

**CPC****COOPERATIVE PATENT CLASSIFICATION****H01F**

**MAGNETS ; INDUCTANCES ; TRANSFORMERS ; SELECTION OF MATERIALS FOR THEIR MAGNETIC PROPERTIES** ( ceramics based on ferrites [C04B 35/26](#) ; alloys [C22C](#) ; { construction of loading coils [H01B](#) } ; thermomagnetic devices [H01L 37/00](#) ; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers [H04R](#) )

**NOTE**

In this subclass, inductances and transformers are regarded as being "for power supply" if they are intended for this purpose even in systems operating at frequencies above 60 cycles/sec.

**H01F 1/00**

**Magnets or magnetic bodies characterised by the magnetic materials therefor ; Selection of materials for their magnetic properties**

**H01F 1/0009**

- . { Antiferromagnetic materials, i.e. materials exhibiting a Néel transition temperature ( [H01F 1/0036](#) takes precedence ) }

**WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 1/00](#) - [H01F 1/44 R](#)

**H01F 1/0018**

- . { Diamagnetic or paramagnetic materials, i.e. materials with low susceptibility and no hysteresis ( [H01F 1/0036](#) takes precedence ) }

**H01F 1/0027**

- . { Thick magnetic films ( forming thick magnetic films [H01F 41/16](#) ; magnetic record carriers [G11B 5/70](#) ) }

**NOTE**

Group [H01F 1/0036](#) takes precedence over groups [H01F 1/09](#) , [H01F 1/11](#) , [H01F 1/20](#) , [H01F 1/33](#) and [H01F 1/36](#)

**H01F 1/0036**

- . { showing low dimensional magnetism, i.e. spin rearrangements due to a restriction of dimensions, e.g. showing giant magnetoresistivity, ( [H01F 1/153](#) , [H01F 1/42](#) and [H01F 10/00](#) take precedence; magnetoresistive sensors [G01D 5/16](#) , [G01R 33/06](#) ; magnetoresistive recording [G11B 5/39](#) ; magnetic-field-controlled resistors [H01L 43/08](#) ) }

**H01F 1/0045**

- .. { Zero dimensional, e.g. nanoparticles, soft nanoparticles for medical/biological use ( preparation of fullerenes in general [C01B 31/0206](#) ) }

**H01F 1/0054**

- ... { Coated nanoparticles, e.g. nanoparticles coated with organic surfactant }

**H01F 1/0063**

- ... { in a non-magnetic matrix, e.g. granular solids ( granular films [H01F 10/007](#) ) }

**H01F 1/0072**

- .. { one dimensional, i.e. linear or dendritic nanostructures }

**H01F 1/0081**

- ... { in a non-magnetic matrix, e.g. Fe-nanowires in a nanoporous membrane }

**H01F 1/009**

- .. { bidimensional, e.g. nanoscale period nanomagnet arrays ( [H01F 10/007](#) takes precedence ) }

|             |       |  |
|-------------|-------|--|
| H01F 1/01   | .     | of inorganic materials ( <a href="#">H01F 1/44</a> takes precedence )  |
| H01F 1/012  | ..    | { adapted for magnetic entropy change by magnetocaloric effect, e.g. used as magnetic refrigerating material ( refrigeration systems using magnetic effects <a href="#">F25B 21/00</a> ) } |
| H01F 1/015  | ...   | { Metals or alloys }   |
| H01F 1/017  | ...   | { Compounds }  |
| H01F 1/03   | ..    | characterised by their coercivity { ( <a href="#">H01F 1/40</a> takes precedence ) }   |
| H01F 1/0302 | ...   | { characterised by unspecified or heterogeneous hardness or specially adapted for magnetic hardness transitions }  |
| H01F 1/0304 | ....  | { adapted for large Barkhausen jumps or domain wall rotations, e.g. WIEGAND or MATTEUCCI effect ( <a href="#">H01F 1/143</a> and <a href="#">H01F 1/15391</a> take precedence ) }          |
| H01F 1/0306 | ....  | { Metals or alloys, e.g. LAVES phase alloys of the MgCu <sub>2</sub> -type ( <a href="#">H01F 1/0304</a> takes precedence ) }  |
| H01F 1/0308 | ..... | { with magnetic shape memory (MSM), i.e. with lattice transformations driven by a magnetic field, e.g. Heusler alloys }  |
| H01F 1/0311 | ....  | { Compounds ( <a href="#">H01F 1/0304</a> takes precedence ) }   |
| H01F 1/0313 | ..... | { Oxidic compounds }   |
| H01F 1/0315 | ..... | { Ferrites }   |
| H01F 1/0317 | ..... | { Manganites }   |
| H01F 1/032  | ...   | of hard-magnetic materials   |
| H01F 1/04   | ....  | Metals or alloys   |
| H01F 1/047  | ..... | Alloys characterised by their composition  |

