal format. Remote controllers for general audio or video entertainment systems with this property are covered by W03-G05A1A.

W05-D08N

[2005]

Constructional details of telemetry / telecontrol equipment

(W05-D08X)

Covers external aspects such as housings and internal details such as PCB mounting. See V04-S and V04-T codes for further details.

W05-D08P

[2009]

Power supply for telemetry / telecontrol equipment

(W05-D08X)

This code covers power supplies specifically for remote measurement or remote control systems. Novel details of power supplies are also assigned relevant codes in U24, e.g. U24-D and U24-E codes.

W05-D08R

[2009]

Repeaters and extenders for remote control and remote monitoring

(W05-D08X)

This code covers arrangements for extending the range of remote control or remote monitoring systems, including devices such as 'remote control extenders', usually based on repeaters. Novel aspects of repeaters are also assigned codes depending on technology, e.g. W02-C04A5 for optical repeaters and W02-G05C for radio types. W05-D08R is intended for arrangements permitting increased separation between e.g. controller and controlled device. Modifications to codes or command sets to increase the scope of the controlled functions and the like are **not** included, being covered by W05-D08J. Remote control extenders specifically for use with AV equipment are covered by W03-G05A8.

W05-D08X

[2002]

Other function or mode aspects

W05-D09

Other transmission systems for measurement or control signals

This code covers systems for transmitting or receiving remote control or remote measurement signals not fitting into any other W05-D subdivision code.

W05-E

Display arrangements

W05-E codes include, in general, display aspects not catered for elsewhere and for specific applications and device technology relevant codes in other classes should be considered, such as T04 codes for computer monitors and W03 codes for television displays. However, note that from 2007, certain W03-A codes (nominally for TV receivers) are used in a general sense for application to displays capable of presenting video information. (See the note at the start of W03 class for further details). Therefore, those searching with W05-E codes are advised to also consider use of W03-A codes for equipment capable of video display where that aspect is significant. From 2007 W05-E10 is introduced for 'electronic paper'.

W05-E01

Forming character by selecting elements

Includes seven-segment types.

Matrix, row, column

W05-E01A

Drive circuitry

Addressing, row/column/segment selection, decoder, driver, switching

W05-E01B

Element arrangements

Matrix, cell, alphanumeric display, filament, lamp, gas discharge, fluorescent, LED, LCD, Shutter, flap, electromagnetic actuator

W05-E02

Arrays or layers of characters

Includes displays where characters are permanently fixed to e.g. moving band, or selectively uncovered, back-lit, etc.

Moving drum, disc, band, motor drive

W05-E03

Advertising displays and systems

This code covers displays used for advertising and similar commercial purposes (in W05-E03A codes), e.g. building signs with company logos and the like, and also advertising via other media such as TV broadcasts and the internet, provided that some visual aspect is involved. These codes may be used alone, or in conjunction with W05-E01 to W05-E05 codes. Signs for indicating emergency exits and the like in buildings are not assigned W05-E03 codes and are covered by W05-A03 codes and other W05-E codes as appropriate.

Lighting control, sequencer, discharge tube, incandescent lamp, LED, animated mobile, rotating display

W05-E03A

Advertising displays

These codes are assigned when some novelty in the actual means of presentation itself, is involved.

W05-E03A1 [2002]

Static illuminated signs and billboards

W05-E03A3 [2002]

Signs and billboards with moving parts

Covers arrangements for bringing a different advertisement into view and for moving part of an advertisement, e.g. animation.

W05-E03A5 [2002]

Addressable or switchable advertising displays

These codes cover displays, generally using switched light sources or addressable back-lit elements, without physical movement of the display itself being involved. Codes specific to the display technology or elements involved are assigned as necessary from e.g. U12, U14, V05, or X26.

W05-E03A5A [2002]

With separately controllable or addressable display elements

This code covers displays with some electrically controllable or addressable aspect, e.g. to allow the appearance of limited movement of a portion of the display. W05-E05A5C takes precedence for matrix-type displays of video type in which there is no restriction on the information presented.

W05-E03A5C [2002]

Novel matrix-type display for advertising

This code takes precedence over W05-E03A5A and covers novel aspects of displays of video or analogous type allowing all display points in a matrix to be addressed as desired.

W05-E03A5E [2002]

Video advertising using standard display

This code includes the use of standard video terminals, of 'TV set' or 'VDU' type arranged to present advertising messages, e.g. to persons in a queue or similar situation in a public area.

W05-E03A6 [2014]

Advertising displays including additional information aspect

This code and its subdivisions cover display arrangements or signs for advertising or similar commercial purpose which include an additional, non-visual aspect.

W05-E03A6A [2014]

Advertising displays including audio aspects

This code covers display arrangements, billboards, or signs for advertising or similar commercial purpose which include an audio aspect, e.g. using recordings. See also W04-E30A3 for audio players in general. W05-E03A6A is not assigned for advertising using standard video displays, as covered by W05-E03A5E which are normally expected to include an audio aspect. Audible advertising without any visual element is covered (from 2014) by W05-F.

W05-E03A6X [2014]

Advertising displays including other additional information aspect

W05-E03A7 [2002]

Advertising displays involving synchronisation with movement of an observer

This code includes arrangements for presenting sequences of video or film type images so as to be viewable by an observer in a vehicle, e.g. a passenger on a train. Systems based on cine film or analogous methods are also assigned S06-B codes (e.g. S06-B05), and those using video projection are also assigned W04-Q01 codes.

W05-E03A9 [2002]

Other advertising display aspects

W05-E03C [2002]

TV advertising

This code covers novel aspects of the creation and transmission of television advertising. For systems checking that commercial messages are actually transmitted, e.g. at a designated time, see W02-F04C5.

W05-E03E [2002]

Internet advertising

Novel aspects of internet communication are covered by W01-A06B7 codes as appropriate, and internet advertising applications in general by T01-N01A2C.

W05-E03G [2002]

Telephone network advertising

This code covers text-based and similar systems involving visual presentation, and does **not** include purely audio messages.

W05-E03M [2015]

Mobile Advertising

Includes advertising mounted on, or carried by vehicles and portable advertising displays and devices.

Advertising

W05-E05 [1987]

General display details

W05-E05 codes may be used alone, in conjunction with other W05-E codes or to highlight display aspects in conjunction with other classes. Note that from 2007, provision has been made to use W03-A codes (nominally for TV receivers) in a wider sense for displays capable of presenting video, thus the use of W03-A codes in a search in addition to W05-E05 codes should be considered for such displays.

W05-E05A [1987]

Filters

From 2007, filters specifically for video displays are covered by W03-A08E1. W05-E05A will continue to be assigned to general or non-video cases.

Polarizer, anti-glare filter, diffuser, lens, fiber-optic

W05-E05B* [1987-2006]

Back lighting and analogous systems

*This code is now discontinued. From 2007, the topics of back and edge lighting for displays are covered by new X26 codes, X26-U04A and its subdivisions, which are used in conjunction with other X26-D codes as appropriate. W05-E05B codes remain valid and searchable for records prior to 2007, and covered back and edge lighting of displays, especially LCDs, in which U14-K01A4C is also assigned, but also the lighting of any translucent or transparent information source, such as advertisements, also assigned W05-E03A1. Note that back lighting or similar for computer monitors or telephone displays was not included, being covered by T04-H03D and W01-C01A2A respectively. X26 codes were also assigned as appropriate for light sources and optical components for illumination.

Passive display, liquid crystal display module, illumination, lamp, light fitting

W05-E05B1* [2002-2006]

Back lighting

*This code is now discontinued.

W05-E05B3* [2002-2006]

Edge lighting

*This code is now discontinued.

W05-E05B5* [2002-2006]

Diffusers and light source filters

*This code is now discontinued. X26-D01E1 is assigned for diffusers and X26-D01C for filters.

W05-E05B6* [2005-2006]

Light guide

*This code is now discontinued. X26-D01F is assigned for this topic.

W05-E05B7* [2002-2006]

Novel light sources

*This code is now discontinued but was normally used with a code specific to the light source itself, e.g. in X26.

W05-E05B9* [2002-2006]

Other back lighting and analogous system details

*This code is now discontinued.

W05-E05C [1987]

Composite display i.e. made up of several individual displays

Multiple CRT, discharge tube, matrix display, large screen, sports ground, stock market, truck-mounted display, passenger information, video wall

W05-E05F [2020]

Flexible/foldable/bendable displays

Includes the structural details of flexible or foldable displays as used in mobile phones and other portable display devices. See also U14 for liquid crystal and electroluminescent displays, and U12 for light emitting diode (LED) displays.

W05-E05G [2006]

General constructional details

This code is used with other W05-E codes or alone, as appropriate. It is not assigned for single applications covered elsewhere, such as for construction of a TV set display. From 2007, constructional details specific to video displays are covered by W03-A09 codes. W05-E05G will continue to be assigned to general or non-video cases.

W05-E07 [1997]

Head-mounted display

This code is used for general or unspecified applications only, and not when a specific code exists elsewhere. Head mounted displays specifically for TV receiver and similar applications are coded in W03-A08E7, and for virtual reality in W04-W07E1A.

W05-E08 [2002]

Display technologies not covered elsewhere

This code is intended for electrical displays not covered elsewhere, and is normally used with codes from other sections as appropriate, e.g. with S06-A codes for electrophotographic displays. Specific display technologies such as EL, LED, LCD, PDP, CRT are not included, and are covered in U12, U14, or V05 as appropriate. Novel technology aspects of electronic paper which cannot be coded elsewhere are covered here, and from 2007 W05-E10 is also assigned.

W05-E10 [2007]

Electronic paper

This code is intended as a general reference for 'electronic paper', interpreted as the use of mainly flexible electronic displays to provide a re-writable medium for presenting information in a form resembling normal printed matter, no power supply being required once data is written. Novel technology aspects will continue to be covered in e.g. U14 codes or in W05-E08.

W05-F [2014]

Audible advertising

This code covers advertising involving audible communication only. Advertising involving audible and visual aspects is not included and is covered by W05-E03A5E for video advertising using a standard display, W05-E03A6A for other visual advertising displays that include audible information and in W05-E03C for TV advertising. W05-F includes audible advertising via the telephone network which is also assigned W01-C05B5G.

Audio Advertisement

W06: Aviation, Marine and Radar Systems

W06-A

Radar, navigation, etc.

Includes analogous systems where principles are applicable to radar, sonar, etc. See also under application, e.g. for aircraft and ships where systems are specific.

W06-A01

Beacon systems

Includes aerials, receivers and transmitters, but see W02-B and W02-G codes also for specific features of RF systems.

W06-A01A [1992]

Fixed beacon providing navigational reference

From 1992, airport/landing strip systems are also coded in W06-B02E.

Hyperbolic, Loran-C, Omega, aircraft landing aid, ILS, microwave landing system, MLS, optical, sonic, ultrasonic system

W06-A01C [1992]

Portable or vehicle-borne beacon for location

Survival craft, liferaft, distress

W06-A02

Direction finders

Bearing measurement, incident radiation angle measurement, DF

W06-A02A

Using radio waves

Antenna direction pattern changing is also covered by W02-B06 codes.

RDF, rotary antenna, antenna array, electronic beam steering, phase comparison, tracking

W06-A02A1 [1992]

Automatic direction finder

Includes systems resolving relative phases of signals from different antennae.

W06-A02C [1992]

Using light

(W06-A02X)

IR, UV, visible, light source location

W06-A02C1 [1992]

Tracking object with electronic imaging

See T04-D codes also, e.g. T04-D07D for detecting movement or position. Includes warehouse monitoring aspects.

Pattern recognition

W06-A02E [1992]

Using sonic or ultrasonic waves

Sound source location, gunfire location

W06-A02X

Other

Nuclear radiation, Geiger counter

W06-A03

Position fixing

Use with W06-A02 codes if direction finding aspect is present.

Multiple direction finding

W06-A03A [1992]

Satellite based system e.g. GPS

See W02-K05 codes for pseudonoise aspects.

Global positioning system, NAVSTAR, coarse, fine, secure, military

W06-A03A1 [1997]

Novel aspects of GPS

Includes novel details concerning the overall GPS infrastructure. Novel GPS receivers are not included here and are coded in W06-A03A5R.

Infrastructure

W06-A03A5 [1997]

GPS applications

Includes **use** of GPS information without necessarily any novel aspect of GPS per se.

W06-A03A5A [2002]

Differential and assisted GPS

Includes systems using ground based transmitter of known accurate position to correct for GPS timing errors, e.g. due to ionospheric conditions, to provide more accurate positioning. Also includes use of pseudolites that transmit GPS format signals when line of sight to sufficient orbiting GPS satellites is restricted.

W06-A03A5C [2002]

Absolute position determination

Includes use of GPS purely as a navigation tool.

W06-A03A5E [2002]

Position determination for secondary purpose

Includes use of GPS position information for control of e.g. setting up of television channels, local information services accessing, etc., without necessarily presenting the geographical information to the equipment user.

W06-A03A5G [2002]

Use of GPS as a time standard

Includes use of GPS timing information, e.g. for time-stamping transmitted data.

W06-A03A5J [2002]

Use of GPS as a frequency standard

W06-A03A5M [2007]

GPS Jamming/anti-jamming

Includes arrangements for protecting GPS receiver from radio frequency (RF) interference to prevent GPS receiver code and carrier tracking from being effected, resulting in poor navigation performance, e.g. in weapons fire and control systems (see also W07 codes). See W02-L01 codes instead for jamming/anti-jamming of (non-GPS) communications in general.

W06-A03A5R [2002]

Novel GPS receiver

Includes novel hand-held or vehicle-borne GPS receiver. This code is normally applied when there is some novelty in the receiver construction itself such as a novel housing or display. For general use of a GPS receiver for position fixing, see W06-A03A5C instead. W02-G03 codes (for communications receivers) are also assigned as appropriate.

W06-A03A5X [2002]

Other GPS applications

W06-A03B [2005]

Using radio waves

Includes the use of a number of radio receivers to determine the position of a transmitted radio signal, e.g. by triangulation, and also determination of own position based on reception of broadcast signals, or other transmissions, from known locations. The use of dedicated beacons transmitting special signals is covered by W06-A01A.

Base station, cell site, cellular, radio station, time-of-arrival, TOA, TV station

W06-A03D [2005]

Using light waves

W06-A03F [2005]

Using sonic or ultrasonic waves

Includes use of omni-directional hydrophones to determine sound source location. See also W02-C07C for hydrophones per se

W06-A04

Radar systems

W06-A04A

Primary radar systems

Includes primary or passive target radar systems where a radar/radio signal is transmitted towards a target and the reflected signal is detected.

Non-cooperating/passive target systems

W06-A04A1

Determining target position

Includes radar based rangefinding (see also S02-B01) and position determination.

Monopulse, distance, height measurement, tracking system, aircraft radio altimeter, level sensing, ground penetrating radar

W06-A04A2

Using relative movement

Clutter suppression is covered by W06-A04E5. For Doppler intruder detector see W05-B01A codes also.

Frequency measurement, target discrimination/classification, MTI, velocity measurement, clutter suppression

W06-A04B

Secondary radar systems

Includes secondary or active radar systems where a radar/radio signal is transmitted towards a target and then a reply signal is actively re-transmitted by the target back towards the originating transmitter/receiver. From 1997 remote reading of e.g. meters, etc., is excluded - see W05-D08G, W05-D08E and W05-D07G codes. All RFID transponder details and interrogation systems are also covered by T04-K codes, such as T04-K03B for novel RFID tags and T04-K02 codes for reading and writing aspects. See also W02-G05 codes for novel RF details such as antenna (W06-A04G7 also), associated with RFID systems. Analogous systems using other than radio waves are coded in the appropriate sections: e.g. W06-A05B codes for sonic/ultrasonic systems, and W06-A06B codes for light based systems.

Interrogation, response, reply, ID, code, sequence, security

W06-A04B1 [1992]

For vehicle or aircraft identification

Includes radio frequency identification of vehicles and aircraft or parts of them, e.g. identification of tyres on a motor vehicle so that a specific deflated tyre can be identified. Also see T04-K03B for RFID transponders per se and T04-K02 codes for reading/writing aspects. See also W02-G05 codes for novel radio/RF details of RF transponders/tags such as antennae. See also W06-A04H1 for anticollision radar and W06-A04H7 for aircraft control aspects. Aircraft on-board navigation systems are also coded in W06-B01B1.

RFID, transponder, IFF, identification of friend or foe, air traffic control, ATC, flight identification

W06-A04B3 [1992]

Security and coding aspects

Includes coding to prevent errors, suppress interference, or for military security.

Squawk

W06-A04B5 [1992]

For object identification

Includes analogous industrial systems for monitoring livestock, people, workpieces, etc.

W06-A04B5A [2002]

Animals and livestock

Includes monitoring of livestock, pets and other animals. See also X25-N02 for monitoring livestock. See also X27-H03 for RF transponders used in pet access control collars and pet monitoring.

Dog, cat, pet, cattle, cow, sheep, horse, pig

W06-A04B5C [2002]

People

For monitoring and identifying people. Also includes monitoring of passport, business cards ID.

W06-A04B5E [2002]

Workpieces

For monitoring industrial workpieces such as bottles on production line. See also T05-G02B1A for systems interrogating transponders attached to workpieces.

W06-A04B5G [2007]

Goods/cargo

Includes monitoring or identifying of goods or cargo, e.g. during shipment/transportation. See also X25-F11 for tracking of goods in e.g. warehouse. See also T04-K03B for transponder tags/labels, T04-K02 for reading and writing aspects, and T01-N01A2E for Internet based tracking. Also see W02-G05 codes for novel RF aspects of transponder tags/interrogation. Monitoring/identifying of goods/articles during their manufacture is covered by W06-A04B5E and T05-G02B1A instead.

Cold chain, logistics

W06-A04B7 [2005]

Using different response medium

Includes secondary radar systems where transmitted and received signals take different forms, for example, when the transmitted signal is radio but the re-radiated signal received is e.g. acoustic.

W06-A04C

Display arrangements

Cathode ray tube, CRT, LCD, liquid crystal, solid-state, PPI, sector, Cartesian, selective brightening, electronic cursor, character generator, MTI

W06-A04D

Pulse system details

See U22 for pulse generation and processing in general. TR switching is coded in W06-A04G5 also. Continuous wave radar systems are covered by W06-A04F.

Pulse generator, pulse shaping

W06-A04D1 [1992]

Pulse generators

W06-A04D3 [1992]

Pulse compression, 'chirping'

W06-A04E

**Jamming; Anti-jamming; Monitoring;
Transforming co-ordinates; Processing**

Codes in this section are used for signal processing aspects of radar systems, either alone or with other codes in W06-A04 as appropriate.

W06-A04E1 [1987]

Jamming; Anti-jamming, including 'passive' systems

Includes e.g. 'passive' chaff systems. Jamming/anti-jamming in general is covered by W02-L codes. Passive reflectors and absorbers are coded in W02-B03 codes also. Signature modification and camouflage aspects, such as radar absorbing coating on aircraft, are coded in W06-A04X only (and in W07-F codes as appropriate).

Noise generator, pulse insertion, window dispersion system, steerable antenna, nulling, notching, cancelling, EW, electronic warfare

W06-A04E1A [1992]

Jamming of radar

Includes electronic countermeasures for 'actively' jamming a radar signal. Passive countermeasures are coded in W06-A04E1 only.

W06-A04E1C [1992]

Anti-jamming and countermeasures to jamming

Includes systems for overcoming an enemy's attempts to actively jam radar signal. Noise and clutter suppression in general is covered by W06-A04E5.

W06-A04E3 [1987]

Monitoring, testing, transforming coordinates

W06-A04E3A [1992]

Monitoring, testing, target simulation, calibration

Includes operator training.

Maintenance, repair, fault, monitor

W06-A04E3C [1992]

Detecting existence, type, or position of radar

Hostile radar monitoring, police speed trap warning receiver, instantaneous frequency measurement receiver, IFM

W06-A04E3E [1992]

Coordinate transformation

Display systems per se are covered by W06-A04C. Video standards conversion in general is covered by W04-N05A.

Cartesian, polar

W06-A04E5 [1987]

Noise/clutter suppression

Moving target discrimination in general is covered by W06-A04A2. Suppression of deliberate interference for anti-jamming is covered by W06-A04E1C. See W06-A04E9 also for correlation signal processing. Noise reduction for receivers in general is covered by W02-G03B codes.

Signal-to-noise ratio improvement, S-N, SNR, velocity discrimination, anti-clutter gain control, ACG, selective blanking, Constant false alarm rate, CFAR

W06-A04E9 [1987]

Other jamming; Anti-jamming; Monitoring; Transforming co-ordinates and processing aspects

Includes transformation and correlation processing. See T01-J04B1 for FFT and T01-J04B2 for data processing implementations of correlators.

Signal processing, angle correction, motion compensation, convolution

W06-A04F [1992]

Continuous wave radar

See U23-A codes for oscillators per se and U23-D codes for phase/frequency control.

CW, carrier, oscillator, FM, ramp, STALO, feedback, linearise

W06-A04G [1992]

General details of radar equipment

Codes in this section are used alone or with other W06-A04 codes as appropriate.

W06-A04G1 [1992]

Transmitter circuitry

Transmitters in general are covered by W02-G01 codes.

W06-A04G3 [1992]

Receiver circuitry

Receivers in general are covered by W02-G03 codes.

W06-A04G5 [1992]

Transmit/receive switching

See also W06-A04D for pulse system aspects. Gas filled switching tubes are covered by V05-A03, electronic switching in general by U21-B codes.

TR

W06-A04G7 [1992]

Antennae and antenna control

See W02-B codes for details of antenna systems.

Beam steering, phased array, active array, scanning, rotary mount, motor drive

W06-A04G9 [1992]

Other radar equipment details

W06-A04H [1992]

Radar systems and applications

Codes in this section are used with other W06-A04 codes or alone, as appropriate.

W06-A04H1 [1992]

Vehicle applications

From 2005 radar anticollision systems have been transferred to W06-A04H1K. Prior to 2005, anticollision systems remain searchable in W06-A04H1.

W06-A04H1A [2005]

Land vehicles

Includes radar systems used on-board motor vehicles and trains.

W06-A04H1B [2005]

Aircraft

Includes planes and helicopters.

W06-A04H1C [2005]

Ships

Includes marine vessels, boats and submarines.

W06-A04H1K [2005]

Anticollision

Can be used in conjunction with above W06-A04H1 codes. Search with W06-B01B1 for aircraft based systems, and X22-J05A for motor vehicles. See W06-A04H1 for anticollision systems prior to 2005.

W06-A04H2 [1992]

Weather radar

Includes on-board aircraft weather radar when used with W06-B01B1. See also S03-D05 for meteorology.

Meteorological

W06-A04H3 [1992]

Mapping/imaging

Synthetic aperture radar per se is coded in W06-A04J.

W06-A04H5 [1992]

Tracking, target seeking

See also W07-A01C for missile radar target-seeking system.

W06-A04H7 [1992]

Traffic control and monitoring

Includes air traffic control, also coded in W06-B02E when based at airport. (Prior to 1992 not coded in W06-B02). See W06-A04B codes also for aircraft automatic ID systems.

ATC

W06-A04H8 [1992]

Industrial radar system

This code is used chiefly in conjunction with other W06-A04 codes to indicate an analogous system used in an industrial environment. For example, use with W06-A04A1 for monitoring levels in a container (also coded in S02-C06D5).

W06-A04H9 [1992]

Other radar applications

W06-A04J [1992]

Synthetic aperture radar

See also W06-A04H3 for mapping.

SAR

W06-A04L [2005]

Bistatic/Multistatic/Passive radar systems

(W06-A04X)

Covers radar systems where the transmitter and receiver(s) are positioned in different locations and includes multistatic radar. See also W06-A04H2 (and S03-D codes) for bistatic weather radar. Also includes passive radar systems that utilize third party signals from commercial broadcast or communications transmitters to detect and track objects based on e.g. time-of-arrival difference of direct and reflected signal paths, or measurement of the bistatic Doppler shift and direction of arrival of the echo.

Passive coherent location, passive covert radar

W06-A04X

Other radar system aspects

Includes signature modification by e.g. absorber materials. For absorber materials per se, see W02-B03D. Includes radar absorbing coatings and paints.

W06-A05 [1983]

Sonar systems

Does not include ultrasound equipment used purely for medical application. See appropriate codes in S05 and S03 only. Does not also include low range systems e.g. for determining material properties or flaws. See appropriate S03 codes only.

Ultrasonic/sonic measurement, object presence/size/thickness determination, Doppler measurement, transponder, locator

W06-A05A* [1983-2001]

For air, sea, land vehicles

*This code is now discontinued and transferred to W06-A05H codes from 2002 onwards. It remains searchable for 1983 to 2001. For **specific** cases, codes for vehicle type are also assigned. See W02-C07 for hydrophone systems. See also W06-C01B1 and X25-N02 for fish-locating equipment used in commercial fishing.

Depth measurement, contact/target detection and classification, echo detection, ultrasonic transmitter/receiver, piezoelectric transducer, fish finding equipment

W06-A05B [1997]

Secondary sonar systems

Includes secondary or active sonar transponders for identification. From 1997 remote reading of measured values is excluded - see W05-D08G, W05-D08E, E05-D07G and W05-D06A5 codes.

Interrogation, response, reply, ID, code, sequence, security

W06-A05B1 [2005]

For vehicle or marine craft identification

W06-A05B3 [2005]

Security and coding aspects

Includes control of sonar/ultrasound signal to prevent detection by unauthorised persons.

ID, code, sequence, security

W06-A05B5 [2005]

For object identification

Includes identification of persons, objects, workpieces etc.

W06-A05B7 [2005]

Using different response medium

Includes secondary sonar systems where transmitted and received signals take different forms, for example, when the transmitted signal is ultrasound but the re-radiated signal received is e.g. radio.

W06-A05C [1992]

Details of sonar systems and equipment

W06-A05C1 [1992]

Transmitter circuits

W06-A05C3 [1992]

Receiver circuits

W06-A05C3A [1992]

Display arrangements

W06-A05C5 [1992]

Sonobuoys

Repeater

W06-A05C6 [2011]

Testing, monitoring, calibrating

W06-A05C7 [1992]

Transducers

Includes transducers per se, beam forming, and mounting arrangements. See V06-V01N and other V06 codes as appropriate.

Piezoelectric, casing, mounting

W06-A05C8 [2002]

Sonar jamming/anti-jamming

Includes equipment and methods.

W06-A05C9 [2002]

Other sonar equipment details

W06-A05D [2005]

Primary sonar systems

Includes primary or passive target sonar systems where a sonar signal is transmitted towards a target and a reflected signal is detected. This code is only applied when no specific sonar application or novel aspect is mentioned. For example, a novel primary sonar receiver will only be coded in W06-A05C3, with the fact that it is used in a primary sonar application, capable of being determined by the omission of any secondary sonar (W06-A05B) codes.

W06-A05D1 [2005]

Determining target position

Includes sonar distance or height sensing.

W06-A05D2 [2005]

Using relative movement

Includes sonar velocity sensing.

Doppler measurement, speed, velocity

W06-A05H [2002]

Sonar systems and applications

W06-A05H1 [2002]

Vehicle applications

W06-A05H1A [2002]

Land vehicles

Also see X22 codes for further vehicle details.

W06-A05H1B	[2002]
Aircraft	
W06-A05H1C	[2002]
Ships	
See W02-C07 for hydrophone systems. See W06-C01B1 and X25-N02 for fish locating equipment used in commercial fishing.	
<i>Depth measurement, fish finding equipment</i>	
W06-A05H1K	[2002]
Anticollision	
Can be used in conjunction with above W06-A05H1 codes. Search with X22-J05B for motor vehicle anticollision systems.	
<i>Anticollision</i>	
W06-A05H3	[2005]
Mapping/imaging	
Includes sonar imaging of seabed (see also S03-C codes).	
W06-A05H5	[2002]
Tracking, target seeking	
<i>Contact/target detection and classification, echo detection</i>	
W06-A05H8	[2002]
Industrial sonar systems	
W06-A05H9	[2002]
Other sonar applications	
W06-A05J	[2007]
Synthetic aperture sonar	
See also W06-A05H3 for mapping/imaging. Includes improving the spatial resolution of an active sonar array by combining data coherently between pings (acoustic pulses) to synthesize a longer effective array.	
W06-A06	[1983]
Non-radio e.m. wave, e.g. light, systems	
Optical communication in general is covered by W02-C04 codes.	
<i>Lidar, distance measuring equipment, DME, transmitter/receiver, light beam modulation</i>	
W06-A06A*	[1983-2001]
For air, sea, land vehicles	
*This code is now discontinued and is transferred to W06-A06H codes from 2002 onwards. It remains searchable for records between 1983 and 2001. For specific systems, appropriate vehicle code is also assigned.	
<i>Anticollision system, target detection</i>	

W06-A06B	[1997]
Secondary light-based systems	
Includes secondary or active optical radar/LIDAR systems. Includes use of optical transponders for identification. From 1997 remote reading of measured values is excluded - see W05-D08G, W05-D08E, W05-D07G and W05-D06A3 codes.	
<i>Interrogation, response, reply, ID, code, sequence, security</i>	
W06-A06B1	[2005]
For vehicle or aircraft identification	
W06-A06B3	[2005]
Security and coding aspects	
<i>ID, code, sequence, security</i>	
W06-A06B5	[2005]
For object identification	
Includes secondary light-based systems for identifying and monitoring of people, objects, workpieces etc.	
W06-A06B7	[2005]
Using different response medium	
Includes secondary light-based systems where transmitted and received signals take different forms, for example, when the transmitted signal is optical but the re-radiated signal received is e.g. ultrasonic.	
W06-A06C	[2005]
Details of non-radio e.m. wave, e.g. light, systems and equipment	
Can be used alone or in conjunction with other W06-A06 codes as appropriate.	
W06-A06C1	[2012]
Transmitter circuits	
W06-A06C2	[2012]
Receiver circuits	
W06-A06C3	[2006]
Display arrangements	
<i>Cathode ray tube, CRT, LCD, liquid crystal</i>	
W06-A06C5	[2006]
Monitoring; Testing; Calibrating	
W06-A06C8	[2006]
Jamming/anti-jamming	
Includes countermeasures and counter-counter measures for optical targeting systems, such as laser designed to illuminate and confuse missile optical targeting sensor. See also W07-F03.	

W06-A06D [2005]

Primary light-based systems

Includes primary or passive target optical radar or LIDAR (light detection and ranging) where a lidar/laser signal is transmitted towards a target and a reflected signal is detected. This code is only applied when no specific optical radar application or novel aspect is mentioned. For example, a novel primary LIDAR receiver will only be coded in W06-A06C, with the fact that it is used in a primary LIDAR application, capable of being determined by the omission of any secondary LIDAR (W06-A06B) codes.

W06-A06D1 [2005]

Determining target position

Includes light-based distance and height sensing. Prior to 2005 indeterminate-application distance sensing was covered in W06-A06.

W06-A06D2 [2005]

Using relative movement

Includes light-based velocity sensing.

W06-A06H [2002]

Non radio e.m. wave, e.g. light, system applications

W06-A06H1 [2002]

Vehicle applications

W06-A06H1A [2002]

Land vehicles

Also see X22 codes for further vehicle details.

W06-A06H1B [2002]

Aircraft

W06-A06H1C [2002]

Ships

W06-A06H1K [2002]

Anticollision

Can be used in conjunction with above W06-A06H1 codes. Search with X22-J05C for motor vehicle anticollision systems.

Anticollision

W06-A06H2 [2006]

Weather lidar

Includes laser radar systems designed for meteorological use. See also S03-D codes for meteorology.

W06-A06H3 [2005]

Mapping/imaging

Includes LIDAR mapping of e.g. rain forest canopy. See S02-B04 only for photographic imaging/surveying.

W06-A06H5 [2002]

Tracking, target seeking

See W07-A01C only for missile heat seeking system.

Target detection, tracking, optical, IR

W06-A06H8 [2002]

Industrial non-radio e.m. wave systems

Includes detecting presence of e.g. bottles to be filled on production line.

W06-A06H9 [2002]

Other non-radio e.m. wave, e.g. light, systems

W06-A06J [2017]

Continuous wave Lidar

W06-A06K [2017]

Synthetic aperture Lidar

W06-A07

Gyroscopes; Inertial navigation systems

From 2007 this code has been expanded to include inertial navigation systems (INS) using e.g. on-board linear accelerometers and rate gyroscopes to determine position/attitude of e.g. missile (see also W07 codes). Includes electrical aspects of gyroscopes used for navigational applications. Includes laser types (see V07 and V08 also). Non-electrical and non-electro-optical types are coded in S02-B07 only.

Optical, fiber, motor driven

W06-A08 [1992]

General or combination system for land navigation

See S02-B08. See T07-A05 also for roadside aspects. See X22-E06D only for on-board vehicles aspects. For purely satellite navigation see W06-A03A5 only.

Vehicle, guidance, beacon, satellite, dead-reckoning

W06-A09

Other (incl. compasses)

Non-electrical aspects of compasses are coded in S02-B06 only.

Magnetic field measurement, heading/course indication

W06-B

Aviation and aerospace systems

W06-B01

Aircraft

W06-B01A

Control systems for power plant, control surfaces, etc; Auto-pilots

Braking control, anti-skid system

W06-B01A1 [1983]

For power plant

Speed, power, flow, starting

W06-B01A1A [2006]

IC engine power plant

Includes control of internal combustion engines e.g. driving propellers.

Propeller, IC

W06-B01A1C [2006]

Gas turbine/jet engine power plant

Includes control of gas turbine jet engines such as turboprop, turbofan, turboshaft, RAMjet, SCRAM jet engines and pulse detonation engines. Also includes control of small gas turbines used as auxiliary power units (APUs) e.g. to generate power when aircraft is on the ground (see also X11-C01 for gas turbine driven electricity generation plant).

Gas turbine engine control, Supersonic Combustion RAMJET

W06-B01A1X [2006]

Other power plant

Includes control of aircraft power plant not already provided for.

W06-B01A5 [1983]

Affecting flight path, e.g. autopilots, control surfaces

See T06-B01 for course/attitude control in general.

Flap/aileron/rudder controls, trim adjustment, course correction

W06-B01B [1997]

Instrumentation; Communications

W06-B01B1 [1983]

For navigation

See W06-A04H1 for anticollision radar systems, and W06-A04H2 for weather radar.

Instrument landing system, ILS, microwave landing system, MLS, beacon homing systems, radar navigation, collision-avoidance, course, heading attitude, altitude, air-speed, ground-speed measurement, stall warning devices, wind shear warning, turbulence detection

W06-B01B3 [2002]

Head-up displays/head mounted displays

Includes displays built into pilot's helmet or goggles. See X27-A02B1A for electrical aspects of helmets and goggles.

W06-B01B5 [1983]

For vehicle/engine parameters

Engine speed, temperature, fuel gauges, cabin pressure, outside temperature/ pressure, ice build-up, weight on landing gear detector

W06-B01B6 [1992]

Black box recorder

See T03/W04 for dynamic recording aspects also.

W06-B01B7 [1992]

Communications equipment; Antennae

See W02-B codes for antennae, W02-G codes for communication equipment such as transceivers, receivers, etc., and W01-C04 for intercoms. For (radio)telephone for use by passengers, search with W01-C07 codes. Public address systems are covered by W06-B01C7.

Aerial mounting, cabling, crew headsets, radio telephone installation

W06-B01B8 [1992]

Data bus systems

See appropriate codes in T01, W01, and W05 (e.g. W05-D codes). This code is used for data bus aspects in general whether for control or instrumentation, (W06-B01A codes also assigned for specific control aspects).

W06-B01C

Electrical equipment (incl. de-icing, lighting)

W06-B01C1 [1992]

Electrical installations

Includes connectors, fittings, and wiring for general application to on-board electrical systems. (See V04 and X12-G codes also). Non-hardware aspects of data bus systems are covered by W06-B01B8.

W06-B01C2	[2002]
External lighting for signalling or navigational reference	
W06-B01C3	[1992]
Electrical power generation, distribution and control	
See X11, X12, X13 and X16 also.	
<i>Alternator, generator, inverter, battery, circuit-breaker</i>	
W06-B01C4	[1992]
De-icing equipment	
Includes thermal and electromechanical systems.	
W06-B01C5	[1992]
Environmental control and internal lighting	
Includes pressurisation system, heating, etc.	
W06-B01C6	[2007]
Electric propulsion	
See also X11 codes for high power electric motors per se and X13-F/G codes for high power electric motor control systems.	
W06-B01C7	[1992]
Public address and in-flight entertainment	
<i>PA, loudspeaker, amplifier, tape recorder, video, VTR, projection</i>	
W06-B01C8	[2005]
On-board security systems	
Includes anti-hijack systems and arrangements to subdue attackers. Use with W06-B01A5 for systems preventing attackers from piloting aircraft, e.g. into building, and W06-B02E for systems enabling remote flying of aircraft from the ground.	
<i>Terrorism, hijack</i>	
W06-B01C9	[1992]
Other aircraft electrical equipment	
Includes emergency escape equipment, food preparation equipment, toilets, etc. Also includes aircraft-mounted weather influencing systems (see also X25-X20) and camera arrangements for aerial imaging/photography.	
<i>Oxygen mask, escape hatch</i>	
W06-B02	
Airport control systems and equipment	
<i>Passenger handling, security, ground equipment</i>	

W06-B02A	[1992]
Security systems	
W06-B02A1	[1992]
For personnel	
Includes detection of concealed weapons, suspicious behavior and detection of infectious diseases in people (see also S05-D codes) at airport. For passport checking see W06-B02R instead.	
<i>Magnetic, electromagnetic</i>	
W06-B02A5	[1992]
For baggage inspection or tracking	
Includes use of transponder tags or bar-code reader. See S03-C03 and S03-E06B codes also for inspection.	
<i>X-ray, neutron, image, tracking, inspection, monitoring, smuggling</i>	
W06-B02A5A	[2006]
Baggage inspection	
Includes detection of concealed articles such as guns and explosives or other illegal substances, e.g. using x-rays or neutron sensors. See S03-C03 and S03-E06B codes also for inspection.	
<i>Image, drugs, narcotics, guns</i>	
W06-B02A5E	[2006]
Baggage tracking and monitoring	
Includes all aspects of tracking and monitoring of location of baggage within airport, e.g. using transponder tags (see also W06-A04B5 and W02-G05 codes) or bar-code reader (see also T04).	
W06-B02C	[1992]
Passenger information equipment	
Includes displays (see W05-E codes also), public address (see W04-S05 codes), passenger guidance robot, etc.	
W06-B02D	[1992]
Ground equipment for servicing aircraft	
<i>Truck, empty, fill, refuel, power line, luggage, baggage</i>	
W06-B02E	[1992]
Ground based navigation and communication equipment	
See W06-A codes for details of beacons etc. Includes runway lights. Only coded here if specific to airports.	
<i>Air traffic control, runway lighting, approach lighting, ILS marker, outer marker, beacon</i>	

W06-B02L [2014]

Aircraft launching/towing, landing, arresting and mooring

Includes catapult for launching military aircraft (Q25-P13) from aircraft carrier (Q24-P13) or launching/winch arrangements for gliders (see also Q25-P05). See Q25-R07 for mechanical details. Also includes arrangements for inflating, launching and mooring hot air balloons. Also includes electrical aspects of landing areas such as helipads that can't be covered elsewhere. See Q25-R02 for runways and helipads per se and W06-B02E for navigation-aiding markers and lights.

W06-B02R [2007]

Check-in/reservation

Includes on-line seat reservation of booking of flights (see also T01-N01A2 codes), and check-in via e.g. mobile phone. See W06-B02C also for airport based information terminals/displays. Also includes ticket purchase authentication method for airport, and passport checking/control

W06-B02S [2011]

Airport safety

(W06-B02X)

Includes fire-fighting (see also X25-X05) and evacuation equipment. Also includes electrical details of bird and animal scaring equipment (see also X25-X02).

Fire fighting, sprinkler, evacuation, smoke alarm

W06-B02T [2011]

Airport terminal equipment

Includes airport specific equipment such as environmental controls including heating, air-conditioning and internal terminal lighting. Includes transportation of passengers and baggage within terminal, such as travelators and bridges/gangways, baggage conveying/sorting. For baggage conveyors used to load aircraft see W06-B02D instead. Also includes general Wi-Fi and internet access terminals provided within airport (also see T01 codes and W06-B02R for terminals used for check-in/reservation).

Lift, escalator, travelator, baggage conveyor, lighting, heating, air conditioning, transportation, wi-fi

W06-B02X [1992]

Other airport systems

Only coded here if specific to airports. Includes electrical airport terminal equipment not covered elsewhere. For mechanical details of airport terminals see Q25-R instead. Includes airport taxi service priority scheduling arrangement.

W06-B03

Space vehicles

Satellites, electrical system, solar panels, cooling, foldable antenna reflectors, space exploration vehicles, space suits, protection systems

W06-B03A [1992]

Propulsion systems

Search with V05-E05A for ion beam thrusters. See also X14-F04 for plasma generators.

W06-B03A1 [2017]

Engine/propulsion system control

Engine fuel supply control.

W06-B03B [1992]

Power supplies

Includes solar power installations, also coded in X15-A codes, e.g. X15-A02 codes for solar panels.

W06-B03C [1992]

Space vehicle communications and connectivity

Includes antennae, antennae mountings, transceivers etc. - but not internal circuitry or general systems aspects of satellite repeaters which are covered by W02-G05 codes. Includes all space vehicle/space station and control center communications and data bus and network arrangements.

W06-B03D [1992]

Life support systems

Includes spacesuits.

Anti-G suit, cooling, heating, oxygen

W06-B03E [1992]

Electrical systems for on-board experimentation or manufacture

W06-B03F [2002]

Navigation and position control

Includes attitude control of satellite or space craft. See also T06-B01 codes for position, attitude and altitude control.

Attitude control, navigation

W06-B03H [2002]

Electrical installations

Includes connectors, fittings and wiring.

Electrical systems

W06-B03J [2002]

Instrumentation

Includes on-board electrical instrumentation, and system status monitoring, testing and reporting.

Monitor, test, status, instrumentation

W06-B03L [2021]

Spacecraft launching systems

W06-B03M [2022]

Space vehicle docking and coupling arrangements

W06-B03X [1992]

Other space vehicle aspects

Includes space exploration vehicles. Can be used to imply e.g. satellite-based aspect, e.g. to imply photographic imaging (S02-B04) takes place from satellite-mounted camera. See W06-B09 for aircraft based aerial photography.

W06-B04 [1983]

Training equipment, simulators

(W06-B09)

See W04-W07 codes for training and educational equipment in general, and W04-W07A for simulators other than for aircraft or space vehicles.

W06-B05 [1992]

Testing of aircraft or space vehicles

See appropriate codes in section S. For in-flight testing also see W06-B01 codes for aircraft and W06-B03 for space vehicles.

W06-B06 [2008]

Design of aircraft and spacecraft

Includes all electrical details of aircraft/spacecraft design. Also see T01-J15 codes for computer aided design (CAD) per se.

W06-B08 [1997]

Manufacture and maintenance of aircraft or space vehicle

Includes manufacturing process of electrical components only or substantial electrical equipment for manufacture or maintenance of any part of vehicle.

W06-B09

Other aviation and aerospace systems

Includes other aircraft and space craft systems not covered elsewhere, such as antistatic or RF screening. From 2006, aircraft types are covered by W06-B15 codes, though other aircraft types such as balloons, airships, and gliders remain searchable in W06-B09 prior to 2006. Also includes aerial refuelling arrangements.

Protective coating for antistatic or RF screening purposes, aerial refuelling

W06-B10 [2020]

Salvaging, recycling and recovery of aircraft and space vehicles or equipment

Including salvaging, recovery and recycling of aircraft and space vehicles. Includes recovery of space vehicle propulsion systems such as reusable booster rockets (also see W06-B03A). Also includes systems for removal of space debris.

W06-B15 [2006]

Specific aircraft types

(W06-B09)

W06-B15A [2006]

Lighter-than-air craft

Includes balloons and airships.

Blimp, dirigible

W06-B15B [2006]

Helicopter; Rotorcraft

W06-B15C [2006]

Glider

W06-B15D [2006]

Commercial and civil aircraft

Only applied if specific to commercial or civil aircraft. Can be used in conjunction with other W06-B15 codes.

W06-B15E [2006]

Military aircraft

Only applied if specific to military aircraft. Can also be used in conjunction with other W06-B15 codes. See W07 also for military equipment per se.

W06-B15F [2006]

Microlight

W06-B15G [2006]

VTOL (Vertical Take-Off and Landing) aircraft

W06-B15H [2021]

Emergency services aircraft

Includes fire fighting and disaster response aircraft and helicopters; police, law enforcement and border security helicopters and drones; and coastguard search and rescue helicopters (see also W06-B15B for helicopters and W06-B15U for drones and UAV).

W06-B15U [2007]

Unmanned aerial vehicles

Includes UAVs and micro UAVs used for geophysical surveying, imaging, military reconnaissance (see also W07-F04), logistics such as food and commodity delivery (see X25-F12), etc.

W06-B15X [2006]

Other aircraft types

(W06-B09)

Includes sea planes, motor vehicles convertible into aircraft, agricultural and crop dusting aircraft (see X25-N01 for insecticide and pesticide spraying per se) and electrical aspects of other aircraft such as hang gliders, ornithopters or parachutes.

W06-C

Shipping

W06-C01

Marine-craft

W06-C01A

Control systems

Steering equipment, automatic pilot, bridge, helm

W06-C01A1 [1992]

Engine control

See W06-C01C9 for engine related hardware such as fuel pumps or ignition systems. Includes IC engine and gas turbine engine control, exhaust gas emissions reduction.

Power control, speed control, pollution control

W06-C01A5 [1992]

Steering, course control

See T06-B01A for course control in general.

Automatic pilot, heading, rudder, trim

W06-C01B

Instrumentation; Communications

Includes aerials (search with W02-B codes) and radio communication equipment (with W02-G codes).

W06-C01B1 [1992]

Instrumentation for navigation

See X25-N02 and W06-A05D1 for fish locating using sonar. See W06-A03A5 and S02-B08 codes for GPS navigation per se. See W04-X01D for sports fishing.

Navigation, compass, satellite, radar, sonar installations, speed, course, depth measurement, chart recorders, fish finding equipment, anticollision

W06-C01B5 [1992]

Instrumentation for monitoring ship condition

Includes engine monitoring. See also relevant S01-S03 codes.

W06-C01B7 [1992]

Communications equipment

Includes equipment for communication on-board and with other vessels or shore stations. See also W01 and W02 codes for telephone and radio communications per se.

W06-C01B8 [1992]

Data bus systems

See appropriate codes in T01, W01, and W05 (e.g. W05-D codes). This code is used for data bus aspects in general, whether for control or instrumentation. (W06-C01A codes also assigned for specific control aspects).

W06-C01C

Electrical equipment (incl. lighting)

Includes external lighting for general illumination of navigational reference (see also X26). See W06-C01C5 only for internal lighting.

W06-C01C1 [1992]

Electrical installations

Includes wiring, connectors, etc. of general application to on-board systems. V04 and X12 codes are also assigned as appropriate.

Switch, plug, duct, trunking, cables, junction box, fittings

W06-C01C3 [1992]

Electrical power generation and distribution

See also U24/X12 for power generation/distribution, X15 for solar/wind power generation and X16 for battery/fuel cell aspects.

W06-C01C5 [1992]

Environmental control and internal lighting

Includes heating, air-conditioning and demisting / defrosting of ship windows. Also includes internal ship lighting (see also X26 codes for illumination per se). For external lighting see W06-C01C.

Climate control

W06-C01C6 [2006]

Public address and on-board entertainment

See also W04 codes for public address and gaming systems per se.

PA, loudspeaker, amplifier, tape recorder, video, VTR, projection, television, game

W06-C01C7 [1992]

Electric propulsion

See X11 codes also for motors per se, and X13 for motor control.

W06-C01C9 [1992]

Other electrical marine vessel equipment

Includes specific equipment such as electric fuel pump or ignition system, e.g. for outboard motor.

W06-C01S [2019]

Ship emergency/safety equipment

Includes all aspects of ship safety such as roll-over prevention, ballast control to improve stability etc. Navigational equipment that can prevent grounding or collision can be covered in W06-C01B1. Also see Q24-B09 for mechanical details of ship emergency/safety equipment. See W06-C10 and Q24-X01 codes instead for lifesaving in water equipment.

W06-C04 [1992]

Simulators and training equipment

(W06-C09)

Simulators and training equipment in general are covered by W04-W07 codes.

W06-C05 [1992]

Testing of ships or ship equipment

W06-C06 [2008]

Design of marine vessels

Includes all electrical details of ship and marine craft design. Also see T01-J15 codes for computer aided design (CAD) per se.

W06-C07 [1992]

Port equipment, buoys, beacons

Prior to 2016 buoys intended for use in a port, harbor, estuary, river or other waterway were covered by W06-C07 while those intended for use in open sea were covered by W06-C09. From 2016 electrical aspects of buoys for all applications are covered by W06-C07C.

W06-C07A [2016]

Port and mooring equipment

Includes electrical aspects of maintenance and dry dock facilities and also loading and unloading equipment such as cranes, hoists and the like, also covered by X25-F05 codes. Mechanical aspects of port equipment are covered by Q24-R codes and of cranes and other lifting equipment by Q38-B. Includes electrical details of onshore and offshore mooring equipment.

Cleaning, renovating, repairing

W06-C07C [2016]

Buoys and beacons

This code covers electrical aspects of buoys and beacons irrespective of their location, i.e. open sea, harbour, inland waterway etc. (Previously buoys intended for use in a port, harbour, estuary, river or other waterway were covered by W06-C07 while those intended for use in open sea were covered by W06-C09, but now W06-C07C covers them all). Buoys in general (including those with no electrical aspects) are covered by Q24-P18. Beacon navigation systems are covered by W06-A01 codes.

Marker buoy, lighthouse, lightship, navigation marker, radio beacon

W06-C07E [2016]

Marine traffic control

Includes offboard/port equipment for controlling marine vessels. Also includes communications between port/shore and vessels or between vessels for traffic control or prioritization purposes.

Marine traffic lights, sign, priority

W06-C08 [2002]

Marine vessel manufacture / assembly / dismantling

Includes electrical aspects of ship or boat manufacture, assembly or dismantling for recycling or disposal. For ship maintenance see W06-C07A.

Shipbuilding, recycle, dismantle

W06-C09

Other shipping details

Includes electrical aspects of diving equipment which in general is covered by Q24-X04. Pre-2016 this code covered buoys intended for use in open sea. From 2016 electrical aspects of buoys for all applications are covered by W06-C07C. Includes marine salvage systems (see also W06-C15F for environmental and salvage vessels per se).

Diving equipment, diver communication systems

W06-C10 [2006]

Life saving equipment

Includes life jackets. See W06-C15C code scope note instead for emergency or survival craft per se.

Buoyancy aid, life vest, light, alarm, beacon, distress

W06-C15 [2006]

Specific marine vessel types

W06-C15A [2006]

Personal/recreational watercraft

Includes jet-skis, kayaks and canoes. See W04-X codes for electrical aspects of sports equipment such as water skis.

W06-C15B [2006]

Submarines; Submersible craft

W06-C15C [2006]

Emergency/rescue craft

Includes life boats and life rafts. See W06-C10 instead for life saving accessories such as life jackets.

Survival craft, inflatable craft

W06-C15D [2006]

Commercial vessels

Only applied if specific to commercial vessels. Can be used in conjunction with other W06-C15 codes.

W06-C15D1 [2006]

Fishing boats; Trawlers

Includes electrical cranes, hoists, winches etc. for handling fish and whales.

W06-C15D3 [2006]

Tankers

Includes oil tankers.

W06-C15E [2006]

Military vessels

Includes aircraft carriers, destroyers, frigates etc. Use with W06-C15B for military specific submarines or W06-C15F for military specific hovercraft. See also W07 for military equipment per se.

W06-C15F [2012]

Environmental and salvage vessels

Includes vessels for collecting pollution/rubbish from open water or any other vessel helping to maintain the environment. Also includes salvage vessels in general (see also W06-C09 for salvage systems per se).

Oil spill, oil slick, salvage, floating refuse collection

W06-C15G [2017]

Floating buildings, drilling platforms, workshops

Includes electrical aspects of floating vessels, towers, houses and buildings normally designed to be static at a fixed location.

W06-C15H [2006]

Hovercraft

See also W06-C15D or W06-C15E for commercial or military specific hovercraft respectively.

W06-C15U [2014]

Unmanned vessels

W06-C15X [2006]

Other marine craft types

Includes amphibious vessels and swamp boats. Includes marine vessels not already provided for.

W06-T [2008]

Other transportation systems

Includes all aspects of teleportation and time travel.

Includes all transportation aspects not able to be covered by any other of the transport related EPI codes.

Time machine, space-time, theoretical

W07: Electrical Military Equipment and Weapons

See W04-X01 codes for analogous equipment (e.g. for sports) corresponding to W07-B or W07-D codes.

W07-A

Missile guidance, navigation and propulsion control

See T06-B01B for target-seeking control in general, and T01-J07D for data processing aspects.

Projectile/shell/torpedo target seeking, heat seeking, radar guidance, image/pattern recognition, aerials, radomes, sensors, optomechanical scanning, remote guidance by radio/light/wire/ optical fiber

W07-A01 [1992]

Guidance and target seeking system

From 1997 propulsion control is covered by W07-A01G code.

W07-A01A [1992]

Navigational aspects

Covers position determination without reference to target, e.g. by dead reckoning, use of GPS (also coded in W06-A03A5), star recognition etc.

W07-A01C [1992]

Target-seeking/tracking system

Includes heat-seeking and radar (or analogous). Use with W07-A01E1 for laser tracking. Also see W06-A codes for target tracking.

Target seeking, tracking, radar, IR, heat

W07-A01C1 [2002]

Laser targeting

Includes use of laser to mark target so that missile can home in on target using reflected light. Use of laser beam containing positional information about target, see W07-A01E1 only.

Laser marking, laser pointing, target designation

W07-A01E [1992]

Remotely guided

Covers control by e.g. ground based operator. Remote control aspects are also coded in W05-D codes.

W07-A01E1 [1992]

By non-wire links

Includes radio and free-space optical systems.

Beam-rider

W07-A01E3 [1992]

By electric cable or optical fiber

See also appropriate codes in V07 for fiber-optic aspects, e.g. V07-H codes.

Reel, dispense, pay-out, tension, control

W07-A01G [1997]

Propulsion control

Prior to 1997 propulsion control was coded in W07-A01.

W07-A01H [2002]

Missile stability/flight control

Includes control of fins e.g. to stabilise missile flight, control missile rotation or act as air brake to control missile range. For course correction see other W07-A01 codes.

W07-A03 [1992]

Details of sensing systems per se

Includes on-board sensors normally associated with navigation/targetting. Codes in this section are used with W07-A01 codes or alone as appropriate.

W07-A03A [1992]

Antennae

Includes antenna on-board missile and not ground based antennae. Radomes are covered by W07-A03D. For full details of radio antennae see W02-B codes.

W07-A03B [1992]

Optical sensors and elements

Includes optical detectors, lenses, filters, video cameras, etc. For solid-state sensor details see appropriate codes in U12, U13, or U14. Video cameras are also coded in W04.

W07-A03D [1992]

Radomes, protective enclosures

Includes covers transparent to RF and also optical range, e.g. IR.

W07-B

Weapon sights; Aiming

Includes mountings e.g. for fixing flashlight to barrel of rifle. See also X26 for torch per se.

Laser range finding

W07-B01 [1992]

Weapon sights

Illuminated sights, image processing, laser sighting

W07-B05	[1992]
Weapon aiming systems	
Includes electrical systems for correcting weapon aim. Also includes electrical aspects of munitions such as rearward facing LED for tracer bullet used to covertly illuminate bullet trajectory to enable aim adjustment. <i>Aiming control, correction, compensation</i>	
<hr/>	
W07-C	
Fuzes, arming	
<i>Detonate, mine, charge, explosive, missile</i>	
W07-C01	[1992]
Fuzes	
Fuzes for non-military application, e.g. blasting, are coded in X25-D codes. Includes detonator elements per se.	
W07-C03	[1992]
Fuze actuation system	
The codes in this section relate to the actual means of actuating the fuze. <i>Ignition, impact switch</i>	
W07-C03A	[1992]
Responsive to sensed vibration	
Includes 'seismic' detection system for e.g. landmine.	
W07-C03C	[1992]
Responsive to sensed proximity	
Includes proximity fuzes working by e.g. radar or analogous system, also assigned W06-A codes as appropriate.	
W07-C03E	[1992]
Time delay actuation	
Electronic time delay circuits are also coded in U21-B02A codes.	
W07-C05	[1992]
Arming/disarming systems	
Covers electrical details of arming and disarming systems, including safety/security arrangements. <i>Safing</i>	
<hr/>	
W07-D	[1983]
Training equipment	
Training equipment in general is coded in W04-W codes. Simulators for aircraft are coded in W06-B04, for ships in W06-C04.	
W07-D01	[1992]
Target practice systems	

W07-D05	[1992]
Simulation systems	
<hr/>	
W07-E	[1992]
Electrically operated weapons	
W07-E01	[1992]
Electrical firing	
Includes electrically activated trigger for hand gun, or electric actuation of firing charge.	
W07-E05	[1992]
Weapon launching systems	
<i>Rocket, grenade, launcher</i>	
W07-E05A	[1992]
With electrical propulsion	
Includes rail guns, also coded as electrical machines in X11, e.g. X11-H09.	
W07-E06	[2007]
Munitions	
Includes electrical aspects of munitions such as projectiles, bullets, missiles, grenades that cannot be coded elsewhere. Also see K03-A codes for physical and mechanical aspects of explosives and ammunition. Includes e.g. arrangements for electronic interrogation and identification of artillery projectiles inside gun before firing.	
W07-E07	[2002]
Laser weapons	
See V08 for novel laser details.	
W07-E08	[2005]
Non-lethal electric weapons	
Includes stun guns and electrical aspects of other non-lethal weapons. Also see W07-F codes for self-defence systems. Also includes electromagnetic weapons or EMP (electromagnetic pulse) weapons for disabling electronic circuitry in hostile weapons systems or degrading explosives.	
W07-E09	[2002]
Other electrically operated weapons	
<hr/>	
W07-F	[1992]
Protection for weapons, personnel or equipment	
Includes camouflage aspects. For radar signature modification search with W06-A04X.	

W07-F01 [1992]

Protection for personnel

Includes fingerprint recognition e.g. for hand gun.

W07-F01A [1992]

Self defence equipment

Includes analogous system for use by e.g. law enforcement officer. Includes e.g. electrical aspects of mace/pepper spray or e.g. combined flashlight/spray. Anti-mugging alarms are coded in W05-B01D.

W07-F01B [2012]

Military specific clothing

Includes clothing, shoes and helmets with electrical content specifically for use by military personnel. Also see X27-A02B1 codes.

Wearables

W07-F03 [1992]

Protection for weapons or equipment

Includes launching of countermeasures to protect aircraft from seeker missile or use of laser to confuse IR sensor on hostile missile. See also W06-A04E1 codes and W06-A06C8 respectively for radar and lidar jamming and countermeasures.

Decoy, flare, anti-radar chaff, jamming, stealth.

W07-F04 [2002]

Early warning and reconnaissance systems

Includes early detection of incoming missiles, and e.g. remote controlled unmanned vehicles for gathering front line video reconnaissance information about enemy forces. See also W02-F01 codes for CCTV aspects.

UAV, unmanned aerial vehicle, MAV, micro aerial vehicle, drone, autonomous

W07-F05 [1992]

Mine sweeping; Weapon/bomb detection

From 2011 this code has been expanded to include all aspects of explosives and weapons detection, as well as systems for making explosives safe or clearing mines or depth charges. See W06-C01 codes for on-board ship aspects. Degaussing is covered by V02-D.

W07-F05A [2011]

Mine sweeping; Bomb detection

Includes all aspects of explosives detection and making safe. Includes detection of roadside improvised explosive devices or mine or depth charge detection and clearing. See W06-C01 codes for on-board ship aspects. Degaussing is covered by V02-D, W07-F03 and W06-C09. See S03 codes for novel sensing arrangements per se.

W07-F05C [2011]

Weapon detection

(W07-F01)

Includes detecting the presence of weapons e.g. during security check at an airport (see also W06-B02A codes), school, hospital etc. See S03 codes for e.g. X-ray sensing per se.

Arms detector, metal detector, knife, gun, X-ray

W07-G [1992]

Assisted/night vision equipment

From 2010 this code has been expanded to include all assisted vision systems as well as all night vision applications. See also V05 for image intensifier tube aspects. This code can be applied for vision enhancement systems such as daytime image enhancement and thermal or IR imaging (see also W04-M01E codes for thermal imaging camera details per se).

W07-G01 [1992]

Goggles

W07-H [1992]

Military equipment testing, inspection and measurement

Includes evaluation of weapons and weapon systems, measurement of muzzle or projectile velocity, military equipment/installation inspection, etc. See also appropriate codes in e.g. S02 or S03 depending on the nature of test involved. See W07-A03 codes for on-board munitions measuring/sensing systems.

W07-J [1992]

General aspects of military electrical equipment

W07-J01 [1992]

Electrical installations, cables, connectors

See V04 and X12 codes for full details of cables, connectors, and electrical fittings.

W07-J03 [1992]

Power generation and distribution

Includes generators, battery power supplies, fuel cells and batteries per se, etc. See also U24, X12, and X16 codes as appropriate.

W07-J05 [1992]

Electrical equipment constructional details

See V04-S and V04-T codes also for casings and constructional details of electrical equipment in general.

W07-J07 [2011]

Manufacture of military equipment

(W07-X)

Includes all manufacturing aspects of weapons and equipment.

W07-J09 [1992]

Other military electrical equipment details

W07-X

Other military equipment

Includes equipment and systems with specific military application not covered elsewhere.

W07-X01 [2002]

Military vehicle systems

Includes electric equipment specifically for military vehicle. See also X22 if the electrical aspect relates to normal vehicle operation, e.g. ignition system, lighting, steering, braking.

Tank, personnel carrier

W07-X03 [2007]

Military/battlefield communications

Includes all communications equipment (but not radar - see W06-A codes instead) with specific military application. Includes all aspects of communications between troops on the battlefield and between troops and command centre. See also W01/W02 for telephone/radio communications per se.

W07-X05 [2012]

Military equipment management/maintenance

Includes management and tracking of military assets.

Inventory, tracking, record keeping, servicing

W07-X07 [2007]

Soldier aids

Includes robotic exoskeletons to assist infantry in carrying heavy loads, and robotic "mules" (see also X25-F05A codes) controlled by soldier to carry military equipment or weapons.

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X11: Power Generation and High Power Machines

X11-A

Steam turbine plant

Coal-fired power plant

X11-A01

Turbines

Impulse, reaction

X11-A01A

Rotors

Shaft, groove

X11-A01A1

Blades

Includes constructional details, including materials, of blades per se. Constructional details of rotors other than blades are coded under X11-A01A2.

X11-A01A2

Materials and mounting

Includes constructional details, including materials, of rotors, excluding constructional details of blades (which are coded under X11-A01A1). Also includes anti-vibration arrangements and mountings/supports of rotors, blade carriers, etc.

Anti-vibration, mounting, blade carrier

X11-A01B

Stators; Seals

Nozzles, blades, fluid guide conduit, sealing fluid

X11-A01C

Cooling; Bearings; Mountings; Casings

Includes details of cooling and de-icing arrangements, anti-vibrations and lubricating arrangements. Also includes details of bearings, mountings and supports, collection of condensation water and drainage.

Anti-vibrations arrangements and mountings/supports for rotors (including for the blades) are only coded under X11-A01A2.

X11-A01D* [1980-2010]

Regulation by flow control

*From 2011 this code is transferred to X11-A10A, but remains searchable for records from 2010-2011.

Valve control

X11-A01E* [1980-2010]

Starting; Shutting down

*From 2011 this code is transferred to X11-A10B, but remains searchable for records from 2010-2011.

Control systems, overspeed protection

X11-A01X

Other turbine details

Includes manufacture.

X11-A08 [2010]

Environmental protection

Includes arrangements for reducing carbon footprint and improving emissions, such as chimney smoke filters and scrubbers for capturing sulphur emissions from coal fired power stations, e.g. carbon capture arrangements.

Flue gas desulphurisation, carbon capture, waste gas scrubbing

X11-A09 [1983]

Other plant details

Includes plant layout and electrical aspects of steam generators. Also includes details of power plant boiler, condenser, feedwater pumps.

Coal-conveyor, chimney smoke-filter, steam generator

X11-A10 [2011]

Monitoring, operation and control

Includes general monitoring, operation and control details. Also includes testing.

X11-A10A [2011]

Regulation by flow control

(X11-A01D)

Valve control

X11-A10B [2011]

Starting, shutting down

(X11-A01E)

Control systems, overspeed protection

X11-B

Hydroelectric plant

Electric power generation produced from sea power, including wave power and tidal energy, is coded under X15-C codes instead.

Hydel

X11-B01

Turbines, Pelton wheels, water wheels

Vanes, buckets, nozzle, blades, rotors, stator, casing

X11-B05 [1997]

Mini and micro plants

(X11-B09)

Run-of-river, streams

X11-B06 [1997]

Pumped storage plant

(X11-B09)

X11-B09

Other details

Includes details of osmotic power or salinity gradient power (also covered by X15-C). From 2005, tidal flow base electric power generation is covered by X15-C codes.

X11-B10 [1997]

Monitoring, operation and control

(X11-B09)

X11-C

Gas turbine; IC engine, Combined cycle and cogeneration plants; Other plants

For aircraft and ships see W06-B and W06-C codes, respectively.

X11-C01 [1997]

Gas turbine plant

(X11-C)

Includes electrical details of gas turbines and external combustion engines used for electric power generation.

X11-C02 [1997]

IC engine plant

(X11-C)

Includes electrical details of IC engine power plant.

X11-C03 [1997]

Combined cycle plant

(X11-A09, X11-C)

Includes electric power generation by combinations of gas turbine and steam turbine cycles, as well as gas and/or steam turbine cycles operating in combination with fuel cells, solar systems or any other power generation equipment.

Electric power generation using combinations of fossil and non-fossil fuel sources are also coded under X15-J.

Details of fuel cells are covered by X16-C codes, and solar systems and other systems using non-fossil fuel sources are covered by X15 codes.

Hybrid

X11-C04 [1997]

Cogeneration plant

(X11-A09, X11-C)

Includes combined heat and electric power generation. Combined heat and electric power generation using non fossil fuel sources are coded under X15-K.

CHP

X11-C05 [2007]

Rankine cycle plant

Involves the generation of electricity by heat-evaporation of a working fluid that drives a turbine. For water/steam working fluids, see X11-A01 codes. Heat input sources include waste heat, solar (see also X15-A codes), etc.

X11-C08 [2010]

Environmental protection

Includes arrangements for reducing carbon footprint and improving emissions, e.g. catalytic converters for exhaust gases.

Catalytic converter

X11-C10 [1997]

Monitoring, operation and control

Includes maintenance and repair of power plant.

X11-C15 [2002]

Microturbine plant

Note: Small machines are in V06.

X11-D

Synchronous machines

See also X11-H02B for details of linear synchronous motors.

Generator, motor, alternator

X11-D01 [1992]

Salient-pole rotor

X11-D02 [1992]

Cylindrical rotor

X11-D03 [1992]

Rotary exciter

X11-D03A [1992]

Brushless exciter

Rotary rectifier

X11-D04 [1992]

Static exciter

Static rectifier

X11-D05 [1997]

Hybrid synchronous machines

(X11-D)

Includes combined permanent magnet and wound rotor type synchronous machines.

X11-E

Asynchronous induction machines

See also X11-H02A for details of linear induction motors.

X11-E01 [1987]

Wound rotor

Includes slip ring and pole-change winding type motors.

X11-E05 [1997]

Induction generator

(X11-E)

Inductor alternator

X11-F

DC mechanical-commutator and universal machines

Motors, generators, series-, shunt-, compound-excitation

X11-G

Permanent magnet synchronous machines

Motors, generators

X11-G01 [2008]

Interior permanent magnet

X11-H

Other electric machines

X11-H01

Non-mechanical-commutator machines

Includes both AC/DC brushless motors.

Electronically-commutated, brushless

X11-H01A [1997]

Permanent magnet

(X11-H01)

For details of speed and torque regulation/control, see also X13-F03C1 and X13-G01C1.

PM AC/DC brushless

X11-H01B [1997]

Switched reluctance

For details of speed and torque regulation/control, see also X13-F03C2 and X13-G01C2.

SR AC/DC brushless

X11-H01C [1997]

Sensorless

(X11-H01)

For details of speed and torque regulation/control, see also X13-F03C3 and X13-G01C3.

BEMF

X11-H02

Linear, sectional and rolling motors

X11-H02A [1997]

Asynchronous

(X11-H02)

See X11-E for details of non-linear induction motors.

Induction, LIM, AC

X11-H02B [1997]

Synchronous

(X11-H02)

See X11-D for details of non-linear synchronous motors.

LSM, AC

X11-H02C [1997]

Direct current

(X11-H02)

DC

X11-H03

Clutches, brakes, gears; MHD generators and electrodynamic pumps

X11-H03A [1987]

Clutches, brakes, gears

This code covers electrodynamic type devices only.

Electric or magnetic clutches, brakes and gears are in X25-L02.

X11-H03B [1987]

MHD generators and electrodynamic pumps

Includes details of electromagnetic pumps for high/medium power applications. Electromagnetic pumps for low power applications are coded under V06-M06K.

X11-H03B1 [1997]

MHD generators

(X11-H03B)

Magneto-hydro-dynamic

X11-H04

Non-dynamo-electric machines

Includes electrostatic generators, motors, clutches or holding devices and thermal effect motors.

X11-H05 [1987]

Superconducting machines

(X11-H09)

See X12-D06 for superconductors per se.

Cryogenic, heat insulation

X11-H09

Other

Includes more than one rotor or stator-, DC interrupter-, AC mechanical commutator-, perpetual motion dynamoelectric- and acyclic-machines, and dynamoelectric converters, etc.

Torque motors, Schrage motors, motor-generator sets, amplidynes, metadynes

X11-H20 [2002]

Starter-generator/motor-generator

X11-J

Constructional details of electric machines

This code is used either alone or in conjunction with the different types of machines listed above. Magnetic materials are in V02-A02.

X11-J01

Magnetic circuits

X11-J01A

Stationary parts

Includes means for mounting magnetic stationary parts to stator structure.

Slots, magnetic poles, cores, laminations, magnetic wedges, magnets, tooth, yokes

X11-J01B

Rotating parts

Includes spider to mount or fasten magnetic part to rotor structure.

Cores, slots, magnets, magnetic poles laminations, magnetic wedges, tooth, yokes

X11-J01X

Other magnetic circuits

X11-J02

Windings

X11-J02A

Conductor shape, form, construction or layout

Includes twisted- or hollow-conductors; provision of cooling fluid ducts.

Coils, double-layer, strip or rectangular section

X11-J02B

Insulation; Shielding; Protection

Includes coil-, slot-insulation and materials, preventing or reducing eddy current losses, protecting against moisture or chemicals.

Corona protection

X11-J02C

Fastening windings

Includes wedges, end turn ties.

X11-J02X

Other windings

From 2013, details of windings layout are coded under X11-J02A.

X11-J03

Current collection arrangements

Includes commutators, slip-rings, brushes and their connections to windings, commutation improving arrangements (see also V04-L01).

Commutator segments

X11-J04

Association with electric components

Includes devices for measuring or protecting machine, resistors, switches or RFI suppressor (see W02-H also), etc.

Direction/rotation detectors

X11-J05

**Mechanical energy handling arrangements
(Structural association with)**

X11-J05A

**Clutches, brakes, gears, pulleys, mechanical
starters**

X11-J05B

Mechanical loads, driving or auxiliary machines

X11-J05X

Other mechanical energy handling arrangements
Bearings, flywheels, balancing, shaft

X11-J06

Cooling or ventilating systems

X11-J06A

Using liquid or solid cooling medium
Includes cryogenic coolers.

X11-J06X

Other cooling or ventilating systems
Includes ambient air flow through the machine and use of fans.
Hydrogen cooling

X11-J07

Casings, enclosures, supports

X11-J07A

Supporting brushes or bearings
Includes bearing shield mounting arrangement or end shield. Also includes cooling and greasing of bearings.

X11-J07X

Other casings, enclosures, supports
Includes casings, enclosures, seals, ribs or fins to improve heat dissipation, noise/vibration reduction.
Machine mountings, housings, explosion-proofing, vibration-damping

X11-J07X1 [2002]

Connectors; Terminal boxes; Junction boxes

X11-J08

Manufacture, testing, repair and maintenance
See also S01-G07 for electrical tests, and T01-J15 for simulation and design of motors and generators.

X11-J08A

Stator/rotor bodies; Commutators; Brushes; Slip-rings
Includes brush wear indicator. See also V04-P02 for general commutators, brushes etc.
Cores, laminating, slotting, magnetic poles, magnetic circuits, casting, moulding

X11-J08B

Windings
Includes direct winding of stator/rotor coils and laying of pre-wound coils.
Winding jigs, inserting wires, conductor bending, coiling

X11-J08C

Insulating, impregnating, centring, balancing
Includes insulating of windings or core laminations and heating or drying of windings, rotors or machines.
Taping

X11-J08M [1997]

Testing, repair and maintenance
(X11-J08)
Includes analysis, diagnosis, monitoring, fault detection.

X11-J08P [1997]

Characterised by use of microprocessors
(X11-J08)

X11-J08X

Other manufacture, testing, repair and maintenance
Castings, enclosures, supports, end shields, bearings

X11-J15 [2002]

Materials

X11-J15A [2002]

Conductive materials
Includes details of materials for thermal or electrical conduction.

X11-J15B [2002]

Magnetic materials

X11-J15C [2002]

Insulative materials
Includes details of materials for thermal or electrical insulation.

X11-U [1997]

Electric machines characterised by applications
These codes are used in conjunction with other X11 codes as appropriate.

X11-U01 [1997]

Electric power generation

X11-U01A [1997]

Steam turbine generator
See X11-A codes for details of steam turbine plants, and X11-J codes for constructional details.
Turbogenerator

X11-U01B [1997]

Hydrogenerator

See X11-B codes for details of water power generation, and X11-J codes for constructional details of generator.

X11-U01C [1997]

Gas turbine generator

See X11-C01 for details of gas turbine generator, and X11-J codes for constructional details.

X11-U01D [1997]

IC engine generator

See X11-C02 for details of IC engine plant, and X11-J codes for constructional details.

X11-U01E [1997]

Wind turbine generator

See X15-B codes for details of wind power generation, and X11-J codes for constructional details of generator.

X11-U01M [2002]

Microturbine generator

See X11-C15 for details of microturbine plants, and X11-J codes for constructional details.

X11-U02 [1997]

Road vehicles

X11-U03 [1997]

Railways

X11-U04 [1997]

Aviation and aerospace

X11-U05 [1997]

Ships and boats

X11-U06 [1997]

Military

X11-U07 [1997]

Industrial machines

X12: Power Distribution / Components / Converters

X12-A

Power resistors

Covers all high power resistors e.g. for lightning arrestors, electric motor loading, etc. Low power resistors are in V01-A. Also includes manufacture.

Voltage-, surge-arrestors, varistors, varistor stack

X12-B

Power capacitors

Includes capacitors generally of the type used for power factor improvement, transmission/distribution reactance compensation, super- or double layer-types for e.g. electric vehicle (see also X21-B04). Low power capacitors are in V01-B. V01-B codes can also be assigned in conjunction with X12-B to highlight the type and novel aspect of the power capacitor, including manufacture. See also X16-L02 for capacitive energy storage in general.

CVT, capacitor bank, ultra-capacitor

X12-C

Power transformers, reactors

X12-C01

Cores, coils, connections, bushings and terminals; Manufacture

X12-C01A [1987]

Cores

Includes magnetic circuit for transformer or reactor e.g. laminations, cores made from strips or sheets, yokes.

Core clamping plates, amorphous cores

X12-C01B [1987]

Coils, windings, connections

Foil windings, insulation spacers, conductors, disc-, poloidal-, spiral-, toroidal-coils

X12-C01B1 [1987]

For reactor

X12-C01B2 [1987]

For transformer

X12-C01B2A [2002]

Using cables as windings

X12-C01C [1987]

Bushings and terminals

Glands, grommets, bulk heads

X12-C01D [1987]

Manufacture; Maintenance

Includes methods and apparatus.

X12-C01D1 [1992]

Cores

X12-C01D2 [1992]

Coils

Includes winding, insulating and connecting leads of coils for power transformers and reactors. Manufacture of insulating materials themselves when not part of the process of manufacturing windings is covered by X12-C01B codes and appropriate X12-E codes.

X12-C01D3 [1992]

Testing

X12-C01D4 [1992]

Superconducting coils/magnets

X12-C01D5 [1992]

Bushings and terminals

X12-C01D6 [1992]

Casing

Also includes transportation packaging.

X12-C01D7 [2002]

Maintenance

(X12-C09)

Includes all aspects of repairs and maintenance, e.g. oil change, polychlorinated biphenyl disposal (see also X12-E02A).

X12-C01E [1992]

Power and distribution transformers

(X12-C, X12-C01)

Also includes transformers for welding, electric furnaces, transmission lines, etc.

X12-C01F [1992]

Power reactors

(X12-C, X12-C01)

Also includes short circuit current limiting-, saturable-reactors.

X12-C01G [1992]

Instrument transformers

(X12-C, X12-C01)

Includes voltage and current transformers. For capacitive voltage transformers see X12-B. For electrical instrumentation see S01-D01 codes.

CT, PT, VT, IT

X12-C01H [2005]

Induction heating coils

See also X25-B02A codes.

X12-C01X [1992]

Other transformer/reactor aspects

Includes other details of transformer or reactor not covered elsewhere.

X12-C02

Cooling, fault detection, control, and tap changing

X12-C02A [1987]

Cooling

Includes fans, gas cooling, evaporative cooling.

Cooling channels or ducts, heat pipes

X12-C02A1 [1987]

Oil-cooling

Includes conservators, expansion chambers.

X12-C02A2 [1987]

Water cooling

X12-C02A3 [1992]

Superconducting device/equipment cooling

Includes all superconducting-related cooling aspects.

X12-C02A3A [2005]

Cryostats

Cryogenics, cryogenics

X12-C02A3C [2005]

Other

Includes, for example, thermoelectric cooling.

X12-C02B [1987]

Fault detection, monitoring, control

Constructional details of controllers are also included here. Includes for example moving a slider along a winding, etc to vary the output.

X12-C02B1 [1987]

Tap changing

Tap switches, no-load-, on-load-tap changer

X12-C03 [1987]

Casing, mounting, supporting or suspending transformers or reactors

(X12-C09)

Also includes noise/vibration reduction.

Tanks, containers, noise damper

X12-C04 [1987]

Preventing or reducing unwanted electric/magnetic effects

(X12-C09)

Includes electric or magnetic screens or shields, using auxiliary coils or cores.

X12-C05 [1987]

Superconducting coil

(X12-C01, X12-C09)

Includes coil for transformer or reactor. See X12-D06 for superconductors per se.

X12-C05A [1987]

For magnets

(X12-C09)

X12-C06 [1992]

High power or large (electro) magnets

(X12-C09)

Includes magnets of the types typically used e.g. for lifting device (see X25-F05 also), accelerators (see X14-G also), etc.

X12-C09

Other general transformer/reactor details

Includes oil cleaners, pressure relief, etc.

Corrosion protection, structural association with built-in electric component

X12-D

Cables, conductors, conductive materials

Covers high power and low power cables/conductors, fibers and other structures.

X12-D01

Materials

Superconducting materials are in U14-F01 and X12-D06B.

X12-D01A

Metals or alloys

X12-D01B

Oxides or sulphides

X12-D01C

**Carbon, silicon, or other non-metallic material;
Conductive polymers**

X12-D01C1 [1992]

Conductive polymers

X12-D01D [2005]

Nano-materials

Includes conductive materials of small dimensions. This code is used in conjunction with the other X12-D codes as appropriate.

Nanotube, carbon nanotube, single wall nanotube, multiwall nanotube, double wall nanotube, SWNT, DWNT, MWNT

X12-D01E [2005]

Ion/proton conductors

To be used in conjunction with other X12-D codes, as appropriate.

X12-D01F [2005]

Conductive dispersions

Generally used when a conductive material is within a dispersion.

X12-D01F1 [2005]

Organic vehicle

X12-D01F2 [2005]

Inorganic vehicle

X12-D01X

Other materials

Includes conductive materials not covered elsewhere.

X12-D02

Non-insulated conductors; Conductive films and structures

X12-D02A

Conductive layers on insulating supports

X12-D02A1 [1992]

Transparent conductive film or electrodes

See also U14-K01A1 for application to LCDs.

ITO, indium titanium oxide

X12-D02A2 [2005]

Anisotropic film

For application to connectors, see V04-A11.

X12-D02C [2005]

Non-insulated conductors

Includes only aspects of conductive part of wires and cables. For other details, such as sheaths, see X12-D03 codes. For manufacture of non-insulated conductors, per se, or forming part of insulated cables, see X12-D07E.

Conductors, wires, stranded conductors, bundled conductors

X12-D02C1 [2005]

High power conductors

Includes conductive part of an insulated wire or cable, non-insulated overhead power line, etc. designed to carry high currents.

X12-D02C1A [2005]

Bus bars

Bus bars, per se; installations are in X12-G03.

X12-D02C2 [2005]

Low power conductors

(X12-D02X, X12-D05)

Includes conductive part of an insulated wire or cable or non-insulated wires designed to carry low currents

X12-D02C2A [2005]

Communication

X12-D02C2B [2005]

Audio/video

X12-D02C2C [2005]

Control and instrumentation

X12-D02C2D [2005]

Conducting nanostructures

Includes nanowires, nanotubes and nanofibers for general use. Specific applications to, for example, battery electrodes are also covered by X16-E codes. For normal size fibers, see X12-D02C2E.

DWNT, SWNT, MWNT, carbon nanotube, CNT

X12-D02C2E [2005]

Fibers

For nanofibers, see X12-D02C2D.

X12-D02X

Other

Includes other conductive structures, such as, within a poorly conductive structure.

X12-D03

Insulated conductor construction

X12-D03A

Flexible, extensible or flat cables

X12-D03A1 [1992]

Flat or ribbon cables

X12-D03A2 [1992]

Flexible and extensible cables

X12-D03B

Sheaths, armouring; Reducing losses; Indicating defects

X12-D03B1 [1992]

Sheaths and armouring

Includes repair of sheaths for which the general 'cable repair' code X12-G01D is also assigned. Repair of a cable sheath in the sense of rectification during manufacture is covered by X12-D07A.

Jacket

X12-D03B2 [1992]

Indicating defects

Includes sensors incorporated within the cable structure to indicate temperature rise, water ingress, etc.

X12-D03B3 [1992]

Reducing losses

Includes arrangements to reduce losses in conductors, sheaths and armourings.

X12-D03C

Cable markings and heat protection

For flame retardants, see also X12-D03X for records prior to 1992.

X12-D03C1 [2007]

Heat protection

Includes measures for improved heat dissipation, shielding or conduction from cables to, for example, operate within rated thermal limits. Also includes flame retardants.

X12-D03C1A [2013]

Cooling

Includes all aspects of cable cooling such as cables per se with integral cooling channels, as well as installations for actively cooling cables and conductors.

Heat dissipation, fan, coolant, air cooling, liquid cooling

X12-D03C2 [2007]

Cable markings

Includes printed markings, use of different color insulation, integral RF tags (also assigned T04-K and W02-G05 codes), and the like, to provide ratings and identification information and to distinguish wires and cables. Markings for security purposes and for deterring theft are also assigned X12-D10.

X12-D03D [1992]

Insulation and its disposition, materials

(X12-D03X)

See also X12-E01, X12-E02 codes.

X12-D03E [1992]

Screens

(X12-D03X)

Includes screens to avoid potential gradients, and to reduce interference. Covers both electrostatic and electromagnetic fields' shielding.

X12-D03F* [1992-2004]

Composite optical fiber- and electric- cable

(X12-D03X)

*This code is now discontinued. It has been transferred to X12-D08 from 2005 but remains searchable for records between 1992 and 2004.

X12-D03G [1992]

Lubricating layers

(X12-D03X)

X12-D03H [1992]

Protection

(X12-D03A, X12-D03X)

Includes protection against e.g. corrosion, termites, chemical attack, etc. Mechanical protection is in X12-D03B1.

X12-D03J [1997]

Contact cable

(X12-D03, X12-D03X)

Sensor cable

X12-D03K	[1997]
Floating and submarine cables	
(X12-D03,X12-D03X)	
X12-D03L	[1997]
Rigid-tube cable	
(X12-D03,X12-D03X)	
X12-D03M	[2002]
Wire harness	
(X12-D03,X12-D03X)	
Includes harnesses per se, and is used in conjunction with other X12-D03 codes as appropriate.	
X12-D03N	[2006]
Drain wire	
(X12-D03X)	
Includes the uninsulated wire located beneath, and in contact with, a grounded shield.	
X12-D03P	[2006]
Cable-strengthening core	
(X12-D03X)	
Includes, for example, steel wire or core located within cable covering to impart strength.	
X12-D03Q	[2006]
Cable-connector combination	
Includes a combination of cable and connector where neither is, or both are, novel. See V04-M17 also.	
X12-D03R	[2011]
Stranded conductors	
X12-D03X	
Other insulated conductor aspects	
X12-D04	
High power and low power cables	
X12-D04A	[2006]
High power	
Includes cables carrying power beyond the level of 110/220V mains. Also includes high power DC cables.	
X12-D04C	[2006]
Low power	
Includes cables carrying power up to and below the level of 110/220V mains. Also includes low power DC cables.	

X12-D05	
Low power cables or wires	
Conductive parts of cables are covered by X12-D02C codes. Other details are covered by X12-D03 codes. The codes in this subsection are used in conjunction with each other as appropriate. For example, a coaxial, RF communication cable would be coded in X12-D05A, X12-D05J and X12-D05M. A loudspeaker cable would be coded in X12-D05B and X12-D05K.	
X12-D05A	[2005]
Communication	
X12-D05B	[2005]
Audio/video	
X12-D05C	[2005]
Control and instrumentation	
X12-D05J	[2005]
HF	
X12-D05K	[2005]
LF	
X12-D05L	[2005]
High speed data	
X12-D05M	[2005]
Coaxial	
X12-D05N	[2005]
Twisted pair	
Includes twisted pairs of both shielded and unshielded type.	
<i>STP, UTP</i>	
X12-D06	
Superconducting cable/materials	
Superconducting wire and line manufacture is covered by X12-D07E1C. Details of superconducting cables, such as sheaths, are covered by X12-D03 codes. Superconducting machines and reactive components are covered, respectively, in X11 and by X12-C codes.	
X12-D06A	[1992]
Cables or lines	
X12-D06A1*	[1992-2005]
Manufacturing	
*This code is now discontinued and has been transferred to X12-D07 from 2006. It remains searchable for records prior to 2006.	

X12-D06B	[1992]
Materials	
Includes all aspects of materials (see also U14-F01 codes).	
X12-D06B1	[1992]
Metal Alloys	
X12-D06B1A	[1992]
Manufacturing and processing	
X12-D06B2	[1992]
Oxide Materials	
X12-D06B2A	[1992]
Manufacturing and processing	
X12-D07	
Manufacture, salvaging	
X12-D07A	
Sheathing, armouring, screening, etc.	
Also includes impervious material coating.	
X12-D07B	
Insulating conductors or cables	
X12-D07B1	
By extrusion, by liquid bath, by spraying	
X12-D07B9	
Other (including winding on tape)	
X12-D07C	[1992]
Stranding-up	
(X12-D07X)	
X12-D07D	[1997]
Cable harness manufacture	
(X12-D07X)	
See also V04-V02 code.	
<i>Wiring harness, wiring loom</i>	
X12-D07E	[2002]
Non-insulated conductor or conductive part of insulated cable	
(X12-D02X)	
Includes manufacture and testing of non-insulated conductors. Other cable testing aspects are covered by X12-D07F.	

X12-D07E1	[2005]
High power conductors	
X12-D07E1A	[2005]
Bus bars	
X12-D07E1C	[2006]
Superconducting line/wire	
(X12-D06A1)	
X12-D07E2	[2005]
Low power conductors	
X12-D07E2A	[2005]
Nano-wires; Nanotubes	
X12-D07E2C	[2005]
Fibers	
X12-D07E3	[2006]
Conductive films	
(X12-D07X)	
X12-D07F	[2007]
Cable testing	
(X12-D07X)	
Includes testing of insulated conductors. Testing of non-insulated conductors is covered by X12-D07E codes. See also S01-G14 for electrical tests on wires and cables. For non-electrical tests, see S02 and S03 classes.	
X12-D07X	
Other cable manufacturing aspects	
<i>Cable marking machine, cable reels, bobbins, spools, salvaging</i>	
X12-D08	[2005]
Composite optical fiber- and electric- cable	
See also V07-F01B4 for optical fiber cables.	
X12-D09	[2005]
Composite power- and signal- cable	
Includes cables having a common outer covering that encloses low and high power cables.	

X12-D10 [2014]

Cable security

This code includes arrangements for preventing or deterring theft of cables, e.g. due to monetary value of conductor materials, based on features of the cable itself, and not features of fittings or installations which are covered by X12-G11. Other X12-D codes are also assigned as appropriate, such as X12-D01 codes for novelty in conductor materials or X12-D03C2 when markings applied to insulated cables enable identification of them after cable theft. Cables incorporating special features to trigger an alarm indicating attempted theft, e.g. by cutting, are also assigned W05-B01 codes.

Code, compound, etch, jacket, laser, marker, signature, trace, unique

X12-E

Insulators

For insulating materials used in general electronic equipment/device, see also V04-X01B from 1997 onwards. Prior to 1997, see also V04-S02. Materials for general electrical equipment are also coded here.

X12-E01

Inorganic substances

X12-E01A

Ceramics

X12-E01B

Mica, asbestos, metallic oxides, cements, gases

X12-E01C [2005]

Inorganic material within organic vehicle

Includes a mixture where the inorganic material is a major constituent.

X12-E01D [2005]

Inorganic nanomaterials

Includes insulating materials of small dimensions. This code is used in conjunction with the other X12-E codes as appropriate.

X12-E01X

Other inorganic insulating substances

Includes glass.

X12-E02

Organic substances

X12-E02A

Liquids, asphalts, bitumens, pitches, natural rubbers

X12-E02B

Resins, waxes, synthetic polymers

X12-E02C [2005]

Organic material within an inorganic vehicle

Includes a mixture where the organic material is a major constituent.

X12-E02D [2005]

Organic nanomaterials

Includes insulating materials of small dimensions. This code is used in conjunction with the other X12-E codes as appropriate.

X12-E02X

Other organic insulating substances

Includes gases, fibrous materials, paper.

X12-E03

Insulators

X12-E03A

Suspension-, supporting-, pin-, lead-through insulators

X12-E03C [1997]

Insulating bodies

(X12-E03A, X12-E03X)

X12-E03C1 [2005]

Tapes, sleeves, tubes

Bead, bobbin

X12-E03C3 [2005]

Grommets

See also X12-G04A3 for use of a grommet within an electrical installation.

X12-E03D [2005]

Insulating nanostructures

Includes nanotubes and nanofibers.

DWNT, SWNT, MWNT, carbon nanotube, CNT

X12-E03X

Other insulators

Includes e.g. measures for improving voltage distribution, composite insulators.

X12-E04

Manufacture

Also includes electrical and mechanical testing of insulators. See also S01-G codes for electrical tests.

X12-F

Spark gaps; Circuits

Does not include spark plugs which are covered by the relevant codes for the motor, X22-A01E1 for land based vehicle motors and W06 for water based vehicle motors.

X12-F01

Spark gaps

Electrodes, voltage-, surge- or lightning protectors/arrestors

X12-F01A [1992]

Overvoltage protection

Includes arcing horns. See also X13-C03.

X12-F02

Circuits

X12-F03 [1992]

Ioniser, ozoniser

(X12-F09)

See also X27-E01B codes for domestic applications.

X12-F04 [1992]

Corona discharge

Includes rings and pointed electrodes. See S06-A02 codes for copiers.

X12-F09

Other spark gap aspects

Includes manufacture.

X12-G

Cable or line installation and maintenance

See W01-D codes for telecommunications cable installation. Low power connectors are in V04.

X12-G01

Methods and equipment

X12-G01A

For installing lines or cables

Maintenance and repair of cable installations is covered by X12-G01D which can be assigned along with X12-G01A codes as necessary. X12-G01A codes are also assigned as appropriate for removal of previously-installed cables.

Laying cables, cable puller

X12-G01A1 [1992]

Overhead installation

Includes transposing of conductors and stringing-up lines and cables etc.

X12-G01A7 [1992]

Underground, building, and water installations

X12-G01A7A [1992]

Digging trenches

X12-G01A7D [1992]

Installing cables in ducts, ground

Ducts per se are in X12-G04A1. This code also covers removal of buried cables.

X12-G01A7E [2022]

Installing cables on vehicles

Includes laying of cables on land/air/water vehicles.

X12-G01A7G [1992]

Submarine

X12-G01A7J [1992]

Cable marking for circuit identification

X12-G01B

For removing cable insulation or armouring

See V04-P03 for electronic circuit application.

Wire stripping

X12-G01C [1983]

Cable and fault locating; Cable/line installation measuring/testing

(X12-G01X)

See S01-G05 also for electrical fault location determination, and S03-C02 codes for cable location by, for example, magnetic fields. Also includes indicators/detectors/recorders for line/cable breaks, lightning strikes, line strain, tripped breaker, etc

X12-G01D [1992]

Maintenance/repair

(X12-G01X)

Includes the use of unmanned vehicles, e.g. radio controlled helicopter for inspecting overhead transmission lines (see also W06-B15U), cleaning of insulators, de-icers, etc.

X12-G01E [1992]

Joining or terminating

(X12-G01X)

Connections per se are in X12-G02.

Crimping tools

X12-G01E1 [1992]

Superconducting wires/cables

(X12-G01X)

X12-G01F [1992]

Safety arrangements

(X12-G01X)

Includes lightning protection, earthing arrangements.

Earth wire, ground wire, earthing grids, lightning-conductors, lightning-rods

X12-G01X

Other cable/line installing aspects

X12-G02

Cable or line connectors or fittings

X12-G02A

Cable or line connectors

X12-G02B

Cable terminations

End connection, terminals, crimping, ferrules, cable glands

X12-G02C

Cable junctions

Joints, splices, protective tubes

X12-G02C1 [1992]

Cold and Heat-shrinkable covers

From 2014 this code is expanded to cover cold-shrinkable covers (previously coded as X12-G02C and now specifically covered by X12-G02C1C) as well as heat-shrinkable covers (now specifically covered by X12-G02C1A).

Sleeve

X12-G02C1A [2014]

Heat-shrinkable covers

(X12-G02C1)

This code is intended for insulation sleeves which shrink around a cable junction on application of heat.

Elastomer, heat gun, thermoplastic

X12-G02C1C [2014]

Cold-shrinkable covers

(X12-G02C)

This code is intended for insulation sleeves which shrink around a cable junction without application of heat, e.g. due to pre-stressing of the sleeve material.

Core, elastomer, rubber, support

X12-G02D [2005]

Grounding connector

For low power earthing connectors, see V04-A05.

X12-G02E [2005]

Sliding connector

Includes, for example, pantograph collectors for a train.

Brushes, slip rings for electric motors are covered by V04-L, V06-M and X11-J codes.

X12-G02F [2005]

Vibration dampers

Includes dampers for an overhead line.

X12-G02G [2007]

Superconductor cable connector/fitting

(X12-G02X)

High power superconducting cable connectors only are covered here. For low power superconducting wire connector, see V04-A10.

X12-G02X

Other cable/line connectors or fittings

Includes connectors or fittings for gas- or oil-filled cables.

Seals, clamps, cooling

X12-G03

Installations of bus-bars

Power rail

X12-G04

For buildings, in ground etc.

Vehicle installations from 1992 onwards are coded exclusively in X22-X01. However, individual items like wire or cable clamps or grommets, which are more generally applicable to other installations are also coded here and, if relevant, elsewhere in X12-E or W01-D or X22-X01. Also, floor structures especially designed to carry cabling is included in X12-G04A or X12-G04A1 depending on whether space between floors is left for cables or concrete ducting is incorporated.

X12-G04A

In, on, or through walls, floors or ceilings, e.g. conduit

Wire harness

X12-G04A1 [1992]

Ducts, ladders, trays, conduits

Includes manufacture.

X12-G04A1A	[2007]
Rigid	
X12-G04A1C	[2007]
Flexible	
X12-G04A1E	[2007]
Fittings	
Includes fittings for joining ducts and distribution boxes, brackets, etc.	
X12-G04A2	[1992]
Clamps	
Includes cable ties, clips and hooks and their manufacture. Cable ties for low-power cables used in e.g. electronic equipment are covered by V04-T01A.	
X12-G04A3	[1992]
Grommets, bushings	
Includes arrangements for leading cables through walls and manufacture.	
X12-G04B	
Distribution and junction boxes	
Ceiling roses and junction boxes are also coded in V04-B09, provided they are of low voltage and low power types. Distribution boxes are also in X13-E02 for industrial switchgear.	
X12-G05	
Overhead installations	
<i>Supports, suspensions, reinforced towers, pylons</i>	
X12-G08	[1992]
Cable or line for supplying relatively movable parts	
(X12-G09)	
X12-G09	
Other general cable/line installation aspects	
Includes labels, signs and tapes warning of e.g. high voltage cable installations, or the presence of cables within a wall or below ground for which X12-G04A codes are also assigned.	
X12-G10	[2007]
Cable dispensing reel	
(X12-G09)	
Includes details of automatic cord winders for headsets.	
<i>Cable drums, reels</i>	

X12-G11	[2014]
Cable or line installation security	
This code includes arrangements for preventing or deterring theft of cables, e.g. due to monetary value of conductor materials, based on features of fittings or installations and not features (e.g. markings) of the cable itself which are covered by X12-D10. Other X12-G codes are also assigned as appropriate, such as X12-G04 codes for underground cable installations. Installations incorporating special features to trigger an alarm indicating attempted theft are also assigned W05-B01 codes.	
X12-H	
Power supply or distribution	
For installations and constructional details of sub-stations see X12-G and X13-E codes, respectively. Note: X13-E is used for constructional details only of switchyards, switchboards etc. X12-H is used for all aspects of load monitoring, control, fault diagnosis, etc.	
X12-H01	
Circuit arrangements for supply or distribution	
X12-H01A	
Adjusting, compensating, balancing	
<i>Power control</i>	
X12-H01A1	[1992]
Voltage control	
X12-H01A1A	[1992]
By load shedding	
X12-H01A1C	[1992]
By reactive power control	
X12-H01A1E	[2006]
By using tap-changing transformer	
See X12-C02B1 for tap changers per se.	
X12-H01A2	[1992]
(Re)active power compensation	
From 2011 this code will cover both active and reactive compensation types.	
<i>Power factor controller, PFC, VAR compensation</i>	
X12-H01A2A	[1992]
On transmission/distribution side	
X12-H01A2B	[1992]
On load side	

X12-H01A2C [2002]
Compensation implemented by series capacitors and shunt reactors

Also includes series/parallel capacitor banks, and synchronous capacitors. This code is used in conjunction with X12-H01A2A or X12-H01A2B whenever possible.

Saturable reactor, synchronous compensator, shunt capacitor

X12-H01A2D [2002]

Static VAR compensation

Includes compensation obtained by the use of capacitors and reactors, respectively, to generate and absorb vars with at least one of them being variable. The variable capacitor or reactor may involve the use of, respectively, thyristor-switched capacitor compensator or thyristor-controlled reactor compensator. This code is used in conjunction with X12-H01A2A or X12-H01A2B whenever possible.

SVC, TCR, TSC

X12-H01A2E [2006]

Power converter

Involves the use of static converters to compensate for system reactance. See also X12-J for converters.

X12-H01A3 [1992]

Short circuit current or in-rush current limiter and over voltage limiter

Includes the use of series reactors/superconducting coils (see also X12-C codes), etc. Applicable only to power lines.

X12-H01A4 [1992]

Harmonics and ripple reduction

Filters in general are covered by U25-E codes. The use of this code is restricted for power lines. Filtering in converter systems is covered by X12-J01E. Also includes suppression of electromagnetic interference for which W02-H codes are also assigned.

X12-H01A5 [1992]

Reducing or preventing power oscillations

X12-H01A6 [1992]

Eliminating or reducing asymmetry in polyphase networks

X12-H01A7 [1992]

Balancing network load by energy storage

(X12-H01A, X12-H09)

For general storage of electric energy, see X12-H06. This code involves the use of e.g. flywheels, batteries, pumped storage hydroelectric plants (see X11-B06, too).

X12-H01A8 [2006]

Frequency regulation

X12-H01A9 [2006]

Load-shedding

Includes load shedding to maintain the balance between generated power and load demand. Also includes shedding to regulate system frequency (see also X12-H01A8). For load shedding to regulate voltage, see X12-H01A1A.

X12-H01B

Multisource systems, system inter-connections, power transfer

Generator synchronising, load sharing

X12-H01B1 [1997]

Distributed power generation system

(X12-H01B)

Includes connection to the utility mains of geographically-distributed solar power, wind power, fuel cell power, gas microturbines, etc. See also U24-J or X12-J codes for power converter details.

X12-H01B2 [2005]

Bulk power transfer/interconnection

Includes arrangements for parallel feeding of a single network by two or more generators, converters, or transformers and also controlling the sharing of output among them.

X12-H01B2A [2008]

Synchronising generator(s) with network

Includes arrangements to synchronise frequency, phase sequence, etc.

X12-H01B3 [2005]

Interconnection of networks operating at different frequencies

X12-H01B4 [2005]

Aircraft and ships

See also W06-B/C codes.

X12-H01B5 [2006]

Electric traction vehicles

Includes high level power distribution system onboard a train, tram, electric vehicle, hybrid electric vehicle. Generally applicable to voltage buses in excess of 42V. Also includes on-board charging and charging control of vehicles. IC engine-driven vehicle systems are covered by U24-H and X22-F codes.

X12-H01C [1992]

High power supply

(X12-H01X, X12-J)

Includes supplies for e.g. welding, induction heaters, etc. Static converters and their controllers are covered by X12-J and X13-G03 codes.

X12-H01D [1992]

HVDC, DC systems

(X12-H01X)

Converter stations, rectifiers, inverters

X12-H01E [2007]

Non-contact power distribution

(X12-H01X)

Includes distribution of energy by electromagnetic waves (See X12-H09 for records prior to 1992). See X21-B01A1C and X16-G03 for non-contact electric vehicle battery charging. Low power non-contact power distribution is coded in U24-H02 codes.

WPT, near-field

X12-H01E1 [2021]

Using capacitive coupling

X12-H01E2 [2021]

Using inductive coupling

See also X12-C codes for novel high power inductive components.

X12-H01E3 [2021]

Using radio waves or microwaves

See also W02 codes for novel RF details such as directional array or Yagi antennae.

X12-H01E4 [2021]

Using light

Includes use of off-board mains supply. See X16-G01 for mains battery charging.

X12-H01E5 [2021]

Using ultrasonic waves

See also V06 codes for novel ultrasonic transducers.

X12-H01E8 [2021]

Wireless power transmission control, monitoring and optimization

Includes optimizing position for non-contact power transfer, reducing electric, magnetic or electromagnetic leakage/interference, detecting foreign objects, as well as transmitting data during power transfer.

X12-H01X

Other circuit arrangements for supply or distribution - including unspecified systems

X12-H02

Emergency or auxiliary supplies

Low power UPS systems are in U24-J.

Standby supplies

X12-H02A [1992]

Diesel-generator rotary UPS

X12-H02B [1992]

Static UPS

X12-H02C [1992]

Rotary UPS

X12-H03 [1983]

Remote control and monitoring; Power system communications

(X12-H09)

X12-H03A [1992]

Remote control and monitoring

Includes network state monitoring, breaker tripping, relay/breaker tripping display. Also includes supervisory display of various system parameters. Constructional details of supervisory desks are in X13-E01. See also W05-D codes for transmission systems for measurement or control signals.

Remote load switching, mains-based switching

X12-H03A1 [2005]

Economics-driven inter-tie or multi-source control

Includes control of network power transfer based on generation costs and tariffs offered for buying and selling of energy. Also includes provision for considering pollution-related costs and setting off of pollution credits. See also X12-H07 and T01-J codes.

X12-H03A3 [2007]

Switching control for equipment connected to mains supply

Includes remotely generated signals to switch domestic equipment, e.g. air conditioner, fridge etc., on and off. For load shedding-related switching see X12-H01A codes. See also W05-D codes.

X12-H03E [1992]

Power systems communications

Includes e.g. power line carrier communications (PLCC) (see W02-C01A), mains-based load control signalling. Also includes pilot relaying (see X13-C01 codes).

X12-H03E1	[2005]
High power transmission/distribution networks	
Typically includes communication/control signals sent over high power lines.	
X12-H03E1A	[2005]
Economics-driven inter-tie or multi-source communication	
Includes control of network communication based on tariffs offered for buying and selling of energy. See also X12-H07 and T01-J codes.	
X12-H03E3	[2005]
Low power mains network	
Typically includes communication/control signals sent over mains wires to switch appliances.	
X12-H03E5	[2005]
Radio network	
X12-H03E7	[2005]
Internet/intranet	
X12-H04	[1992]
Utility load measurements	
(X12-H09)	
Includes meters and metering/measuring arrangements relating only to electrical power systems covering generation, transmission and distribution. Also covers such measurements for domestic, commercial and industrial premises. See also S01 codes for all electrical measurements.	
X12-H04A	[1992]
Remote metering	
(X12-H09)	
Includes arrangements for obtaining meter readings from the customer premises-based meters. Customers, in this context, include domestic, commercial and industrial users. Does not cover arrangements for metering/measuring power line electrical values for display at, for example, a load control centre. Such items are in X12-H04D. See also W05-D codes for transmission of measured values.	
X12-H04B	[2005]
Internet/intranet metering	

X12-H04C	[2006]
Individual transmission/distribution/mains line meters	
Includes current, voltage, power, energy, frequency, etc. meters, per se. Does not include meters not designed for the purpose of generation, transmission/distribution. Where the meter has the facility to be interrogated by a central station or electricity provider, see also X12-H04A.	
X12-H04D	[2006]
Metering/measurement systems	
Includes arrangements/circuitry for obtaining measures of voltage, current, etc for power systems. Individual current/voltage transformers are covered by X12-C codes. By their nature, these are 'remote' measurements but are not coded in X12-H04A.	
X12-H04E	[2006]
Other metering/measurement systems	
Includes recording of transients, harmonics, over voltages/current data, line fault parameters, lightning strikes, etc.	
X12-H04U	[2005]
Applications	
To be used in conjunction with other H04 codes.	
X12-H04U1	[2005]
Protection	
Includes metering arrangements for use with protection devices. See also S01, X12-C01G and X13-C for electrical instrumentation, instrument transformers and protection circuits.	
X12-H04U2	[2005]
Network control	
See also X12-H03A codes for control and monitoring of networks.	
X12-H05	[1992]
Network simulators	
(X12-H09)	
Includes not only network simulation but also modelling of the system to manage load demand/generation, predicting power consumption and outcomes of operational parameter changes, etc. T01-J15 codes for computer-aided design and simulation are also assigned as appropriate.	

X12-H06 [1992]

Electric energy storage

(X12-H09)

For pumped storage hydroelectric systems, see also X11-B06 and X12-H01A7 codes. This code includes systems using superconducting coils, etc. See also X16-L. Storage for load-balancing purposes is in X12-H01A7.

X12-H07 [2005]

Power trading across separate networks/generators

Includes computerised trading of power based on varying tariffs and pollution costs and credits. See also T01-J codes. To be used with other X12-H03 codes for communication and control aspects.

X12-H08 [2013]

Smart grids

Includes smart grids used for power transmission and management. Use with other X12-H codes as appropriate, such as X12-H03 codes for remote control and monitoring, X12-H04 codes for smart metering of power usage, X12-H01B codes for distributed power supply/control and X15-A08 and X15-B05 for solar/wind power control/monitoring. Also see other codes such as X27-V for home automation e.g. where smart grid automatically turns off household equipment, or manages use of off-peak power for domestic equipment.

Intelligent

X12-H09

Other power supply/distribution aspects

X12-J

Power converters

See U24-D for low power converters.

X12-J01

General converter details

X12-J01A

Generation of control voltages

See U21-B01 and U21-B05 codes for electronic switching.

X12-J01A1 [1992]

For bipolar transistor

X12-J01A1A [1992]

For IGBTs

X12-J01A3 [1992]

For FETs

X12-J01A5 [1992]

For thyristors

X12-J01A7 [1992]

For control of other devices

X12-J01A9 [1992]

Characterised by PWM

See U22-E for PWM in general.

X12-J01B [1983]

Circuit protection

(X12-J01X)

See also X13-C04D.

X12-J01C [2012]

Power factor correction

X12-J01E [1992]

Reducing harmonics and ripples

(X12-J01X)

See U25-E for filters in general.

X12-J01E1 [2006]

Harmonics reduction

X12-J01E2 [2006]

Ripple reduction

X12-J01E5 [2014]

Reducing electromagnetic interference

(X12-J01E)

This code covers measures to reduce electromagnetic interference generated by the converter itself, e.g. based on circuitry or on constructional details such as screening for which V04-U codes are also assigned. W02-H01 codes (general codes for EMI/RFI reduction at source) are also assigned as appropriate.

Electromagnetic compatibility, EM, EMC, filter, harmonic, PWM frequency, radio frequency interference, RF, SMPS, switched mode, switching frequency, switching regulator, switching transient

X12-J01G [1992]

General cooling details

(X12-J01X)

See also V04-T03 codes.

X12-J01J	[2006]
Measurements/monitoring/testing (X12-J01X)	
See S01 for related electrical instrumentation.	
X12-J01K	[2007]
Constructional details (X12-J01X)	
X12-J01X	
Other converter aspects	
X12-J02	
DC-DC converters	
X12-J02A	
Without intermediate AC	
X12-J02B	
With intermediate AC	
X12-J03	
AC-AC converters	
X12-J03A	[2005]
Matrix converter	
X12-J04	
AC-DC converter <i>Rectifier</i>	
X12-J04A	[1992]
Half-wave	
X12-J04C	[1992]
Full-wave	
X12-J04C1	[1992]
Bridge	
X12-J04C1A	[1992]
Characterised by diodes	
X12-J04C1B	[1992]
Characterised by thyristors	
X12-J04E	[1992]
Multiplier	

X12-J05	
DC-AC converter <i>Inverter</i>	
X12-J05A	
Full- and half-bridge	
X12-J05A1	[1992]
Characterised by bipolar transistors	
X12-J05A1A	[1992]
Characterised by IGBTs	
X12-J05A3	[1992]
Characterised by FETs	
X12-J05A5	[1992]
Characterised by thyristors	
X12-J05A9	[1992]
Characterised by other switches	
X12-J05B	[2005]
Inverter-type To be used in conjunction with other inverter codes such as X12-J05A.	
X12-J05B1	[2005]
Voltage source inverter	
X12-J05B2	[2005]
Current source inverter	
X12-J05B3	[2005]
Utility inter-tie inverter Includes inverters fed by solar/wind power/etc generators for connecting to a mains/utility supply. For low power inverters, see U24-D codes.	
X12-J06	[2005]
Pulse voltage supply See U24-D06 for low power pulse supply. See U22-A03 also for energy-storage pulse generation.	
X12-J09	
Other converters Includes dynamic converters.	

X12-J10

[2007]

Bidirectional converter

This code is used in conjunction with other codes to indicate a bidirectional novelty.

X13: Switchgear, Protection, Electric Drives

NOTES:

(1) This class contains high power and indeterminate size apparatus. Low power mechanical and electromechanical switches are coded in V03 only, and electronic switches are coded in U21 only.

(2) X13-A01 and X13-A02 codes are common to switches, circuit breakers and circuit protectors.

X13-A

Switchgear contacts; Special switch arrangements

X13-A01

Contact material, structures and manufacture

X13-A01A [1992]

Materials

X13-A01B [1992]

Structures

Shape

X13-A01C [2002]

Contact manufacture; Testing; Monitoring

X13-A02

Contact engagement techniques

Includes contacts details not covered by X13-A01 codes, e.g. details of contact engagement, heating or cooling of contacts, cleaning or lubricating of contact-making surfaces, increasing contact pressure, preventing vibration of contacts, etc.

X13-A03

Switch operating and driving mechanisms (general)

X13-A03A

Operating parts

Levers, pushbuttons, handles, rods

X13-A03B

Mechanisms

Drives, springs, actuators, cams, gear motors

X13-A03C

Interlocking; Arc control

Locking, latches

X13-A03X

Other

Includes casings.

Housing, cover

X13-A04

Special switch arrangements

X13-A04A

Snap-action and time delay

X13-A04B

Linearly movable operating parts

X13-A04B1

Slide switches

X13-A04B2

Push-button switches

X13-A04C

Rotary switches

X13-A04C1

Unlimited or unspecified angle

Knobs

X13-A04C2

Restricted angle

Lever-, toggle-operated, handles

X13-A04D

Tumbler and lockable switches

Rockers

X13-A04E

Encased or on carriage

See X13-E03A also.

Gas-insulated

X13-A04F

Switch manufacture; Testing; Monitoring

X13-A04G [1987]

Contactors

(X13-A04X)

X13-A04G1 [1987]

Electromagnetic

Electromagnets, arc control, cores

X13-A04G5 [1997]
Characterised by type of interrupting medium

X13-A04G5A [1997]
Air gap

X13-A04G5B [1997]
Gas-insulated

X13-A04G5C [1997]
Vacuum

X13-A04H [1987]
High power vacuum and gas-filled tubes
(X13-A04X)
See also V05-A09 and V05-B codes.
Thyratrons, discharge tubes

X13-A04X
Other switches
Includes explosively-actuated high power switches.

X13-B
Circuit breakers

X13-B01
Air-break without arc control
Includes isolators, sectionalisers and fuse-switches.
Blades

X13-B02
Breaking incorporating arc extinguishing
Includes air and liquid circuit breakers.
Oil-break

X13-B02A [1987]
Vacuum circuit breakers
Contacts, electrodes, bellows

X13-B02B [1992]
Gas circuit breakers

X13-B03
Breaking with separate arc extinguishing means
Oil-break

X13-B03A [1983]
Air/gas-blast circuit breakers

X13-B03A1 [1992]
Gas-blast circuit breakers

X13-B03A1A [1997]
SF6 circuit breakers
Sulphur hexafluoride

X13-B04
Arc extinguishing, prevention and detection
Includes use of magnets, auxiliary/multiple contacts, insulating body between contacts, impedances, arcing horns, etc.
Blow-out magnets, resistance-switching

X13-B05 [1983]
Driving mechanisms
(X13-B09)
Includes fluid-, pneumatic-, hydraulic-, motorised- or EM-actuators.
Electromagnetic, springs, linkages, pistons, cranks, rods

X13-B08 [1992]
Manufacture, assembly, testing, maintenance
(X13-B09)
Measurements, monitoring

X13-B08A [1997]
Optical fiber sensors

X13-B08B [1997]
Microprocessors

X13-B09
Other circuit breaker details
Includes interlocks, cases, ensuring operation at a predetermined point, vents for arc products, DC circuit breaker, etc.

X13-C
Emergency protective circuit arrangements
This code is for power equipment protection. Low power electronic apparatus protection is in U24-D and U24-F. Exceptions: certain overcurrent and overvoltage protection aspects are in X13-C03 and its application e.g. telephone line protection is in W01-C.

X13-C01
Disconnection responsive to electrical input
Note: X13-C01A to X13-C01X codes may be used together with X13-C04, X13-C10, X13-C15 and X13-C20 codes.

X13-C01A
Excess current
Overcurrent, short-circuits

X13-C01B

Earth fault current or potential

Includes ELCB and RCCB. See also X13-D05.

Earth leakage circuit breakers, residual current circuit breakers, leakage current

X13-C01C

Excess, under- or no-voltage

X13-C01D

Difference between magnitudes or phase of voltages or currents

Differential protection

X13-C01E [2007]

Distance or impedance

Includes all aspects of distance/impedance relaying. See also S01-D05B for impedance measurements.

X13-C01F [2008]

Arc fault

For detecting and protecting against arcing faults.

X13-C01X

Other disconnection responsive to electrical input

Includes protection schemes responding to power reversal, impedance, loss of synchronism, frequency deviations, etc.; and also includes automatic disconnections and reconnections, indicating operation of fault clearing apparatus, protection CTs and PTs, etc.

Fault indicators, auto-reclosure

X13-C02

Disconnection responsive to non-electrical input

Includes disconnection responsive to temp., line rupture, overspeed of motor/generator etc.

Heat, thermal, line breakage

X13-C03

Limiting excess current or voltage

See X12-A and X12-F codes also.

Surges, transients

X13-C03A [1997]

Overvoltage limiters

X13-C03A1 [1997]

SiC surge arresters

Silicon carbide

X13-C03A2 [1997]

MOV surge arresters

Metal-oxide varistors

X13-C03A3 [1997]

SF6 surge arresters

X13-C03B [1997]

Overcurrent or earth fault current limiters or suppressors

Peterson coil

X13-C03B1 [1997]

Superconducting current limiter

X13-C04

Protection circuits characterised by applications

X13-C04A

Cable or line systems

X13-C04B

Transformers, generators or sync. capacitors

X13-C04C

Motors

Includes means responding to excess current, voltage increase or reduction, phase interruption, increase or decrease of speed, wrong direction of rotation, etc.

X13-C04D

Converters

Includes rectifiers and inverters. See also X12-J01B.

X13-C04X

Other protection circuits characterised by applications

Includes protection for distribution gear, static capacitors, busbars, etc.

X13-C09

Other emergency protective circuit arrangements

Includes personnel protection.

X13-C10 [1992]

Solid-state (analogue) relay protection

X13-C15 [1997]

Digital or numeric relay protection

X13-C15A [1997]

Microprocessors

X13-C15B	[1997]
Artificial intelligence	
X13-C15B1	[1997]
Expert systems	
X13-C15B2	[1997]
Neural networks	
X13-C15C	[1997]
Fuzzy logic	
X13-C15N	[1997]
Characterised by novelty of specific components	
X13-C15N1	[1997]
Signal conditioning	
X13-C15N2	[1997]
A/D signal conversion	
X13-C15N3	[1997]
Protection algorithms	
X13-C20	[1997]
Testing of protection schemes	
X13-C20A	[1997]
Programmable simulators	

X13-D
Fuses; Moulded case circuit breakers; General circuit protectors

X13-D01
Melting fuses

X13-D01A
Electrical details
Includes fusible member and its materials, caps, cartridge fillings.
Fuse-links, -elements, -strips, terminals

X13-D01B
Constructional details
Includes fuse operation indicators, holders, bases, distinguishing marks, etc.
Housing, body, cover

X13-D01C	[1992]
Manufacture, assembly, testing (X13-D06)	
X13-D01T	[1997]
Characterised by type of fuse	
X13-D01T1	[1997]
Semi-enclosed fuses	
X13-D01T2	[1997]
Cartridge fuses	
X13-D01T3	[1997]
Expulsion fuses	
X13-D01T4	[1997]
Striker fuses	
X13-D01T5	[1997]
Printed fuses	
X13-D01T6	[1997]
Fuse resistors	
X13-D01T7	[1997]
SMT fuses	
X13-D01T8	[1997]
Vacuum fuses	
X13-D01T9	[1997]
SF6 fuses	
X13-D02	
Overload circuit breakers See X13-D03, X13-D04 and X13-D06 to X13-D09 codes for details.	
X13-D02A	[1983]
Hand reset mechanism Reset mechanisms include levers, tumblers, knobs, push-buttons.	
X13-D02B	[1983]
Power reset mechanism Includes reclosure types of reset mechanisms.	
X13-D02C	[1983]
Separate resetting action	

X13-D03

Electrothermal or combined EM and electrothermal release mechanisms

Includes bimetal element, expanding rod, strip or wire, fusible mass.

X13-D03A [1997]

Combined EM and electrothermal release mechanisms

X13-D04

Electromagnetic release mechanisms; Reset mechanisms

Electromagnets, armatures, poles

X13-D04A [1992]

Reset mechanisms

X13-D05

Protective switches actuated by abnormal electrical conditions other than solely by excess current

Earth fault currents, current falling below certain level, excess or under voltage, ELCB or RCCB.

X13-D06

Constructional details

Includes housings, casings, bases, mountings, operation indicators, terminals, connections, distinguishing marks.

Terminal colour coding

X13-D07 [1987]

Arc control

(X13-D09)

Arc extinguishing, arc chutes, arc splitters, blow out magnets, arc quenching

X13-D08 [1992]

Manufacture, assembly, testing

For monitoring malfunction of circuit breakers and harmful gases released from them.

(X13-D06)

X13-D09

Other fuses; Moulded case circuit breakers; General circuit protectors

Includes CT for MCCB, locking/interlocking, name or rating plate and the protectors not covered by X13-D01, X13-D02 and X13-D05.

Electrodynamic release, motor-driven

X13-D10 [2002]

Solid state circuit breakers

Contactless

X13-D11 [2002]

Miniature circuit breakers

X13-D12 [2005]

Thermal fuses

Includes one-shot thermal fuses, thermal protectors and thermal cutoffs.

X13-D20 [2002]

Circuit breakers characterised by novel mechanism

X13-D20A [2002]

Sensing mechanism

X13-D20B [2002]

Trigger mechanism

X13-D20C [2002]

Latching and release mechanism

X13-D20D [2002]

Operating mechanism

X13-E

Switchboards, switchyards

Note: This code covers switching devices in association with each other or with transformers, fuses etc. Also, includes mainly constructional details with electrical aspects of power distribution control in X12-H. Motor control centres are covered, with electrical aspects in X13-F and X13-G.

X13-E01

Boards, desks, frameworks

Includes mounting of switches thereon, mosaic or mimic diagrams for supervisory desks or panels.

Rails, slides, building blocks

X13-E02

Casings, boxes

Includes mounting of devices therein, switch box nameplate.

Switch cabinets

X13-E03

Indoor, outdoor or board mounting arrangements

Includes pole mounted units, and transformer substations.

Switch yards

X13-E03A [1992]

Switchgear carriage

X13-E03B [1992]

Switchgear cubicle

X13-E03C [1997]

Characterised by use of SF6

GIS, gas insulated switchgear, sulfur hexafluoride gas insulated switchgear

X13-E04

Wiring, circuit and safety arrangements

Shutters, guards, earth-pins, -plates, fuse arrangements, CT-, PT- arrangements, interlocks, earthing, racking

X13-E04A [1987]

Wiring; Bus-bars

Includes clamps, arrangements for bus-bars and wiring of units on boards or in boxes.

Arrangements, layouts

X13-E08 [1992]

Manufacture, assembly, testing, maintenance, repair

(X13-E09)

Monitoring

X13-E08A [1997]

Optical fiber sensors

X13-E08B [1997]

Microprocessors

X13-E09

Other switchboards, switchyards

Includes venting arc gases from cubicles, cooling, etc.

X13-F*

Starting, stopping or regulating electric machines

*This code is now discontinued and transferred to X13-H from 201401, but remains searchable and valid for records prior to 2014.

Low power motor control is in V06-N.

X13-F01*

Starting electric motors or converters

*This code is now discontinued and transferred to X13-H01A from 201401, but remains searchable and valid for records prior to 2014.

Includes details of star-delta starters, motor control centres, switches, EM contactors. Also includes starting of generators.

X13-F02*

Stopping or slowing electric machines

*This code is now discontinued and transferred to X13-H01B from 201401, but remains searchable and valid for records prior to 2014.

Plugging, supply reversal, reversing motor, regenerative-, resistive-, dynamic-braking

X13-F03*

Speed regulation of electric motors

*This code is now discontinued and transferred to X13-H01 from 201401, but remains searchable and valid for records prior to 2014.

Involves measuring of speed and comparing with a reference to change motor speed; universal motor speed control.

X13-F03A*

Varying field or armature current in DC motors

*This code is now discontinued and transferred to X13-H01C from 201401, but remains searchable and valid for records prior to 2014.

X13-F03A1*

Using tubes or semiconductors

*This code is now discontinued and transferred to X13-H01C1 from 201401, but remains searchable and valid for records prior to 2014.

Pulse modulation, chopper control, static converters

X13-F03A1A* [1992-2013]

Field supply control

*This code is now discontinued and transferred to X13-H01C1A from 201401, but remains searchable and valid for records prior to 2014.

X13-F03A1B* [1992-2013]

Armature supply control

*This code is now discontinued and transferred to X13-H01C1B from 201401, but remains searchable and valid for records prior to 2014.

X13-F03A9*

Other

*This code is now discontinued and transferred to X13-H01C9 from 201401, but remains searchable and valid for records prior to 2014.

Ward-Leonard sets, metadynes, amplidynes

X13-F03B*

Varying stator or rotor current in AC motors

*This code is now discontinued and transferred to X13-H01D from 201401, but remains searchable and valid for records prior to 2014.

Brush shifting, transductor

X13-F03B1* [1992-2013]

Using semiconductors

*This code is now discontinued and transferred to X13-H01D1 from 201401, but remains searchable and valid for records prior to 2014.

X13-F03B1A* [1992-2013]

Frequency control

*This code is now discontinued and transferred to X13-H01D1A from 201401, but remains searchable and valid for records prior to 2014.

X13-F03B1B* [1992-2013]

Voltage control

*This code is now discontinued and transferred to X13-H01D1B from 201401, but remains searchable and valid for records prior to 2014.

X13-F03B1C* [1992-2013]

Vector speed regulation

*This code is now discontinued and transferred to X13-H01D1C from 201401, but remains searchable and valid for records prior to 2014.

Field-oriented, flux-vector, direct-torque, control

X13-F03C* [1992-2013]

AC/DC brushless motors

(X13-F03X)

*This code is now discontinued and transferred to X13-H01E from 201401, but remains searchable and valid for records prior to 2014.

X13-F03C1* [1997-2013]

Permanent magnet

(X13-F03C)

*This code is now discontinued and transferred to X13-H01E1 from 201401, but remains searchable and valid for records prior to 2014.

PM AC/DC brushless

X13-F03C2* [1997-2013]

Switched reluctance

(X13-F03C)

*This code is now discontinued and transferred to X13-H01E2 from 201401, but remains searchable and valid for records prior to 2014.

SR AC/DC brushless

X13-F03C3* [1997-2013]

Sensorless

(X13-F03C)

*This code is now discontinued and transferred to X13-H01E3 from 201401, but remains searchable and valid for records prior to 2014.

BEMF

X13-F03D* [1997-2013]

Asynchronous motors

*This code is now discontinued and transferred to X13-H01F from 201401, but remains searchable and valid for records prior to 2014.

Induction

X13-F03E* [1997-2013]

Synchronous motors

*This code is now discontinued and transferred to X13-H01G from 201401, but remains searchable and valid for records prior to 2014.

X13-F03E1* [2006-2013]

With permanent magnet

*This code is now discontinued and transferred to X13-H01G1 from 201401, but remains searchable and valid for records prior to 2014.

X13-F03E2* [2006-2013]

Without permanent magnet

*This code is now discontinued and transferred to X13-H01G2 from 201401, but remains searchable and valid for records prior to 2014.

X13-F03F* [1997-2013]

Linear motors

*This code is now discontinued and transferred to X13-H01H from 201401, but remains searchable and valid for records prior to 2014.

X13-F03F1* [1997-2013]

Asynchronous

*This code is now discontinued and transferred to X13-H01H1 from 201401, but remains searchable and valid for records prior to 2014.

Induction, AC, LIM

X13-F03F2* [1997-2013]

Synchronous

*This code is now discontinued and transferred to X13-H01H2 from 201401, but remains searchable and valid for records prior to 2014.

AC, LSM

X13-F03F3* [1997-2013]

Direct current

*This code is now discontinued and transferred to X13-H01H3 from 201401, but remains searchable and valid for records prior to 2014.

DC, linear

X13-F03X*

Other speed regulation of electric motors

*This code is now discontinued and transferred to X13-H01X from 201401, but remains searchable and valid for records prior to 2014.

Includes control for multi-motors, etc.

X13-F09*

Other

*This code is now discontinued and transferred to X13-H01X from 201401, but remains searchable and valid for records prior to 2014.

X13-F10* [1997-2013]

Microprocessor based starting, stopping or speed regulation

*This code is now discontinued and transferred to X13-H05 from 201401, but remains searchable and valid for records prior to 2014.

X13-F20* [2005-2013]

Starter-generator/motor-generator speed regulation

*This code is now discontinued and transferred to X13-H07 from 201401, but remains searchable and valid for records prior to 2014.

X13-F25* [2005-2013]

Speed regulation or starting/stopping of electrical machines or converters characterized by specific switching or control device

*This code is now discontinued and transferred to X13-H10 from 201401, but remains searchable and valid for records prior to 2014.

X13-F25A* [2005-2013]

Characterized by bipolar transistors and diodes

*This code is now discontinued and transferred to X13-H10A from 201401, but remains searchable and valid for records prior to 2014.

X13-F25B* [2005-2013]

Characterized by IGBTs

*This code is now discontinued and transferred to X13-H10B from 201401, but remains searchable and valid for records prior to 2014.

X13-F25C* [2005-2013]

Characterized by FETs

*This code is now discontinued and transferred to X13-H10C from 201401, but remains searchable and valid for records prior to 2014.

X13-F25D* [2005-2013]

Characterized by thyristors

*This code is now discontinued and transferred to X13-H10D from 201401, but remains searchable and valid for records prior to 2014.

X13-F25E* [2005-2013]

Characterized by combination of switching devices

*This code is now discontinued and transferred to X13-H10E from 201401, but remains searchable and valid for records prior to 2014.

X13-F25F* [2005-2013]

Characterized by AC-to-DC converter

*This code is now discontinued and transferred to X13-H10F from 201401, but remains searchable and valid for records prior to 2014.

X13-F25G* [2005-2013]

Characterized by DC-to-AC converter

*This code is now discontinued and transferred to X13-H10G from 201401, but remains searchable and valid for records prior to 2014.

X13-F25H* [2005-2013]

Characterized by AC-to-AC

*This code is now discontinued and transferred to X13-H10H from 201401, but remains searchable and valid for records prior to 2014.

X13-F25J* [2005-2013]

Characterized by DC-to-DC converter

*This code is now discontinued and transferred to X13-H10J from 201401, but remains searchable and valid for records prior to 2014.

X13-G*

Controlling electric machines or converters

*This code is now discontinued and transferred to X13-H from 201401, but remains searchable and valid for records prior to 2014.

X13-G01*

Speed or torque of electric motors

*This code is now discontinued and transferred to X13-H01 from 201401, but remains searchable and valid for records prior to 2014.

Includes universal motor speed control.

X13-G01A*

Varying field or armature current in DC motors

*This code is now discontinued and transferred to X13-H01C from 201401, but remains searchable and valid for records prior to 2014.

Ward-Leonard sets, amplidynes, metadynes

X13-G01A1* [1992-2013]

Using semiconductors

*This code is now discontinued and transferred to X13-H01C1 from 201401, but remains searchable and valid for records prior to 2014.

Pulse modulation, chopper control, static converters

X13-G01A1A* [1992-2013]

Field supply control

*This code is now discontinued and transferred to X13-H01C1A from 201401, but remains searchable and valid for records prior to 2014.

X13-G01A1B* [1992-2013]

Armature supply control

*This code is now discontinued and transferred to X13-H01C1B from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B*

Varying stator or rotor current in AC motors

*This code is now discontinued and transferred to X13-H01D from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B1*

Using tubes or semiconductors

*This code is now discontinued and transferred to X13-H01D1 from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B1A* [1992-2013]

Frequency control

*This code is now discontinued and transferred to X13-H01D1A from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B1B* [1992-2013]

Voltage control

*This code is now discontinued and transferred to X13-H01D1B from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B1C* [2005-2013]

Vector speed control

*This code is now discontinued and transferred to X13-H01D1C from 201401, but remains searchable and valid for records prior to 2014.

X13-G01B9*

Other

*This code is now discontinued and transferred to X13-H01D9 from 201401, but remains searchable and valid for records prior to 2014.

X13-G01C* [1992-2013]

AC/DC brushless motors

(X13-G01X)

*This code is now discontinued and transferred to X13-H01E from 201401, but remains searchable and valid for records prior to 2014.

X13-G01C1* [1997-2013]

Permanent magnet

(X13-G01C)

*This code is now discontinued and transferred to X13-H01E1 from 201401, but remains searchable and valid for records prior to 2014.

PM AC/DC brushless

X13-G01C2* [1997-2013]

Switched reluctance

(X13-G01C)

*This code is now discontinued and transferred to X13-H01E2 from 201401, but remains searchable and valid for records prior to 2014.

SR AC/DC brushless

X13-G01C3* [1997-2013]

Sensorless

(X13-G01C)

*This code is now discontinued and transferred to X13-H01E3 from 201401, but remains searchable and valid for records prior to 2014.

BEMF

X13-G01D* [1997-2013]

Asynchronous motors

*This code is now discontinued and transferred to X13-H01F from 201401, but remains searchable and valid for records prior to 2014.

Induction

X13-G01E* [1997-2013]

Synchronous motors

*This code is now discontinued and transferred to X13-H01G from 201401, but remains searchable and valid for records prior to 2014.

X13-G01E1* [2006-2013]

With permanent magnet

*This code is now discontinued and transferred to X13-H01G1 from 201401, but remains searchable and valid for records prior to 2014.

X13-G01E2* [2006-2013]

Without permanent magnet

*This code is now discontinued and transferred to X13-H01G2 from 201401, but remains searchable and valid for records prior to 2014.

X13-G01F* [1997-2013]

Linear motors

*This code is now discontinued and transferred to X13-H01H from 201401, but remains searchable and valid for records prior to 2014.

X13-G01F1* [1997-2013]

Asynchronous

*This code is now discontinued and transferred to X13-H01H1 from 201401, but remains searchable and valid for records prior to 2014.

Induction, AC, LIM

X13-G01F2* [1997-2013]

Synchronous

*This code is now discontinued and transferred to X13-H01H2 from 201401, but remains searchable and valid for records prior to 2014.

AC, LSM

X13-G01F3* [1997-2013]

Direct current

*This code is now discontinued and transferred to X13-H01H3 from 201401, but remains searchable and valid for records prior to 2014.

DC, linear

X13-G01X*

Other speed or torque of electric motors

*This code is now discontinued and transferred to X13-H01X from 201401, but remains searchable and valid for records prior to 2014.

Includes control for multi-motors, etc.

X13-G02*

Electric generators control

*This code is now discontinued and transferred to X13-H02 from 201401, but remains searchable and valid for records prior to 2014.

See V06-N40 codes for speed control of low power generators.

X13-G02A*

Varying field

*This code is now discontinued and transferred to X13-H02A from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T* [1997-2013]

Characterised by type of prime mover or generator

*This code is now discontinued and transferred to X13-H02T from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T1* [1997-2013]

Steam turbine generator

*This code is now discontinued and transferred to X13-H02T1 from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T2* [1997-2013]

Hydrogenerator

*This code is now discontinued and transferred to X13-H02T2 from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T3* [1997-2013]

IC engine generator

*This code is now discontinued and transferred to X13-H02T3 from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T4* [1997-2013]

Gas turbine generator

*This code is now discontinued and transferred to X13-H02T4 from 201401, but remains searchable and valid for records prior to 2014.

X13-G02T5*	[1997-2013]
Wind turbine generator	
*This code is now discontinued and transferred to X13-H02T5 from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02T6*	[2002-2013]
Microturbine generator	
*This code is now discontinued and transferred to X13-H02T6 from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02T7*	[2006-2013]
Synchronous generator	
*This code is now discontinued and transferred to X13-H02T7A from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02T8*	[2006-2013]
DC generator	
*This code is now discontinued and transferred to X13-H02T8 from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02T9*	[2006-2013]
Other generators' control	
*This code is now discontinued and transferred to X13-H02T9 from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02T9A*	[2006-2013]
Induction generator	
*This code is now discontinued and transferred to X13-H02T7B from 201401, but remains searchable and valid for records prior to 2014.	
X13-G02X*	[1980-2013]
Other control details	
*This code is now discontinued and transferred to X13-H02X from 201401, but remains searchable and valid for records prior to 2014.	
Includes control by varying prime mover speed, controlling clutch or other mechanical power transmission device, obtaining desired frequency or voltage in predetermined relation, capacitor variation for asynchronous generator.	
<i>Prime-mover control, frequency control</i>	

X13-G03*	[1980-2013]
Static converters	
*This code is now discontinued and transferred to X13-H03 from 201401, but remains searchable and valid for records prior to 2014.	
This code is used together with X12-J01A and converter-type codes. For low power converter control see U24-D codes.	
X13-G03A*	[1980-2013]
Controlling DC/AC stages or converters	
*This code is now discontinued and transferred to X13-H03A from 201401, but remains searchable and valid for records prior to 2014.	
<i>Inverter control</i>	
X13-G03B*	[1980-2013]
Controlling AC/DC stages or converters	
*This code is now discontinued and transferred to X13-H03B from 201401, but remains searchable and valid for records prior to 2014.	
<i>Rectifier control</i>	
X13-G03C*	[2006-2013]
DC-DC converter	
*This code is now discontinued and transferred to X13-H03C from 201401, but remains searchable and valid for records prior to 2014.	
X13-G03D*	[2006-2013]
AC-AC converter	
*This code is now discontinued and transferred to X13-H03D from 201401, but remains searchable and valid for records prior to 2014.	
X13-G03X*	[1980-2013]
Other converters' control	
*This code is now discontinued and transferred to X13-H03X from 201401, but remains searchable and valid for records prior to 2014.	
X13-G04*	[1980-2013]
Dynamo-electric brakes or clutches; Non-static converters	
*This code is now discontinued and transferred to X13-H04 from 201401, but remains searchable and valid for records prior to 2014.	
From 2006, controllers for reactors/transformers are covered by X12-C02B codes only. For static converters, see X12-J01A and X13-G03 codes only.	

X13-G10* [1997-2013]

Microprocessor based control

*This code is now discontinued and transferred to X13-H05 from 201401, but remains searchable and valid for records prior to 2014.

Includes details of DSP processor, ECU, PLC etc.

X13-G15* [2002-2013]

Remote motor control

*This code is now discontinued and transferred to X13-H06 from 201401, but remains searchable and valid for records prior to 2014.

X13-G20* [2002-2013]

Starter-generator/motor-generator control

*This code is now discontinued and transferred to X13-H07 from 201401, but remains searchable and valid for records prior to 2014.

X13-G25* [2005-2013]

Speed control of electrical machines characterized by specific switching or control device

*This code is now discontinued and transferred to X13-H10 from 201401, but remains searchable and valid for records prior to 2014.

X13-G25A* [2005-2013]

Characterized by bipolar transistors and diodes

*This code is now discontinued and transferred to X13-H10A from 201401, but remains searchable and valid for records prior to 2014.

X13-G25B* [2005-2013]

Characterized by IGBTs

*This code is now discontinued and transferred to X13-H10B from 201401, but remains searchable and valid for records prior to 2014.

X13-G25C* [2005-2013]

Characterized by FETs

*This code is now discontinued and transferred to X13-H10C from 201401, but remains searchable and valid for records prior to 2014.

X13-G25D* [2005-2013]

Characterized by thyristors

*This code is now discontinued and transferred to X13-H10D from 201401, but remains searchable and valid for records prior to 2014.

X13-G25E* [2005-2013]

Characterized by combination of switching devices

*This code is now discontinued and transferred to X13-H10E from 201401, but remains searchable and valid for records prior to 2014.

X13-G25F* [2005-2013]

Characterized by AC-to-DC converter

*This code is now discontinued and transferred to X13-H10F from 201401, but remains searchable and valid for records prior to 2014.

X13-G25G* [2005-2013]

Characterized by DC-to-AC converter

*This code is now discontinued and transferred to X13-H10G from 201401, but remains searchable and valid for records prior to 2014.

X13-G25H* [2005-2013]

Characterized by AC-to-AC

*This code is now discontinued and transferred to X13-H10H from 201401, but remains searchable and valid for records prior to 2014.

X13-G25J* [2005-2013]

Characterized by DC-to-DC converter

*This code is now discontinued and transferred to X13-H10J from 201401, but remains searchable and valid for records prior to 2014.

X13-H [2014]

Control of electric machines

(X13-F, X13-G)

Low power motor control is in V06-N.

X13-H01 [2014]

Speed or torque regulation of electric motors or converters

(X13-F03, X13-G01)

Includes universal motor speed control.

X13-H01A [2014]

Starting electric motor or converters (X13-F01)

Includes details of star-delta starters, motor control centres, switches, EM contactors. Also includes starting of generators.

X13-H01B [2014]

Stopping or slowing electric machines or converters

(X13-F02)

Plugging, supply reversal, reversing motor, regenerative-, resistive-, braking, dynamic braking

X13-H01C	[2014]
Speed or torque regulation by varying field or armature in DC motors	
(X13-F03A, X13-G01A)	
Involves measuring of speed and comparing with a reference to change motor speed, universal motor speed control.	
X13-H01C1	[2014]
Using tubes or semiconductors	
(X13-F03A1, X13-G01A1)	
<i>Pulse modulation, chopper control, static converters</i>	
X13-H01C1A	[2014]
Field supply control	
(X13-F03A1A, X13-G01A1A)	
X13-H01C1B	[2014]
Armature supply control	
(X13-F03A1B, X13-G01A1B)	
X13-H01C9	[2014]
Other details of speed or torque regulation by varying field /armature current in DC motors	
(X13-F03A9)	
<i>Ward-Leonard sets, metadynes, amplidynes</i>	
X13-H01D	[2014]
Speed or torque regulation by varying stator or rotor current in AC motors	
(X13-F03B, X13-G01B)	
<i>Brush shifting, transducer</i>	
X13-H01D1	[2014]
Using semiconductors	
(X13-F03B1, X13-G01B1)	
X13-H01D1A	[2014]
Frequency control	
(X13-F03B1A, X13-G01B1A)	
X13-H01D1B	[2014]
Voltage control	
(X13-F03B1B, X13-G01B1B)	
X13-H01D1C	[2014]
Vector speed regulation	
(X13-F03B1C, X13-G01B1C)	
<i>Field-oriented, flux-vector, direct-torque, vector control</i>	

X13-H01D9	[2014]
Other details of speed or torque regulation by varying stator or rotor current in AC motors	
(X13-G01B9)	
X13-H01E	[2014]
AC/DC brushless motors	
(X13-F03C, X13-G01C)	
X13-H01E1	[2014]
Permanent magnet	
(X13-F03C1, X13-G01C1)	
<i>PM AC/DC brushless</i>	
X13-H01E2	[2014]
Switched reluctance	
(X13-F03C2, X13-G01C2)	
<i>SR AC/DC brushless</i>	
X13-H01E3	[2014]
Sensorless	
(X13-F03C3, X13-G01C3)	
<i>BEMF</i>	
X13-H01F	[2014]
Asynchronous motors	
(X13-F03D, X13-G01D)	
<i>Induction</i>	
X13-H01G	[2014]
Synchronous motors	
(X13-F03E, X13-G01E)	
X13-H01G1	[2014]
Synchronous motors with permanent magnet	
(X13-F03E1, X13-G01E1)	
X13-H01G2	[2014]
Synchronous motors without permanent magnet	
(X13-F03E2, X13-G01E2)	
X13-H01H	[2014]
Linear motors	
(X13-F03F, X13-G01F)	
X13-H01H1	[2014]
Asynchronous linear motors	
(X13-F03F1, X13-G01F1)	
<i>Induction, AC, LIM</i>	

X13-H01H2	[2014]
Synchronous linear motors	
(X13-F03F2, X13-G01F2)	
<i>AC, LSM</i>	
X13-H01H3	[2014]
Direct current linear motors	
(X13-F03F3, X13-G01F3)	
<i>DC, linear</i>	
X13-H01X	[2014]
Other speed or torque regulation of electric motors	
(X13-F03X, X13-F09, X13-G01X)	
Includes control for multi-motors, etc.	
X13-H02	[2014]
Electric generators control	
(X13-G02)	
See V06-N40 codes for speed control of low power generators.	
X13-H02A	[2014]
Varying field	
(X13-G02A)	
X13-H02B	[2014]
Frequency control	
(X13-G02X)	
X13-H02C	[2014]
Voltage control	
(X13-G02X)	
X13-H02D	[2014]
Vector speed control	
(X13-G02X)	
X13-H02E	[2014]
Capacitor variation	
(X13-G02X)	
Asynchronous generators are coded under X13-H02T7B.	
X13-H02T	[2014]
Characterised by type of prime mover or generator	
(X13-G02T)	
X13-H02T1	[2014]
Steam turbine generator	
(X13-G02T1)	

X13-H02T2	[2014]
Hydrogenerator	
(X13-G02T2)	
X13-H02T3	[2014]
IC engine generator	
(X13-G02T3)	
X13-H02T4	[2014]
Gas turbine generator	
(X13-G02T4)	
X13-H02T5	[2014]
Wind turbine generator	
(X13-G02T5)	
X13-H02T6	[2014]
Microturbine generator	
(X13-G02T6)	
X13-H02T7	[2014]
Synchronous/Asynchronous generator	
X13-H02T7A	[2014]
Synchronous generator	
(X13-G02T7)	
X13-H02T7B	[2014]
Asynchronous generator	
(X13-G02T9A)	
<i>Induction</i>	
X13-H02T8	[2014]
DC generator	
(X13-G02T8)	
X13-H02T9	[2014]
Other generators' control	
(X13-G02T9)	
X13-H02X	[2014]
Other electric generator control details	
(X13-G02X)	
Includes control by varying prime mover speed, controlling clutch or other mechanical power transmission device. From 2014, details of frequency control are coded under X13-H02B, voltage control under X13-H02C and by variation of capacitor under X13-H02E.	
<i>Prime-mover control</i>	

X13-H03	[2014]
Static converters control	
(X13-G03)	
This code is used together with X12-J01A and converter-type codes. For low power converter control see U24-D codes.	
X13-H03A	[2014]
Controlling DC/AC stages or converters	
(X13-G03A)	
<i>Inverter control</i>	
X13-H03B	[2014]
Controlling AC/DC stages or converters	
(X13-G03B)	
<i>Rectifier control</i>	
X13-H03C	[2014]
Controlling DC-DC converters	
(X13-G03C)	
X13-H03D	[2014]
Controlling AC-AC converters	
(X13-G03D)	
X13-H03X	[2014]
Other converters' control	
(X13-G03X)	
X13-H04	[2014]
Dynamo-electric brakes or clutches; Non-static converters	
(X13-G04)	
From 2006, controllers for reactors/transformers are covered by X12-C02B codes only. For static converters, see X12-J01A and X13-H03 codes only.	
X13-H05	[2014]
Microprocessor based control	
(X13-F10, X13-G10)	
Includes details of DSP processor, ECU, PLC etc.	
X13-H06	[2014]
Remote motor control	
(X13-G15)	
X13-H07	[2014]
Starter-generator/motor-generator control	
(X13-F20, X13-G20)	

X13-H10	[2014]
Speed control of electrical machines characterized by specific switching or control device	
(X13-F25, X13-G25)	
These codes are used together with other X13-H codes as appropriate.	
X13-H10A	[2014]
Characterized by bipolar transistors and diodes	
(X13-F25A, X13-G25A)	
X13-H10B	[2014]
Characterized by IGBTs	
(X13-F25B, X13-G25B)	
X13-H10C	[2014]
Characterized by FETs	
(X13-F25C, X13-G25C)	
X13-H10D	[2014]
Characterized by thyristors	
(X13-F25D, X13-G25D)	
X13-H10E	[2014]
Characterized by combination of switching devices	
(X13-F25E, X13-G25E)	
X13-H10F	[2014]
Characterized by AC-to-DC converter	
(X13-F25F, X13-G25F)	
<i>Rectifier</i>	
X13-H10G	[2014]
Characterized by DC-to-AC converter	
(X13-F25G, X13-G25G)	
<i>Inverter</i>	
X13-H10H	[2014]
Characterized by AC-to-AC converter	
(X13-F25H, X13-G25H)	
X13-H10J	[2014]
Characterized by DC-to-DC converter	
(X13-F25J, X13-G25J)	
X13-H99	[2014]
Other control details of electric machines	

X13-U [1997]

Characterized by application to specific equipment or industry

For records prior to 2005, these codes were used for applications of medium and high power electric machines control only. From 2005 onwards, these codes are used for applications of fuses, protectors, circuit breakers, and medium and high power switches and electric machines control. See V03 codes for low power electric switches and V06 codes for low power electric machines.

X13-U01 [1997]

Road vehicles

X13-U02 [1997]

Railways

X13-U03 [1997]

Aviation and aerospace

X13-U04 [1997]

Ships and boats

X13-U05 [1997]

Military

X13-U06 [1997]

Industrial machines

X14: Nuclear Power Generation

See also section K for further details of nuclear reactors and nuclear power.

X14-A

Reactor processes

Includes all aspects of reactor processes.

X14-A01

Fast fission

Fast-breeder, fast neutrons

X14-A02

Thermal

Includes boiling-water reactor, pressurised water reactor.
Gas-cooled, PWR, BWR, AGR, thermal neutrons

X14-A03

[1992]

Fusion reactors

Includes plasma confinement and generation.
JET, Tokamak, toroidal-, poloidal-coils, plasma generation

X14-A03A

[1992]

Cold fusion

(X14-A09)
Electrolysis, palladium

X14-A09

Other reactor processes

Includes sub-critical reactors.

X14-B

Reactor components

Includes all aspects (electrical and non-electrical) of components except for cooling where certain items e.g. heat exchangers are excluded.

X14-B01

Pressure vessels, containment

Concrete structures, seals, walls

X14-B02

Shielding; Emergency protection

Includes biological-, reflecting- and thermal-shields.
Neutron shield, emergency shut-down, neutron reflection, gamma radiation thermal shielding

X14-B03

Cooling

Includes pumping or circulating of coolant.
Circulation pumps, liquid, sodium circulation, coolant flow control

X14-B04

Fuel elements

X14-B04A

Manufacture

Includes fuel element manufacture and materials for the fuel and its cladding.

X14-B04X

Fuel assemblies and other details

Includes bundles of pin-, rod- or tube-shaped fuel elements, spacer grids, casings, jackets.
Cladding, grids

X14-B05

Moderator or core structure

Includes locating or supporting of fuel elements, supporting complete structure.
Fuel supports, fuel grids, moderator composition, supporting core, grid supports, heavy water, graphite, core shroud

X14-C

Nuclear power plant and control

Documents are included in X14-C02 to X14-C06 only if some electrical aspects are disclosed. X14-C01 covers both electrical and non-electrical aspects.

X14-C01

Control of nuclear reaction

Includes control or poison rods and their drive arrangements. Also includes control circuits.
Control material, neutron absorber, shut-down, hafnium, boron, cadmium, erbium, europium

X14-C02

Monitoring and testing reactor

See also section S for general instrumentation e.g. S03-G codes covers nuclear or X-radiation.
Probes, measuring-temp, -reactivity, -radioactivity, -strain, -neutron-flux

X14-C03

Fuel handling

Includes fuel handling arrangements to load fuel elements into the reactor and discard used elements. Also includes storage and associated handling of unused fuel, prior to use in the reactor.

Robots, lifting devices, discharging/dismantling irradiated fuel

X14-C04

Manufacture of reactor

X14-C05

Power plant

X14-C05A

Generation of electricity or mechanical energy

X14-C05B

Plant control

Regulating plant parameters, flow, level, feedwater control

X14-C05C [2002]

Measurements relating to plant

(X14-C05X)

For in-situ reactor-related measurements, see X14-C02. Includes arrangements, for example, to check the integrity of welded joints. See also the relevant instrumentation codes in section S.

X14-C05X

Other nuclear power plant aspects

Includes safety suits, personal radiation monitors, cabling, protection. Also includes electrical details of water desalination systems for producing potable water (see also X25-H03 for water treatment). If water is used for cooling the reactor, X14-B03 should be applied.

Cable inlets, plant simulator, dosimeter badge, nuclear desalination, hot cell

X14-C06 [2013]

Maintenance, service, repair

X14-C99 [2018]

Other nuclear power plant details

Includes arrangements to provide heat for purposes other than conversion into power, e.g. for heating buildings.

X14-D

Radioactive waste treatment, power plant decommission, decontamination, etc.

Includes only electrical apparatus and methods for water disposal, decommission of power plant, decontamination of radioactive contaminants, e.g. safety wear (masks, clothes, etc), etc.

Decontamination, disposal, storage, electrolytic waste disposal, decommission

X14-E

Energy from radioactive sources

Includes only electrical apparatus and methods for radioactive/nuclear cells, etc.

X14-F

Plasma technique

Includes generation and handling of plasma for fusion reactors. For other uses, only electrical aspects are included.

X14-F01 [1992]

For fusion

Magnetic confinement

X14-F02 [1992]

For integrated circuit manufacture

See also appropriate U11-C codes.

X14-F03 [1992]

For burners and torches

See also X24-D05.

Plasma gun

X14-F04 [2002]

For propulsion

Covers plasma propulsion techniques for ordnance, space vehicles, etc. See also W06-B03 and W07 codes.

X14-G

Particle accelerators

Documents are included in X14-G only if some electrical aspects are disclosed. See also K08-G and L03-H04D.

X14-G01 [1987]

Linear

Linac, magnets

X14-G02 [1987]

Cyclic

Synchrotrons, cyclotrons, betatrons, magnets

X15: Non-Fossil Fuel Power Generating Systems

NOTES:

See X11-A, X11-B and X11-C codes for steam turbine plants, coal-fired power plants, hydroelectric plants, gas turbine plants, IC engine plants, co-generation plants, etc. Nuclear power generation details are covered by X14 only. See also X11-J codes for in-depth constructional details of the generators, e.g. stator, rotor, windings, insulation, etc. See also X12 codes for details of power distribution to e.g. power transmission networks (powergrids).

X15-A

Solar power

X15-A codes cover all details of solar batteries, solar power, solar powered charging of batteries, when there is some novelty/importance regarding the solar aspect. Includes power generation from solar rays as well as other optical radiation, photoelectrochemical and thermophotovoltaic actions. If details about e.g. the semiconductor materials used in the cell (photolayers, etc.), the photoreceivers, the manufacture/packaging of the cells, etc., U12-A02A codes should also be applied. See also X15-A04 or X15-A05 to highlight small scale or large scale power generation, respectively.

Photoelectrochemical and dye-sensitized solar cells are also coded under X16-A04. Chargers using solar energy to charge a battery are also coded under X16-G02A.

Details of redox batteries, such as vanadium redox batteries, used for storing energy generated from solar farms to supply power during low generation periods, are coded under X16-C.

X15-A01

Solar heat/radiation collection; Concentrators

Includes solar heat/radiation collection and concentration for both solar thermal energy conversion systems (see also X15-A01A) as well as systems using direct conversion of solar energy (see also X15-A02).

X15-A01A [2005]

Heat collecting panels; Heat collecting pipes

Includes panels provided with pipes carrying liquid that is heated by the sun. Direct conversion panel details are in X15-A02.

Collectors, heat pipes

X15-A01A1 [2011]

Working fluids

(X15-A01C4)

Includes arrangement details of working fluids such as water, molten salts etc.

Heat absorber

X15-A01C [2005]

Concentrators

Includes arrangements to direct sun's rays onto the solar panels/heat pipes using reflectors, lenses and sun-tracking dishes. This code can be applied in conjunction with X15-A01A to highlight application to solar thermal energy conversion systems or X15-A02 to highlight application to direct solar energy conversion systems.

X15-A01C1 [2010]

Mirrors

Focussing mirror, parabolic mirror, parabolic troughs

X15-A01C2 [2010]

Lenses

Focussing lenses, Fresnel lenses

X15-A01C3 [2010]

Tracking arrangements

Includes heliostats.

X15-A01C4* [2010-2010]

Working fluids

*From 2011 this code is transferred to X15-A01A1, but remains searchable for records in 2010. Includes arrangement details of working fluids such as water, molten salts, etc.

X15-A01C9 [2010]

Other concentrators details

X15-A02

Direct conversion photovoltaic panel details; Solar/photovoltaic cells details

X15-A01C codes can be used in conjunction with X15-A02 codes to highlight the concentrators, e.g. mirrors, tracking arrangements, etc. See also U12-A02A codes.

X15-A02A [1983]

Single cells

Includes photovoltaic or solar cells (see also U12-A02 codes) and their manufacture. See U12-A02A7 for circuitry arrangements for solar cells.

X15-A02B [1983]

Assemblies of cells

Includes details of interconnections between individual cells. Details of the solar panel or module are covered by X15-A02C.

X15-A02C [2002]

Solar/photovoltaic panel details

Includes mechanical details of solar/photovoltaic panels, modules or tiles, including anti-reflective coating, glass cover to protect the cells from the elements, cleaning system for removing dust (sand) and dirt from the surface of the solar/photovoltaic panels. Also includes interconnections between panels. Mechanical details of roof structures are coded under X15-A02X only. Details of single cells and assemblies of cells (including interconnections between individual cells) are coded under X15-A02A and X15-A02B, respectively.

Solar cell modules, panels, tiles, anti-reflective coating

X15-A02D [2002]

Photoelectrochemical cells

(X15-A02A)

See also X16-A04 and other X16 codes for more detailed breakdown of the details of such cells, and U12-A02 codes.

X15-A02D1 [2005]

Dye-sensitised solar cells

Includes the use of an organic dye and electrolyte for absorbing solar energy and hole transport.

DSSC, Gratzel cells

X15-A02E [2002]

Thermophotovoltaic cells

Includes cells where IR rays are converted to electricity. See also U12-A02 codes.

X15-A02F [2005]

Organic solar cells

Includes cells that use electron-acceptor and electron-donor organic materials.

X15-A02X [2010]

Other solar/photovoltaic panels/cells details

Includes mechanical details of roof structures. Mechanical details of solar/photovoltaic panels, modules or tiles are coded under X15-A02C only. Includes wiring to solar battery, details of junction boxes (also covered by V04-B09 and X12-G04B codes), and cooling arrangements, Solar module packing.

X15-A04 [2002]

Small scale solar power generation

Covers generation of electricity, for example, to power watches, calculators, etc. Also includes domestic or micro installations. This code is used in conjunction with other X15-A codes.

X15-A05 [2002]

Large scale solar power generation

Covers high power systems, for example, for powering space crafts, vehicles, etc. Includes solar systems installed on roofs of buildings (see also X27-E01A5 for domestic solar heating systems). This code is used in conjunction with the above relevant codes.

Solar-powered vehicles, solar water heating system

X15-A05A [2010]

Solar tower; Solar chimney

Includes use of greenhouse structure to heat air to create updraft in tower containing turbines to generate power.

X15-A05B [2010]

Solar Stirling engine

Includes use of concentrated solar energy as heat source within engine.

X15-A05H* [2010-2015]

Hybrid/Combination plant

*This code is now discontinued and has been transferred to X15-A10 from 201601. It remains searchable for records prior to 2016.

Includes solar thermal plants that are combined with other (including fossil fuel-based) heat or electricity generating equipment to cope with overcast skies or night operation. Details of combination plants not involving solar power are coded under X15-J.

X15-A05X [2010]

Other large scale solar power generation

X15-A08 [2010]

Control, monitoring and testing

Includes control, monitoring and testing details of solar and photovoltaic cells, solar heat collecting devices and concentrators. This code is used in conjunction with other X15-A codes as appropriate. Also includes solar cell evaluation apparatus or solar simulator e.g. to measure theoretical outputs of solar panels.

Simulation

X15-A09

Other solar power aspects

Includes use of solar energy to raise steam for driving generators. Excludes solar energy for heating water, which is covered by X27-E01A codes.

X15-A10 [2016]

Hybrid/Combination plant

(X15-A05H)

Includes solar thermal plants that are combined with other (including fossil fuel-based) heat or electricity generating equipment to cope with overcast skies or night operation. Also see X15-A05 for large scale solar combined plant. Also includes small scale combined solar and wind turbine power generation (also see X15-A04 for small scale solar combined power generators). Details of combination plants not involving solar power are coded under X15-J.

X15-A15 [2019]

Manufacture, servicing and maintenance (solar power)

Includes manufacture, servicing and maintenance details of solar power energy plants. This code is used in conjunction with other X15-A codes as appropriate.

X15-B

Wind power

Includes arrangements for electricity generation using wind power. Details of converters and interconnection to the utility mains are covered by, respectively, U24-D/X12-J and X12-H01B codes.

Details of redox batteries, such as vanadium redox batteries, used for storing energy generated from wind farms to supply power during low generation periods, are coded under X16-C.

X15-B01

Motors

Constructional details, e.g. gearing systems, clutches, cooling and ventilating systems, manufacture details, rotors and stators details, etc, are also covered by X11-J codes. Blade details are covered by X15-B01C.

X15-B01A [1987]

Turbines

Vanes, windmills, drives

X15-B01A1 [2005]

Large scale

X15-B01A3 [2005]

Small scale

Includes microturbines, e.g. those located at the bottom of a chimney, vehicles, e.g. electric vehicles, etc. For small scale power plants, see X15-B04.

X15-B01A5 [2010]

Horizontal turbines

X15-B01A6 [2010]

Vertical turbines

X15-B01B [1987]

Generators

See also X11.

Asynchronous, synchronous

X15-B01C [2010]

Blade design; Blade material

Includes construction details of blades, including design, materials of blades per se, and attachments for connecting/supporting the blades.

Damping arrangement, de-icing

X15-B02 [2005]

On-shore systems

This code is used in conjunction with other codes as appropriate.

X15-B03 [2005]

Off-shore systems

This code is used in conjunction with other codes as appropriate.

X15-B04 [2006]

Small scale power plant

This code is used in conjunction with other codes as required to indicate the small scale nature, where disclosed, of the plant such as used in vehicles, within a chimney etc.

Small size

X15-B05 [2006]

Control, monitoring and testing

Includes electrical aspects only. Includes blade pitch control, control of blade angle, noise emission monitoring, etc.

Speed control, simulation

X15-B06 [2006]

Support structures

Includes wind turbine tower and its manufacturing.

X15-B09

Other wind power aspects

Includes details of lightning protection system, etc.

X15-B15 [2019]

Manufacture, servicing and maintenance (wind power)

Includes manufacture, servicing and maintenance details of wind power energy plants. This code is used in conjunction with other X15-B codes as appropriate.

X15-C

Sea power

Includes use of heat differential between different depths. Hydroelectric power generation using water turbines driven by river flow or river falls is coded under X11-B only.

Details of power plant, e.g. turbines, blades, etc, are also covered under X11-B and X11-J codes.

Details of osmotic power or salinity gradient power are covered by both X11-B09 and X15-C.

Ocean currents, ocean thermal energy conversion, vortex power

X15-C01 [1983]

Wave power

X15-C01A [2010]

Wave energy capture methods

X15-C01A1 [2010]

Point absorbers; Buoys

Includes floating structure with components that move relative to each other due to wave action.

Salter duck ®, Edinburgh duck ®, buoyant moored device

X15-C01A2 [2010]

Attenuators; Surface following

Includes long multi-segment floating structures oriented parallel to the direction of the waves that flex at the segments and drive hydraulic pumps or other converters.

Hinged contour device, Pelamis ®

X15-C01A3 [2010]

Terminator devices; Oscillating water columns

Includes devices that extend perpendicular to the direction of wave propagation and capture or reflect the power of the wave.

OWC

X15-C01A4 [2010]

Overtopping devices

Includes reservoirs that are filled by incoming waves to levels above the average surrounding ocean and where gravity causes the water released to fall back and drive hydro turbines.

X15-C01A9 [2010]

Other wave energy capture methods

X15-C01B [2010]

Installation location

X15-C01B1 [2010]

On-shore installation

X15-C01B2 [2010]

Near-shore/Off-shore installation

X15-C01C [2010]

Power take-off

Includes details of power take-offs such as hydraulic ram, elastomeric hose pump, pump-to-shore, hydroelectric turbine, air turbine and linear electrical generator.

X15-C02 [2005]

Tide energy

Tidal, tides

X15-C02A [2010]

Tide energy plant type

X15-C02A1 [2010]

Tidal stream systems

X15-C02A2 [2010]

Barrages

X15-C02A3 [2010]

Tidal lagoon

X15-C02A9 [2010]

Other tide energy plant type

X15-C02B [2010]

Novel turbine arrangements

X15-C03 [2010]

Control, monitoring and testing

Includes control, monitoring and testing details of either wave power and/or tide energy plants. This code is used in conjunction with other X15-C codes as appropriate.

Simulation

X15-C15 [2019]

Manufacture, servicing and maintenance (sea power)

Includes manufacture, servicing and maintenance details of sea power energy plants. This code is used in conjunction with other X15-C codes as appropriate.

X15-D	[1997]
Thermoelectric power generation	
(X15-X)	
Includes details of thermoelectric generators that convert heat directly into electricity, or generate power from temperature difference (Seebeck effect). Details of thermoelectric devices applied to refrigeration using the Peltier effect are coded under X27-F02B1 only. See also U14 codes.	
<i>Thermovoltaic elements, thermoelectric battery</i>	
X15-E	[1997]
Biomass, biofuel and waste fuel combustion power generation	
(X15-X)	
Includes electrical details of power generation using biomass, waste fuel and biofuels. Biofuels, including their production, are covered by CPI codes. Also includes systems such as electrostatic precipitators for reducing nitrogen oxides, volatile organic compounds and particulate emissions.	
<i>Waste-to-Energy</i>	
X15-G	[2010]
Geothermal power	
(X15-X)	
X15-G01	[2011]
Electricity generation	
Includes generation of electricity from steam produced by heating water pumped down to underground hot rocks.	
<i>Geothermal power</i>	
X15-G02	[2011]
Thermal power	
Includes use of geothermal energy for water heating and provision of hot water to homes and buildings.	
<i>Geothermal heating</i>	
X15-H	[2010]
Profiting from waste heat	
Includes waste heat recovery arrangements, e.g. for recovering heat from sewage or waste water for use in water heating (see X27-E03) e.g. for shower or dishwasher. See X11-C04 instead for combined heat and power plants per se.	

X15-J	[2011]
Combined cycle plant	
Includes electric power generation by combinations of different non-fossil fuel sources or combinations of non-fossil fuel and other fossil fuel sources such as gas turbines (see also X11-C01). Details of combination plants involving solar power are also coded under X15-A05H (pre-2016).	
See X11-C03 only for electric power generation solely using fossil fuel sources.	
<i>Hybrid</i>	
X15-K	[2011]
Cogeneration plant	
Includes provision of combined heat and electric power using non-fossil fuel sources.	
Combined heat and electric power generation using fossil fuel sources are coded under X11-C04.	
<i>CHP</i>	
X15-T	[2011]
Power generation from traffic flow	
(X15-X)	
Includes using vehicular traffic flow, animal or human traffic flow etc. to generate electricity. Includes use of compressible hydraulic cylinders or piezoelectric generators buried beneath road that use weight of traffic passing over them to generate electricity.	
<i>Parasitic energy harvesting, hydraulic compressible speed bump</i>	
X15-V	[2011]
Control, monitoring and testing	
Includes control, monitoring and testing details of all X15 sections other than X15-A (solar power), X15-B (wind power) and X15-C (sea power). Control, monitoring and testing details for solar, wind and sea power are only coded under X15-A08, X15-B05 and X15-C03 respectively.	
<i>Simulation</i>	
X15-W	[2011]
Constructional details, manufacture, servicing and maintenance	
Includes constructional, manufacturing, servicing and maintenance details for all X15 sections other than X15-A (solar power), X15-B (wind power) and X15-C (sea power). This code is used in conjunction with other X15-D to X15-X codes as appropriate.	

X15-X

Other non-conventional power generation

Includes non-conventional power generation systems that can't be coded elsewhere, such as power generated from muscle contraction/relaxation, human exercise. From 2010, geothermal plants are transferred to X15-G. From 2011, generation of electricity from vehicular, animal or human traffic flow is transferred to X15-T.

X16: Electrochemical Storage

NOTES:

- (1) Manufacture of a cell of a particular type is coded with the cell.
- (2) General details like lead acid battery cases are coded with the cell type and its relevant code e.g. X16-F01 and X16-B01B.
- (3) Electrode details are not coded with the cell type if specific provision is made in X16-E.

X16-A

Non-rechargeable or primary cells

Cooling, heating and air-conditioning details are coded under X16-K codes, and also under one or more X16-A code(s) to highlight the type of primary cells/batteries. The same applies to battery charging (X16-G codes), battery measurements and testing (X16-H codes), and battery/cell materials recovery and recycling (X16-M).

X16-A01

With aqueous electrolyte

X16-A01A

Dry cells

Button cells, Zinc-carbon battery

X16-A01B [1992]

Metal-air cell

(X16-A01X, X16-D)

See also X16-D.

Zinc-air

X16-A01X

Other primary cells

X16-A02

With non-aqueous electrolyte

X16-A02A [1987]

Lithium-based cell

Lithium-copper oxide, lithium-thionyl chloride, lithium-chromoxide, lithium-manganese dioxide, lithium-sulphur dioxide, lithium-polycarbon monofluoride

X16-A03 [1987]

Reserve cells

X16-A03A [1987]

Thermal cells

X16-A03B [1987]

Sea-water cells

(X16-A01X)

X16-A04 [1987]

Photoelectrochemical cells

See also U12-A02A and X15-A02D codes.

X16-A05 [2005]

Micro- and printed-primary cell

To be used together with the battery electrolyte type e.g. non-aqueous cell.

X16-B

Rechargeable or secondary cells

Cooling, heating and air-conditioning details are coded under X16-K codes, and also under one or more X16-B code(s) to highlight the type of secondary cells/batteries. The same applies to battery charging (X16-G codes), battery measurements and testing (X16-H codes), and battery/cell materials recovery and recycling (X16-M).

X16-B01

Cells

X16-B01A

Alkaline

Nickel-zinc, alkali

X16-B01A1 [1992]

Nickel-cadmium

X16-B01A3 [1992]

Metal-hydrogen

(X16-B01A, X16-B01X)

Includes nickel-hydrogen, etc. cells.

X16-B01B

Lead-acid

Also includes recombination type and valve regulated lead acid (VRLA) type.

X16-B01C [1987]

High-temperature sodium-sulphur

(X16-B01X)

X16-B01C1 [1992]

Other high-temperature cells

(X16-B01X)

X16-B01D [1987]

Metal-halogen

(X16-B01X)

See also X16-D02.

X16-B01F	[1992]
Non-aqueous (X16-B01X) Includes organic electrolytes.	
X16-B01F1	[1992]
Lithium-based (X16-B01X) Includes secondary lithium cells when the state of the electrolyte is not known.	
X16-B01F1A	[2005]
Liquid electrolyte	
X16-B01F1C	[2005]
Solid electrolyte Includes solid polymer lithium electrolyte cells.	
X16-B01G	[2005]
Micro- and printed-secondary cell To be used together with any other battery electrolyte-type cell e.g. alkaline.	
X16-B01X	
Other secondary cells Includes gas-tight accumulators.	
X16-B09	
Other secondary cells' aspects Includes servicing, maintenance and battery/cell reconditioning. If recycling, see also X16-M and X25-W04.	
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X16-C	
Fuel cells and associated components Fuel cell electrodes, casings and electrolytes are coded under X16-E06A, X16-C18 and X16-J codes respectively. Cooling, heating and air-conditioning details are coded under X16-K codes, and also under one or more X16-C code(s) to highlight the type of fuel cells. The same applies to battery charging (X16-G codes), battery measurements and testing (X16-H codes), battery/cell materials recovery/recycling (X16-M) and manufacturing details (X16-S). <i>Redox cell, oxidants, VRB, Vanadium redox battery</i>	
X16-C01	[1992]
Solid oxide and solid polymer fuel cell	
X16-C01A	[1997]
Solid oxide fuel cell Includes cells using e.g. zirconium oxide electrolyte. <i>SOFC</i>	

X16-C01A1	[2005]
Tubular Includes tubular solid oxide electrolyte with inner and outer electrodes.	
X16-C01A3	[2005]
Monolithic Includes planar and corrugated solid oxide electrolyte with electrodes on its major surfaces.	
X16-C01C	[1997]
Solid polymer fuel cell <i>PEM, SPEFC, SPE fuel cell, proton exchange membrane, solid polyethylene fuel cell, SPFC, PEMFC</i>	
X16-C02	[1992]
Molten carbonate fuel cell <i>MCFC</i>	
X16-C03	[1992]
Alkaline fuel cell <i>AFC</i>	
X16-C04	[1992]
Phosphoric acid fuel cell <i>PAFC</i>	
X16-C06	[2005]
Bio-fuel cell Includes, for example, cells with electrodes having a 'bio' catalyst.	
X16-C07	[2005]
Micro/flat fuel cell Includes fuel cells using, for example, a small replaceable fuel tank. To be used together with the type of cell such as SOFC.	
X16-C09	[1992]
Control Includes catalyst temperature control using fuel and air flow, gas and air circulation, etc.	
X16-C15	[1992]
Fuel/gas supply arrangements, storage facility; Combustion products/exhaust gas handling	
X16-C15A	[2005]
Fuel/gas supply arrangements For supplying gas to electrodes.	

X16-C15A1	[2005]
Manifolds	
X16-C15A2	[2005]
Flow plates	
<i>Bipolar plates</i>	
X16-C15A3	[2005]
Fuel wicking	
X16-C15A4	[2005]
Liquid and air transmission pump	
X16-C15C	[2005]
Fuel storage facility	
X16-C15C1	[2005]
Bulk storage facility	
X16-C15C2	[2005]
Replaceable fuel container	
<i>Cartridge, reservoir, cassette, tank</i>	
X16-C15C3	[2005]
Hydrogen storage/absorption material	
X16-C15C3A	[2005]
Nanomaterial/nanotube	
X16-C15E	[2005]
Exhaust/waste handling	
X16-C16	[1997]
Anode and cathode gases separators or separating arrangements	
(X16-F02)	
See X16-F02 for other membranes and anode and cathode separators.	
X16-C17	[1997]
Fuel processing	
X16-C17A	[2005]
Hydrogen generation	
Includes all aspects of hydrogen manufacture if for ultimate, stated use in fuel cells.	
X16-C17A1	[2005]
Reformer	
Includes extraction of hydrogen from hydrocarbons such as methanol, gasoline, etc.	

X16-C17C	[2005]
Catalyst	
For electrode catalyst, see X16-E06A5A.	
X16-C17E	[2005]
Heater	
Includes heating arrangement for fuel processing. For battery and fuel cell heating, see X16-K02.	
X16-C18	[2005]
Fuel cell housing, stack, and sealing arrangements	
(X16-F01, X16-F01A, X16-F06)	
See X16-F codes for batteries.	
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X16-D	
Hybrid cells, etc.	
Includes fuel cell in combination with primary or secondary cell.	
X16-D01	[1992]
Metal-air	
X16-D02	[1992]
Metal-halogen	
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X16-E	
Electrodes	
X16-E01, X16-E02 are either used on their own or in conjunction with the relevant battery type.	
X16-E01	
Active materials	
X16-E01A	[1992]
Organic compounds	
X16-E01A1	[1992]
Polymers	
X16-E01C	[1992]
Inorganic compounds	
X16-E01C1	[1992]
Oxides, complex oxides	
X16-E01E	[1992]
Conductive material	
X16-E01G	[1992]
Manufacturing	

X16-E01H [1992]
Characterised by active material size/structure
To be used together with X16-E01A/E01C codes.

X16-E01H1 [2005]
Nanomaterials
To be used together with X16-E01A/E01C codes.

X16-E01J [2005]
Binders and fillers
(X16-E09)

X16-E02
Carriers, plates, collectors
Collectors, grids, supports

X16-E03
Primary cell electrodes

X16-E03A [1992]
Non-aqueous electrolyte

X16-E03A1 [1997]
Lithium-based non-aqueous electrolyte

X16-E04
Lead-acid accumulator electrodes

X16-E05
Alkaline accumulator electrodes

X16-E05A [1992]
Nickel-cadmium

X16-E05C [1992]
Metal-hydrogen
(X16-E05, X16-E09)
Includes nickel-hydrogen, etc. cells. Also includes hydrogen storage alloys.

X16-E06
Fuel and hybrid cell electrodes
Also includes inert electrodes and catalysts.

X16-E06A [1992]
Fuel cell

X16-E06A1 [2005]
Electrode materials
Includes all 'active' materials for the electrodes and catalysts. For fuel processor catalyst, see X16-C17C1.

X16-E06A1A [2005]
Nanomaterials/nanotubes
Nanocarbon

X16-E06A5 [2005]
Electrode details
Includes constructional and arrangement details of electrodes.

X16-E06A5A [2005]
Catalyst
For fuel processor catalyst, see X16-C17C1.

X16-E06A5C [2005]
Membrane electrode assembly
MEA

X16-E06A5E [2005]
Gas diffusion layer
GDL

X16-E06C [1992]
Hybrid
(X16-E06, X16-E09)

X16-E06C1 [1992]
Metal-air

X16-E06C2 [1992]
Metal-halogen

X16-E07 [1987]
Depolariser
(X16-X)

X16-E08 [1992]
Non-aqueous electrolyte cell electrodes
(X16-E09)

X16-E08A [1992]
Lithium-based
(X16-E09)

X16-E09
Other electrode aspects
Includes electrodes not coded above and miscellaneous items relating to electrodes.
Surfactant

X16-E10	[1992]
Sodium-sulphur (X16-E09)	
X16-E11	[2005]
Photoelectrochemical cell electrode See also U12-A02 and X15-A02 codes for solar cells.	
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X16-F	
Constructional details of cells or batteries	
X16-F01	
Cases, seals, shapes For battery holders, see X16-F06 codes.	
X16-F01A	[1987]
Sealing arrangement <i>Gaskets</i>	
X16-F01C	[2005]
Casing Used in conjunction with X16-F01A and X16-F01F codes when appropriate. <i>Covers, containers, housings, walls, lids</i>	
X16-F01F	[1992]
Characterised by shape of casing Used when casing/sealing arrangement is novel.	
X16-F01F1	[1992]
Button/coin	
X16-F01F2	[1992]
Cylindrical/tubular	
X16-F01F3	[1992]
Prismatic	
X16-F01F4	[2005]
Micro- or printed-battery	
X16-F02	
Separators, membranes, spacers Steam separators are not coded here but under X16-K01 only, and fuel cell separators are coded under X16-C16 only. <i>Cotton, nylon, polypropylene, cellulose-rayon, cellulose-nylon, cellulose-nylon paper, polyethylene, cellophane, polytetrafluoroethylene, woven, non-woven, diaphragm</i>	

X16-F03	
Terminals, internal connections, vents, filler caps	
X16-F03A	[1987]
Terminals; Internal connections	
X16-F03A1	[2005]
Terminals Includes externally accessible terminals to contact any equipment being powered by the battery. See X16-F05 for connections used for grouping cells or batteries to form packs.	
X16-F03A3	[2005]
Internal connections Includes internal connections within cell or battery, inaccessible on the outside.	
X16-F03B	[1987]
Vents, filler caps <i>Valves, safety devices, pressure relief</i>	
X16-F04	[1987]
Electrolyte circulating arrangement (X16-F09)	
X16-F05	[1987]
Battery connectors; Jumper cables (X16-F09) See also V04 for connectors. <i>Clamps</i>	
X16-F06	[1992]
Battery holder/compartament associated with electrical/electronic equipment; Battery packs; Charging pods (X16-F09) Grouped/stacked fuel cells are covered by X16-C codes.	
X16-F06A	[2005]
Battery packs Also covers individual batteries or cells grouped together by external connectors such as groups of batteries for electric vehicles, power station batteries, etc. Battery packs using a specific type of cell such as alkaline are also covered by X16-B01 codes. <i>Battery module</i>	
X16-F06C	[2005]
Battery compartment/holder associated with electrical/electronic equipment See also V04-S03 for casings incorporating such holders/compartments.	

X16-F06E	[2005]
Charging pods; Cells or battery holder	
Includes constructional details. For battery charging circuits, see X16-G codes.	
X16-F06E1	[2005]
Charging pods	
Includes battery-powered equipment holders designed for charging the battery.	
X16-F06E2	[2005]
Cell or battery holder	
Includes battery or cell, per se, holder for charging. For example, a mains plug adapter with charging circuit within and section for holding cells to be charged.	
X16-F09	
Other cell constructional details	
Includes getter, packaging carton, theft prevention, nameplate labels, waterproof and dust proof protection, vibration damping arrangements, etc.	
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X16-G	
Battery chargers	
X16-G01	
Using AC mains	
X16-G02	
Using other sources	
Jumper cables are coded in X16-F05.	
X16-G02A	[1983]
Using solar cells	
X16-G02B	[2002]
Using another battery	
X16-G02C	[2002]
Using generator	
Includes battery charging using an electric generator. <i>Piezoelectric</i>	
X16-G02C1	[2008]
IC engine-driven	
X16-G02C2	[2008]
Wind power-driven	
X16-G03	[2005]
Non-contact charger units	
To be used in conjunction with other codes. For example, non-contact mains charger is also coded in X16-G01.	

X16-H	[1987]
Battery measurements and testing	
(X16-G)	
Includes electrical and non-electrical measurements.	
X16-H01	[1992]
Remaining charge	
See also S01-G06 codes.	
X16-H02	[1992]
Measurements / testing associated with intrinsic / extrinsic properties	
Includes sensing level, density or humidity of electrolytes, detecting leakage of electrolyte solution, measuring durability of electrolyte film, measuring fuel (e.g. hydrogen) level, concentration or density, measuring specific gravity of electrolytes, measuring membrane air permeability, etc. Temperature control / monitoring is coded under X16-H05 only. See also relevant S codes, e.g. S02-C06 codes for level measurements.	
X16-H03	[2002]
Voltage/current	
See also S01-D and S01-G06 codes.	
X16-H04	[2002]
Battery classification	
Includes testing to classify battery into different types.	
X16-H05	[2009]
Temperature	
Includes details of temperature control and monitoring. See also S03-B codes for temperature measurements.	
X16-H09	[2002]
Smart battery	
This code is used where a battery provides power to an equipment and also stores status data and/or has the facility to transfer this data to the equipment.	
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X16-J	[1987]
Electrolytes	
(X16-X)	
Includes dendrite inhibitor, composition.	
X16-J01	[1992]
Solid	
Includes gel electrolyte as well.	
X16-J01A	[1992]
Organic	

X16-J01C	[1992]
Inorganic	
X16-J01E	[2005]
Nanomaterials	
To be used together with other appropriate X16-J codes.	
X16-J01G	[2005]
Gel	
To be used together with other appropriate X16-J codes.	
X16-J02	[1992]
Liquid	
X16-J03	[1992]
Molten/fused salt	
Includes electrolytes which are normally solid at room temperature but liquid at operating temperatures.	
X16-J07	[1992]
Aqueous	
X16-J08	[1992]
Non-aqueous	
X16-J09	[1992]
Electrolyte holders or matrix	
X16-K	[1987]
Battery cooling, heating, etc.	
(X16-X)	
X16-K01	[2005]
Cooling	
<i>Water cooled, refrigeration, baths, coolant circulation, steam separator</i>	
X16-K02	[2005]
Heating	
Includes, for example, heating to aid correct battery operation.	
X16-K03	[2005]
Air conditioning	
Includes humidification, such as moisture introduction within a fuel cell gas, PEMFC humidity control, etc	

X16-L	[1987]
Other types of electric energy storage	
(X16-X)	
Includes non-chemical and non-battery types of storage of electric energy. See also X12-H codes for storage of excess generated energy. Does not include pumped storage hydroelectric systems. Includes flywheel storage systems.	
X16-L01	[1987]
Storage heaters	
See also X27-E01A4.	
X16-L02	[1987]
Capacitors	
Includes capacitors of the type used for supplying power e.g. electrochemical double layer capacitor/supercapacitor (see also V01-B01D codes).	
X16-M	[2002]
Battery materials recovery	
Includes recovery and recycling details. See also X16-A, X16-B, X16-C codes to highlight the type of batteries/cells. See also X25-W04 for electrical recycling details. Details of battery manufacturing are coded under X16-S.	
X16-S	[2020]
Battery manufacturing apparatus/method	
Includes all apparatus, mechanisms and method used during the manufacture of battery parts. Details of battery materials recovery are coded under X16-M only. Manufacture of active materials is coded under X16-E01G only. See also other X16 codes as appropriate to highlight the type of batteries/cells manufactured. Prior to-2020, manufacturing details of batteries were coded in X16-X.	
<i>Modelling, simulation</i>	
X16-X	
Other general battery aspects	
From 2020, manufacturing details of batteries are coded under X16-S.	

X21: Electric Vehicles

X21-A

Electric propulsion and braking

X21-A01

Electric propulsion

Includes all aspects of electric traction for ridden vehicles except electric train/tram (see X23-A codes), electric luggage trolleys (see X25-F05 codes) and electric ship propulsion (see W06-C01 codes). Also, any application not catered for specifically is included. In general, this code will be used in conjunction with other claimed aspects e.g. heating systems.

X21-A01A [1987]

Wheelchair

Includes invalid carriages and mobility vehicles for disabled persons. Also see S05-G02A for wheelchairs or S05-K01 for mobility aids. See Q22-C02 for novel mechanical details of wheelchairs.

X21-A01B [1987]

Forklift truck

Includes electric motor driven forklift trucks (see also X25-F05A). See also X21-X for novel hydraulic fork assemblies. IC engine-driven trucks are instead coded in X22-P05F and X25-F05A, as well as other X22 codes as appropriate depending on the claimed aspects.

X21-A01C [1997]

Electric bicycle

Includes electric tricycle.

X21-A01D [1997]

Hybrid vehicle

Includes vehicles utilising electric traction motor and other power source, i.e. internal combustion engine. Can be used in conjunction with other X21-A01 codes such as X21-A01H for hybrid bus.

HEV, PHEV, plug-in hybrid vehicle

X21-A01D1 [2002]

Parallel hybrid vehicle

Includes vehicle whose wheels are driven by both electric motor and e.g. internal combustion engine, including four wheel drive type vehicles where IC engine drives front wheels and electric motor(s) drive rear wheels. Also see X22-P04A and other relevant X22 codes.

X21-A01D3 [2002]

Series hybrid vehicle

Includes vehicle with electric traction motor and battery that is charged e.g. by IC engine driven generator. See also X21-B04C for on-board IC engine driven generator. Previously coded as electric vehicle in X21-A01F and X21-B04C and not X21-A01D as only electric traction present.

X21-A01E [1997]

Electric golf cart

Excludes electric golf trolley. See also W04-X01F codes.

X21-A01F [1997]

Electric motor car

Includes electric vehicles (EV). Can also be applied to indicate general or unspecified electric vehicle application. See X21-A01J instead for fuel cell powered electric vehicles.

X21-A01G [2002]

Electric scooter/motorcycle

See W04-X03E2 for child's electric toy scooter.

X21-A01H [2002]

Electric bus/lorry

Includes trolley buses. See X23 only for trams.

X21-A01J [2007]

Fuel cell vehicle

(X21-A01F)

Includes electric vehicles powered using fuel cell technology. Can be used in conjunction with other X21-A01 codes as appropriate, e.g. X21-A01H for fuel cell bus. See X21-A01F for battery driven electric vehicles. Unspecified vehicles using fuel cells are considered to be electrically-propelled vehicles rather than motor vehicles and are thus coded here.

FCV

X21-A01L [2015]

Driverless/autonomous electric vehicles

Includes electric vehicles that can drive themselves. Used with other X21 codes as required, e.g. X21-H for automatic steering and X21-A05 for safety/monitoring arrangements.

X21-A01M [2002]

Other electric vehicles

Includes riding or ride-on type electrically propelled mowers (see also X27-A01A) as well as personal electric transportation devices such as self-balancing vehicle or electric skateboard. See W04-X03E2 for outdoor toys such as skateboards.

Segway®, hoverboard

X21-A01R [2021]

Recreational electric vehicles

Includes electric recreational vehicles such as camper, go-kart, RV, ATV, electric snowmobile or electric ski cycle.

X21-A02

Mounting of propulsion units; Gearing

X21-A02A [2002]

Transmission system and its control

Includes control of clutch, gear ratio and general transmission details.

Gearing, clutch, drive shafts

X21-A02C [2021]

Thermal management of transmission systems

Includes transmission cooling arrangements. See also X11-J codes for high power motor/transmission cooling.

X21-A03

Electrodynamic and (electro)mechanical brake systems

X21-A03A [1997]

(Electro)mechanical

Also includes mechanical friction brakes with additional electrical details.

ABS, anti-lock braking

X21-A03C [1997]

Electrodynamic

Includes regenerative, resistive and eddy current braking. See also V06-N06 and X13-F02 codes.

X21-A04

Traction motor speed or torque control

See also V06-N, X13-F03 and X13-G01 codes. Includes control of motor output torque, e.g. to supplement torque delivered to wheels by IC engine of hybrid vehicle during gear shifting (see also X21-A01D1 and X22 codes as appropriate).

X21-A04A [1997]

Rectifier control

See also U24-D, X12-J and X13-H03B codes.

X21-A04C [1997]

Inverter control

See also U24-D, X12-J and X13-H03A codes.

X21-A05

Safety; Monitoring; Instrumentation

From 2010 this code has been expanded to include general instrumentation, e.g. for vehicle dashboard. Includes protective arrangements, anti-collision systems etc. Also includes overall arrangements for determining whether it is safe to operate in autonomous driving mode. See also X21-A01L for autonomous electric vehicles per se.

X21-A05A [2013]

Safety systems

Includes electric vehicle safety systems such as cameras for internal/external view, airbags, seatbelts, horns, anti-collision systems, noise generators to make vehicle more noticeable to pedestrians etc.

X21-A05A1 [2022]

Passenger and pedestrian protection

Includes airbags to protect vehicle occupants or pedestrians, seat belts, active head restraints etc.

X21-A05A2 [2022]

External view and internal-view cameras

Includes rear-view reversing cameras and 'enhanced' or 'assisted' vision cameras/display.

X21-A05A3 [2022]

Horns, noise generators

Includes noise generators to make vehicle more noticeable to pedestrians etc.

Pedestrian awareness

X21-A05A5 [2022]

Anti-collision and parking systems

X21-A05E [2013]

Monitoring; Instrumentation

Includes general instrumentation, e.g. for vehicle dashboard.

X21-A06 [1997]

Measurements

(X21-A05)

Includes battery remaining charge indicators (see also S01-G, X16-H and X21-B01 codes), maximum distance before need for recharging, speed, novel sensors, etc.

X21-A06A [2021]

Speed and slip sensor

Includes sensing of wheel speed or general vehicle speed.

X21-A06B [2021]

Acceleration and shock sensor

Includes measurement of acceleration, deceleration and shock or impact sensing.

X21-A06C [2021]

Temperature sensor

Includes measurement of battery, motor and other system temperatures.

X21-A06D [2021]

Current and voltage sensors

Includes remaining battery capacity measurement, and other electrical apparatus parameters measurement.

X21-A06F [2021]

Distance and deviation sensors

Includes measurement of distance to object and distance between vehicles to maintain safe distance. Also includes lane deviation measurement. See also X21-A05 codes for safety and monitoring per se.

X21-A06H [2021]

Position or angle sensors

Includes rotary or angular position sensing (see also S02-A10D codes), resolvers, encoders (see also U21-A03J).

X21-A06X [2021]

Other vehicle measurements

X21-A07 [1997]

Electric traction motor; Motor-generator

Includes details of the traction motor per se. See also V06-M and X11 codes for further detailed breakdown of motor details. Also includes motor-generator. See X11-H20 for motor-generators per se.

X21-B

Power supply and related aspects

X21-B01

Battery and fuel cell arrangements

Includes traction batteries and fuel cells, and their charging (see also X16).

X21-B01A [1997]

Traction battery; Fuel cell

Includes novel battery and fuel cell details and their grouping to attain higher operating voltage. See also X16 codes for a more detailed breakdown of batteries and fuel cells (X16-C), per se.

X21-B01A1 [1997]

Charging arrangements

See also X16-G codes. Includes battery discharging arrangements, e.g. to fully discharge battery before recharging.

X21-B01A1A [1997]

On-board charging systems

Includes charging battery using onboard device such as generator. Also see X16-G02C for battery charging using generator.

X21-B01A1C [1997]

Off-board charging systems

Includes use of off-board mains supply. See X16-G01 for mains battery charging. Also see X16-G03 for wireless battery charging and X12-H01E codes for non-contact power distribution.

Wireless, inductive

X21-B01B [2002]

Battery management systems

Includes battery control, charging control, on-board power supply systems, over-voltage and short-circuit protection.

X21-B01B1 [2021]

Battery thermal management

Includes heating and cooling arrangements for batteries and fuel cells. Also see X16-K01 and X16-K02 for battery cooling and heating respectively.

X21-B01E [2012]

Battery exchange/leasing

Includes arrangements for enabling a depleted battery to be removed from a vehicle and replaced with a fully charged battery. Also includes battery leasing.

Lease, exchange, replace

X21-B02

Power supply lines; Power feed

Includes off-board power supply aspects, such as overhead lines for trolley buses (see also X12-G codes).

Power supply cables, overhead lines

X21-B03

Current collectors

Overhead pick-up shoes, brushes

X21-B04 [1997]

Combination of battery and other source

Includes e.g. additional use of electrolytic capacitor, mechanical flywheel, secondary battery.

X21-B04A	[1997]
Wind turbine or solar cell array	
See also X15-B and X15-A codes for wind and solar power generation respectively.	
X21-B04C	[1997]
On-board IC engine-driven generator	
X21-B04C1	[2002]
IC engine control	
Control of internal combustion engine driving generator in series hybrid vehicle. This code is not applied for parallel hybrid vehicles, since novel engine control can be adequately highlighted by the application of X22-A codes.	
<i>Fuel injection control, ignition timing control, pollution control, series hybrid</i>	
X21-B05	[1997]
Power converter	
Includes details of DC-DC converters, power rectifiers and inverters (see also U24-D and X12-J codes depending on power level). Converter control is covered by X21-A04 codes.	
X21-C	[1997]
Electric vehicle accessories	
(X21-A01)	
X21-C01	[1997]
Passenger compartment heating systems	
X21-C02	[1997]
Passenger compartment air conditioning/ventilation systems	
Includes passenger compartment air-conditioning, cooling, ventilating and air treatment arrangements.	
X21-C03	[2020]
Passenger accommodation; Passenger cabin	
Includes passenger accommodating arrangements such as seats, beds, seat belts, tables, electric blinds, electric windows. See Q14-C codes for mechanical details.	
X21-C12	[2020]
In-car office/information equipment	
Includes systems to allow working from in-car "office" such as email, internet browsing for booking tickets, hotel reservations, local information, navigation systems etc. For internet gaming see X21-C13 instead.	

X21-C13	[2020]
In-car entertainment systems	
Includes all in-car entertainment devices such as television (including streamed TV services) and games machines powered from vehicle supply.	
<i>DVD, TV, MP3, MP4, game</i>	
X21-C20	[1997]
Other electric vehicle accessories	
Includes electric vehicle accessories not covered by other X21-C codes.	
X21-D	[1997]
Electric connectors and wiring installations	
See V04 codes for electric connectors and X12-G04 codes for common installation features like wiring clamps.	
X21-E	[1997]
Electric switches	
Includes all switches associated with electric vehicles. See also V03 codes. See U21 for electronic switching.	
X21-F	[1997]
Lights	
Includes internal and external vehicle lighting. See also X26 codes or more details.	
<i>Headlamp, taillamp, ambience lamps</i>	
X21-H	[2002]
Steering systems	
Includes electric steering arrangements and automatic steering.	
<i>Power steering, automatic steering</i>	
X21-J*	[2012-2013]
Servicing and testing	
*This code is now discontinued and transferred to X21-X16 from 201301, but remains searchable for 2012 patents. Includes electric vehicle maintenance and servicing equipment. For arrangements for exchanging depleted battery with fully charged one, see X21-B01E instead.	

X21-K [2010]

Electric vehicle communications and connectivity; Multiplexing; Networking; V2X

(X21-X)

Includes vehicle to everything communications (V2X; C-V2X). Includes all communications, connectivity, networking and multiplexing, including cellular (also see W02-C03C1L) and dedicated short range communication (also see W01-A06C4E). Includes communication within an electric vehicle (intra-vehicle), communications between vehicle and other vehicles (inter-vehicle), roadside (V2I), pedestrians (V2P) etc. Includes electric vehicle telephones and hands-free systems. See W01 and W02 codes for telecommunications per se.

Multiplex, DSRC, 5G, cellular, data transmission, LAN, local area network, WAN, wide area network, Bluetooth®, CAN bus, controller area network, bus, Ethernet, VAN, UART, universal asynchronous receiver/transmitter

X21-K02 [2021]

Electric vehicle to network; Vehicle to cloud communications

Includes electric/hybrid vehicle to cloud (V2C) communication that uses V2N access to broadband cellular mobile networks to enable data exchange with the cloud (also see T01-N codes). Includes over the air (OTA) updates to vehicle software; Remote vehicle diagnostics (also see X22-X16).

V2N, V2C, IoT

X21-K03 [2021]

Intra-vehicle; Vehicle to device communications networking/connectivity

Includes in-car high speed, integrated communications networks and multiplexing arrangements for interconnecting various vehicle systems e.g. using wireless LAN, serial data bus, Bluetooth® etc. (see also W01 codes), avoiding the need for dedicated point-to-point wiring. Includes vehicle to device (V2D) and cellular V2D (C-V2D) communications to e.g. connect tablet, smartphone or wearable to e.g. vehicle infotainment system. Includes app for controlling vehicle locking.

V2D, C-V2D, App, mobile phone

X21-K05 [2021]

Inter-vehicle communications; V2V

Includes communication between different electric/hybrid vehicles to enable them to wirelessly exchange information about their speed, location, and heading. Includes DSRC V2V and C-V2V communication providing 360 degree awareness of other vehicles. Includes vehicle to motorcycle communication.

Platooning, cooperative adaptive cruise control, V2M, C-V2M

X21-K06 [2021]

Electric vehicle to pedestrian communications

Includes communication between vehicle and persons, pedestrians or cyclists including V2P and cellular V2P communication. Includes warning pedestrian, cyclist or electric scooter rider of danger e.g. approaching vehicle and for warning drivers of presence of other road users.

V2P, C-V2P, cyclist, e-bike, bicycle, scooter

X21-K08 [2021]

Electric vehicle to offboard/infrastructure communications; V2I

Includes communication between electric/hybrid vehicle and offboard infrastructure, roadside units or traffic signals (also see T07-B codes) or device. Includes cellular vehicle-to-infrastructure (C-V2I) communications. Also includes dedicated short range communication (DSRC) based V2I.

Infrastructure, offboard, V2I, C-V2I, traffic signal

X21-K08G [2021]

Electric vehicle to grid communications; V2G

Includes communication between vehicle and grid (V2G) to enable plug-in hybrid and electric vehicles to supply vehicle electric power to electricity grid for peak load levelling or to stabilise intermittent renewable power supplies. Also see X12-H codes for power distribution and X21-B01A1C for smart charging, e.g. charging vehicle battery at night while supplementing grid load during the day. Also includes vehicle to home (V2H) power transfer e.g. for emergency power supply (see X12-H02) or supplementing renewable wind/solar power.

Sell electricity, load-levelling, bidirectional V2G, unidirectional V2G, V1G, smart charging, backup power

X21-M [2012]

Suspension systems and control

Includes electrical control of mechanical springs and dampers, electrical springs and dampers. For electrical suspension control of IC engine vehicle refer X22-M only.

X21-N [2012]

Noise/vibration/Harshness reduction

Includes all electrical details of arrangements to reduce noise, vibration and harshness in the vehicle. For mechanical NVH reduction see Q17-N instead.

X21-R [2018]

Rider assist

Includes systems for assisting riding of vehicles such as motorcycles or mono-wheel vehicles. Includes balance-aiding and self-balancing systems e.g. using gyroscopes or automatic steering correction to keep motorcycle upright.

Gyroscope, balance, balancing

X21-U [2005]

Electric vehicle rental, hiring and sharing systems

Includes overall system associated with electric vehicle hiring and rental with some on-board vehicle aspect, e.g. enabling user to book vehicle on-line (see T01-N and T01-J05 codes) while central controller provides authorisation and remote access to allocated vehicle. Also includes car pooling arrangements with some on-board vehicle aspect.

X21-W [2020]

General By-wire / (Semi)Autonomous control

Includes general by-wire control systems including 'total' electric vehicle by-wire control and specific controllers not covered elsewhere. Also includes general (semi)autonomous electric vehicle control but specific system control codes can also be applied such as X21-A04 for electric motor control and X21-B01B for on-board electric power supply control. For systems for determining whether it is safe to operate in autonomous driving mode see X21-A05. See X21-A01L for driverless/autonomous electric vehicles per se and Q19-L for mechanical aspects of an autonomous vehicle.

X21-X [1997]

Other electric vehicle features

Includes electrically operated fork assembly on forklift truck (also see X21-A01B and X25-F05A for forklift per se).

X21-X03 [2018]

Anti-theft and Anti-hacking

Includes anti-theft arrangements with some kind of immobilisation of electric vehicle and systems for preventing hacking or overriding of electric vehicle systems. Includes devices for preventing door lock/motor start signal jamming, code grabbing, 'App' (application) hacking etc. See W05-B codes for theft alarms per se. See X21-K for electric vehicle communications/networking per se.

Door lock, hack, steal, immobilizer

X21-X16 [2013]

Electric vehicle maintenance and testing

Includes electric vehicle servicing equipment. See X21-B01E for battery exchange equipment. Also includes arrangements for testing electric vehicle systems. See X21-J instead from 2012-2013.

X21-X20 [2013]

Electric vehicle design/manufacture/assembly

Includes electric details of design, manufacture and assembly of electric/hybrid vehicles and their components. See X25-X14 for manufacturing/assembly plant per se. Also includes systems for dismantling vehicle to enable recycling of materials (see also X25-W04). See X16-M and X21-B01 codes also for recycling of batteries and their materials. See T01-J15 codes for computerised design.

X22: Automotive Electrics

X22-A

For internal combustion engines

X22-A01

Ignition

Includes spark modification arrangement, obtaining ignition using laser.

X22-A01A

Ignition systems (using)

Includes ignition coil and cable, accessories e.g. connectors.

X22-A01A1

Magneto- or dynamo-electric generators without subsequent storage

X22-A01A2

Inductive energy storage

X22-A01A3 [1987]

Glow plug heating

(X22-A01A9)

Diesel engine, compression ignition

X22-A01A5 [1992]

Automatic ignition disablement

(X22-A01A9)

Includes disabling ignition e.g. after crash to prevent fire (also see X22-A01A7). Ignition disablement for anti-theft purposes is covered by X22-A08C only.

X22-A01A7 [1992]

Safety

(X22-A01A9)

X22-A01A9

Other ignition systems

Includes capacitive energy storage, ignition noise reduction circuits (see W02-H also). For ignition noise reduction associated with spark plugs, see X22-A01E1J.

RFI suppression

X22-A01B

Advancing or retarding ignition

Ignition control, ignition timing, pre-ignition

X22-A01B1 [1983]

Dependent on knock detection

Pinking or detonation detection

X22-A01B2 [1992]

Advancing

X22-A01B3 [1992]

Retarding

X22-A01C

Distributors; Circuit makers/breakers; Pick-up devices

X22-A01C1 [1992]

Distributors

See V04-L09 for distributors in general.

Distributor rotor, distributor cap

X22-A01C2 [1992]

Circuit-makers or -breakers

X22-A01C3 [1992]

Pick-up devices

Pick-up devices, e.g. sensor wheel in distributor, adapted to sense particular points of timing cycle. For sensing points of timing cycle, e.g. using cam shaft sensor, see X22-A05C instead.

X22-A01D

Testing ignition installations or timing

Includes ignition mis-fire detection. See also S02-J01A.

Strobes, timing light

X22-A01E

Spark and glow plugs

Includes plasma plugs, connectors, covers.

X22-A01E1 [1987]

Spark plugs

Spark gaps, discharge

X22-A01E1A [1992]

Electrodes

X22-A01E1C [1992]

Insulators

Ceramic

X22-A01E1E [1992]

Manufacture

X22-A01E1G [1992]

Ignition coil/spark plug combinations

X22-A01E1J	[1992]
Ignition noise reduction/spark plug combination	
X22-A01E3	
Glow plugs	
Includes glow plugs for pre-heating compression ignition diesel engines (see also X22-A20C).	
X22-A02	
Fuel systems	
X22-A02A	[1983]
Fuel injection apparatus	
<i>Electromagnets, injectors, piezoelectric, ultrasonic, common rail, direct injection</i>	
X22-A02A1	[2005]
Fuel injection valve	
Includes atomiser, EM fuel injection valve (also see V02 codes, e.g. V02-E02A1 for electromagnetic valve per se), and injectors.	
<i>Electromagnetic, piezoelectric, EM, valve, atomiser</i>	
X22-A02A3	[2005]
Common rail arrangements	
Includes fuel injection systems using a common rail fuel assembly. Also see X22-A20C for diesel engine applications.	
<i>Common rail</i>	
X22-A02A5	[2005]
Non-diesel direct injection	
Includes direct injection arrangements, e.g. for use in petrol engine.	
<i>Homogeneous, stratified, direct</i>	
X22-A02B	[1987]
Fuel filters and heaters	
(X22-A02, X22-A09)	
<i>Diesel fuel heaters, electric heaters, PTC element, preheaters</i>	
X22-A02C	[1987]
Carburettors	
<i>Atomisers</i>	
X22-A02D	[1987]
Fuel pumps	
See X22-A03A3 for fuel pump control.	

X22-A02E	[1992]
Fuel vapour recovery system; Fuel purging	
See X22-A03A4 for fuel purging control.	
X22-A02F	[2005]
Fuel additive/treatment systems	
Fuel additive/treatments to improve combustion.	
Includes water/steam injection and fuel ionising arrangements.	
<i>Steam, water, magnetic, ultrasonic, economiser, urea</i>	
X22-A02R	[2013]
Fuel pressure regulator	
Includes electronic pressure regulators and electromagnetic valves for controlling fuel pressure. Also see X22-A02A3 if regulator is used in a common rail fuel system.	
X22-A03	
Engine control	
X22-A03A	
Fuel control	
X22-A03A1	[1983]
Fuel-injection	
<i>Valve controllers</i>	
X22-A03A1A	[1992]
Injection timing	
X22-A03A1C	[1992]
Injection quantity	
X22-A03A2	
Air-fuel ratio; Exhaust gas recirculation	
X22-A03A2A	[1992]
Air-fuel ratio	
<i>Mixture control</i>	
X22-A03A2B	[2021]
Variable compression ratio	
Includes control of engine compression ratio so that lower ratios are used at higher loads to increase power and higher ratios are used at lower loads to increase fuel efficiency.	
X22-A03A2C	[1992]
Exhaust gas recirculation	
<i>EGR</i>	

X22-A03A3 [1997]

Fuel pump control

(X22-A02D,X22-A03A)

See X22-A02D for fuel pumps, per se.

X22-A03A4 [1997]

Fuel purging control

(X22-A02E,X22-A03A)

See X22-A02E for fuel purging systems, per se.

X22-A03A5 [2013]

Fuel pressure regulation

Includes fuel pressure regulator control to limit high pressure of fuel. For novel fuel pressure regulators per se, see X22-A02R. For fuel pump control see X22-A03A3 instead.

X22-A03B [1983]

Speed

(X22-A03X)

Includes throttle valve and air control.

X22-A03B1 [1992]

Cruise control

(X22-A03B, X22-G)

This code is used for general cruise control systems either on its own or in conjunction with X22-G03A (transmission based cruise control) or X22-C02D4 (brake based cruise control).

Adaptive cruise control

X22-A03B1A [1992]

By throttle control

Includes the use of servomechanisms operated electrically or fluidically.

X22-A03B1C [2007]

Active cruise control

Includes adaptive cruise control and inter-vehicle distance or vehicle spacing/separation control, e.g. using radar distance sensing (see also W06-A04 codes).

Automatic distance regulation, ADR

X22-A03B2 [1992]

Drive-by-wire/electronic throttle control

Includes 'drive-by-wire' type controllers e.g. using servomotors to control throttle position.

X22-A03B3 [1992]

Idling speed control

X22-A03B5 [1992]

Exhaust braking control

Engine braking

X22-A03C [1987]

Turbocharging, supercharging

(X22-A03X)

X22-A03D [1987]

Power

(X22-A03X)

Includes multi-cylinder in/out of operation control.

Load control, multi-cylinder switching, torque

X22-A03D1 [1992]

Traction control

Used alone or in conjunction with X22-C02C1, or X22-G03B depending on variable being controlled.

Wheel slip control, ASR

X22-A03E [1987]

Stop-start

Includes automatically stopping engine while waiting at level crossing to reduce fuel consumption.

(X22-A03X)

X22-A03F [1992]

Complete engine management

Includes, generally by using a computer, simultaneous control of several aspects of the IC engine e.g. ignition, fuelling, EGR, etc. Also includes integrated engine/transmission control. See also X22-G.

X22-A03F1* [1992-1996]

Fuzzy control

*This code is now discontinued and transferred to X22-A03K. It is still searchable and valid for records from 1992 to 1996.

X22-A03G [1992]

Inlet/outlet valve control

(X22-A03X)

Includes control of intake and exhaust valve timing. Also includes cam control in which multiple, selectable cam lobes can be selected to adjust valve timing, deviation and lift.

X22-A03H [1997]

Temperature control

(X22-A03X)

X22-A03I [2005]

Swirl control

Includes control of air motion in combustion chamber e.g. to enable stratified or ultra-lean burn combustion.

X22-A03J [1997]

Pollution control

(X22-A03A,X22-A03X,X22-A07)

Exhaust gas recirculation and cleaning systems, per se are in X22-A07.

X22-A03K [1997]

Fuzzy control

Fuzzy logic systems per se are covered by T01-J16B where novel technology details are given. See X22-A03F1 codes for records from 1992 to 1996. See also X22-Q for fuzzy control applied to non-engine systems.

X22-A03L [1997]

Secondary air control

(X22-A03B,X22-A03X)

Includes secondary air introduction control for air intake and exhaust passages. It is used on its own or together with other relevant codes e.g. X22-A03J if secondary air control is performed with a view to reducing pollutants.

X22-A03W [2006]

Engine-related by-wire control

Includes engine-based by-wire controllers not covered elsewhere. Drive-by-wire for vehicle/engine speed control is coded in X22-A03B2 instead. See X22-W for general non-engine based by-wire control. Also see X22-K codes for novel vehicle networking/communications systems that enable the by-wire control.

X22-A03X

Other IC engine control aspects

Includes vibration suppression control.

X22-A04 [1983]

Starting motors

Includes motor per se and associated gearing. See X11 for further details of high power motors. Starter solenoid is included in X22-A08 only. For combined starter/generator also see X22-F02 and X11-H20 (or X13-G20 for starter/generator control).

X22-A05 [1983]

Engine related measurements and sensors

(X22-A09)

Only includes on-board measurement or off-board diagnostics interfacing with on-board system. General measurement systems are included in section S, and vehicle testing systems are coded in S02-J. Includes electrical sensors per se as well as their mounting arrangements.

X22-A05A [1983]

Knock detectors; Pressure; Vibration

(X22-A09)

See also S02-F codes for further details. Includes combustion chamber pressure measurement.

X22-A05A1* [1992-2004]

Ambient pressure

*This code is now discontinued and transferred to X22-A05A4, but remains searchable and valid for records from 1992 to 2004.

X22-A05A2 [2005]

Knock detection

Includes pinking and pre-ignition detection.

X22-A05A3* [1992-2004]

Negative pressure

*This code is now discontinued and transferred to X22-A05A4, but remains searchable and valid for records from 1992 to 2004.

X22-A05A4 [2005]

Pressure detection

Includes detection of both ambient and negative pressure.

X22-A05A6 [2005]

Vibration/noise detection

X22-A05B [1983]

Gas sensors

(X22-A09)

See also S03-E03 codes for gas sensors per se.

Exhaust gas, oxygen, lambda, air, emissions, CO, NOx

X22-A05C [1987]

Engine rotation or speed sensors; TDC position sensors

For ignition point sensing see X22-A01C3.

Crankshaft angle/position, rpm counter

X22-A05D	[1987]
Fuel, gas and air flow sensors	
X22-A05E	[1992]
Throttle position sensor (X22-A09)	
X22-A05F	[1992]
Temperature	
X22-A05F1	[1992]
Exhaust	
X22-A05F3	[1992]
Engine	
X22-A05G	[1992]
Engine torque	
X22-A05H	[1992]
Multi-fuel proportion measuring	
X22-A05L	[2012]
Fuel/oil level sensing Includes fuel and oil level sensors. For dashboard warning of fuel/oil level see X22-E01A and X22-E01C respectively.	
X22-A05N	[2005]
Engine related diagnostics Includes diagnostic devices interfacing with engine management system.	
X22-A05X	[1992]
Other IC engine measurements/sensors	
X22-A06	[1987]
Air treatment; Air filters (X22-A09) From 2009 the scope of this code has been widened to include all electrical aspects of intake air treatment and filtering, such as: air filters with integral clogging detectors (see also X22-A05X for clogging detection and maybe X22-E10 and X22-E01 for driver warning), and e.g. photochemical treatment of intake air with UV light to create ozone to improve combustion. Control of intake air flow using a standard throttle valve should instead be coded in X22-A03B instead under speed control. For novel mechanical aspects of intake air treatment and filtering see Q51-H05 and Q17-E codes.	

X22-A07	[1987]
Catalytic converters, exhaust gas cleaning (X22-A09) Includes pollution reduction hardware such as particle burner, exhaust gas particle trap clogging detector, exhaust gas recirculating valve and system. For control of EGR, see X22-A03A2C. For pollution control see X22-A03J instead. <i>Filters, catalysts, electric heaters, EGR, valve</i>	
X22-A08	[1987]
Starters, ignition switches, relays (X22-A09) Includes starter solenoid. Further details of switches and relays are in V03-C and V03-D. Novel gearing and starter motors per se are coded in X22-A04. X22-A08 can also be applied to indicate "engine starting" when dealing with engine control patents, where the control is specifically implemented while trying to start an engine. <i>Solenoids</i>	
X22-A08A	[1992]
Remote/keyless IC engine starting	
X22-A08C	[1997]
IC engine immobiliser For general anti-theft devices see X22-X03.	
X22-A09	
Other IC engine aspects Includes lubricating, engine braking, etc. <i>Exhaust braking</i>	
X22-A10	[1992]
Engine cooling (X22-A09) <i>Fans, pumps</i>	
X22-A11	[1992]
Inlet/exhaust valves (X22-A09)	
X22-A12	[1992]
Engine noise/vibration reduction and damping (X22-A09) Includes active noise and vibration suppression devices such as electrically controlled engine mounts. See X22-A03X for general engine noise/vibration control. See W04-V07 codes also for active audible noise cancelling.	

X22-A13	[1992]
External heating to assist starting	
Includes electric resistance heater built into engine block or off-board heater slid under engine block, both powered by e.g. off-board mains supply.	
X22-A14	[1992]
Turbo- and super-charger	
Turbo- and super-charger control is coded in X22-A03C only.	
X22-A15	[1992]
Intake air heaters; Engine/cooling water heaters (X22-A09)	
X22-A16	[2002]
Vehicle engine servicing equipment	
Includes electrical aspects of oil change/reconditioning apparatus. Includes on-board systems that burn dirty oil in combustion chamber and replenish engine with clean oil.	
<i>Oil change</i>	
X22-A17	[2010]
Waste heat recovery (X22-A09)	
Includes engine exhaust heat recovery systems, e.g. for passenger compartment heating. See X22-F03 also if exhaust heat is being converted into auxiliary supply of electric power.	
X22-A20	[1992]
Type of engine	
This code relates to type w.r.t fuel used. Petrol- and indeterminate fuel-types are NOT covered.	
X22-A20A	[1992]
Mixed fuel	
Includes e.g. alcohol and petrol dual fuel type engines. Also includes engines combusting e.g. petrol and oxyhydrogen (HHO).	
<i>Brown's gas</i>	
X22-A20C	[1992]
Diesel	
X22-A20E	[1997]
Single unconventional fuel	
Includes e.g. alcohol burning engines and bio-fuel engines.	

X22-A20E1	[2007]
Gaseous fuels	
Includes engines running on LPG (liquefied petroleum gas), natural gas, hydrogen or liquid nitrogen. (See X21 codes for vehicles using hydrogen in a fuel cell arrangement). See Q51-D07A for mechanical aspects of gaseous fuelled engines.	
X22-A20E3	[2007]
Bio fuels; Alcohol	
Includes engines running on free fatty acid methyl ester ("bio diesel") or alcohol such as methanol or ethanol. See Q51-D07C for mechanical aspects of bio fuel/alcohol fuelled IC engines.	
X22-A20G	[2010]
Air	
Includes engines that are capable of being driven completely or partially by compressed air.	
X22-A20T	[2007]
Two-stroke	
Includes IC engines operating on two-stroke cycle, e.g. used in moped (see also X22-P02).	
X22-A20X	[2011]
Other engines	
Includes implosion engines using e.g. HHO (Brown's gas) made e.g. from electrolysis of water to produce hydrogen and oxygen which when combusted contracts to suck up piston rather than push it down.	
<i>Oxyhydrogen</i>	
<hr/> X22-B	
Lighting or signalling	
See also X26 for further details. Vehicle lamp circuitry and mounting arrangements are coded in X22 only.	
X22-B01	
Main lights	
<i>Headlamps, light control, fault detection, fog lamps</i>	
X22-B01A	[1987]
Bulbs; Light sources	
Includes novel light sources such as headlight bulbs per se.	
X22-B01A1	[1992]
Discharge lamps	
Includes Xenon and High Intensity Discharge (HID) tubes. See also X26-A codes.	

X22-B01A3 [1992]

Incandescent lamps

See also X26-B codes.

Halogen lamps

X22-B01A5 [2008]

LEDs

Includes novel light emitting diodes used for vehicle headlamps. See also U12-A01 codes and X26-H for LEDs per se.

X22-B01B [1987]

Fixtures

Includes lenses, reflectors, bulb holders.

Parabolic reflectors, sockets

X22-B01C [1987]

Washers

X22-B01D [1987]

Switches

See also V03 codes for mechanical switches per se. Electronic switching is covered by U21 only.

X22-B01E [1992]

Position control/beam aiming arrangements

Includes mechanical and motorised arrangements for adjusting headlamp position, and controlling movement of e.g. reflector to adjust headlamp aim e.g. to follow curve as vehicle negotiates a bend. See also X26-L.

Tilt control, aim, direction

X22-B01F [2002]

Headlight control circuitry

Includes control of headlamp or front fog/driving lamp illumination and automatic dimming.

X22-B02

Indicators

For indicating intention or presence of vehicle to other road users.

X22-B02A

Braking indicators

From 2005, direction and braking indicators are separated, with turning indicators transferred to X22-B02D and braking indicators remaining in X22-B02A. Prior to 2005, X22-B02A remains searchable for both turning and braking indicators.

Switches, centre, high level brake lamp, stop lamp

X22-B02A1 [1992]

Slowing/accelerating indication

Includes activation of vehicle brake lights in response to driver removing foot from accelerator pedal. See X22-B02A for brake lighting in response to depression of brake pedal.

Slowing, decelerating, accelerating

X22-B02A2 [2002]

Indicating level of braking intensity

Includes selective illumination of array of LEDs to indicate braking severity.

X22-B02B [2005]

Fixtures

Includes reflectors, lenses and bulb holders (see also X26-D01 codes).

Lens, reflector, refractor, diffuser, filter

X22-B02D [2005]

Turning/direction indicators

See X22-B02A for records prior to 2005.

Switches, direction, flasher, repeater, indicator

X22-B02R [2005]

Reversing indicators

Includes reversing lights and audible reversing warnings.

Backing, reverse, beep

X22-B02X

Other vehicle indicator arrangements

Includes side lights, tail lights, hazard lights and warning lights. Reversing lamps and novel fixtures such as reflectors, are coded also in X22-B02R and X22-B02B respectively, from 2005.

X22-B03

Interior lighting; Horns; Portable emergency signal devices

X22-B03A* [1992-2004]

Audible reversing warning

*This code is now discontinued and transferred to X22-B02R from 2005 onwards. It remains searchable and valid for records up to 2004.

X22-B03B [2005]

Interior lighting

Includes courtesy lights, dashboard lights and lighting for other compartments such as vehicle boot.

X22-B03E	[2005]
Emergency signalling devices	
Includes portable emergency services flashing lights and emergency sirens, search- or spot-light mounted on vehicle roof and electrical details of warning triangle (see also T07-X) to be placed on the road before scene of an accident or broken down vehicle. For mechanical details of emergency signalling devices see Q14-C05 instead.	
X22-B03H	[2005]
Horns	
For mechanical details of vehicle horns see Q14-C04 instead.	
X22-B05	[1992]
Illuminated displays for other drivers	
(X22-B09)	
Includes illuminated number plates and displays conveying e.g. "Thank You", "Assistance required" or other messages, e.g. to help diffuse road rage situation. Also includes illuminated hub caps and decorative emblems and displays for advertising. (See also W05-E03A codes).	
<i>Bus destination sign, illuminated licence plate, number plate, emblem, decoration, advertisement</i>	
X22-B09	
Other vehicle lighting arrangements	
Includes general use light switches and door-lock lights. Also includes illumination not intended to warn other road users of vehicle presence/intentions, such as flood light to warn driver of puddle when exiting vehicle.	
X22-C*	[1980-1996]
Braking, steering	
*This code is now discontinued. The 'braking' aspect of the code is transferred to X22-C02 from 1997 onwards but remains valid and searchable for documents from 1980 to 1996. The 'steering' aspect of the code is valid and remains searchable for records from 1980 to 1982. However, since 1983 steering systems have been located in X22-C05, which will remain in force.	
<i>Hand brakes, dual-circuit, servo, steering</i>	
X22-C01*	[1983-1996]
Anti-skid and anti-lock arrangements	
*This code is now discontinued and transferred to X22-C02C from 1997 onwards. It is still searchable and valid for records from 1983 to 1996.	
<i>Modulating brake pressure</i>	

X22-C01A*	[1992-1996]
Braking for traction control	
*This code is now discontinued and transferred to X22-C02C1 from 1997 onwards. It is still searchable and valid for records from 1992 to 1996. This code was previously used either on its own or in conjunction with X22-A03D1 and X22-G01B. It normally included sensing of wheel acceleration to control braking.	
<i>ASR, traction control braking, anti-slip braking</i>	
X22-C01B*	[1992-1996]
Anti-lock braking	
*This code is now discontinued and transferred to X22-C02C3 from 1997 onwards. It is still searchable and valid for records from 1992 to 1996. It previously included sensing of wheel deceleration to control braking pressure.	
<i>ABS, anti-lock braking</i>	
X22-C02	[1997]
Braking	
(X22-C)	
See X22-C for records from 1980-1996. See Q18-A codes for mechanical aspects of vehicle brake systems.	
X22-C02A	[1997]
Parking brakes	
(X22-C)	
Includes electrical aspects of hand brakes and foot actuated parking brakes. See X22-G codes also for transmission based parking brakes. See X22-C for records from 1980-1996.	
X22-C02C	[1997]
Braking force controller	
(X22-C,X22-C01)	
See X22-C and X22-C01 for records from 1983 to 1996.	
X22-C02C1	[1997]
Anti-slip brake regulation	
(X22-C01A)	
This code is used either on its own or in conjunction with X22-A03D1 and X22-G03B. Normally includes sensing of wheel acceleration to control braking force for the wheel that has lost its grip. See X22-C01A for records from 1992 to 1996.	
<i>ASR, traction control braking</i>	
X22-C02C3	[1997]
Anti-lock brake system	
(X22-C01B)	
Normally includes sensing of wheel deceleration to control braking pressure to then prevent any wheel from locking. See X22-C01B for records from 1992 to 1996.	
<i>ABS, anti-skid braking system</i>	

X22-C02C5 [2005]

Electronic stability control

(X22-C02C)

Includes control of braking to enhance vehicle stability, e.g. to control vehicle yaw. See X22-M for vehicle suspension based electronic stability control.

X22-C02C7 [2002]

Brake-by-wire

X22-C02D [1997]

Automatic brake initiation

(X22-C,X22-C01)

Involves braking without any driver intervention. See X22-C for records from 1980 to 1996.

X22-C02D1 [1997]

Collision prevention

(X22-C)

See also X22-J05 codes. See X22-C for records from 1980 to 1996.

X22-C02D1A [2013]

Brake safety

Includes arrangements for detecting inadvertent depression of accelerator pedal instead of brake pedal and automatically applying brakes in response. For novel pedal position sensing see X22-X06L.

X22-C02D2 [1997]

Automatic hill stop brake

Includes brake that is released when the clutch or accelerator pedal is depressed. See X22-C for records from 1980 to 1996.

X22-C02D3 [1997]

Theft prevention

(X22-C)

See also X22-X03. See X22-C for records from 1980 to 1996.

X22-C02D4 [2002]

Cruise control

Includes brake activation to maintain distance between vehicles.

Automatic distance regulation, ADR, cruise control

X22-C02X [2012]

Other braking arrangements

X22-C05 [1983]

Steering

Includes electrical aspects of steering wheel details. See Q18-B codes for mechanical aspects of vehicle steering systems.

X22-C05A [1992]

Power steering

Includes speed responsive power-assisted steering. Includes motor/gearing arrangements and power steering control.

Power assist

X22-C05A1 [1992]

Four-wheel steering

Includes electrical aspects only. See Q18-B09 instead for mechanical passive four wheel steering systems.

X22-C05A3 [2002]

Steer-by-wire

X22-C05A3A [2005]

Steering feedback/'feel' control

Includes arrangements for controlling e.g. torque feedback to steering wheel to improve or adjust driver 'feel', e.g. due to lack of mechanical linkage between wheels and steering wheel.

Feel, feedback

X22-C05B [1992]

Automatic steering

See T06-B01A, and T07-D01 codes.

X22-C05C [1992]

Displays, controls, switches, etc

Includes connectors also when specifically used with steering system. See also X22-X01A.

X22-D

Lockable switches; Locks; Theft alarms

Includes key, and lock heaters for de-icing.

X22-D01 [1992]

Locks and keys

Includes electrically-operated central locks. Also includes door lock heaters (see also X25-B codes for electric heating per se, and possibly X22-J02C prior to 2007). See Q14-H01 for mechanical aspects of vehicle locks.

X22-D01A [1997]

Remote-controlled and keyless entry

X22-D01A1 [2005]

Remote-controlled

Includes radio control. Also see W05-D codes for remote control aspects.

Radio-controlled, IR, infrared, remote-locking

X22-D01A2 [2005]

Keyless entry

Includes use of radio frequency (RF) transponders for keyless door (un)locking (see also T04-K03B and W06-A04B and W02-G05B codes as appropriate).

X22-D01A2A [2005]

Biometric access

Includes fingerprint and voice recognition or retinal scanning (see also S05-D01C5A).

X22-D01A2C [2005]

Card/keypad access

Includes smart/magnetic strip card reader or keypad code entry devices (also see T04 codes).

X22-D02 [1992]

Lockable switches

Includes lockable cover of switch panel.

X22-D03 [1992]

Theft alarms/theft monitoring

See also W05-B codes.

X22-D03A [2005]

Theft alarms

Includes audible and visual alarms (see also W05-B01 codes), e.g. sirens or flashing vehicle hazard lights (see also X22-B codes).

X22-D03C [2005]

Theft monitoring

Includes remote monitoring/indication of vehicle theft, e.g. to central station or vehicle owner (see also W05-B05 codes). Also includes GPS tracking of stolen vehicle (see also W06-A03A5 codes). For in-car camera systems capturing image of thief for on-board recording or remote transmission, see also W02-F01 codes.

X22-E

Instrumentation for dashboard and steering wheel

Includes touch-sensitive screens (see also T04-F codes). Also includes internal display for passengers e.g. in a bus indicating approaching stops (see also T07-A05D). For more details about general instrumentation for vehicles, section S codes must be searched. For example, S01-G06 for battery charge indicator, S02-G codes for speed sensors, S02-J codes for brake and transmission testing, and S02-K06 for recording or indicating in general. Also includes control of all information/warnings presented to driver according to driving situation, e.g. to prioritise important warnings and prevent driver from being distracted by display of minor warnings during emergency situations. For haptic feedback also see W05-A01A1 and for voice warnings see W04-V04C codes. For mechanical aspects of dashboard construction or mechanical instrumentation, see Q17-A11 instead.

Displays, panels, instruments

X22-E01 [1983]

Engine performance and operation indicators

X22-E01A [1992]

Fuel

Includes specific fuel consumption, filter clogging, fuel contamination, level.

X22-E01B [1992]

Temperature

Includes engine radiator/coolant temperature.

X22-E01C [1992]

Oil

Includes pressure, level, contamination.

X22-E02 [1983]

Brakes, tyres, transmission, steering

X22-E02A [1992]

Brakes

Includes brake wear indicator, brake oil contamination and level indicators, parking brake failure detector.

X22-E02B [1992]

Wheels and tyres

Includes tyre pressure measurement (see also S02-F04C1A).

X22-E02C [1992]

Transmission

Includes gear change indication.

X22-E02D [2005]

Steering

Includes indication of information directly relating to vehicle steering system, e.g. steering angle display. For indication of failure of steering angle sensor also see X22-E10 and X22-X06H. This code is not used for general displays mounted on steering wheel. E.g. for speedometer mounted on steering wheel, see X22-E05 and X22-C05C only.

X22-E03 [1987]

Battery charging/condition indicators

From 2006 this code has been expanded to include all vehicle battery warning/indicating aspects. See X22-E and X22-F01 codes prior to 2006. Includes indication of remaining battery capacity (see also S01-G06A and X16-H01), or battery charging/discharging indication. Also includes warning that battery is connected to off-board charger, to prevent vehicle driving off while connected.

X22-E04 [1987]

Driver alertness alarms; Driving behaviour sensing/warning

From 2014 this code has been expanded to include all driver/driving behaviour/condition analysis and warning. Includes driver reflexes/breath tester up to 201382.

X22-E04A [2014]

Driver alertness alarms/tester

Includes driver reflexes/breath tester, e.g. for preventing driver from driving if drunk or under the influence of drugs. Includes alerting driver through vibration alert through steering wheel or seat (also see W05-A01A1 for vibration based annunciation).

Intoxication detector, drowsiness detector, haptic indication

X22-E04D [2014]

Driver/driving behaviour analysis

Includes systems for monitoring driving behaviour, especially of young persons, e.g. to enable reduction in price of car insurance when safer driving is confirmed.

X22-E05 [1987]

Vehicle or engine speed; Mileage indicators

Includes tachographs (see T05-G also), rpm counter. Accident data recorders which give more details like acceleration, brake application, etc. are coded in X22-E12.

Odometers, milometers, taximeters, tachometer

X22-E06 [1987]

Navigational aids

See W06-A and S02-B08 codes also for general navigation systems. Information processing aspects of vehicle guidance systems are covered by T01-J07D3.

Vehicle position sensors, information display, direction indicators, head-up display, HUD

X22-E06A [1992]

Using dead reckoning systems

Includes use of map information stored in e.g. CD-ROM, and compass and wheel turn angle sensors.

X22-E06B [1992]

Using GPS

X22-E06C [1992]

Using roadside beacons

X22-E06D [1992]

Using combination of methods

From 2002, W06-A08 is no longer applied for combination navigation systems specifically for motor vehicles.

X22-E06F [2002]

Navigation information updating system

Includes system for updating map information e.g. for area in which vehicle travels, using information from off-board centre. Also used when off-board traffic centre provides driver with alternative route to destination to avoid congestion/accident (see also X22-E11, T07-G01 and T07-A05C codes).

X22-E07 [1992]

Head-up display

Includes general projection displays, e.g. for head-up display of current vehicle speed (see also X22-E05) or head-up display of e.g. navigational data (see also X22-E06). See also W04-Q01K for head-up video displays.

Projection, windscreen, head-up

X22-E08 [1992]

Radar surveillance detector

See W06-A04E3C also.

X22-E09 [1992]

TV/video camera for all round view

Only used when camera image is presented to driver. For video image recognition of e.g. road signs or obstacles, see X22-E13A only. Also see W04-M01 codes for novel video cameras per se, and W02-F01E for CCTV systems where image is presented to driver.

X22-E09A [2006]

For external view

Includes rear-view reversing cameras and 'enhanced' or 'assisted' vision cameras/displays, such as IR imagers for assisting driver when driving at night or in poor weather conditions (see also W07-G and W04-M01E codes as appropriate). Also see W02-F01E for vehicle external view CCTV system.

X22-E09C [2006]

For internal view

Includes video camera for enabling driver to view interior of vehicle, e.g. to enable bus driver (also see X22-P05A) to see if passenger wants to alight or to monitor vandalism. Can also be used for anti-theft purposes, e.g. to capture image of thief inside vehicle (see also X22-D03C).

X22-E10 [1992]

Service-need/general accessories malfunction displays

Includes faulty lights, oil-change alarms, etc. For indicating faults/problems with any onboard systems.

X22-E11 [1992]

Traffic management/driver information systems

Includes presentation of all types of traffic, weather and road information to driver (see also T07-G codes for off-board traffic and weather information provision aspects). See X22-E06F instead for systems for updating vehicle navigational route information.

Congestion, accident, flood, pot hole, road surface repairs

X22-E12 [1997]

Accident data recorder

(X22-E05)

Includes automatic recording of speed, acceleration, brake application, direction indicator position, headlight on/off status, etc. Tachographs are only coded in X22-E05.

ADR, drive recorder

X22-E13 [1997]

Collision-imminence warning/alarm

(X22-E)

Includes lane deviation or crossing alarms, and distance to obstacle indicator (see also X22-X06 codes). For systems detecting imminence of collision, see X22-J05 codes. For systems preventing collision by e.g. automatic brake application, see X22-C or other appropriate codes.

Road marking sensor, lane marking sensor, deviation, collision warning display

X22-E13A [2002]

Image recognition

Includes video image recognition of obstacles or road signs, e.g. to identify change of speed limits or hazards, road edges. See also T01-J10B/T04-D codes for image recognition. For systems presenting actual video image of road to driver display, see X22-E09 instead.

X22-E14 [2002]

Warning of approaching emergency vehicle

Includes detection of siren and activation of dashboard light or muting vehicle radio.

Ambulance, police car, fire engine

X22-E99 [2008]

Other instrumentation

Includes dashboard instrumentation and warnings not covered previously.

X22-F

Power supplies; Batteries; Alternators; Charging

Includes solar cell panels.

X22-F01 [1987]

Batteries

Includes vehicle battery, per se. Other battery details are in X16.

Connectors, cut-off switch

X22-F01A [1987]

Charging

Includes chargers per se (see also X16-G) and charging control.

X22-F01A1 [1992]

Jumper cables

X22-F01A2 [1992]

Off-board chargers

X22-F02 [1987]

Alternators; Dynamos

Includes vehicle alternator per se (with further details in X11), output controllers (see also X13-G02). For combined starter/generator also see X22-A04 and X11-H20 (or X13-G20 for starter/generator control). Also includes dynamos used as a primary power source on bicycles.

Rectifiers, regulators, dynamo, AC generator, DC generator

X22-F03	[1997]
Auxiliary supply	
(X22-F,X22-X)	
Includes power supply arrangement for external apparatus, e.g. welding equipment, and encompasses additional battery or generator, including roof mounted wind turbines or solar panels (see also X15 codes). Also includes power supply for microprocessor used e.g. for engine or other controllers. Includes power generated from exhaust heat recovery (see Q51-J02F for mechanical details of exhaust heat recovery).	
<i>Wind turbine, solar panel, back-up battery</i>	
X22-F04	[2002]
Vehicle power supply control systems	
Includes prioritisation of supply of power to specific or essential vehicle systems.	
X22-F05	[2002]
Use of cigar lighter socket or auxiliary output as power supply, e.g. for vehicle accessories	
Includes kettle, perfume dispenser, portable light and other devices that are powered from cigar lighter socket. Includes Non-contact charging pad to charge mobile phone (also see U24-H02 and W01-C01E5E codes). Used in conjunction with other X22 and cross-reference codes as appropriate.	
<i>Mobile phone charging, wireless charging</i>	
X22-F09	[1997]
Power supply or battery circuit disablement; Switches	
(X22-F,X22-X)	
Includes automatic disabling of power from electrical circuits to prevent fire risk upon sensing of crash. Also includes hidden switches for power cut-off for anti-theft purposes.	
X22-G	[1983]
Power train	
Includes power take-off arrangements used to drive auxiliary devices. Also see X22-P09 and X25 for tractor power take-off.	
X22-G01	[1992]
Transmission/clutch/gear systems	
Includes electrical aspects of powertrain hardware such as novel solenoid valves used in the hydraulic system, electric aspects of differentials (See X22-G05 only for four-wheel drive aspects), motor gearing etc. that are used in an unspecified type of transmission system. Use X22-G01C/X22-G01E instead if type of transmission is detailed.	
<i>Automatic transmission, manual transmission, CVT, differential</i>	

X22-G01A*	[1992-2004]
Cruise control	
*This code is now discontinued and transferred to X22-G03A. It is still searchable and valid for records from 1992-2004. This code is used either on its own or in conjunction with X22-A03B1 or X22-C02D4 depending on variables being controlled.	
X22-G01B*	[1992-2004]
Traction control	
*This code is now discontinued and transferred to X22-G03B. It is still searchable and valid for records from 1992-2004. This code is used either on its own or in conjunction with X22-A03D1 or X22-C02C1 depending on variables being controlled.	
X22-G01C	[2005]
Automatic transmission systems	
Includes continuously variable transmission (CVT).	
X22-G01D	[2009]
Semi-automatic transmission systems	
Includes manually shifted transmissions in which all the operations normally performed by the driver when changing gear are performed by electronically controlled actuator assemblies. Includes clutchless transmissions and paddleshift transmission control arrangements.	
X22-G01E	[2005]
Manual transmission	
X22-G03	[2005]
Powertrain/transmission control systems	
Includes integral engine/transmission control (also see X22-A03F). Search with T01-J07D1A for microprocessor controlled transmission. See also X22-G01 for records prior to 2005.	
X22-G03A	[2005]
Cruise control	
This code can be used on its own or in conjunction with X22-A03B1 or X22-C02D4 depending on the variables being controlled. See also X22-G01A for records prior to 2005.	
X22-G03B	[2005]
Traction control	
This code can be used on its own or in conjunction with X22-A03D1 or X22-C02C1 depending on the variables being controlled. See also X22-G01B for records prior to 2005.	

X22-G03G	[2005]
Shift-by-wire	
Includes steering wheel mounted gear change arrangements. Paddle-shift.	
X22-G03N	[2005]
Transmission noise/vibration/harshness control	
Includes arrangements for reducing shift-shock. see also X22-A03F for integral engine/transmission control aspects. See also X22-X08 for passenger compartment noise and vibration reduction in general and X22-A12 for engine noise reduction.	
X22-G05	[1992]
Four wheel-drive systems	
Includes electrical aspects of four, six and all wheel drive systems, such as electrically lockable differentials and electrically locking hubs.	
X22-G07	[2012]
Lubrication/cooling arrangements	
Lubrication and cooling aspects of transmission systems. For mechanical aspects refer to Q13-A20 and Q13-A22.	
X22-H	[1983]
Window winders	
(X22-X)	
<i>Electric window, power window</i>	
X22-H01	[1987]
Control	
See also V06-N.	
<i>Control circuits, obstruction detection</i>	
X22-H02	[1987]
Motors	
Includes motors per se. See V06-M codes for further motor details.	
X22-J	[1983]
Vehicle accessories	
(X22-X)	
Includes electrical aspects of motor vehicle accessories. See Q14 for mechanical details of vehicle accessories.	
X22-J01	[1983]
Windscreen wipers	
Includes screen washers, motors per se and their controllers (with details in V06-M and V06-N). Also includes snow and ice removal e.g. by using vibrators. For rain or moisture sensors see X22-X06E codes and S03-F09, and S03-E codes.	
<i>Switches, position detection, washers</i>	

X22-J02	[1983]
Heating, ventilating, air-conditioning	
Includes electrical aspects of overall passenger compartment HVAC system.	
<i>Control, motors, temp sensors, fans, blowers</i>	
X22-J02A	[1987]
Demisters	
For windscreens, mirrors. See also X25-B01C1C.	
X22-J02C	[1992]
Heating	
Includes heating for passenger compartments. See X25-B01 codes for electrical heating per se.	
X22-J02D	[2005]
Ventilating	
Includes electrical aspects of passenger compartment ventilating. See X22-J02E instead if ventilator/blower is part of an air-conditioning/climate control system. See X22-J03A5 instead for ventilated seats.	
X22-J02E	[1992]
Air conditioning; Climate control	
For novel temperature or humidity sensing arrangements see X22-X06X and S03 codes.	
<i>Compressors, refrigeration</i>	
X22-J02E1	[2005]
Climate control	
X22-J02E3	[2005]
Air treatment arrangements	
Includes de-odorisers, perfume dispensers and air ionisers etc. Also includes sterilisation arrangements for killing microorganisms, e.g. using UV radiation.	
<i>De-odorisers, perfume dispenser, ioniser</i>	
X22-J03	[1983]
Seats, seat belts	
(X22-X)	
<i>Control, motors</i>	
X22-J03A	[1992]
Seats	
X22-J03A1	[1992]
Heaters	
X22-J03A2	[1992]
Massaging devices	

X22-J03A3 [2002]

Headrest

Includes automatic adjustment of vehicle headrest according to driver preference. From 2005 active head restraints are transferred to X22-J03A3A.

X22-J03A3A [2005]

Active head restraint

Includes active control of seat headrest to place it in optimum position to protect occupant's head/neck during a collision. Prior to 2005, active head restraints were coded in X22-J03A3 and X22-J11.

X22-J03A5 [2007]

Cooling

(X22-J03A, X22-J02)

Includes ventilating and air-conditioning systems used to cool motor vehicle seats. See X22-J03A and X22-J02 codes prior to 2007.

X22-J03B [1992]

Belts

Inertia sensors

X22-J03B1 [1992]

Automatic release, retraction

X22-J04 [1983]

Mirrors

(X22-X)

Includes mirrors with heaters, loudspeakers, lights, aerials.

Motors, rear-view mirrors, adjusting, wing mirrors, positioning, demisters

X22-J05 [1983]

Anti-collision and parking aids

(X22-X)

These codes are used either on their own or in conjunction with other codes for related anti-collision aspects. The latter include:

- (a) imminence of collision warning systems (see X22-E13);
- (b) controlling vehicle automatically to avoid collision e.g. automatic application of brakes (see X22-C02D1);
- (c) measuring and indicating distance to obstacle or preceding vehicle (see X22-X06F); and
- (d) detecting deviation from lane or road marking (see X22-X06G).

Distance sensing, warning alarm

X22-J05A [1992]

Radar systems

For more details on radar see W06-A04.

X22-J05B [1992]

Sonar systems

See W06-A05 also.

Ultrasonics

X22-J05C [1992]

Optical systems

Includes e.g. laser rangefinder. See W06-A06 codes also.

Lidar

X22-J05M [2021]

External sensor mountings; Cleaning

Includes external environmental sensor motorized mountings and positioning systems. Includes sensor cleaning arrangements such as wipers or washers for LIDAR (see also X22-J05C), SONAR, or camera (see also X22-E09A).

X22-J06 [1983]

Lighters

Socket, heater coil

X22-J07 [1987]

Air bags

Includes inflatable side curtains and knee bolsters.

X22-J08 [1987]

Sun visors; Sun roof; Convertible soft top roof

Includes obstruction detection and roof open/close motors.

Controllers, convertible tops, vanity mirror lights

X22-J09 [1992]

Sun screens, curtains

(X22-J, X22-X)

X22-J10 [1992]

Accessories remote starting arrangements

X22-J11 [2002]

Passenger safety systems

Includes anti-submarining seats, flip-up roll over bars and roll over control arrangements. For airbags and seatbelt pre-tensioners see X22-J07 and X22-J03B1 only. From 2005 active head restraints are coded in X22-J03A3A only. Also includes general passenger safety aspects such as systems preventing driver from using mobile telephone or viewing movie whilst driving.

Fire extinguishers, bumpers

X22-J11A [2002]

Emergency signalling

Includes manually activated signalling and automatic mayday signalling or automatic activation of locating beacon after vehicle accident (also see W06-A01C for vehicle borne locating beacon). Automatically illuminated 'assistance required' sign (also see X22-B05).

X22-J11B [2002]

Pedestrian protection systems

Includes vehicle mounted apparatus such as exterior bonnet airbag to protect other road users in event of collision.

X22-J11C [2010]

Vehicle specific clothing

Includes electrical details of all vehicle specific clothing. See X22-P01 and X22-P02 for bicycle and motorcycle wearables. See Q14-C16 for mechanical details of vehicle specific clothing.

Helmets, jackets, gloves, electric heating, LED, lighting, wearable

X22-J12 [2002]

In-car office/information equipment

Includes e-mail, facsimile equipment powered by vehicle supply and on-board aspects such as novel displays and user interfaces used to view e.g. Internet information. From 2007 general Internet browsing e.g. for downloading local tourist information, map information, restaurant menus and shop opening times or for making hotel reservations and booking tickets, is transferred to X22-K08.

X22-J13 [2002]

In-car entertainment systems

Includes television and games machine powered from vehicle supply. Includes monitors e.g. mounted in rear of headrest (see X22-J03A3 also).

VTR, DVD, TV, MP3, game

X22-J14 [2012]

License plates

Includes license plates with RFID transponder (also see W06-A04B and T04-K codes). Illuminated number plates are also codes in X22-B05.

X22-J15 [2012]

Passenger display arrangements

Includes prompter for reminding passenger of approaching destination point, and for reminding passenger to not forget personal items when disembarking.

X22-J19 [2013]

Steps and running boards

Includes automatically controlled retractable steps (see also X22-X19 and S05-K if for disabled person assistance) and illuminated running boards. See Q14-I instead for mechanical details.

X22-J20 [2010]

Vehicle stands, supports, jacks

(X22-J99)

Includes on-board kick-stands for bicycles or motorcycles (see also X22-P01 or X22-P02 respectively), as well as electrical details of off-board stands and supports for parking cycles. For mechanical details of e.g. cycle stands see Q14-J instead. For parking fee charging details see T05 codes. Also includes electrical details of on-board jacks. See X22-X16 for off-board servicing equipment.

Holder, support, rack, stand, kickstand, parking, lock

X22-J99 [2007]

Other vehicle accessories

(X22-J)

Includes electrical accessories not covered elsewhere such as refrigerated cool box (see also X27-F codes) powered from cigarette lighter socket (see also X22-F05). See Q14 instead for mechanical vehicle accessories.

Ash tray

X22-K [1987]

**Vehicle communications and connectivity;
Multiplexing; Networking; V2X**

(X22-X)

Includes vehicle to everything communications (V2X; C-V2X). Includes all communications, connectivity, networking and multiplexing, including cellular (also see W02-C03C1L) and dedicated short range communication (Also see W01-A06C4E). Includes communication within a motor vehicle (intra-vehicle), communications between vehicle and other vehicles (inter-vehicle), roadside (V2I), pedestrians (V2P) etc. Includes vehicle telephones and hands-free systems. See W01 and W02 codes for telecommunications per se.

Multiplex, DSRC, 5G, Fcellular, data transmission, LAN, WAN, wide area network, Bluetooth®, CAN bus, controller area network, bus, ethernet, VAN, UART, universal asynchronous receiver/transmitter, V2X, C-V2X

X22-K01* [2007-2008]

Multiplex control system

*This code is now discontinued and combined with X22-K03 from 2009 onwards since current vehicle networking and multiplexing are essentially the same thing. It is still searchable and valid for records from 2007 to 2009. See W05-D02 also for multiple access and multiplexing control signals transmission, and T01-J07D1B for multiplex control system using microprocessor technology. Used to highlight multiplex control of distributed (electrical) loads via single electric cable/bus and fiber-optic systems.

X22-K02 [2021]

Vehicle to network; Vehicle to cloud communications

Includes vehicle to cloud (V2C) communication that uses V2N access to broadband cellular mobile networks to enable data exchange with the cloud (also see T01-N codes). Includes over the air (OTA) updates to vehicle software. Remote vehicle diagnostics (also see X22-X16). Includes browsing and downloading information such as navigation data (see X22-E06F), local tourist information, shop opening times (see X22-J12), restaurant menus, music files (see X22-J13) and making hotel reservations or booking tickets using in-car connectivity to the cloud. See X22-K08 for connectivity to e.g. wifi hotspot in service station.

V2N, V2C, IoT

X22-K03 [2007]

Intra-vehicle; Vehicle to device communications networking/connectivity; Multiplexing

(X22-K01)

Includes in-car high speed, integrated communications networks and multiplexing arrangements for interconnecting various vehicle systems, e.g. using wireless LANs or serial data buses, Bluetooth® etc. (see also W01 codes), avoiding the need for dedicated point-to-point wiring. For enabling internal communications between previously standalone vehicle control systems such as engine and braking systems. Includes DSRC vehicle to device (V2D) and cellular vehicle to device (C-V2D) communications to e.g. connect smartphone, tablet or wearable to vehicle infotainment system. Includes app for controlling vehicle locking/starting.

CAN bus, CAN 2.0, LAN, LIN, Ethernet, wireless, UART, VAN, ABUS, SAE J1850, local interconnect network, controller area network, universal asynchronous receiver/transmitter, V2D, C-V2D, mobile phone

X22-K05 [2007]

Inter-vehicle communications; V2V

Includes communication between different vehicles to enable them to wirelessly exchange information about their speed, location, and heading. Includes DSRC V2V and C-V2V communication providing 360 degree awareness of other vehicles. Also includes systems such as Bluetooth (RTM) ad-hoc networks for allowing communication between different vehicles, e.g. for passing traffic or navigation data between vehicles (see also X22-E06F, for informing vehicle of presence of nearby vehicles e.g. by transmitting GPS position data between vehicles, or for automatic collision avoidance (see also X22-J05 codes) or other safety purposes.

Platooning, cooperative adaptive cruise control, wireless, piconet, cellular V2V

X22-K06 [2021]

Vehicle to pedestrian communications; V2P

Includes communication between vehicle and persons, pedestrians or cyclists including DSRC V2P and cellular V2P communication. Includes warning pedestrian or cyclist of dangers such as approaching vehicle and for warning drivers of presence of other road users.

V2P, C-V2P, cyclist, bicycle

X22-K08 [2007]

Vehicle to offboard/infrastructure communications; V2I

(X22-J12)

Includes communication between motor vehicle and offboard infrastructure, roadside units or traffic signals (also see T07-B codes). Includes cellular vehicle-to-infrastructure (C-V2I) communications. Also includes dedicated short range communication (DSRC) based V2I. Includes systems for communication between vehicle and external systems such as wifi hotspot in service station for downloading information via offboard system that provides connectivity.

Infrastructure, offboard, V2I, C-V2I

X22-K11 [2008]

Vehicle telephone

Includes all aspects of car phones, including hands-free arrangements. Also see W01 codes for telephones and cellular communication per se. Also see X22-X02B for novel phone mounting arrangement.

X22-K99 [2007]

Other multiplexing/networking/ communications

X22-L	[1987]
Speech synthesizers; Speech recognition units for various applications; Gesture control	
(X22-X)	
From 2020 this code has been expanded to cover other forms of non-touch control mechanisms such as gesture control. See W04-V codes also for speech analysis/synthesis per se. Includes systems for recognizing hand movements, facial expressions or eye movements used to control vehicle functions (also see S05-D01C5A). For microphones etc. used for car telephone see X22-K11 instead.	
<i>Microphone, gestural, eye tracking, gaze</i>	
X22-M	[1987]
Suspensions	
(X22-X)	
Includes control of suspensions.	
<i>Dampers, height controllers, shock absorbers, spring vibration control, levelling</i>	
X22-M01	[2006]
Suspension systems	
Includes electrical aspects of motor vehicle suspension hardware.	
X22-M01A	[2008]
Mechanical springs/dampers	
Includes electrical aspects of motor vehicle suspensions using mechanical/pneumatic/fluid springs and dampers.	
X22-M01C	[2008]
Electrical springs/dampers	
Includes suspensions that utilise linear electromagnetic motors (LEMs) at each wheel in place of conventional shock absorbers and springs. See also V06 codes for linear electric motors per se.	
X22-M03	[2006]
Suspension control	
Includes suspension control arrangements such as active suspension, electronically controlled dampers, body roll control etc.	
X22-N	[1987]
Switches for general application	
(X22-X)	
See also V03 for mechanical switches per se. Electronic switching is covered by U21 codes only.	
X22-P	[1992]
General vehicle types	

X22-P01	[1992]
Bicycle	
<i>Tricycle</i>	
X22-P02	[1992]
Motorcycle	
<i>Moped</i>	
X22-P03	[1992]
External combustion e.g. gas turbine	
X22-P04	[1992]
Hybrid	
Includes vehicles with electric motor- and IC engine- prime movers. Also see X21-A01D and other X21 codes as appropriate.	
<i>Parallel hybrid</i>	
X22-P04A	[2007]
Hybrid-electric	
Includes series/parallel/mixed hybrid-electric and hybrid-fuel cell vehicles	
X22-P04E	[2007]
Hybrid-mechanical	
Includes electrical details of hybrid-flywheel and hybrid-pneumatic or hybrid-hydraulic vehicles.	
<i>Petro-hydraulic, petro-air, compressed air</i>	
X22-P05	[1992]
Commercial vehicles	
Includes non-specific delivery vehicles	
X22-P05A	[2002]
Bus/coach	
X22-P05B	[2002]
Lorry/truck	
Includes articulated trucks/heavy goods vehicles.	
X22-P05C	[2002]
Taxi	
X22-P05F	[2005]
Forklift truck	
See also X25-F05A. Electric forklift trucks are coded in X21-A01B only.	
X22-P05H	[2010]
Road cleaning vehicles	
(X22-P05X)	
Includes road sweepers and snow ploughs (see also X25-U05).	

X22-P05R	[2010]
Refuse collection vehicles (X22-P05X) Includes rubbish trucks.	
X22-P05X	[2002]
Other commercial vehicles Includes commercial vans and tow trucks.	
X22-P06	[1992]
Military	
X22-P07	[1992]
Construction <i>Bulldozer</i>	
X22-P08	[1992]
Recreation <i>Go-kart, caravan, RV, snowmobile, ATV</i>	
X22-P09	[1992]
Agricultural See also X25-N codes.	
X22-P10	[1992]
Emergency services Includes ambulances, fire engines, police cars.	
X22-P11	[2002]
Towed trailers Includes electrical aspects, e.g. lights on rear of trailer towed by vehicle (see X22-B02 codes also) or trailer of heavy goods vehicle (see X22-P05B also).	
X22-P12	[2012]
Amphibious vehicles Also see W06-C15X or Q24-P30 as appropriate.	
X22-P15	[2015]
Driverless/autonomous vehicles Includes vehicles that can drive themselves. Used with X22-C05B, X22-C02D, X22-A03B codes and X22-J05 codes as required for automatic steering, braking, speed control and radar type anti-collision systems.	
X22-Q	[1992]
Non-engine related fuzzy control This code is used either on its own or in conjunction with other related codes, e.g. X22-M for suspension systems. Fuzzy logic systems, per se, are covered by T01-J16B where novel technology details are given.	

X22-R	[2018]
Rider assist Includes systems for assisting riding of vehicles such as motorcycles or mono-wheel vehicles. Includes balance-aiding and self-balancing systems e.g. using gyroscopes or automatic steering correction to keep motorcycle upright. <i>Gyroscope, balance, balancing</i>	
X22-U	[2005]
Motor vehicle rental, hiring and sharing systems Includes overall system associated with motor vehicle hiring and rental with some on-board vehicle aspect, e.g. enabling user to book vehicle on-line (see T01-N and T01-J05 codes) while central controller provides authorisation and remote access to allocated vehicle. Also includes car pooling arrangements with some on-board vehicle aspect. <i>Hiring, leasing, rental, car-pool, car sharing, internet, booking</i>	
X22-W	[2006]
Non-engine related by-wire control Includes general by-wire control systems, including 'total' vehicle by-wire control and specific controllers not covered elsewhere such as by-wire headlamp beam aiming controller (see also X22-B01E and X26-L). By-wire brake (X22-C02C7), shift (X22-G03G) and steer (X22-C05A1) controllers are coded in their relevant sections ONLY. See X22-A03W only for general engine based by-wire controllers. Also see X22-K codes for novel vehicle networking/communications systems that enable the by-wire control. Also includes overall systems for determining whether it is safe to operate in autonomous driving mode and for switching between manual and (semi)autonomous driving modes. See also X22-P15 for autonomous vehicles per se and other codes as appropriate. Includes vehicle intelligent adaptive control systems. <i>Driver-profile auto adaptation</i>	
X22-X	
Other vehicle aspects Includes static electricity (see also X25-S) and cathodic protection (see also X25-R06), driving instruction simulators (see also W04-W07A), etc.	
X22-X01	[1987]
Wiring harnesses; Electrical connectors in general See V04 also for connectors and harnesses. Includes all wiring/cabling installations.	
X22-X01A	[1997]
Electric connectors See also V04 codes.	

X22-X01B	[1997]
Wiring or cable installations	
Includes also wiring harnesses, see V04-V02 and X12-D07.	
X22-X01B1	[1997]
Clamps	
For general cable clamps, see also X12-G04A2.	
X22-X01B2	[1997]
Grommets or bushing	
See also X12-E03C and X12-G04A3.	
X22-X01C	[2012]
Fuse box/wiring box	
Includes fuse boxes and their covers (see also X13-D codes), and wiring boxes.	
X22-X02	[1987]
Aerials; Radio and loudspeaker mountings, etc.	
See W02-B and W03-B codes for further aerial and radio details.	
<i>Antenna, window aerials, automatic aerial retraction</i>	
X22-X02A	[1992]
Aerials	
X22-X02A1	[1992]
Roof/body mounted	
X22-X02A3	[1992]
Glass-mounted	
X22-X02B	[1992]
Radio, cassette player, CD player, minidisk player, and loudspeaker mountings; etc.	
Includes mounting for other electronic devices such as mobile phone, handheld navigation device or computer.	
<i>Car telephone mounting</i>	
X22-X03	[1992]
Anti-theft and Anti-hacking	
Includes anti-theft arrangements with some kind of immobilisation of vehicle (see X22-A08C for engine based immobilisers) and systems for preventing hacking or overriding of vehicle systems. Use with X22-D codes such as X22-D01A for arrangements for preventing jamming, code grabbing, App hacking etc. to illegally gain vehicle access. See W05-B codes for theft alarms per se. See X22-K codes for vehicle communications per se.	
<i>Steal, theft, override</i>	

X22-X04	[1992]
Refrigeration for container trucks	
See also X27-F for refrigeration per se.	
X22-X05	[1992]
Electrical aspects of doors, boots, windows	
Includes electrical door opening/closing devices (see X22-D01 instead for door locking arrangements and X22-H codes for window winders). Also includes electrical aspects of streamlining devices such as spoilers.	
<i>Roof spoiler, aerodynamic, sliding door, remote control tailgate opening, electrochromic glass, privacy glass</i>	
X22-X06	[1992]
Non-engine related measurements/sensors	
These codes are used on their own or in conjunction with other codes depending on claimed aspects. For general instrumentation, S01, S02, and S03 codes should also be searched. Includes electrical sensors per se and their mounting arrangements. These codes are generally applied when the sensor is novel per se or when a standard sensor is used in an unusual way.	
X22-X06A	[1992]
Wheel speed and slip sensors	
Includes sensing of wheel speed or general vehicle speed. Measurement of engine speed is coded in X22-A05C only.	
X22-X06B	[1992]
Acceleration or shock sensors	
Includes measurement of acceleration, deceleration and shock or impact sensing. See also S02-G03.	
X22-X06C	[1997]
Road friction sensor	
See also S03-F08.	
X22-X06D	[1997]
Seat occupation sensor	
Also includes child seat presence or absence detector to then inhibit or trigger e.g. air bag. See also S03-C06.	
X22-X06E	[1997]
Rain or moisture sensor	
(X22-J01,X22-X06)	
See S03-F09 and S03-E codes. Includes humidity sensor.	
X22-X06F	[1997]
Distance to obstacle measurement	
See also X22-E13 or X22-J05 codes and S02-B01.	
X22-X06G	[1997]
Lane deviation sensing arrangement	
Includes optical recognition of white line.	

X22-X06H [1997]

Steering angle/torque sensor

From 2010 this code has been expanded to include steering torque sensing. Prior to 2010 see X22-X06(X).

X22-X06J [1997]

Yaw sensor

Measuring angular rotation or movement around yaw axis/direction of heading.

Centre of gravity, vertical axis accelerometer, gyroscope

X22-X06K [1997]

On-board weighing system

See X22-P05B for lorry on-board load/cargo weighing arrangements.

X22-X06L [1997]

Control pedals' position sensors

X22-X06M [2002]

Submergence sensing arrangement

For detecting submergence of vehicle in water, e.g. for control of vehicle windows to allow escape from sinking vehicle.

Sinking detection

X22-X06N [2005]

Non-engine related diagnostics

Includes diagnostic devices interfacing with vehicle control devices. See also S02-J codes for testing per se.

X22-X06T [2010]

Temperature sensor

Includes non-engine temperature sensing e.g. for control of vehicle air conditioner (see also S03-B codes). For engine related temperature sensing see X22-A05F codes instead.

X22-X06X [2005]

Other non-engine related measurements/sensors

Includes other specific measurements and sensors such as suspension height sensor (see also X22-M), gear shift and gear position sensors (see also X22-G). Includes coupling sensor.

Ground clearance measurement

X22-X07 [1992]

Road toll devices

See also T07-A03E for roadside charging aspect.

X22-X08 [1992]

Noise/vibration/harshness reduction

Includes general noise, vibration and harshness (NVH) control for improving comfort of vehicle occupants. For transmission based NVH control see X22-G03N only, and for engine based vibration and noise reduction see X22-A12 or X22-A03X as appropriate. See also W04-V. See Q17-N for mechanical NVH reduction arrangements.

X22-X09 [1992]

On-board tyre inflator

X22-X10 [1992]

Electronic components

Includes components e.g. ASICs for vehicles but with no mention of its specific use. See also appropriate U codes. Also includes general electronic control units where specific function being controlled is not detailed. See X22-A03 for general engine based ECUs where specific engine system being controlled is not detailed.

X22-X11 [2002]

Agricultural implements and their control

Includes electrical aspects of implements attached to tractor and driven by power take-off.

X22-X12 [2002]

Pedal arrangements

Includes pedals that are electrically positioned according to driver's requirements and other electrical arrangements connected to pedal operation or adjustment. See X22-X06L for control pedals' position sensors per se.

Electronic accelerator pedal

X22-X16 [2005]

Vehicle maintenance equipment and service monitoring; Vehicle testing

Includes on-board aspects associated with e.g. fleet maintenance, vehicle servicing equipment (see X22-A16 for engine servicing equipment) and remote service monitoring (see X22-E10 for on-board service required warning). Includes off-board arrangements for testing/measuring vehicle wheel alignment (see also S02-J02A), vehicle rolling roads and engine dynamometers (see also S02-J01A). See X22-X06 codes for on-board vehicle measurement systems.

X22-X18 [2007]

Vehicle (un)loading arrangements

Includes tail lifts used on lorries (see also X22-P05B), vehicle mounted cranes and other loading/unloading ramps/fixtures. See Q15 codes for mechanical (un)loading aspects.

X22-X19 [2007]

Disabled people aids

(X22-X)

Includes all systems or vehicle adaptations for helping physically challenged persons drive or travel in motor vehicle. Includes wheelchair lifting arrangements and ramps. See also S05-K01. For mechanical aspects see Q15-B13 instead.

X22-X20 [2008]

Vehicle design/manufacture/assembly

Includes electrical details of design, manufacture and assembly of vehicles and vehicle components. See Q16-D codes for mechanical aspects of vehicle design and manufacture.

X22-X20A [2008]

Vehicle manufacture/assembly/dismantling

Includes manufacture and assembly of motor vehicles and their components. See X25-X14 for manufacturing/assembly plants per se. Also includes systems for dismantling vehicles e.g. to enable recycling of materials (see also X25-W04).

Spray painting, end-of-life disposal

X22-X20E [2008]

Vehicle design

Includes all electrical details of vehicle design. Also see T01-J15 codes for computer aided design (CAD).

Simulation testing

X23: Electric Railways and Signalling

Note: Also includes non-electric traction railways with substantial electrical content in the disclosure. See Q21 instead for mechanical aspects of railways.

X23-A

Electric railways

X23-A01

Propulsion, braking, suspension

X23-A01A [1983]

Propulsion

Includes transmission of mechanical power.
Drive system, mountings

X23-A01A1 [1987]

Electric motor

Includes motors per se, with further details in X11.
Linear motors, induction motors, dc motors, coils, magnetic circuits

X23-A01A2 [1987]

Engines

Includes engine control and electrical hardware aspects of railway vehicle engines.
Diesel-electric locomotive, diesel, petrol, fuel

X23-A01A2B [2016]

Engine control

Includes general combustion engine control such as speed, fuel and ignition control. For pollution control see X23-A01A2C instead.

X23-A01A2C [2014]

Exhaust gas cleaning systems; Pollution reduction

Includes electrical details of locomotive engine exhaust gas cleaning systems and pollution reduction arrangements. For mechanical aspects see Q21-C01C and Q51-J02 codes.
Catalytic converters, EGR, catalyst electric heating

X23-A01A3 [1997]

Power converters

See X23-A02A for converter control for train/tram motors. See also X12-J and X13-G03 codes.

X23-A01A4 [1997]

Magnetic levitation arrangements

Includes superconducting magnets/coils for levitation or suspending of railway car. See also X12-C05 codes.

X23-A01A5 [1997]

Transformers

Includes supply step-down and converter transformers. See X12-C codes for further transformer details.

X23-A01B [1983]

Braking

Includes train brakes as well as track brakes.

X23-A01B1 [1997]

(Electro)mechanical brakes

Includes electromagnetic and electrically-operated mechanical brakes (see X25-L02 also) as well as electro-pneumatic and electro-hydraulic brakes.
Electro-magnetic, electrohydraulic, electropneumatic

X23-A01B3 [1997]

Electrodynamic brakes

Includes resistive, eddy current and regenerative brakes (see also X13-F02).

X23-A01B5 [1997]

Automatic braking

Includes ATP(automatic train protection)-triggered braking to prevent accidents. See also X23-B02.

X23-A01C [2005]

Suspension

Includes electrical aspects of railway vehicle suspension systems, such as carriage/ride tilt control. Magnetically levitated suspension/propulsion systems are coded in X23-A01A4 only.

X23-A01L [2012]

Lubrication arrangements

Electrical aspects of train/locomotive lubrication.

X23-A02

Motor control; Monitoring operation

Includes motor protection, safety interlocks e.g. dead man's handle, operating data monitoring. Also see X13-C.

X23-A02A [1987]

Motor control

See also X13-F or X13-G.

X23-A02C [1997]

Automatic train control

See also X23-A01B5 for automatic braking. Includes train door opening, vehicle status reporting, speed limiting, etc.

X23-A02E [1997]

Data bus

Includes the bus, per se, and associated hardware for communications (see also W05-D06F) between sub-systems and the main system on the train. Also, allows remote monitoring and control on multiple unit trains. Carries signals from ATP and ATC systems for various controls and status reporting.

X23-A02G [2002]

On-board monitoring systems

Includes on-board radio communication, e.g. between head and end of train, and general on-board system monitoring. Includes on-board camera and image analysis to prevent collision.

X23-A03

Power supply aspects

X23-A03A [2002]

Power supply lines; Off-board supply

Includes all power supply aspects i.e. track side poles, insulators, (see also X12-G codes) etc., supply protection (see also X13-C codes), substations for feeding power to the railway network (see also X13-E codes).

Electric overhead supply, power rails

X23-A03C [2002]

On-board power supply systems; Power supply control

Includes on-board generators per se, with further details in X11 or X13 if its control is part of the invention, and power supply or conversion arrangements etc.

Battery, fuel cell

X23-A04

Current collectors

Pick-up, pantograph, brushes, shoes

X23-A05

Measuring; Testing

Includes brake monitoring sensors, track straightness determination, etc.

X23-A08 [2012]

Shunting or short distance haulage devices

Electrical aspect of shunting or short distance haulage devices.

X23-A09

Other on-board (electric) railway train details

Includes connectors for cables passing between carriages etc. Includes refrigerated compartment for transporting cargo. For other offboard railway system details see X23-S99 instead.

X23-A09A* [2002-2009]

Off-board/railway station systems

*This code is now discontinued and transferred to X23-S. It is still valid and searchable for records prior to 2010. From 2005 major electric track laying equipment is transferred to X23-X. For station based passenger information/communications systems see X23-C02.

X23-A09A1* [2005-2009]

Security systems

*This code is now retired and transferred to X23-S01. It remains searchable and valid for records prior to 2010.

X23-A09A1A* [2005-2009]

For personnel

*This code is now discontinued and transferred to X23-S01A. It is still valid and searchable for records prior to 2010. Includes detection of concealed weapons. Also includes all aspects of passenger tracking and monitoring, including authorisation/access control for passengers (see T05-D codes also).

X23-A09A1E* [2005-2009]

For baggage

*This code is now discontinued and transferred to X23-S01E. It is still valid and searchable for records prior to 2010. Includes all aspects of baggage inspection, monitoring and tracking. Includes use of transponder tags (see also W02 codes) or bar-code reader (see also T04 codes). See S03-C03 and S03-E06B codes for inspection.

X23-A09A3* [2005-2009]

Station safety systems

*This code is now discontinued and transferred to X23-S03. It is still valid and searchable for records prior to 2010. Includes fire-fighting arrangements and automatic platform-edge doors control. Prior to 2005, platform edge doors control was coded in X23-A09.

X23-A09A9* [2005-2009]

Other station details

*This code is now discontinued and transferred to X23-S99. It is still valid and searchable for records prior to 2010. Includes transportation of baggage and passengers, and railway station specific heating and air-conditioning.

X23-A10 [1997]

Environmental control and lighting

(X23-A09)

Includes on-board train heating and air-conditioning systems, internal and external train lighting.

X23-A13 [2002]

On-board train accessories

Includes electrically adjustable seats, electric windows, electric door locks etc. Also used for in-train entertainment systems.

X23-A15 [2013]

Passenger safety systems

Includes seat belts, airbags and fire-fighting equipment on-board the train. For station based passenger safety systems see X23-S03 instead. See X25-X05 also for fire-fighting equipment per se.

X23-A16 [2014]

Cargo (un)loading arrangements

Includes train mounted cranes and other loading/unloading ramps/fixtures. See Q21-J06 for mechanical (un)loading aspects. For station side equipment see X23-S99 instead.

X23-A17 [2014]

Traction increasing equipment

Includes dispensing of particulate matter such as sand under train wheels on track to prevent wheel slippage and increasing grip. For mechanical aspects see Q21-D10A

X23-B

Signalling; Safety

X23-B01

On route devices controlled by passage of train

X23-B01A [1997]

Axle counters; End-of-train passage detection

Includes null flux detector and eddy current detector.

X23-B01C [1997]

Track circuits

Includes associated transmitter and receiver circuits (see also W02 codes e.g. W02-C02 codes for near field systems, W02-C03 codes for radio systems, and W02-G codes for radio equipment per se).

AC-, DC-, audio frequency-, track circuits

X23-B02

On route devices controlling vehicle device

For ATP and ATC signalling to control brakes and train operation see X23-A01B5 and X23-A02C codes.

Cab-, ATP-, automatic train protection-, ATC-, automatic train control-, signalling

X23-B02A [1997]

Magnetic and inductive transponders

Includes train-mounted detector coils to pick-up safe passage tone, speed monitor tone and proceed tone from track-side equipment.

X23-B02C [1997]

Radio communication link

Includes provision of communications (see also appropriate W02-B, W02-C and W02-G codes) between the driver and signal centres. Also includes RF beacons to provide track data like speed limits, gradients, speed and braking commands, destination, stopping patterns, etc.

X23-B02C1 [1997]

Radio communications system for speech

Includes speech radio for train dispatching and safety-critical operational messages. On-board public telephones are coded in X23-C01 only.

X23-B03

Points and signal operation; Signals

Lamp details are in X26. Road/rail traffic intersection signalling is also in T07.

Switching, lamps, relays

X23-B04

Station blocking; Interlocking between points and signals; Warning devices along route

X23-B04A [1997]

Signals and points interlocking

Includes relay interlocking.

X23-B04A1 [1997]

Solid state interlocking

Includes processor-based interlocks.

SSI, solid state interlocking, electronic

X23-B04C [1997]

Station blocking; Track blocking

Includes track blocking for preventing two trains from entering same track block, for anti-collision purposes.

X23-B04E	[1997]
Warning and safety devices along route or between trains	
From 2006 this code has been expanded to include warning devices operating between trains as well as warning devices along train route.	
X23-B04E1	[2002]
Signalling to portable alarm unit	
Includes transmission of on-coming train warning to portable unit carried by track maintenance personnel. Also see W05 codes.	
X23-B05	
Traffic control; Classification yards	
Includes marshalling of trains. Used for local control of trains e.g. in shunting yard. For control of entire railway network see X23-B05C only.	
X23-B05A	[1997]
Rail/road crossing systems	
Includes level crossings.	
X23-B05C	[1997]
Integrated central control	
Includes system for automated transit control, automatic train scheduling and supervisory system. Also includes vehicle movement, power distribution, alarms for faults, system status information.	
X23-B09	[1997]
Other signalling aspects	
Includes e.g. track conductors for improved signal transmission compared with use of the rails in track circuits.	
X23-C	[1997]
Passenger information/communications systems	
(X23-A09,X23-B)	
<i>Railway/train information</i>	
X23-C01	[1997]
On-board PA system; Displays; Telephones	
(X23-B02C1)	
Includes automatically triggered, e.g. by train or signalling, systems. See W04-S05 and W05-E codes, respectively, for PA systems and general displays. See also W05-A codes for warning tones. Also includes on-board public telephones (also see W01 codes), systems for enabling use of passenger's mobile phone e.g. while in tunnel, and passenger information arrangements e.g. allowing on-board internet browsing (see also T01 codes).	

X23-C02	[1997]
Off-board platform/station systems	
Includes automatically triggered, e.g. by train or signalling, systems. Also includes station based timetable displays, internet browsing systems, computerised ticket reservation systems and other station based information/communications systems.	
X23-D	[2014]
Type of carriage or wagon	
Includes electrical details of specific types of carriages. For mechanical aspects see Q21-C03 codes.	
X23-D01	[2014]
Wagon/freight car	
Includes electrical details of wagons, vans or freight cars.	
X23-D02	[2014]
Hopper car	
Includes electrical details of e.g. wagons for carrying particulate material with dispensing openings at bottom of wagon.	
X23-D03	[2014]
Tanker wagons	
Includes tankers carrying fluids.	
X23-D04	[2014]
Mine cars	
Includes electrical aspects of mine locomotives and cars. Also see X25-D for mining.	
X23-D05	[2018]
Passenger carriages	
Includes electrical aspects of passenger carriages. See Q21-C03A for mechanical details.	
X23-D09	[2014]
Other railway vehicles	
Includes electrical details of rail vehicles convertible for use on road (see also Q19-R02).	
X23-P	[2014]
Railway Type	
Includes electrical details of special railway types.	
X23-P01	[2014]
Elevated railways	
Includes electrical details of elevated railways with or without suspended vehicles.	

X23-P02	[2014]
Monorail	
Includes electrical details of monorail aspects.	
X23-P03	[2014]
Cableways	
Includes electrical aspects of aerial ways, cableways.	
X23-P05	[2014]
Magnetically levitated railways	
For novel MAGLEV train suspension/ propulsion details see X23-A01A4 also.	
X23-P06	[2014]
Underground railways	
Includes electrical details of underground railways/Metro <i>Subway, metro</i>	
X23-P09	[2014]
Other railway types	
Includes rack railway.	
X23-N	[2012]
Noise/vibration/Harshness reduction	
Includes all electrical details of arrangements to reduce noise, vibration and harshness in the train. For mechanical NVH reduction see Q21-N instead.	
X23-S	[2010]
Station/off-board railway systems	
(X23-A09A)	
Includes electrical aspects of all offboard/station/platform details. From 2005 major electric track laying equipment has been transferred to X23-X. For station based passenger information/communications systems see X23-C02 instead. See Q21-A codes for mechanical details of offboard railway stations and tracks. For offboard power supply systems see X23-A03A instead.	
X23-S01	[2010]
Security systems	
(X23-A09A1)	
Includes off-board systems for protecting railway passengers and cargo.	

X23-S01A	[2010]
For personnel	
(X23-A09A1A)	
Includes detection of concealed weapons. Also includes all aspects of passenger tracking and monitoring, including authorisation/access control for passengers (see T05-D codes also).	
X23-S01E	[2010]
For baggage	
(X23-A09A1E)	
Includes all aspects of baggage inspection, monitoring and tracking. Includes use of transponder tags (see also T04-K03B, W06-A04B and W02-G05 codes) or bar-code reader (see also T04-A03B1). See S03-C03 and S03-E06B codes for inspection.	
X23-S03	[2010]
Station safety systems	
(X23-A09A3)	
Includes fire-fighting arrangements (see also X25-X05) and automatic platform-edge doors control (see also X25-U01). Prior to 2005, platform edge doors control was coded in X23-A09.	
X23-S05	[2010]
Tunnels	
(X23-A09A5)	
Includes electrical details of tunnel construction and maintenance, as well as tunnel lighting arrangements (see also X26 codes). See Q21-A codes for mechanical details of railway or subway tunnels.	
X23-S99	[2010]
Other offboard/station details	
(X23-A09A9)	
Includes transportation of baggage and passengers (see also X25-F codes), and railway station specific heating and air-conditioning (see also X27-E codes).	
X23-X	[2005]
Other railway system details	
Includes major electric railway track laying equipment and track maintenance equipment (coded in X23-A09A prior to 2005). See Q21-A01 for mechanical details of track maintenance/construction.	
<i>Track repair, track-laying</i>	
X23-X16	[2014]
Maintenance; Servicing; Testing	
Includes locomotive/train servicing and testing equipment.	
<i>Service, maintain, test, diagnostics</i>	

X23-X20

[2014]

Rail vehicle design/manufacture/assembly

Includes electric details of design, manufacture and assembly of railway trains and their components. See X25-X14 for manufacturing/assembly plant per se. Also includes systems for dismantling vehicle to enable recycling of materials (see also X25-W04). See X16-M for recycling of batteries and their materials. See T01-J15 codes for computerised design.

X24: Electric Welding

Note: Patents are coded in X24 only if the soldering or welding equipment is useful in the electrical or electronic industry e.g. PCBs, electric motors, or if substantial electrical content is disclosed.

X24-A

Electric soldering

X24-A01

Solder, soldering methods, flux

Solder wire

X24-A01A [1992]

Solder, flux

Includes details of solder manufacture. See also P55-D01.

X24-A01C [1992]

Soldering methods

X24-A02

(De)soldering equipment, irons, bits, baths

Includes soldering equipment and systems.

Tinning, heaters

X24-A02A [1992]

(De)soldering irons, bits

X24-A02C [1992]

Wave soldering baths

X24-A02E [1992]

Reflow soldering using laser, hot gas, electric heating, etc.

(X24-A09)

For use of laser, see also X24-D03B.

X24-A02X [2007]

Other soldering equipment

Includes spray soldering systems using solder droplets in stream of hot gas to build up solder deposit, e.g. for fixing conductor wires to semiconductor circuit (see also U11 codes). Also includes ultrasonic and laser soldering equipment.

X24-A04 [2006]

Soldering accessories

Includes solder feeding devices and dispensers.

X24-A09

Other electrical soldering aspects

Includes brazing, control and measurements. Also includes cooling details of soldering, soldering simulators and recycling of solder. From 2006, solder feeding devices have been transferred to X24-A04..

X24-B

Arc welding or cutting

X24-B01

Seam and built-up arc welding

X24-B02

Arrangements or circuits

X24-B02A

Generating ignition voltage; Stabilising and magnetic control of arc

Arc ignition, moving arc

X24-B02X

Other circuit details

Includes protective circuits, remote controls.

Power supplies, pulse supply

X24-B03

Automatic feeding of electrodes or work

Includes welding robots, motor control.

Robot control, positioning, guiding

X24-B04

Electrodes and accessories

Includes welding rods, electrodes, materials and media. Also includes all aspects of cables and connectors, and other accessories with significant electrical content. Includes protective mask (see also X27-A02B1A).

X24-B05

Submerged-arc welding, stud welding

Includes shielded metal-arc welding using a covered electrode stick, and submerged arc welding where weld area is protected by granulated flux. Also includes electroslog and flash butt welding.

X24-B06

Using shielding gas

Includes WIG (Wolfram inert gas), GMAW (gas metal-arc welding) or MIG (metal inert gas), TIG (tungsten inert gas) or GTAW (gas tungsten-arc welding) and associated shielding gas feed control. Also includes plasma-arc welding/cutting (PAW) where heat for melting is provided by arc formed between non-consumable tungsten electrode and constricting orifice of torch itself.

WIG, MIG, TIG, GMAW, GTAW, plasma-arc

X24-B09

Other arc welding or cutting aspects

Includes welders using insulated electrodes, percussion welding, testing.

Inspecting, measurements

X24-C

Resistance welding or cutting

X24-C01

Electric supply or control circuits

Monitoring

X24-C04 [2006]

Electrodes and Accessories

X24-C09

Other resistance welding or cutting aspects

Includes spot welding, resistance seam welding (forming a series of overlapping spot-welds), resistance butt welding and projection welding (where the flow of current is confined to protrusions embossed on surface of material to be welded). For robotic spot welding see also X25-A03E1.

Spot welder, seam, projection

X24-D

Other welding, cutting or boring

X24-D01

Welding by induction heating

X24-D02

Electron-beam welding or cutting

See V05-F02 also for electron beam equipment.

Beam focussing, melting, cutting, etching, trimming, hole punching, shaping, beam control, multiple beam

X24-D03

Laser beam welding or cutting

See appropriate V08 codes for laser control details.

Shaping, optical system, control

X24-D03A

[1992]

For metal working

Covers all aspects of working metal using laser beam (and having sufficient electrical content) e.g. cutting, trimming, hole forming etc. Also see appropriate corresponding codes in X25-A codes e.g. for cutting per se. Also includes laser-hybrid welding combining laser welding and e.g. shielded arc welding (also see X24-B06), and robotic laser welding.

Laser-hybrid

X24-D03B

[1992]

For electrical and electronic components

Covers etching of PCBs see V04-R01C5 also, cutting substrate see U11-C07A4 also, trimming resistor valve see V01-A04H3 and trimming capacitor valve see V01-B04C3 also. For reflow soldering using laser see X24-A02E also.

X24-D03X

[1992]

Other laser beam welding/cutting aspects

Includes details of laser cutting through other materials, such as glass, ceramics, etc.

X24-D04

Welding of plastics materials

See also X25-A06 and maybe T06-D13 for plastics working. Includes dielectric welding, RF welding and high frequency welding to fuse plastics together.

Electric resistance heaters

X24-D05

[1987]

Flame or gas welding/cutting

From 2006, details of plasma welding are covered by X24-B06 only.

Blow torch

X24-D06*

[1992-2005]

Ultrasonic

(X24-D09)

*This code is now discontinued and transferred to X24-D08A. It is still searchable for records from 1992-2005.

X24-D07*

[1992-2005]

Friction welding

(X24-D09)

*This code is now discontinued and transferred to X24-D08C. It is still searchable for records from 1992-2005.

X24-D08 [2006]

Solid state welding

Includes low temperature welding processes not involving fusion. Includes hot pressure welding and roll welding.

Cold welding, HPW, ROW

X24-D08A [2006]

Ultrasonic welding

Involves applying ultrasonic vibrations parallel to interface of surfaces being joined, which are under compressive force, so that welding is reached through a solid state process involving atomic movement and diffusion. Also see X24-D04 for ultrasonic welding of plastics.

USW

X24-D08C [2006]

Friction welding

Includes friction stir welding, and inertia welding.

FRW

X24-D08E [2006]

Magnetic pulse welding

Includes cold welding of electrically conductive metals in the total absence of fusion.

Cold welding, inductor coil, capacitor discharge

X24-D08G [2006]

Diffusion bonding

Involves solid state diffusion by application of pressure and temperature to a joint surface for a prescribed period of time.

Aerospace, titanium, loading press, cladding, diffusion welding, DFW

X24-D08X [2006]

Other solid state welding/bonding

Includes explosive welding and forge welding processes.

EXW, FOW

X24-D09

Other welding, cutting or boring aspects

(X24-B09)

Includes non-specific welding apparatus with substantial electrical content, and includes electrolytic welding

X24-D10 [2006]

Welding, cutting, boring accessories

Coverage is restricted to all aspects of cables and connectors, with other accessories requiring significant electrical content.

Welding mask, goggles

X24-D11 [2020]

Testing of weld

Includes testing, monitoring aspects of welding.

X24-E* [1980-2005]

Welding rods, electrodes, materials or media

*This code is now discontinued, but remains searchable for records prior to 2006. Novel welding rods, electrodes, cables, connectors etc. are now covered by the electrode/accessory codes in the relevant areas, e.g. X24-B04, X24-C04 and X24-D10.

X24-F

Electro-erosion

X24-F01

Apparatus, devices, electric circuits

X24-F01A

For electro-erosion in an electrolytic medium

Electrochemical, ECM

X24-F01B [1992]

Electrical discharge machining

(X24-F01X)

Includes arc or spark discharge.

Discharge machining, EDM, discharge wire cut, EDWC

X24-F01X

Other electro-erosion/machining apparatus

X24-F02

Electrodes

Includes moving and spacing of electrodes.

X24-F04 [2006]

Electro-erosion accessories

Includes cables and connectors for electro-erosion and electrical discharge machining equipment. See also V04 codes for connectors and X12 codes for cables.

X24-F09

Other electro-erosion details

X24-G

Welding generators/motors or transformers/inductors

See also X11, X12.

X25: Industrial Electric Equipment

This class, apart from the exceptions below, includes only those patents with substantial electrical content.

Appropriate control aspects relating to various codes in this class are in T06-D. For example, general machine tool control is represented by X25-A03F and T06-D06.

EXCEPTIONS: Electric furnaces and heating, components (e.g. pumps) and electrolysis apparatus.

X25-A

Working materials

X25-A01

Casting metals

Includes all electrical aspects of casting e.g. EM stirrer. Control see T06-D05B also.

Moulding, continuous-, centrifugal-casting, ingot, foundries, die, ladles

X25-A02

Shaping (excluding cutting)

Control see T06-D05A also.

Forming, extruding, corrugating, seaming, folding, squeezing, blanking, electromagnetic forming, electro-hydraulic forming

X25-A02A [1983]

Presses

Control details see T06-D20.

Baling, rams

X25-A02B [1983]

Rolling

Control details see T06-D05A1.

Mills, sheets, foils, tubes, strips, bars, rods

X25-A02C [1992]

Forging

Control details see T06-D05A.

X25-A02D [1992]

Hammering, bending, punching

For control details see T06-D05A. See X25-X10 instead for engraving systems

Stamping

X25-A02E [1992]

Wire drawing

Control details see T06-D05A.

X25-A02F [2018]

Straightening/stretching; Edge/Metal Flanging

Covers electrical details only. Mechanical details are covered in P52 class. Also includes finishing details such as attaching head to a drawing-pin, and metal shaping using fluid pressure, shock waves, etc.

Chemical explosives, edge-curling, edge armoring

X25-A03

Tools

Includes screw tighteners and general aspects of tools. For general control of machine tools see T06-D06 also.

For systems for cleaning of work space, e.g. combined sanding and dust extracting machine, also see X25-H05.

Workpiece positioning, work tables, tool changing, chucks, turret

X25-A03A [1983]

Turning

Includes lathes.

X25-A03B [1983]

Boring, drilling, cutting

X25-A03B1 [2002]

Boring, drilling

Centre-point

X25-A03B2 [2002]

Cutting

Includes cutters, saws, trimming, grooving. See also T06-D07 for control apparatus.

X25-A03C [1983]

Milling, grinding, polishing

(X25-A09)

Control details T06-D07A also.

X25-A03C1 [1992]

Milling

Broaching, nanometer milling machine

X25-A03C2 [1992]

Grinding, abrading, honing, lapping

Blasting, planing, sanding, sander

X25-A03C3 [1992]

Polishing, burnishing

X25-A03D [1983]

Handheld tools

Used in conjunction with the above codes if applicable.

For example, handheld drills are also coded in X25-A03B.

X25-A03E	[1983]
Manipulators	
Control details see T06-D07B also and for CAM/CAD robot programming see T01 also.	
<i>Robots, grappling, gripper, programmable</i>	
X25-A03E1	[1992]
Applications e.g. welding	
X25-A03E2	[1992]
Assembling	
Covers robots used in car manufacturing plants when robot details are claimed. See also X25-F01 for conveyor details.	
X25-A03F	[1983]
Control	
Used in conjunction with above codes for different tool types. Also includes details of industrial automation system.	
<i>Monitoring, simulation</i>	
X25-A03R	[2019]
Riveting	
See also T06-D06A and X25-A03F for riveter control. See X25-X prior to 2018.	
X25-A04	
Cathodic sputtering	
Mainly apparatus for sputtering and chemical vapour deposition included. For methods, substantial electrical details must be disclosed. See U11-C09 for sputtering and CVD apparatus used for integrated circuit manufacture and appropriate T03/W04 codes for magnetic head manufacture. Non-cathodic, e.g. general plasma (laser) deposition is not included - see X25-A09 and X14-F codes.	
<i>Cathodes, targets, coating, deposition, anodes, evaporation</i>	
X25-A05	[1983]
Working glass	
(X25-A09)	
<i>Forming glassware, gob</i>	
X25-A06	[1983]
Working plastics	
(X25-A09)	
Includes welding (see also X24-D04), fusing, extruding, moulding, injecting etc. For control details, see T06-D13 also.	

X25-A07	[1987]
Working rubber	
(X25-A06)	
<i>Tyre manufacture</i>	
X25-A08	[2006]
3D / 4D / 5D printing; Additive manufacturing	
Details of 3D scanners are coded under T04-M05. See also X25-A06 for electrical aspects of working plastics.	
<i>3D replicator, rapid prototyping, solid freeform fabrication, SFF, 3D modelling, active origami</i>	
X25-A08A	[2016]
Method for 3D / 4D / 5D printing and additive manufacturing	
X25-A08B	[2016]
Apparatus for 3D / 4D / 5D printing and additive manufacturing	
Computer control details of 3D printing / additive manufacturing machines are coded under T01-J07B3 and T06-D17. For details of 3D scanners see T04-M05. For ink-jet printhead details see S06-G03.	
<i>Extruder</i>	
X25-A08C	[2016]
Types of 3D / 4D / 5D printing and additive manufacturing	
X25-A08C1	[2016]
Stereolithography	
<i>SLA</i>	
X25-A08C2	[2016]
Fused deposition modelling / 3D / 4D / 5D printing using inkjet technology	
Inkjet technology is also coded under S06-G10.	
<i>FDM®, extruders, extrusion tips, fused filament fabrication, FFF</i>	
X25-A08C3	[2016]
Selective laser sintering	
<i>SLS</i>	
X25-A08C4	[2016]
Laminated object manufacturing	
<i>LOM</i>	
X25-A08C9	[2016]
Other types of 3D / 4D / 5D printing and additive manufacturing	

X25-A08M [2016]
3D / 4D / 5D printing and additive manufacturing materials

Codes in X25-A08M section indicate the type of material used to produce the printed object. For novel material compositions, see the relevant codes in classes A-M.

X25-A08M1 [2016]
Metals

X25-A08M2 [2016]
Plastics

X25-A06 should also be applied.

X25-A08M3 [2016]
Organic materials

Includes organic materials used to produce biological products such as human tissue replacements. See also X25-A08U2.

X25-A08M4 [2018]
Food

See also X25-A08U7 and X25-P01X.
Chocolate

X25-A08M8 [2020]
4D-compatible materials

Materials which are compatible with 4D printing techniques. This code is used in conjunction with other X25-A08M codes.
Programmable matter

X25-A08M9 [2020]
Other 3D / 4D / 5D printing and additive manufacturing materials

Includes specific materials not covered by other X25-A08M codes, e.g. concrete, silica sand, magnesium sand, chromite sand, etc.

X25-A08U [2016]
3D / 4D / 5D printing and additive manufacturing applications

Codes in X25-A08U section are used in conjunction with other X25-A08 codes to highlight what is manufactured using the 3D / 4D / 5D printing and additive manufacturing systems.

X25-A08U1 [2016]
Domestic and personal items

See also P21-P28 classes.
Watch, clothes, footwear, jewellery, kitchen equipment, tableware

X25-A08U2 [2016]
Pharmaceutical; Medical

See also B class codes for pharmaceutical applications; P32 for prosthetics.
Bio-printing, prosthetics, pills, tissue engineering

X25-A08U3 [2016]
Vehicles; Aerospace

See Q24 / Q25 / W06 classes for aerospace and shipping; Q11-Q19 / X21 / X22 for land vehicles and Q21 / X23 for railway vehicles.

X25-A08U4 [2016]
Industrial

Includes manufacture of components not covered by other X25-A08U codes. Includes manufacture of components used in the construction and building industry. See X25-A06 for electrical aspects of working plastics.
Tool, robotics, television, phone, oil/gas industry

X25-A08U5 [2016]
Sports, toys, entertainment and arts

Includes art pieces, figurines, action figures, etc. For manufacture of sports equipment, toys and novelty items see also P36 class.

X25-A08U6 [2016]
Defence

See also Q79 / W07 classes for military weapons etc.
Weapons, ammunitions, military

X25-A08U7 [2016]
Food industry

See also X25-P codes for electrical aspects of food processing.

X25-A08U9 [2016]
Other specific 3D / 4D / 5D printing and additive manufacturing applications

X25-A08X [2016]
Other details of 3D / 4D / 5D printing and additive manufacturing

X25-A09
Other material working aspects

Includes metallic coating, e.g. plasma deposition, plasma spray coating or plasma transferred arc hardfacing, e.g. for applying wear-resistant metallic material such as Stellite® to steel. For other coating, such as painting, see X25-K05.
Cement, ceramic, concrete

X25-A10 [2007]

Working wood

Includes arrangements for working wood. See other X25-A codes to highlight the action being carried out, e.g. X25-A03A for wood turning. For felling of timber or processing lumber see X25-X01 instead.

Turning

X25-B

Electric heating

All domestic applications are also in X27.

X25-B01

Ohmic resistance heating

Includes protective arrangements, IR heaters e.g. quartz lamps.

X25-B01A

Electrodes

X25-B01B

Heater element materials or conductor arrangements

X25-B01C

Plate heaters

Includes resistance heaters having extended surface area substantially in a two-dimensional plane.

X25-B01C1

Non-flexible elements

X25-B01C1A [1992]

Panels

X25-B01C1B [1992]

Hotplate; Cooker hob

Covers all aspects of resistance heating in cookers, see X27-C02 also.

X25-B01C1C [1992]

Windscreen heater, demister

Includes windscreen and wing mirror heaters. See also X22-J02A for vehicle windscreen demister.

X25-B01C3 [1992]

Flexible elements

(X25-B01C9)

Includes heating nets or webs.

X25-B01C3A [1992]

Electric blanket

See X27-E02 also for electric blanket.

X25-B01C3B [1992]

Under carpet, wall heating elements

See X27-E01A3 also, for wall, carpet and underfloor heating.

X25-B01C3C [1992]

Pads, seats

See X22-J02 and X22-J03 also for vehicle seat. See X27-E02 also for domestic application. See X27-A also for domestic seat application.

Mattress

X25-B01C9

Other plate heaters

Foils

X25-B01D

Rod or tube elements

Also includes heating cables.

Electric bar heater

X25-B01E

With granular, powdered or fluid current path, furnace elements

X25-B01E1 [1992]

Furnace elements

See X25-C01 also for ohmic resistance furnace.

X25-B01E2 [1992]

Water, immersion heaters

See X27-E03A also for domestic water heating.

X25-B01F [2005]

Positive Temperature Coefficient heaters

PTC, self regulating

X25-B01H [1992]

Infrared heaters (includes lamps)

Halogen, IR

X25-B01H1 [1992]

Cooking apparatus

See also X27-C02A for cooker.

X25-B01H3 [1992]

Industrial applications

Includes dryers, etc.

X25-B02

Electric-, magnetic- or electromagnetic-field heating

Laser heating

X25-B02A

Induction heating

Power supply, control

X25-B02A1 [1983]

Inductors

See X12-C also.

Coils

X25-B02A2 [1992]

Cooking appliances

See also X27-C06 for induction cooker.

X25-B02B

Microwave heating

Details of microwave power tubes per se are in V05, waveguide devices in general in W02-A. Includes circuits, feed lines, waveguides, mode stirrers and door seals.

Control, antenna, magnetrons, chambers

X25-B02B1 [1992]

Cooking; Oven

Aspects of cooking vessels are only in X27-C01.

Microwave oven, chambers, magnetrons, antenna, control

X25-B02B3 [1992]

Industrial scale heating; Drying

For large scale food processing etc. see X25-P01 and X27-C also, for drying see X25-G also.

X25-B02D [1992]

Dielectric heating

Includes radio frequency (RF) heating where alternating electric field causes molecules to repeatedly align with field creating heat similar to friction.

X25-B02F [2011]

Thermoelectric/Solid state heating

(X25-B)

Includes thermoelectric heating using an applied voltage to cause a temperature difference across the thermoelectric module, e.g. a sandwich formed from two ceramic plates with N and P type bismuth telluride in between. Charge carriers, i.e. electrons and positive holes absorb heat on one side of the thermoelectric module and transport it to the other side where it is used for heating. See X27-F02B1 for thermoelectric cooling.

Peltier heater, thermoelectric heat pump, solid state

X25-B02X

Other electric-, magnetic- or electromagnetic-field heating aspects

Includes electron beam heating, etc.

X25-B03

Electric discharge heating

X25-B03A

Electrodes or electrode arrangements

X25-B03B

Arc discharge or glow discharge

X25-B03X

Other electric discharge heating aspects

Includes power control, power supplies.

X25-B04

Automatic switching for heating equipment

Control, thermostats

X25-C

Industrial furnaces

Elements for the various heater types are in X25-B. Other details are coded in relevant places in X25-C. Incinerators for industrial waste disposal are also coded under X25-W01A. Mechanical details of general solid waste disposal are coded by P43-E codes.

Cremation

X25-C01

Ohmic resistance

Resistance element, temp control, power supply, charging/discharging, crucible, hearth

X25-C02

Electric discharge

Includes arc furnaces.

Electrode, power supply, crucible, hearth

X25-C03

Monitoring, control

X25-C05 [1992]

Induction furnace

(X25-C09)

Zone melting, coreless, core-type, coil

X25-C07

Gas Furnaces

Includes electrical aspects of gas furnaces.

Electrode, power supply, crucible, hearth

X25-C09

Other industrial furnaces

X25-D

Soil-shifting; Mining

X25-D01 [1983]

Soil shifting, excavators

Includes fuzes and blasting using explosives (see W07-C codes for military applications). See T06-D08E also, for control details.

Dredger, bulldozer

X25-D02

Mining

Covers rock or ground testing (see also specific S03 codes e.g. S03-E14E which includes investigation methods of soil, rock etc.). Use T06-D11 also, for control details.

Dust removal, roof condition monitor, rock hardness testing, powered support, quarries, miner's helmets, blasting, detonator, mineshaft ventilation

X25-D02A [1983]

Handling material, e.g. lift, conveyor

See also X25-F.

Vehicles, mine locomotives

X25-D02B [1983]

Tools

Shears, drills, picks, cutters

X25-D02C [1992]

Intrinsically safe power supply/equipment; Testing

X25-E [2020]

Earth-drilling, well logging

Also includes pumping and heating to aid oil recovery. Control details see T06-D12 also. Also see H01-A, H01-B and H01-C codes respectively for well logging, drilling and producing.

Cables, connectors

X25-E01 [1983]

Drilling equipment

Covers large-scale deep-well drilling e.g. oil, gas, water, etc. For drilling in the construction industry, see X25-U, and for drills used in the mining industry, see X25-D02B.

X25-E02 [1983]

Well logging

Geophysical prospecting in general is in S03-C.

X25-E02A [1992]

Measuring arrangements

Sondes, sampling, penetration depth, measuring, testing, surveying

X25-E02A1 [1992]

Transmission details

See appropriate W05-D codes for transmission details.

X25-E03 [2006]

Well production; Extraction of oil, gas, water, etc.

Includes pumping assemblies. Also see X25-L03A for novel electric pumps per se.

X25-F

Conveying, lifting, hauling, handling materials

Includes filling materials, labelling, tagging, e.g. electronic tagging using e.g. radio frequency ID tags to track goods/items during conveyance (see also W06-A04B5 and W02-G05 codes), etc. General control details are also coded in T06-D08 as appropriate.

Tagging machines, weighing

X25-F01 [1983]

Conveyors

Includes vibratory feeders and detecting articles on conveyor.

Belts, transporting goods, shelving and retrieving, locating, addressing

X25-F01A [1983]

Conveyor control

See also T06-D08C for control.

X25-F02 [1983]

Web/strip/coil handling

See T06-D08A also for control details dealing with web-advancing apparatus, and T06-D08B also for control of article feeding or tension regulation.

Rolls, sheets, tension-control, filaments, winding, coiling, wrapping, tension control

X25-F02A [1992]

Paper or envelope handling

X25-F03 [1983]

Packing; Dispensers

X25-F03A [1987]

Packing; Bottling; Packages; Labelling/tagging

Includes all electrical details of packaging plant and methods as well as electrical details of packages/bottles per se. For packaging of TV receivers, AV equipment or electronic components in general, see W03-A19C, W03-G10G and V04-X01A respectively. From 2012, mechanical details of packaging processes and equipment are coded under Q31, details of container/closure and transit packaging under Q32, details of packaging container and closure materials under Q33, and the types of goods packages, bottled, labelled, etc, under Q34

X25-F03A1 [2011]

Packing/Bottling plant and methods

Includes methods for filling and sealing packages as well as bottling and tinning plants. Also see other X25 and X27 codes as according to what is being packaged, e.g. see also X25-P01X for canning food, X25-P01C for bottling milk and X27-A02 for packaging beauty treatments. Also includes unpacking and bundling details.

Wrapping, stapling, stapler, canning, filling

X25-F03A3 [2011]

Electrical aspects of packaging; Smart packages; Labels and tags

Includes electrical details of packages/bottles per se such as packages with built in sensors, displays, expiry or deterioration indicators or tags. See X25-F11 and T05-G02 for systems for tracking of packages or goods being shipped. If the package is intended for a specific use, also see other X25 and X27 codes as appropriate, e.g. X25-P01X for food, X25-P01C for milk and X27-A02C for packages for stationery.

Carton, box, bottle, pouch, lid, sensor, display

X25-F03A3A [2011]

Smart packages

Includes packages/bottles containing smart devices such as RFID tags or electric time-temperature or food quality indicators. Novel aspects of tags and labels are also assigned X25-F03A3C. Also see T04-K and W02-G05 for novel transponders/labels attached to package, and X25-F11 and T05-G02 for systems for tracking of packages or goods being shipped. If the package is intended for a specific use, also see other X25 and X27 codes as appropriate, e.g. X25-P01X for food, X25-P01C for milk and X27-A02C for packages for stationary. See X27-F05 for intelligent refrigerators that monitor smart food items.

Sensor, alarm, warning, display

X25-F03A3C [2011]

Labels and tags

(X25-F08)

Includes novel labels or tags applied to smart packages for which X25-F03A3A is also assigned. Also includes methods and systems for the attachment of labels or tags to goods, or the printing of a label on a package (also see S06-G codes for printing using inkjet technology). Also see T04-K and W06-A04B5 codes for labelling/tagging using a smart or RFID tag/label and also W02-G05 codes when novel RF details are involved, such as receiver or transmitter circuitry or antennae. See T03-H02A codes for labelling of record carriers such as CDs or cassettes. Product-identifying tags providing electronic article surveillance (EAS) capability are also assigned W05-B01A2 codes depending on the technology use. Also see X25-F11 for tracking of tagged/labelled goods and X25-F07 for automated warehousing utilising tagged goods.

Bar code, smart label, transponder, RF-ID, transponder, passive tag, battery-assisted passive tag, BAP, active tag

X25-F03B [1992]

Dispensers

Dispensing measured volumes in general is covered by S02-C04 codes.

Stamps

X25-F03B1 [1992]

Dispensers for comestibles

Includes vending machines for food/drink etc, see relevant T05-H codes also. See X27-X for stock control in pub e.g. optics etc.

Beer, water, dispensing

X25-F03B2 [1992]

Forecourt dispensers

Includes petrol pump, air dispenser in garage for vehicle tyres, etc.

X25-F04 [1983]

Lifts

Includes details of passengers lifts and goods lifts.
Electrical details of doors are also coded under X25-U01.
Elevators, floor indicators, door operation, escalators

X25-F04A [1983]

Control

See also T06-D08D for control details.
Floor-call, speed/acceleration control, motor control, dispatching

X25-F05 [1983]

Cranes, hoists, winches, trucks

Includes lifting magnets, cable car, jack, ski lift, vehicle mounted equipment (see X22-also). For control details see T06-D08E also. Details of passengers lifts and goods lifts are included under X25-F04.

X25-F05A [1987]

Trucks, goods or robotic vehicles

Includes IC engine and electric forklift trucks, vehicles mounted with lifting platform (also see X22-X18 or Q15-A codes), and walk behind trucks (also see X22-P05F or X21-A01B for IC engine and electric fork lifts respectively). See T06-D08F for forklift control. See Q19-C06 instead for mechanical aspects of forklift trucks. Also includes walking robots and electrical aspects of shopping trolleys such as electric drive arrangements and advertising displays/bar-code readers. See Q22-A02 for mechanical aspects of trolleys and Q38-B for mechanical details of trucks and robotic vehicles.

Fork lift, walking robot, electric shopping trolley, climbing robot, inspection robots, autonomous

X25-F05A1 [1987]

Running on tracks

Includes robotic vehicles/trucks running on tracks or following painted lines on factory floor using e.g. optical sensors or image processing (see also T01-J10B/T04-D codes). See also T06-B01A and T06-D08F for 2D position control of goods conveying vehicles.

Factory automation vehicles, automatic guided vehicle, AGV

X25-F06 [1987]

Sorting

(X25-F)

See also X25-W04 for recycling, and T05-K.

X25-F07 [2002]

Automated warehousing

Includes shelving and retrieving arrangements. See also T06-D08 for control, X25-F01 for conveyors, X25-F05A for conveying trucks and X25-F03A3C for warehousing of tagged goods. Electrical details of manipulators used to grab goods are also coded under X25-A03E.

X25-F08* [2002-2010]

Labelling/Tagging

*This code is now discontinued and transferred to X25-F03A3C but remains searchable and valid for codes from 2002-2010. Includes details of the actual attachment of the label or tag to the item, or printing of the label on the item (also see S06-G codes for printing using inkjet technology). See X25-F03A codes if the labelling/tagging is part of the packing/bottling arrangement, and X25-F11 for goods tracking arrangements. See also T04-K, W06-A04B5 and possibly W02-G05 codes for labelling/tagging using a smart or RFID tag/label. See T03-H02A codes for labelling of record carriers such as CDs or cassettes.

X25-F09 [2007]

Inventory/Stock management

Includes inventory management and monitoring of materials/articles being removed/replaced from storage area. See T01-J05A2 for non-networked inventory monitoring or T01-N01A2 for network, e.g. Internet, based systems.

Stock control

X25-F11 [2007]

Goods tracking

Includes arrangements for monitoring location of goods containers or individual articles being moved. For use of radio transponders attached to goods, also see X25-F03A3C and T04-K03B for transponder tags/labels and T04-K02 for reading and writing aspects. See also T01-N01A2E for Internet based tracking. Novel RF details of transponder tags/interrogation are also covered by W02-G05 codes and W06-A04B5 codes cover RF transponder identification. See W05-B01A2 codes instead for theft alarms triggered by transponder tags.

X25-F12 [2016]

Delivery methods and equipment

Includes use of drones to deliver articles in remote or difficult locations (also see W04-X03E1M and W06-B15U for unmanned aerial vehicles used for commercial/industrial application). Also see S02-B04 for aerial photographic surveying and W07-F04 for aerial reconnaissance.

Delivery, drop, package, post, supplies, logistics, quadcopter, rotorcraft

X25-G

Drying

See T06-D20 for control details also.

Heater control, air flow control, microwave heaters, infrared heaters, electric heaters

X25-H

Separating materials, cleaning, sterilizing

X25-H01

Magnetic separation

Coils, electromagnets

X25-H02

Electrostatic separation

X25-H02A

From gases or vapour

X25-H02A1

Plant or installations

Electrostatic precipitation, power supply, controllers

X25-H02A2

Constructional details

X25-H02B

From liquids or solids

X25-H03 [1983]

Water and sewage treatment

(X25-H09)

Includes water distillation, water sterilization e.g. using ultraviolet radiation, desalination plant, aerator, swimming pool cleaning (see X25-X06 also). Water recycling is also coded under X25-W04.

X25-H04 [2006]

Ground/soil decontamination

Includes cleaning of contaminated soil, e.g. from pollution by petroleum or heavy metal spills.

X25-H05 [2006]

Industrial workspace cleaning

Includes e.g. vacuum systems for dust extraction or removing swarf etc. during machining of materials. Can be used in conjunction with X25-A codes as appropriate. See X27-E01B only for general air-conditioning of industrial work spaces.

Vacuum, dust, extraction

X25-H06 [2011]

Mechanical separation

Includes separation by mechanical means such as centrifugal separators and separation by floatation.

X25-H09

Other material separation and cleaning aspects

Includes electro dialysis, dry cleaning plant (see X27-D09 for domestic scale dry cleaning), general disinfection and sterilization, etc. From 2011, separation by floatation is coded in X25-H06. Details of industrial laundry equipment are also coded under X25-T05.

Fractional distillation, general cleaning

X25-H09A [2002]

Ultrasonic cleaning

Includes ultrasonic bath and ultrasonic sterilizers. See X27-D07A for domestic ultrasonic mixed mode cleaning.

X25-H09C [2002]

Vehicle washer

Includes electrical aspects of vehicle washing equipment.

Car wash

X25-J

Mixing, crushing

Includes centrifuges, magnetic mixing, ore crusher. See T06-D04 for control details. Includes large scale shredders. Small size shredders, e.g. used in offices to shred confidential documents, are coded under X27-A02C only.

Pulverising, grinding, milling, ball mills, cyclone

X25-K

Spraying and coating equipment

X25-K01

Electrostatic spraying equipment

X25-K05 [1987]

Coating equipment

X25-K09

Other spraying and coating equipment

Includes atomisers.

X25-L

Components

Includes novel electrical components per se, and mechanical parts of these components, e.g. a mechanical impeller used in an electric pump. To be coded in the X25-L section, the electrical components themselves need to be novel. Therefore, a novel electrohydraulic system using off-the-shelf solenoid valves will be coded in X25-L09 but X25-L01A will not be applied as well since the valves are not novel. Motor vehicle applications are excluded from this section – See X22 instead.

X25-L01

Valves

Includes electro hydraulic valves.

Motorised valves, electric actuators, position monitor, fluid-pressure actuator (electrical)

X25-L01A [1983]

Electromagnetic

Details of electromagnets are in V02-E.

Solenoids, control, coils

X25-L02

Electric brakes, clutches, gears

Electromagnets, EM coupling, transmission

X25-L03 [1983]

Pumps, compressors

(X25-L09)

Electrically-driven, controllers

X25-L03A [1992]

Pumps

X25-L03B [1992]

Compressors

See X27-F02C1 for compressor used in refrigeration.

X25-L04 [1983]

Blowers, fans

(X25-L09)

Electrically-driven, controllers

X25-L05 [1987]

Vibrators

(X25-L09)

Electromagnetic, motorised, coils, electrodynamic

X25-L06 [1987]

Seals, magnetic bearings

(X25-L09)

Magnetic seals

X25-L07 [1987]

Heat exchangers, heat pipes

(X25-X)

Includes heat exchanger comprising built-in electric resistance heater to supplement heat exchange or solenoid flow control valve.

X25-L09

Other electrical components

Includes shock absorbers, electroviscous actuators, etc. Electrohydraulic valves are coded under X25-L01 only.

Novel details of electrohydraulic systems other than valves are coded under X25-L09.

Dampers, electrorheological fluid

X25-M

Locks

Alarm systems are in W05-B. See also T04-A and T05-D for card readers and access control systems, respectively.

Keys, alarms

X25-M01 [1983]

Electronic

Codes, keyboard-operated, magnetic card, memory

X25-M02 [1983]

Electric/magnetic

Electromagnets, solenoids, slides, bars, coil, bolts

X25-N

Agriculture

X25-N01 [1983]

Arable

Includes insecticide spraying, bird scarers, greenhouse. See also X25-X02 for vermin/insect extermination. Also includes details of rice polishing/milling and flour polishing/milling (see also X25-P01X for general food processing).

Seed treatment, grain silos, ventilation, parasite/vermin extermination, agricultural produce grading/sorting, hay baling, weeding

X25-N01A	[1983]
Soil working, sowing, harvesting	
Includes tractors. For control see T06-D01A. From 2015, mechanical details of soil working and planting are coded under P11, and mechanical details of harvesting are coded under P12.	
<i>Ploughs, depth control, combine harvesters, threshers</i>	
X25-N01B	[1987]
Fertilising; Irrigating; Culture	
See T06-D01B for control details. Includes rain influencing systems for agricultural reasons (see also X25-X20 code).	
<i>Sprinklers</i>	
X25-N02	[1983]
Livestock	
Includes branding, bee-keeping, egg incubator, horse training (see W04-X01 also). For control details see T06-D01C also.	
<i>Poultry-, cattle-, fish-farming, trawler fishing gear, eggs grading</i>	
X25-N02A	[1987]
Feeding and drinking	
Also includes manufacture of animal feed (also coded under X25-P01X).	
<i>Automatic feeders, dispensers, compound feed</i>	
X25-N02B	[1987]
Milking	
See also X25-P01C for milk processing, and X25-F03A for milk bottling.	
<i>Milking control, metering, monitoring</i>	
X25-N02C	[1987]
Housing; Fencing	
Includes heating and air conditioning. For electric fence see X25-X11 also.	
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X25-P	
Foodstuff industry, tobacco, pharmaceuticals	
X25-P01	[1983]
Bulk food processing	
See T06-D02 for control details also.	
<i>Industrial cooking, bread baking, food sorting</i>	
X25-P01A	[2002]
Industrial cooking/baking equipment	
Includes industrial scale food processing such as mixing bread dough and kneading, and also industrial cooking/baking systems such as large scale ovens. For domestic cooking/baking see X27-C codes instead.	

X25-P01B	[2002]
Industrial beer brewing/alcoholic beverage production equipment	
Includes electrical aspects of large scale beer or wine making equipment, and - since 2006 - this code also covers electrical details of equipment for producing all type of alcoholic beverages, including spirits, etc. See X27-X02 only for small scale domestic brewing/wine making. Also includes packaging/bottling of beverages. See also X25-F03A1 for bottling.	
<i>Distillery, winery</i>	
X25-P01C	[2002]
Milk processing	
Includes pasteurisation. See X25-N02B for milking control, metering and monitoring for livestock. See X25-F03A for bottling of milk.	
X25-P01X	[2002]
General food processing	
Includes meat slicing, food packing/canning (also see X25-F03A for food packing/tinning). Also includes food/packaging sterilization/disinfection e.g. using mechanical cleaning, chemicals, heat, radiation or electricity. See e.g. X27-D10 for general domestic scale sterilizing/disinfecting. Also includes details for milling and polishing rice or other seeds, manufacturing of animal feed, and 3D printed food. Details of 3D printing are also included under X25-A08M4 and X25-A08U7. Manufacturing of animal feed is also coded under X25-N02A.	
<i>Packing, canning, tinning, sterilising, UV, microwave, ultrasonic, plasma, flour/rice polishing/milling, oil pressing</i>	
X25-P02	[1987]
Pharmaceuticals	
For control details see T06-D02A also.	
X25-P03	[1997]
Tobacco	
(X25-P)	
<i>Cigarette manufacture, perforating filter paper, cigarette packing</i>	
<hr/>	
X25-Q	
Metallurgic processes	
For control details see T06-D09 also. For industrial furnaces per se, see X25-C. Also includes electrical details of powder metallurgy process (see also M22-H).	
X25-Q01	[1983]
Iron and steel manufacture	
<i>Furnace control, arc furnaces, blast furnaces, cupola</i>	

X25-Q02 [1983]

Heat treatment, cold working, etc.

Annealing, quenching, hardening, tempering

X25-R

Electrolysis, electrophoresis

X25-R01

For production of non-metals

Terminals

X25-R01A

Cells

X25-R01B

Electrodes

Anodes, cathodes

X25-R01C

Separators

Membranes, ion exchange separators, diaphragms

X25-R01D

Control

X25-R02

For metal refining, etc.

Cells, electrowinning, baths

X25-R03

Electroforming

X25-R04

Electroplating

Does **not** include electroless (e.g. nickel) plating via a chemical reduction process without use of electrical energy (see M13-B codes instead).

Electrodeposition

X25-R04A

Cells

Electrodes

X25-R04B

Control

Current control, measurements, monitoring

X25-R05

Anodising

Coating

X25-R06

Electrolytic cleaning, etching, polishing; Sacrificial anodes

Corrosion protection, cathodic protection

X25-R07 [1983]

Electrophoretic coating

Includes anodic and cathodic coating of electrode with non-conductive organic coating, where colloidal particles suspended in a liquid medium migrate under the influence of an electric field and are deposited onto the electrode.

Electropainting, E-coating, electrocoating, EP

X25-S

Static electricity prevention

Includes lightning rods (see also X12-G) and materials.

Antistatic coatings, discharging

X25-S01 [1992]

Clean room; Computer installation

See also T04-L08 when used with computer installations e.g. data centers, and U11-C15 when the clean room is used during semiconductor manufacturing.

X25-T [1983]

Textile and paper industries

(X25-X)

X25-T01* [1983-2005]

Fiber, yarn, etc. manufacture

(X25-X)

*This code is now discontinued and transferred to X25-T04A from 2006. It is still searchable and remains valid for records from 1983-2005. See T06-D03B for control details also.

Spinning, winding, bobbins, twisting, combing, carding, crimping

X25-T02* [1983-2005]

Fabric manufacture

(X25-X)

*This code is now discontinued and transferred to X25-T04B from 2006. It is still searchable and remains valid for records from 1983-2005. From 2006 embroidery machines have been transferred to X25-T04C. See T06-D03C for control details also.

Knitting machines, tension-control, embroider, looms, wefting machines, warping machines

X25-T03*	[1983-2005]
Sewing machines (X25-X) *This code is now discontinued and transferred to X25-T04C from 2006. It is still searchable and remains valid for records from 1983-2005. See T06-D03D for control details also.	
X25-T04	[2006]
Textile industry <i>Bleaching, binding</i>	
X25-T04A	[2006]
Fiber, yarn, etc. manufacture See T06-D03B also for control details. <i>Spinning, winding, bobbins, twisting, combing, carding, crimping</i>	
X25-T04B	[2006]
Fabric manufacture See T06-D03C also for control details. <i>Tension-control</i>	
X25-T04B1	[2006]
Weaving machines <i>Looms, wefting, warping machines, tension-control</i>	
X25-T04B2	[2006]
Knitting machines <i>Weft knitting</i>	
X25-T04B3	[2006]
Non-woven fabric production machines Includes production of non-woven fabrics such as wadding, felt or fleece, and the production of fabrics, e.g. by welding together thermoplastic fibers (see also X24-D04). <i>Cotton wool</i>	
X25-T04C	[2006]
Sewing machines; Embroidery machines See T06-D03D also for control details of sewing and embroidery machines. <i>Sew, embroider</i>	
X25-T04D	[2007]
Textile printing; Textile dyeing See also S06-G10 if using inkjet printing. See also F03-F codes for dyeing/printing.	

X25-T04G	[2006]
Other textile industry aspects Includes industrial scale fabric pressing/ironing, fabric cutting, industrial electric scissors etc.	
X25-T05	[2017]
Industrial laundry equipment Includes commercial and industrial laundry washing and drying equipment. Also includes industrial dry-cleaning plants (see also X25-H09), laundry feeders (see also X25-F01), folders, industrial ironing equipment, stackers and garment baggers (see also X25-F03A). Drying details are also coded under X25-G, and cleaning details are also coded under X25-H codes. Domestic scale laundry washing and drying equipment is coded under X27-D only. <i>Batch dryer, washer extractor, batch washing system</i>	
X25-T09	[1987]
Paper industry (X25-X) See T06-D03A also for control details.	
X25-T09A	[2002]
Paper manufacture	
X25-T09B	[2002]
Cardboard manufacture	
X25-T09C	[2002]
Paper shredding/cutting See X27-A02C also for domestic size shredder and business equipment.	
X25-T09G	[2002]
Other paper industry aspects See also X25-W04 for paper recycling, X25-A02A for paper press, and X25-F02A only for paper and envelope handling. Includes book binding (see also S06-C05). <i>Binding, printing</i>	
X25-U	[1983]
Building, construction industry (X25-X) <i>Concrete mixers, pile-drivers, stone cutters</i>	
X25-U01	[1983]
Doors and windows (X25-X) Includes gates, skylights. Also includes lift doors. Lift doors are also coded under X25-F04. <i>Doors control, drive motors, garage door, road barrier, electrochromic covering</i>	

X25-U02 [1997]

Car Parks; Car storage and retrieval
(X25-X)

X25-U05 [1987]

Road construction; Road maintenance e.g. road cleaning, gritting

Includes electrical details of road tunnels, e.g. ventilation system. Also includes monitoring of road condition, e.g. damage of road surface. If road condition is transmitted to the driver of a vehicle, T07-G02 should also be applied. If the monitoring system is mounted on the vehicle, see X22 only.

De-icing, snow ploughs

X25-V [1987]

Cryogenics
(X25-X)

Includes electrical aspects of cryogenics producing very low temperatures (i.e. below -150 degrees Celsius).

X25-W [1997]

Industrial waste disposal, recycling; Electric steam boilers
(X25-X)

X25-W01 [1997]

Industrial waste disposal
(X25-X)

Includes details of large scale garbage disposal control systems and large non-domestic bins. Domestic waste disposal, such as kitchen waste disposal units and electrical rubbish bins, are coded under X27-K only. Recycling processes/systems are coded under X25-W04 only. Does not include radioactive waste disposal (see K07-B or X14-D).

X25-W01A [2002]

Incinerators

Electrical details of furnaces are coded under X25-C.

X25-W02 [1997]

Electric steam boilers
(X25-X)

X25-W04 [2002]

Recycling processes/systems

Includes recycling processes for plastics, paper and aluminium, as well as retrieval and sorting of waste for recycling. See also X25-F06 for sorting, and X25-T09 for paper industry. For recycling of copier and printer components also see S06-K04C. Water recycling is also coded under X25-H03.

X25-X

Other

Includes fume cupboard, ventilators etc. For riveting see X25-A03R.

X25-X01 [2002]

Timber industry

Includes tree felling and transporting equipment, wood drying (see X25-G also) and sawing of lumber. For wood working such as wood turning, see X25-A10 instead.

X25-X02 [2002]

Vermin/insect extermination, repulsion or trapping

Includes devices for killing, trapping and deterring/scaring pests such as rats or flies. See X27-X for domestic insecticide dispenser, and X25-N01 for arable insecticide spraying.

X25-X03 [2002]

Killing and stunning of animals

Includes abattoirs (see also X25-N02 for livestock animals). Also includes animal deterrent/repulsion systems, e.g. for preventing wild animals from straying into specific area. Also see X25-N02 for deterring livestock and X25-X11 for electric fences per se. For vermin/insect deterrent systems see X25-X02 instead.

Abattoir, stun

X25-X04 [2002]

Ozone manufacture

Also see X27-E01B2 for air-conditioning, and X12-F03.

X25-X05 [2002]

Fire fighting equipment

Includes details of early fire warning systems e.g. in buildings. W05-B02 codes are also assigned for fire alarms. Mechanical details of fire fighting equipment are coded by P35-C codes.

Sprinklers, fire extinguishers

X25-X06 [2002]

Swimming pools

Includes electrically operated covers, lights, heaters, etc. See X26 for lighting and X27-E03/X25-B for electric water heating.

X25-X07 [2002]

Leather working/cutting

See X27-A02B1B also for footwear manufacture.

X25-X08	[2002]
Stirling engines	
Includes engines used in refrigeration systems. See X27-F for refrigeration.	
X25-X09	[2002]
Lubricating systems	
X25-X10	[2002]
Engraving systems	
Includes engraving using mechanical means as well as laser marking. Also includes stamping. See X25-A02D for punching/stamping.	
<i>Laser coding</i>	
X25-X11	[2002]
Electric fence	
See also X25-N02C for livestock fencing.	
X25-X12	[2002]
General industrial safety systems	
Used in conjunction with other X25 codes as appropriate.	
X25-X13	[2005]
Industrial combustion	
Includes boilers using solid, liquid or gaseous fuels and involving electrical aspects. Domestic scale combustion, e.g. central heating gas boiler, is not included - see X27-G.	
X25-X14	[2005]
Manufacturing/assembly plants	
Includes assembly line systems and general manufacturing plants. For novel assembly/manufacturing devices, such as manipulators or conveyors, see X25-A03E and X25-F01, respectively. Control details of manufacturing processes using 5G technology are also covered by W02-C03C1L.	
<i>Industry 4.0, vehicle assembly line, car manufacturing plant</i>	
X25-X20	[2008]
Weather influencing/manipulation	
Includes all electrical aspects of systems for controlling weather conditions such as using artificial lightning to produce rain or disperse clouds. Also includes electrical aspects associated with dispersing materials for cloud seeding. For measurement of weather conditions see S03-D codes. See W06-B01C9 for aircraft-mounted weather influencing systems, and X25-N01B if rain is being influenced for agricultural reasons.	

X25-Y	[1997]
Pipelines	
X25-Y01*	[1997-2004]
Toilets	
*This code is now discontinued and transferred to X27-L from 2005. It is still searchable and remains valid for records from 1997-2004. Public and domestic toilets and urinals. Includes toilets with integral bidets (see also X27-A02A).	
X25-Y02	[1997]
Pipelines	
Includes flow control valves, sensors and other electrical components, e.g. for large scale oil, sewage and water pipes. See also X25-L01 for valves per se, and X25-H03 for water and sewage treatment.	

X26: Lighting

NOTES:

(1) Also includes illumination obtained by unconventional sources like LED, EL devices. However, such devices used for displays and signalling are not included.

(2) Vehicle lamp circuitry / control and mounting arrangements onto vehicle body are coded in X22 only. X26 codes are applied to highlight the type of lamp (e.g. LED, incandescent, etc), or novel details of fixtures (e.g. lenses, refractors, etc.).

X26-A

Discharge (including arc) lamps

Discharge tubes for purposes other than lighting are in V05.

X26-A01

Lamps

X26-A01A

Multi-discharge path, arc, electron-stream and external electrode lamps

Xenon lamp

X26-A01B [1987]

Electrode-less, microwave lamps

(X26-A01X)

Waveguides, antennae, EM coils, field generation, inductive coupling, travelling wave discharge, microwave discharge, capacitive discharge, sulphur lamp

X26-A01B1 [2008]

Plasma lamps

Includes electrode-less lamps using plasma discharge.

X26-A01C [1997]

Dielectric barrier discharge lamps

(X26-A01X)

X26-A01D [2002]

High pressure discharge lamps

Covers metal halide, sodium vapour, etc lamps.

HID, high intensity discharge

X26-A01E [2002]

Low pressure discharge lamps

Covers mercury, sodium, etc lamps operating at fractional pressures. Low pressure electrodeless and fluorescent lamps are in X26-A01B and X26-A01E1, respectively.

Deuterium arc lamp

X26-A01E1 [2002]

Fluorescent lamps

X26-A01X

Other discharge lamps

X26-A02

Construction

X26-A02A

Containers; Seals

Includes end caps.

X26-A02A1 [1987]

Seals; Leading-in conductors

Leads, cement, cermet seals

X26-A02A2 [1992]

Containers

Bulb, envelope, chamber, tube

X26-A02A2A [2002]

Inner envelope

X26-A02A2B [2002]

Outer envelope

X26-A02B

Electrodes, shields, screens

X26-A02C

Fillings

Metal halides, mercury, sodium, iodides

X26-A02D

Filters, phosphors

Fluorescent coatings, luminescent coatings

X26-A02E [2002]

Inductor or HF coil

(X26-A02X)

Includes coil and toroidal core for operating electrodeless lamp. Coil arrangements, e.g. for impedance matching, are also covered by the relevant V02-F and U25 codes.

X26-A02F [2005]

Integral light source and reflector

For reflectors as part of a light fixture, see X26-D01A.

X26-A02G [2005]

Integral operating circuit/envelope

Includes constructional details of the combination.
Electrical details of the operating circuits are covered by X26-C01 codes.

X26-A02X

Other discharge lamp constructional details

Includes pressure maintenance, gettering, tube-shatter prevention, cooling, etc.

Amalgams

X26-A03

Manufacture

Also includes testing, phosphor recovery, packaging, etc.

X26-A03A [1992]

Welding end caps

X26-A03B [1992]

Container

Includes coating of films.

X26-A03C [1992]

Electrodes

X26-B

Incandescent lamps

X26-B01

Lamps

Includes photo-flash bulbs (see also S06-B03B).

Photoflash arrays, primers

X26-B01A [2005]

Halogen lamps

Tungsten lamp

X26-B01B [2005]

Heating lamp

See X25-B/X27-C codes, respectively, for industrial/cooking/heating applications.

X26-B02

Constructional details

X26-B02A

Envelopes, seals, filament mountings, connections

X26-B02A1 [1987]

Envelopes, seals

Includes end caps, filters e.g. coated onto the inside of the envelope.

Bulbs

X26-B02A2 [1987]

Filament mountings, connections

Also includes lead wires, lead-in conductors.

X26-B02A3 [2005]

Filaments

(X26-B02X)

X26-B02B [2005]

Integral light source and reflector

For reflectors as part of a light fixture, see X26-D01A.

X26-B02X

Other incandescent lamp constructional details

Includes fillings, getters, etc.

X26-B03

Manufacture

Also includes testing, packaging etc.

X26-B03A [1992]

Incandescent bodies

X26-B03B [1992]

Vessels

X26-C

Lamp operation and control

Vehicle lamp circuitry and control are coded in X22-B01F **only**. LED circuitry and control are coded in X26-H03 **only**.

X26-C01

Discharge (including arc) lamps

For unspecified lamp-type controllers, see X26-C03 codes.

X26-C01A

Operating and controlling flashlamps

For camera flash see S06-B03A also.

Strobes

X26-C01B

Lamp operating circuits; Starters

X26-C01B1	[1992]
Inductive ballast; Inductive components; Starter switches	
Includes normally non-electronic starting aids.	
X26-C01B1A	[2005]
Inductive ballast	
Includes inductive starting circuit.	
X26-C01B1C	[2005]
Inductive components	
Includes novel inductors/transformers specifically for use in (non)electronic ballasts. See V02-G codes for further details for reactors and transformers.	
X26-C01B2	[1992]
Electronic ballast	
<i>Ignition circuit</i>	
X26-C01B2A	[1992]
Inverters	
See also U24-D05 codes for further details.	
X26-C01B3	[1992]
For electrodeless lamps	
This lamp-type code is used with the above 'ballast' codes, as appropriate.	
X26-C01B4	[2002]
For high pressure discharge lamps	
This lamp-type code is used with the above 'ballast' codes, as appropriate.	
X26-C01B5	[2002]
For low pressure discharge lamps	
This lamp-type code is used with the above 'ballast' codes, as appropriate.	
X26-C01B5A	[2005]
Fluorescent lamp	
<i>CCFL, cold cathode fluorescent lamp</i>	
X26-C01C	
Controlling lamp intensity	
<i>Dimming</i>	
X26-C01D	[2005]
Current/power/voltage control	
For general low power control circuits for voltage and current. See also U24-D/E codes.	
<i>On-Off</i>	

X26-C01E	[2005]
Remote control	
See also W05-D codes for remote controllers.	
X26-C01X	
Other discharge lamp operation/control	
X26-C02	
Incandescent lamps	
For unspecified lamp-type controllers, see X26-C03 codes.	
X26-C02A	[2005]
Halogen lamps	
X26-C02B	[2005]
Heating lamp	
See X25-B/X27-C codes, respectively, for industrial/cooking/heating applications.	
X26-C02C	[2005]
Dimmer	
See also W05-D codes for remote controllers.	
X26-C03	
Lamps (general)	
See also V04-Q30U and other V04-Q codes for details of printed circuits.	
<i>Transformers, wiring, PCB</i>	
X26-C03A	
Regulating voltage or current; Controlling intensity	
X26-C03A1	[1992]
Regulating voltage or current	
X26-C03A5	[1992]
Controlling intensity	
<i>Dimming</i>	
X26-C03C	[1992]
Remote-controlled switching	
(X26-C03X)	
Includes all aspects of remotely controlling the light, including remotely adjusting the brightness (also coded in X26-C03A5) and remotely switching the light on/off (also coded in X26-C03E). See also W05-D codes. Also includes real-time monitoring of street lamps.	
X26-C03E	[1992]
On-off switching	
(X26-C03X)	
Includes use of person presence/absence detection.	

X26-C03X

Other general lamp circuit arrangements

Includes circuitry to detect lamp failure.

X26-D [1983]

Fixtures

Arrangement details for supporting, suspending or attaching the light/lamp to e.g. a wall, ceiling, floor, etc, not involving details of light distribution are coded by X26-R. For vehicle lighting, see also X22-B codes.

X26-D01 [1992]

Reflectors, refractors, diffusers, filters, screens

Generally, includes items considered to be part of the light fitting structure. So, excludes optical systems that are at some distance from the light source.

X26-D01A [2002]

Reflectors

X26-D01B [2002]

Refractors

Lens

X26-D01C [2002]

Filters

X26-D01D [2002]

Screens

Gobo, "Goes-Before-Optics"

X26-D01E [2002]

Diffusers

A diffuser in the form of a cover for a light fitting is also coded in X26-D03.

X26-D01E1 [2002]

For displays

Includes diffusers for back- and edge-lighting arrangements for displays (see also X26-U04A1 and X26-U04A2 respectively). See also W05-E05B codes (only for records prior to 2007) and U14-K01A codes, respectively, for general display and LCD back-lighting.

X26-D01F [2002]

Light guides

Includes light guides such as a plate, glass block, optical fibre, etc. used locally within a light fitting. For guiding of light over some distance, see X26-G. Where the light guiding aspect relates to the backlighting of an LCD, see also U14-K01A and W05-E05B (only for records prior to 2007) codes.

X26-D01G [2002]

Polarisers

X26-D02 [1992]

Cooling

For cooling arrangements associated with the lamp itself, see X26-A02X and X26-B02X.

X26-D03 [2002]

Housing or case for light fitting

Includes protective fittings such as a cage, etc. Also includes cover glasses, globes and bowls as part of the housing for the light fitting. This code is used in conjunction with other codes as appropriate, e.g. X26-D01E for a globe with diffusing property.

X26-E [1983]

Portable lights

(X26-X)

Includes lights which can be carried around personally or moved around.

X26-E01 [1987]

Portable battery-powered lights

X26-E01A [2005]

Torches

Flashlights

X26-E01A1 [2005]

LED-based

X26-E01B [2005]

Lanterns

X26-E01C [2005]

Penlights

X26-E01D [2005]

Key ring lights

X26-E01E [2005]

Portable lights using renewable/green energy resources, e.g. solar lights

From 2006, this code has been expanded to include all small solar powered lights, such as garden/path lights, etc. From 2020, this code has been expanded further to include all portable lights using renewable/green energy resources, including wind powered lights or combinations of different green energy resources. Details of the solar cells are covered by X15-A codes and details of wind power are covered by X15-B codes. Non-portable lights using renewable/green energy resources are coded under X26-S.

X26-E01F [2005]

Wearable

Includes portable lights mounted on clothing, shoes, jewellery, etc.

Watch, helmet mine lamp

X26-E02 [1987]

Portable mains-powered lights

X26-E02A [2005]

Table lamps

X26-E02B [2005]

Floor lamps

X26-E02C [2005]

Emergency

Includes portable and fixed emergency lights, e.g. exit lights with batteries previously charged by the mains, and emergency lights in e.g. an operating theatre when the main power is off.

X26-E02D [2005]

Night lights

Includes light/mains plug combinations used in, say, children's rooms.

X26-F [1987]

Lamp holders

(X26-A02X, X26-B02X)

See also V04-K01.

Bayonet, screw holder

X26-G [1987]

Illumination using optical guiding structures

(X26-X)

Includes, in general, the use of guides such as optical fibers, rods, etc in leading light from a source to a distant location. For light guiding structures within a light fitting or for 'local' use, see X26-D01F. For optical fiber-based illumination, see also V07-N03. Guiding of solar/sun light is not included unless a space is illuminated with a combination of natural and electric lights with, for example, the latter controlled to supplement or supplant natural light depending on ambient conditions.

X26-H [1992]

Light emitting diodes (LEDs)

(X26-X)

Includes all LEDs only when used for illumination. OLEDs or organic LED-based lighting is covered by X26-J **only**.

X26-H01 [2008]

LEDs; Details of P-N junctions and semiconductor structures

Includes semiconductor P-N junction type LEDs, per se, when used for illumination. See also U12-A01 codes for more details of the diodes.

X26-H02 [2009]

Constructional details of LED lights

Includes constructional details of LED lamps such as envelopes, lead wires, lead-in conductors, reflectors, etc. See also X26-D codes for cooling arrangements (X26-D02), reflectors (X26-D01A), housing (X26-D03), etc.

Leading-in conductor, seal

X26-H03 [2008]

LED circuits/control

X26-H03A [2011]

LED circuits

Includes circuits for driving/operating LEDs. See also U12-A01A5 codes.

X26-H03C [2011]

LED control

Includes voltage control, intensity control, remote switching, on/off control, etc. LED control is only coded here and does not need an X26-C03 code to be applied.

Dimming

X26-J [1992]

Electroluminescent devices (EL)

(X26-X)

Includes electroluminescent devices - such as OLEDs - and their circuits, when used for illumination. Does not include EL/OLED (organic LED) displays. See also U14-J codes for all electroluminescent light sources and displays. Manufacture of electroluminescent light sources are not covered by X26 codes, but by U14-J codes only. LED-based lighting is covered by X26-H **only**.

X26-K [1992]

Stage Lighting

(X26-X)

Gobo, "Goes-Before-Optics"

X26-L	[2002]
Beam aiming arrangement	
(X26-X)	
Includes motorised movement of, for example, a reflector to vary beam direction. See X22-B01E also for vehicle applications. Also includes movement of the light, per se, as in stage lights, etc.	
<i>Searchlight positioning</i>	
X26-M	[2002]
Decorative or special-effects lighting	
(X26-X)	
Includes lighting for Christmas decorations, decorative light strings, etc. See also W04-X03C for novelties and ornamental lights, and X26-X for light strings.	
X26-N	[2002]
Laser	
(X26-X)	
Includes arrangement of lasers for illumination. See V08 codes for claimed details of lasers.	
X26-P	[2002]
Shades	
(X26-X)	
X26-Q	[2008]
Lamps with non-visible output	
Includes lamps that primarily produce illumination outside of the visible spectrum.	
X26-Q01	[2008]
IR lamps	
Includes all lamps that produce IR illumination, e.g. IR LEDS (see also X26-H codes) used for night vision/surveillance system illumination. Can be used in conjunction with other X26 codes as appropriate, such as X26-U03 for infrared lamps used for heating/curing. See also X25-B01H for infrared heating lamps, and X27-C02A for domestic cooking hobs using infrared lamps.	
<i>Infrared</i>	
X26-Q03	[2008]
UV lamps	
Includes all lamps that produce UV illumination, e.g. fluorescent back-lights (see also X26-A codes) and sun tan lamps (see also X26-U01).	
<i>Ultraviolet</i>	

X26-R	[2010]
Supporting/suspending arrangements for light fitting	
(X26-X)	
Includes arrangement details for supporting, suspending or attaching the light/lamp to e.g. a wall, ceiling, floor, inside a refrigerator, in a vehicle, etc. Includes wall, ceiling or floor attachments, lamp posts, clips, clamps, suction or magnetic attachments, details of pendants, hand grips, etc. Details of light distribution, e.g. reflectors, refractors, filters, polarisers, etc, are covered by X26-D codes.	
X26-S	[2017]
Lights using renewable/green energy resources, e.g. solar lights	
Covers all kinds of non-portable lights powered by renewable/green energy, such as solar or wind powered lights, or combinations of different green energy resources. Portable lights using renewable/green energy resources are coded under X26-E01E. Details of solar panels are coded under X15-A, and details of wind power under X15-B.	
X26-U	[2005]
Lighting applications	
To be used with other relevant X26 codes. See also appropriate classes e.g. S05 for medical applications.	
X26-U01	[2005]
Cosmetic	
Includes lights for sun tanning, and (flashing) lights for toothbrushes, vanity/compact mirrors, etc. See also X27 codes.	
X26-U02	[2005]
Medical	
Includes lights used during treatment of acne, jaundice, psoriasis, etc., during photo-chemistry, colour and light therapies, in surgical instruments (e.g. endoscope), etc.	
X26-U03	[2005]
Heating/curing, disinfection/sterilisation	
Includes e.g. IR heat lamps or UV lamps used for curing adhesives or inks. Not used when X26-B01B/C02B are applied. See also X25-B01H for infrared heating lamps. Also includes disinfection and/or sterilisation using UV or IR light sources see also X27-D10.	
X26-U04	[2005]
Displays/signs	
For back- and edge-lighting.	

X26-U04A [2007]

Displays

Includes light sources and fittings for lighting of displays. For LCDs see also U14-K01A codes, and T04-H03D if LCD is also for computer monitors.

X26-U04A1 [2007]

Back-lighting

See also U14-K01A4C for LCD back-lighting. For records prior to 2007, see also W05-E05B1.

X26-U04A2 [2007]

Edge-lighting

For records prior to 2007, see also W05-E05B3.

X26-U04B [2007]

Signs

Includes the lighting of any translucent or transparent information source, such as advertisements (see also W05-E03A1), traffic-related signs (see also T07-B codes and X26-U06 for street signs) etc.

X26-U05 [2005]

General lighting system

Includes general lighting systems on building sites.
GLS

X26-U05A [2005]

General commercial lighting

Includes general lighting arrangements used specifically in commercial/business applications such as office lighting.

X26-U05B [2009]

General domestic lighting

Includes general lighting arrangements used in domestic settings, e.g. ceiling pendant lights, wall lights, bathroom mirror lights. Also includes lighting arrangements in domestic appliances (e.g. refrigerator, oven, hood, furniture, etc.), and garden lighting. Lights for toothbrushes are coded under X26-U01 only. Domestic applications are also coded under X27 codes.

X26-U06 [2005]

Street

Includes street lighting (e.g. lamppost), illuminated traffic bollards (also see T07-X), and lighted signs, such as road signs (also see T07-B codes). Illuminated road signs are also coded under X26-U04B and T07-B codes. Also includes lighting details of traffic lights (see T07-B05A for traffic signalling per se). Includes tunnel and bridge lighting details.

Lamppost, bollard, road markings

X26-U07 [2005]

Vehicles

Includes lighting for motor vehicle, electric vehicle and train.

X26-U08 [2005]

Marine vessels

Includes beacon lights and ship navigation lights. See also W06-C01C (lighting equipment for marine vessels) and W06-C07C (buoys and beacons).

X26-U09 [2005]

Aircraft/space craft

X26-U10 [2006]

Projectors

Includes display projectors and cine projectors. See also W04-Q01 and S06-B, codes respectively.

X26-U11 [2006]

Cameras

X26-U11A [2006]

Digital cameras

See also W04-M01 codes.

X26-U11B [2006]

Film-based cameras

See also S06-B codes.

X26-U12 [2016]

Plant growth

Includes LEDs or any other lighting arrangements for plant growing purpose.

Greenhouse

X26-U99 [2006]

Other lighting applications

Includes light arrangement in reptile houses, aquaria, vivaria, umbrellas, vases, sewing machines, screwdrivers, keys, handbags, clothes, rucksacks, walking stick lights, etc. Cosmetic items, e.g. toothbrushes, are coded under X26-U01 only. See also X27 codes for domestic/personal items. Also includes teaching equipment using training and simulation aids i.e. for illustrating light refraction etc.

X26-V [2020]

Maintenance, repair and cleaning of lamps

This code is used in conjunction with other X26 codes as appropriate.

X26-X

Other light sources and details

Covers lighting details not involving light emission (X26-A, etc), light distribution (X26-D) or light/lamp attachments. Includes light strings/garland etc. Light strings for Christmas lights or other decorative or novelty lights are also coded in X26-M. From 2010 see X26-R **only** for supporting/suspending arrangements for light fitting. Also includes water-tight and gas-tight arrangements.

Insect repellent

X27: Domestic Electrical Appliances

Also includes industrial cooking, space heating, refrigeration and combustion, with significant electrical content. Non-electrical domestic appliances with some electrical aspects are also covered here.

X27-A

Garden and personal articles

X27-A01 [1983]

Garden equipment

Includes electrical aspects only e.g. power distribution, motor, switch, etc. Includes potted plants.

X27-A01A [1987]

Lawn mower, hedge clipper

Includes hedge trimmers, Trimmers®, tree and shrub clippers and also robotic type lawn mowers (T06-B01A may also be required for 2-D position control).

Electric motor, switch, cable, IC engine, protective cut-out

X27-A01B [2006]

Garden furniture

Includes garden furniture such as patio heaters, patio umbrellas etc. incorporating some electrical content, such as built-in lights (see also X26 codes).

X27-A02 [1983]

Personal articles

Includes e.g. calorie counter, wristwatches are not included - see S04, bathroom scales, hair thickening device, umbrella, beauty treatment, powder compact, pill timing/warning device, also W05-A and S05-X, key finder (see W05-A also depending on transmission details). From 201501, non-electrical details of umbrellas are coded under P24-A02.

Facial steamer

X27-A02A [1983]

Personal hygiene

Includes articles for washing - e.g. foot washers, bidets, contact lens steriliser, incontinence detector, weighing scales, roller towel.

X27-A02A1 [1987]

Driers, hair curlers

Includes drier for hair, hands, feet, nail polish and body. Also includes hair extension apparatus and hair straighteners etc. From 201501, non-electrical details of hair curlers, etc, are coded under P24-C01.

Heating element, hair brush, smoothing tongs

X27-A02A2 [1987]

Massaging devices, sunbeds

Includes light sources. See also S05-A and X26-A.

Solarium, ultraviolet, lamp, tan, UV, sunbed

X27-A02A3 [1987]

Electric toothbrushes; Electric razors

X27-A02A3A [1992]

Electric toothbrushes

Includes electric toothbrushes and toothpaste dispensers. From 201501, non-electrical details of manual toothbrushes are coded under P24-E.

Motor, switch, head, brush, battery

X27-A02A3B [1992]

Electric razors; Hair clippers; Depilatory tool

(X27-A02A)

Includes all aspects e.g. blades, foil, handle. Also includes electric hair clipper. From 201501, non-electrical details of shaving equipment are coded under P24-C02.

Head, motor, switch, brush, battery, wet, dry

X27-A02A4 [1997]

Bath; Shower; Washbasin

(X27-X)

Includes electrical aspects such as electric mixer tap or presence detector. For electric water heating aspects of e.g. showers or baths, see X27-E03A1 only.

Sink, tap, detector, EM valve

X27-A02B [1983]

Clothing, jewellery

Includes electrical aspects only, flashing badges, shirts, buttons etc. See also W05-A as appropriate.

X27-A02B1 [1987]

Clothing

Includes electrical aspects only. X27-A02B1 codes can be used alone or in conjunction with one another depending on claimed aspects.

Backpack, rucksack

X27-A02B1A [2002]

Garments

Includes electrical aspects of e.g. shirts, buttons, protective helmets, heated gloves, life jackets. Non-electrical details of garments are coded by P21 codes.

X27-A02B1B [2002]

Footwear and its manufacture

Includes safety boots and shoes (see X25-X07 for electrical aspects of leather cutting). Non-electrical details of footwear are coded by P22 codes.

X27-A02B1E [2005]

With integral electrical parts

Includes clothing in which e.g. lighting, sensors, wiring, heating elements (see-X25-B01 codes), actuators and other electrical parts are integrated into fabric. E.g. includes electrical elements such as resistive heating elements woven into fabric, flexible electrical coatings applied to fabric or fibers, or e.g. LEDs moulded into plastic sole of shoe. Also see X25-T codes for fabric manufacture per se.

X27-A02B1F [2005]

With attachable electrical parts

Includes electrical parts that are attachable to clothing. E.g. includes LED fixed to cap by clip, or LED incorporated in button that is sewn onto e.g. shirt fabric.

X27-A02B2 [1987]

Jewellery

In general includes jewellery with electrical devices e.g. flashing LEDs to create eye-catching effect.

Brooch, clip, jewel

X27-A02C [1987]

Stationery and business equipment

Includes electrical aspects only of pens, briefcases, diaries, files incorporating computer, note pads, etc. For notepad computers and PDAs see T01 only, and for electronic blackboards and other conference equipment see W04-W05 only.

Bag, magnetic clasp or button, suitcases

X27-A02D

Spectacles, goggles

Includes electrical aspects only, e.g. liquid crystal light valve for welding goggles, see X24 also. For the manufacture of glasses see also X25-A03C2 and X25-A05 for glass lenses or X25-A06 for soft, plastic lenses.

X27-A02E [2007]

Walking sticks

Includes sticks with integral electrical components. Also see S05-K01 for walking sticks used by physically challenged person. From 201501, non-electrical details of walking sticks are coded under P24-A01.

X27-A02F [2014]

Electronic cigarettes

Includes details of atomizer, cartridge, disposable cartomizer. Packaging details are coded under Q34-M02. Electrical details of tobacco cigarettes (including their manufacture) are coded under X25-P03.

E-cigarette, personal vaporizer, PV, electronic nicotine delivery system, ENDS

X27-A03 [1997]

Furniture

(X27-A)

Electrical aspects **only** of mattresses, beds, chairs, tables, seats, sofas, pillows (including travel pillows), cushions etc. Heaters for seats, beds, pillows, etc. are coded under X27-E02. See also X25-B codes for novel electrical heating elements per se. See also X26 codes for novel lighting elements.

Mattress, chair, table, cupboard

X27-B

Kitchen appliances

Includes all aspects of electrical kitchen appliances. Tableware, glassware and cutlery (with no electrical content) are coded under P27-B03.

Other non-electrical kitchen equipment, such as spice racks, egg slicers, coffee grinder, vacuum flasks, etc. are coded under P28-A.

X27-B01 [1983]

Tea/coffee machines, kettles

Includes water reservoir, flow heater, jug, jug funnel etc. Excludes paper filters and funnels for cups. Large size coffee/tea machine, see X25-P01 also.

Percolator, cappuccino machine, espresso maker

X27-B02 [1987]

Pop-up toasters

X27-B03 [1987]

Food processors/mixers

Includes juice extractor, food processor tools, ice-cream manufacture, blenders, fruits and vegetables peeling machines. See X27-C08 instead for bread makers. Small handheld fruit and vegetable peelers are coded under X27-B04.

Motor, beater, grinder, chopper, blade, churner

X27-B04 [1987]

Knives, tin openers etc.

Includes bottle openers, and handheld fruit and vegetable peelers.

Can opener

X27-B05 [1997]

Extractor hoods

(X27-B)

For extractors for use in toilets, see X27-L. For ventilators per-se see X27-E01B1.

X27-B09 [2007]

Other kitchen appliances

Includes electrical details of food warmer for serving trolley, soda mixer, beverage dispenser for e.g. carbonated drinks, kitchen tap, milk frother (see X27-B01 instead if part of cappuccino machine), buffet food container with automatic lid etc. Also includes cutlery or drinking vessels (cups, glasses, etc.) with electrical content, such as integrated lights, temperature displays, etc. Also includes baby bottle sterilisers and baby food warmers. Food warmers, bottle sterilisers, and cutlery specially made for children/babies are also coded under X27-X01.

X27-C

Cooking appliances

Includes all aspects of apparatus using electrical heating, and electrical aspects only of gas cooker. Excludes discardable hob covers e.g. metal foil.

X27-C01 [1983]

Microwave ovens

See also X25-B02B for microwave heating in general. Covers all aspects, including heater for browning, switches, fans, lamps, etc. Microwave-transparent cooking-ware is included only if the patent bears an 'H' IPC.

X27-C01A [1987]

Constructional details

Includes chamber/cavity, door, seal, interlocks etc.

X27-C01B [1987]

Magnetron, control, waveguide, turntable

X27-C01B1 [1992]

Magnetron, waveguide, turntable

Antenna

X27-C01B3 [1992]

Control and power supplies of microwave oven

Timer, programmer

X27-C02 [1983]

Electric ovens, hobs

Ceramic, plate, glass, hotplate

X27-C02A [1987]

Using lamps

Lamps are also in X26-B.

Filament, halogen, incandescent, infrared, tungsten

X27-C02C [2002]

Fan assisted electric ovens

X27-C03 [1987]

Electric grills and electric fryers

(X27-C09)

X27-C03A [1992]

Electric deep-fat fryers

Rotofryer, twin fryer

X27-C03B [1992]

Electric grills; Oven toasters; Electric roasters

X27-C03C [1992]

Electric griddles

Includes sandwich maker, steak griddle etc.

X27-C03D [2009]

Electric frying pans; Electric woks

Includes standalone electric frying pans and electric woks. Electric deep-fat fryers are coded under X27-C03A only.

X27-C04 [1987]

Electric steamers; Electric pressure and rice cookers

(X27-C09)

Includes cooking by steam using self-contained vessel with heater.

Rice cooker, egg steamer, pressure cooker

X27-C05 [1987]

Gas cookers

(X27-C09)

Includes electric aspects only. Gas igniters are in X27-G01 only, unless forming part of cooker construction, e.g. pilot lighter.

Hob, burner, valve

X27-C06 [1987]

Induction cookers

(X27-C09)

See also X25-B02A for general aspects of induction heating.

X27-C07 [1992]

Combination ovens

Includes joint cooking apparatus such as resistance, microwave, convection. See appropriate X25, X27 codes for claimed heating.

X27-C08 [2006]

Breadmakers

For specific electric heating details also see appropriate X25-B codes.

X27-C09	[1983]
Other cooking appliances	
Includes electrical devices inserted into food to measure temperature, cooking time estimation. Also includes slow cookers, and other cooking vessels with electrical content not covered by other X27-C codes. Non-electrical cookware and ovenware are coded under P28-A02 only.	
<hr/>	
X27-D	
Cleaning and disinfecting appliances	
Includes all aspects of domestic cleaning. Commercial and industrial laundry washing and drying machines are coded under X25-T05 only. General cleaning is also in X25-H09.	
X27-D01	[1983]
Washing machines	
Includes all aspects, e.g. feet, doors, water inlet/outlets pipes etc. Excludes kitchen 'furniture' aspects such as worktop under which machine is kept.	
<i>Control, programme timer switch, cam, pump, detergent dispenser, motor, laundry machine, drum, packaging for machine</i>	
X27-D01A	[1983]
Clothes washers	
Also see X27-D07 codes for mixed mode cleaning, e.g. using ultraviolet radiation to kill bacteria. Also includes details of washing machines specifically made for washing shoes.	
X27-D01A1	[2007]
Machine types	
X27-D01A1A	[2007]
Vertical axis washers	
Includes vertical axis top loader machines.	
X27-D01A1B	[2007]
Front loading horizontal axis washers	
Includes drum type washer.	
X27-D01A1C	[2007]
Top loading horizontal axis washers	
X27-D01A1D	[2007]
Tilt axis washers	
Includes fixed and variable tilt axis washers.	
X27-D01A1X	[2007]
Other machine types	
Includes twin tub machines.	

X27-D01A3	[2007]
Component parts/constructional details	
X27-D01A3A	[2007]
Providing mechanical energy to clothes	
Includes drums, lifters, agitators, pulsators.	
X27-D01A3B	[2007]
Drive arrangements	
Includes drive motors, drive belts and transmissions. See also V06-M codes for novel motors/transmissions per se.	
<i>Contra rotation</i>	
X27-D01A3C	[2007]
Casings	
Includes machine housings, doors, seals, feet, wheels, insulation etc.	
X27-D01A3D	[2007]
Dispensing systems	
Includes soap powder and fabric conditioner dispenser trays and from 2007 ball type dispensers placed in the washing machine drum.	
X27-D01A3E	[2007]
Liquid management systems	
Includes water supply/discharge pipes, valves, pumps, pump seals, water heaters, water recirculation and spray systems.	
X27-D01A3F	[2007]
Vibration damping systems	
Includes active suspensions and counter weights for reducing machine noise and vibration.	
X27-D01A3X	[2007]
Other component parts	
Includes packaging such as boxes and transit bolts.	
X27-D01A5	[2007]
Control systems of clothes washers	
Includes all electrical control aspects such as programme timer switches. Also see T06-A05C for use of control algorithms to optimise wash cycle according to sensed parameters. For control of mechanical variables such as liquid flow or level, also see T06-B codes.	
X27-D01B	[1983]
Dishwashers	
Also see X27-D07 codes for mixed mode cleaning, e.g. using ultrasonic vibration to enhance cleaning action.	

X27-D01B1	[2007]
Machine types	
X27-D01B1A	[2007]
Built-in or wheeled	
Includes front loading traditional type full size or slimline dishwashers.	
<i>Free-standing</i>	
X27-D01B1B	[2007]
Drawer type	
Includes twin drawer dishwashers.	
X27-D01B1X	[2007]
Other configurations	
Includes top loading or portable, small size 'counter top' dishwashers.	
X27-D01B3	[2007]
Component parts/constructional details	
X27-D01B3A	[2007]
Racks	
X27-D01B3B	[2007]
Drive arrangements	
Includes pump drive motors, belts, transmissions etc.	
X27-D01B3C	[2007]
Casings	
Includes machine housings, doors, seals, tubs, feet, wheels, insulation etc.	
X27-D01B3D	[2007]
Dispensing systems	
Includes salt and cleaning powder/tablet dispensers.	
X27-D01B3E	[2007]
Liquid management systems	
Includes water supply/discharge/recirculation, valves, water heaters, pumps, pump seals and spray arms.	
X27-D01B3F	[2007]
Drying systems	
Includes heater elements (see also X25-B01 for electrical resistance heating per se), heat exchangers, air flow arrangements, vents, condensing arrangements etc.	
X27-D01B3G	[2007]
Soil collection and management	
Includes filters, screens, sizers and choppers.	

X27-D01B3X	[2007]
Other component parts	
X27-D01B5	[2007]
Control systems of dishwashers	
Includes all electrical control aspects. Also see T06-A05C for use of control algorithms to optimise cleaning cycle according to sensed parameters. For control of mechanical variables such as liquid flow, also see T06-B codes.	
X27-D01C	[1987]
Combined washer/driers	
This code can be used in conjunction with X27-D01A or X27-D02 codes as appropriate to highlight the novel aspects.	
X27-D02	[1983]
Laundry driers	
Includes clothes and shoe driers.	
<i>Drum, spin, tumble, condenser</i>	
X27-D02A	[2007]
Machine types	
X27-D02A1	[2007]
Electric vented tumble driers	
X27-D02A2	[2007]
Gas vented tumble driers	
X27-D02A3	[2007]
Heat pump tumble driers	
X27-D02A4	[2007]
Condensing tumble driers	
X27-D02A5	[2007]
Microwave tumble driers	
X27-D02A6	[2007]
Non-tumble driers	
Includes cabinets, bags, drying rooms and drawers for drying flat or hanging clothes. See also X27-D07E for use of steam to assist in removing creases from hanging clothes during drying.	
X27-D02A9	[2007]
Other driers	
X27-D02B	[2007]
Component parts/constructional details	

X27-D02B1	[2007]
Providing mechanical energy to clothes	
Includes drums and lifters.	
<i>Tumble</i>	
X27-D02B2	[2007]
Drive arrangements	
Includes drive motors, drive belts, gears etc. See also V06-M codes for details of motors/transmissions per se.	
<i>Contra rotation</i>	
X27-D02B3	[2007]
Heating systems	
Includes electrical heaters (see also X25-B codes), combustion aspects (see also X27-G codes) and heat exchangers.	
X27-D02B4	[2007]
Air moving systems	
Includes blowers, ducts, vents, valves and air recirculation arrangements.	
X27-D02B5	[2007]
Casings	
Includes housings, doors, seals, feet, wheels, insulation etc.	
X27-D02B6	[2007]
Dispensing systems	
Includes deodoriser/conditioner (see also X27-D07M) dispensers.	
X27-D02B7	[2007]
Vibration damping systems	
Includes damping arrangements to reduce machine noise	
X27-D02B8	[2007]
Lint management systems	
Includes mechanical lint/fluff filters.	
X27-D02B9	[2007]
Other component parts	
X27-D02C	[2007]
Control systems of laundry driers	
Includes all electrical control aspects such as programme/temperature control switches. Also see T06-A05C for use of control algorithms to optimise drying performance according to sensed parameters such as load weight. For sensing of temperature or moisture content, see also S03-B and S03-E02C1 codes respectively.	

X27-D02L	[2007]
Clothes lines	
See X27-D06 prior to 2007. Includes motorized arrangements for raising and lowering line or for rotating rotary washing line. Details of purely mechanical clothes lines are coded under P28-C05.	
X27-D02X	[2007]
Other laundry driers	
For electrical aspects of mangles, see X27-D09 instead.	
X27-D03	[1983]
Irons	
For electrical aspects of ironing boards search X27-D09 also.	
<i>Steam, sole plate, heater</i>	
X27-D04	[1983]
Vacuum cleaners	
Includes constructional details of vacuum cleaner, e.g. casing. Details of replaceable items, e.g. nozzles, tools, are coded under X27-D04A only. Also see X27-D07 for mixed mode cleaning, e.g. using ultraviolet radiation to kill mites or bacteria. For combined vacuum cleaner and e.g. carpet washer, also see X27-D08.	
<i>Motor, suction, fan</i>	
X27-D04A	[1992]
Accessories	
Includes all aspects e.g. paper bag, wheels, attachments, tools, nozzles etc.	
<i>Hose, nozzle filter, brush, bag</i>	
X27-D04B	[1992]
Motors	
Includes vacuum cleaner motors per se. See also V06 codes for a more detailed breakdown of motors per se.	
X27-D04B1	[1992]
Control systems of vacuum cleaners	
X27-D04C	[2002]
Cyclone type	
Includes dual and multi-cyclone type vacuum cleaners.	
X27-D04R	[2006]
Robotic vacuum cleaners	
Includes autonomous vacuum cleaners. Also see X27-U for domestic assistance robots per se.	
<i>Automatic guidance</i>	

X27-D05 [2002]

Floor cleaners/washers/polishers

From 2006 this code has been expanded to include all floor sweeping, washing and polishing machines. Also includes robotic floor cleaning machines (T06-B01A may also be required for 2-D position control). For carpet cleaning see X27-D08 only.

Sweeper

X27-D06* [2002-2006]

Clothes lines

*This code is now discontinued and transferred to X27-D02L from 2007. It is still searchable and valid for records from 2002-2005. Includes motorised arrangements for raising and lowering line or for rotating rotary washing line.

X27-D07 [2005]

Mixed mode cleaning

Includes cleaning systems with secondary cleaning, disinfecting, deodorising or sterilising function. This code can be used in conjunction with other X27-D codes to specify the primary cleaning function.

X27-D07A [2005]

Using vibration

Includes use of ultrasonic vibrator to provide enhanced cleaning action.

X27-D07C [2005]

Using radiation

Includes use of ultraviolet or microwave radiation e.g. to kill germs.

UV, microwave

X27-D07E [2007]

Using steam/vapour

decreasing function. Includes steam generation arrangements and vapour generation from a liquid/solid. Includes use of steam in refresh cycles to deodorise and remove creases from unwashed clothes.

Anti-wrinkle, de-crease, non-iron, refresher

X27-D07F [2007]

Bubble systems

Includes water aeration arrangements and air bubble generators for improving cleaning.

X27-D07K [2007]

Using chemicals

Includes anti-microbial generators, chemical coatings for machine components and spray systems to deliver disinfectant to the clothes.

X27-D07K1 [2007]

Chemical coatings

Includes drums (see also X27-D01A3A for washing machines) coated with anti-microbial substance e.g. nano-silver (see also D09-A01 and E35-B chemistry codes).

X27-D07K3 [2007]

Chemistry generation

Includes silver/copper/zinc/ozone/ions generated inside the machine using e.g. electrolysis systems (see also X25-R codes), photocatalysts etc.

Anti-microbial, ionisation, ozoniser

X27-D07K5 [2007]

Dispensing systems

Includes systems for dispensing/spraying e.g. anti-microbial/sterilising chemicals to the clothes.

X27-D07M [2007]

Fabric enhancement

Includes electrical aspects of systems for treating clothes with stain resistance or water and insect repellency chemicals. See also X27-D01A3D and X27-D02B6 for fabric conditioner dispensers used in clothes washer and drier respectively.

X27-D07X [2005]

Using other medium

Includes use of other systems to provide a secondary cleaning/deodorising action.

X27-D08 [1992]

Carpet cleaners/ shampoo machines

X27-D09

Other cleaning appliances

Includes mangles, trouser press and domestic scale dry cleaning (for commercial dry-cleaning, see X25-H09 and X25-T05 only). Also includes electrical aspects of ironing boards and clothes pegs. Details of ironing boards with no electrical details are coded under P28-C05.

X27-D10 [2006]

Disinfection and sterilization arrangements

Includes general disinfection and sterilization systems not covered elsewhere, e.g. using ultraviolet/microwave radiation or heat. For mixed mode cleaning/sterilizing see X27-D07 codes only. For air treatment arrangements see X27-E01B2 only. Industrial food processing sterilization is covered by X25-P01X only, and medical sterilization is covered by S05-G01 codes only.

X27-E

Heating, ventilating, air conditioning

Includes all aspects of electric heating and electrical aspects only of other types of heating e.g. gas or oil combustion. See also X27-G for details of domestic combustion. Details of electric heaters are also in X25-B.

X27-E01

Space heating and air conditioning systems

For heating combined with cooling i.e. air conditioning, e.g. by using refrigeration systems, see also X27-E01B.
Room, building

X27-E01A [1983]

Heating systems (incl. control)

Includes control circuits, thermostat, heating cost measurement and calculation, storage heater control system.

X27-E01A1 [1987]

Circulating water, warm air

Includes central heating systems pump or fan.

X27-E01A2 [1987]

Electric radiant bar and fan-heaters, oil filled electric heaters

X27-E01A3 [1987]

Electric underfloor, electrically-heated carpets

X27-E01A4 [1987]

Electric storage heaters

See also X16-L.

X27-E01A5 [1987]

Solar heating

Includes electrical aspects only e.g. combination solar and electric heating.

Collector

X27-E01B [1983]

Air-conditioning

Includes only electrical aspects of air conditioners (e.g. mechanical heat exchangers are excluded), control systems, refrigeration systems (see also X27-F). Vehicle air-conditioning is only in X22-J02E.

X27-E01B1 [1987]

Electric fans, ventilators

Motor, ceiling, blade, table, portable

X27-E01B2 [1987]

Ozoniser, air cleaner and freshener, (de)humidifier

Details of air cleaning for computer rooms or laboratories are also coded in T04-L08, and clean rooms are also coded in X25-S01.

Electrostatic, filter, purification, atomiser, ion generation

X27-E01C [2010]

Climate control

Includes systems that automatically maintain room temperature by e.g. automatic window opening (see X25-M01 for novel electric windows per se), usage of waste heat etc.

X27-E02 [1987]

Electric blankets, heating pads

(X27-E09)

See also X27-A if part of bed construction. If pad is portable, see also X27-A02.

X27-E03 [1987]

Water heaters

Includes electric details of gas and solar water heaters.

Temperature-control

X27-E03A [1987]

Electric

Includes through-flow heater, water bed heater.

X27-E03A1 [1987]

Shower, whirlpool bath, sauna

Includes Jacuzzi® and Turkish bath, which is also coded in X27-A02A.

X27-E09

Other heating, ventilating, air conditioning aspects

Includes foot warmer.

X27-F

Refrigeration

Includes all domestic and industrial systems, e.g. cold rooms and components, display cabinets, water coolers, heat pump systems (for air-conditioning, see X27-E01B also), refrigerated containers for lorry (see also X22-X04). Cryogenics is in X25-V. Also includes refrigerant per se. From 2006 ice manufacture is transferred to X27-F04, though ice manufacture remains searchable in X27-F prior to 2006.

X27-F01 [1983]

Constructional details

Includes door, seal, feet, cabinets, ice tray.

X27-F02 [1983]
Refrigeration/heat pump systems/components
Includes air circulation e.g. by fan.

X27-F02A [1987]
Refrigeration systems
Includes details of overall refrigeration system.

X27-F02A1 [2005]
Magnetic cooling
Includes magnetic fridge and freezers that utilise magnetocaloric effect of some metals that become hot when magnetised and cool when demagnetised.
Magnetic, magnetocaloric

X27-F02B [1987]
Heat pump systems
Also includes heat recovery using refrigerant.

X27-F02B1 [2005]
Solid state heat pumps
Includes thermoelectric cooling, e.g. for mini fridge and freezers and picnic coolers. See V04-T03C instead for thermoelectric cooling used in electronic devices, and U14-E05A2 for thermoelectric devices. Also includes electrocaloric effect cooling using e.g. thin film perovskite PZT (PbZrTiO₃) to provide cooling under an applied electric field. See X25-B02F for thermoelectric heating.
Thermoelectric, Peltier effect

X27-F02C [1987]
Components
Includes heat exchangers, expansion valve absorbers, adsorbers, condenser, evaporator, etc.

X27-F02C1 [1987]
Compressors, electric motors, pumps
Screw, rotating vane, scroll, centrifugal, rotary, swashplate, reciprocating

X27-F02C2 [1987]
Frost/temp. sensors, interior lights, switches
See also S03-B codes for temperature sensors, X26 codes for lighting and V03 codes for switches per se.
Thermostat

X27-F02X [2007]
Other refrigeration components

X27-F03 [1983]
Refrigeration control
Includes defrost activation, ice monitoring, leak detection.

X27-F04 [2006]
Ice manufacture
Includes domestic and industrial ice manufacture. For ice cube trays per se, see X27-F01 only. Also includes working / handling of ice and production of ice or snow for winter sports etc. See also P36-A08C for ice rinks.

X27-F05 [2007]
Intelligent refrigerators
Includes reader-writer equipment to know the content of the fridge (see also T04-K codes), or screen display on fridge door displaying a list or an image of the fridge content. This code does not include details on refrigeration per se, see X27-F03 for refrigeration control details.

X27-G
Domestic combustion
Includes domestic boilers using solid, liquid or gaseous fuels and involving electrical aspects. Exhaust gas sensors per se are not included, see e.g. S03-E02, S03-E03. Combustion processes for central heating are also coded in X27-E03. See X25-X13 instead for industrial combustion aspects such as gas fired furnaces.

X27-G01 [1983]
Igniters
Includes cigarette lighters using piezoelectric crystal (also see X27-A02 and V06-M06D).
Ignition, light spark, fuel

X27-G02 [1983]
Combustion control; Flame monitors
Includes fuel/air supply control.

X27-H [1987]
Domestic pets
(X27-X)
Includes electrical aspects only.
Dog, cat, fish, budgerigar, tortoise, rabbit, guinea pig

X27-H01 [1987]
Aquarium, vivarium
Covers electrical aspects such as air conditioning, heating, lighting systems, etc. of aquaria and vivaria. Other environment-controlled housings, such as kennels, dog houses, aviaries etc, are coded under X27-H04.
Heater, pump, lighting, air

X27-H02 [2005]
Feeding and drinking
Includes heated food bowl and timed food dispenser.
Timer, dispenser

X27-H03 [2005]

Control and training

Includes electrical or electromagnetic shocking apparatus for the control/training of pets, e.g. dogs. Also includes ultrasonic deterrent devices for confining pets within a specific area. Includes pet searching systems, transponder collars for controlling pet access e.g. through cat flap, and RFID or identification tags. Transponders and RFID are also coded under T04-K codes and W06-A04B5 and W02-G05B codes as appropriate.

Control, train, shock, deterrent, behaviour, identification tag, pet searching system

X27-H04 [2009]

Environmental control; Housings

Includes electrical aspects, such as air conditioning, heating, lighting systems, etc. for kennels, aviaries, etc. Details for aquaria or vivaria are coded under X27-H01 instead. Electrical details of pet transporting bags/boxes or carriers are coded under X27-H09 only.

Dog house, kennel, aviary

X27-H09 [2007]

Other domestic pet aspects

Includes heated pet transporting bags/boxes.

X27-K [1997]

Domestic waste disposal

Includes only electrical aspects of domestic waste disposal, such as kitchen waste disposal units and electrical rubbish bins. Large non-domestic bins are coded under X25-W01 only.

X27-L [2005]

Toilets

Includes all electrical aspects of public and domestic toilets and urinals. Includes toilets with integral bidets (see also X27-A02A). Prior to 2005, toilets were coded in X25-Y01.

X27-T [1997]

Curtains, blinds

(X27-X)

Includes electrical aspects, e.g. remote curtain opening/closing device.

X27-U [2006]

Domestic assistance robots

Includes e.g. humanoid robots which carry out general housework, nursing (see also S05 codes) and other duties. For task-specific robots also see relevant codes elsewhere, e.g. X27-D codes for cleaning robots. For industrial scale robots see X25-A03E or X25-F05A only.

X27-V [2006]

Home automation

Includes systems for automatically controlling/programming multiple pieces of domestic equipment, e.g. using internet or telephone communication. For remote control of individual domestic devices, use the appropriate device code only (see also W05-D codes), and for individual robotic/automated equipment, such as a robotic vacuum cleaner, use the appropriate code (e.g. X27-D04R) only.

Total home control

X27-X

Other domestic electrical appliances

Includes ash tray, insecticide dispenser for house, wallpaper stripping iron, mail box, paper towel dispenser (also X25-F03), pill bottle warning alarm indicating lid removal (also W05-A02) etc. Can also be used for indicating general domestic appliance “white goods” application, including mechanical aspects of unspecified or general white goods.

Mosquito repeller, doorbell

X27-X01 [2002]

Baby equipment

Includes equipment for babies, toddlers and young children. Includes baby monitoring alarms, babies prams, nappy wetting alarm, baby chamber pot (see X25-L also), etc. Also includes cutlery and cups with electric contents, such as lights or temperature displays. Cutlery and cups with electric contents are also coded under X27-B09.

Baby food/bottle warmer, baby bottle sterilizer

X27-X02 [2002]

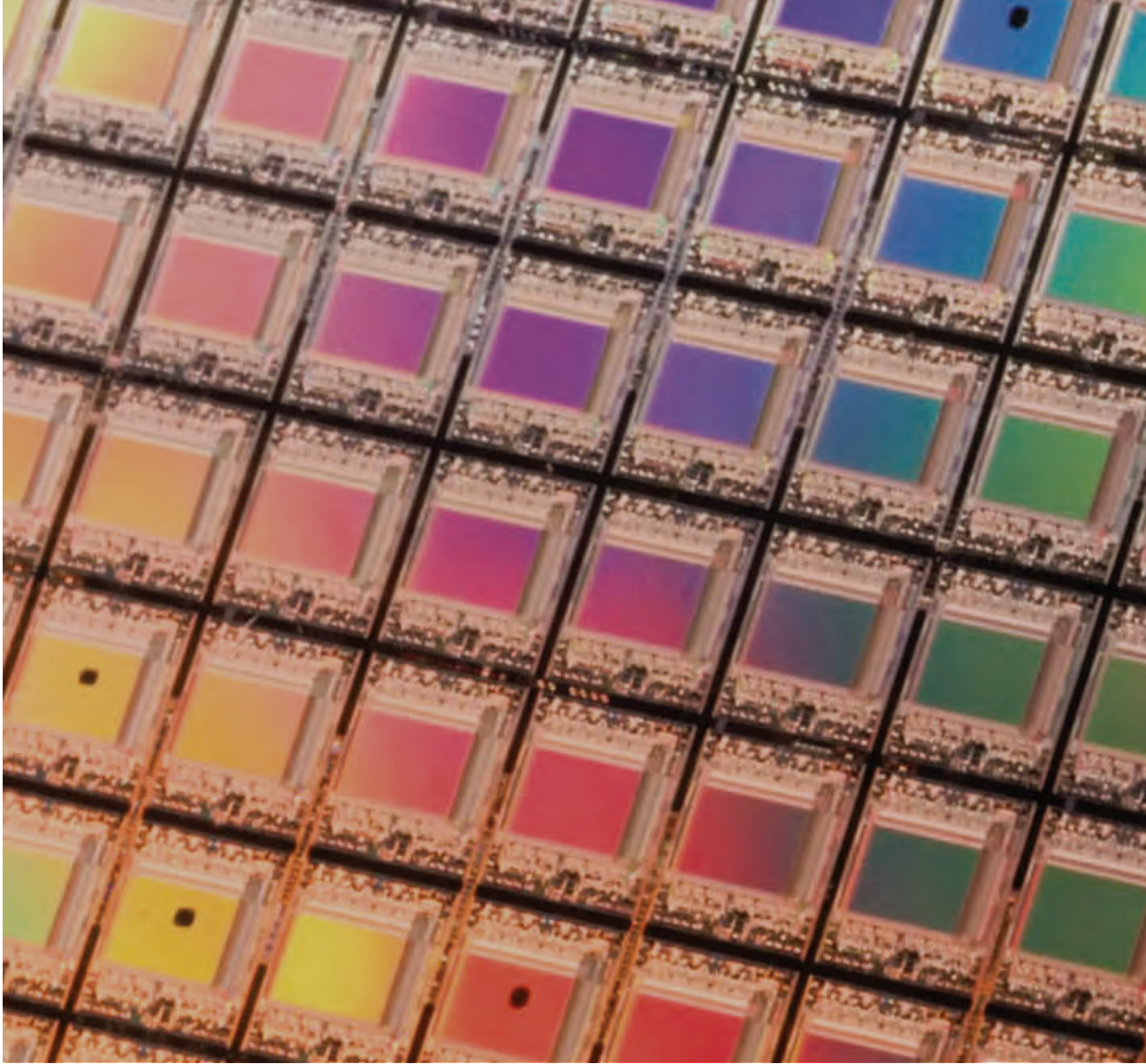
Domestic beer brewing/alcoholic beverage production equipment

Includes beer brewing plant (domestic scale), beer mat, beer dispenser (see also X25-F03B1). Also includes domestic wine production equipment. Industrial beer brewing/alcoholic beverage production equipment is coded under X25-P01B. Also include electrical details of wine cellars. Refrigeration details of wine cellars are coded under X27-F codes.

X27-X03 [2007]

White goods with built-in secondary function

Includes white goods such as refrigerators and microwaves having additional built-in device providing secondary function, e.g. television, video display, computer for e.g. Internet browsing. This code can be used in conjunction with other X27 codes to highlight the primary function of the device. For example, a refrigerator with a built-in TV display will be also coded in X27-F01 and W03-G03A/W03-A codes.



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