**NOTE**

In groups [H01F 1/053](#) to [H01F 1/059](#) , an alloy is classified in the last appropriate place

|             |       |  |
|-------------|-------|--|
| H01F 1/053  | ..... | containing rare earth metals   |
| H01F 1/0533 | ..... | { in a bonding agent }   |
| H01F 1/0536 | ..... | { sintered }   |
| H01F 1/055  | ..... | and magnetic transition metals, e.g. SmCo <sub>5</sub>                     |
| H01F 1/0551 | ..... | { in the form of particles, e.g. rapid quenched powders or ribbon flakes } |
| H01F 1/0552 | ..... | { with a protective layer }  |
| H01F 1/0553 | ..... | { obtained by reduction or by hydrogen decrepitation or embrittlement }    |
| H01F 1/0555 | ..... | { pressed, sintered or bonded together }                                   |
| H01F 1/0556 | ..... | { pressed }  |
| H01F 1/0557 | ..... | { sintered }   |
| H01F 1/0558 | ..... | { bonded together }  |
| H01F 1/057  | ..... | and IIIa elements, e.g. Nd <sub>2</sub> Fe <sub>14</sub> B                 |
| H01F 1/0571 | ..... | { in the form of particles, e.g. rapid quenched powders or ribbon flakes } |
| H01F 1/0572 | ..... | { with a protective layer }  |

|             |       |   |
|-------------|-------|---|
| H01F 1/0573 | ..... | { obtained by reduction or by hydrogen decrepitation or embrittlement }   |
| H01F 1/0574 | ..... | { obtained by liquid dynamic compaction }   |
| H01F 1/0575 | ..... | { pressed, sintered or bonded together }  |
| H01F 1/0576 | ..... | { pressed, e.g. hot working }   |
| H01F 1/0577 | ..... | { sintered }  |
| H01F 1/0578 | ..... | { bonded together }   |
| H01F 1/0579 | ..... | { with exchange spin coupling between hard and soft nanophases, e.g. nanocomposite spring magnets }                                     |
| H01F 1/058  | ..... | and IVa elements, e.g. Gd <sub>2</sub> Fe <sub>14</sub> C   |
| H01F 1/059  | ..... | and Va elements, e.g. Sm <sub>2</sub> Fe <sub>17</sub> N <sub>2</sub>   |
| H01F 1/0593 | ..... | { of tetragonal ThMn <sub>12</sub> -structure }   |
| H01F 1/0596 | ..... | { of rhombic or rhombohedral Th <sub>2</sub> Zn <sub>17</sub> structure or hexagonal Th <sub>2</sub> Ni <sub>17</sub> structure }       |
| H01F 1/06   | ..... | in the form of particles, e.g. powder ( <a href="#">H01F 1/047</a> takes precedence; { record carriers <a href="#">G11B 5/70605</a> } ) |
| H01F 1/061  | ..... | { with a protective layer }   |
| H01F 1/063  | ..... | { with a non magnetic core }  |
| H01F 1/065  | ..... | { obtained by a reduction }   |
| H01F 1/066  | ..... | { obtained by liquid dynamic compaction }   |
| H01F 1/068  | ..... | { having a L10 crystallographic structure, e.g. [Co,Fe] [Pt,Pd] (nano)particles }   |

**WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 1/06](#) - [H01F 1/06 E](#)

|            |       |  |
|------------|-------|--|
| H01F 1/08  | ..... | pressed, sintered, or bound together   |
| H01F 1/083 | ..... | { in a bonding agent }   |
| H01F 1/086 | ..... | { sintered }   |
| H01F 1/09  | ....  | Mixtures of metallic and non-metallic particles ; Metallic particles having oxide skin   |
| H01F 1/10  | ....  | Non-metallic substances, e.g. ferrites { e.g. [(Ba,Sr)O(Fe <sub>2</sub> O <sub>3</sub> ) <sub>6</sub> ] ferrites with hexagonal structure }  |
| H01F 1/11  | ..... | in the form of particles { ( for magnetic record carriers <a href="#">G11B 5/70626</a> ) }   |
| H01F 1/111 | ..... | { with a non-magnetic core }   |
| H01F 1/112 | ..... | { with a skin ( <a href="#">H01F 1/113</a> takes precedence ) }  |
| H01F 1/113 | ..... | in a bonding agent   |
| H01F 1/117 | ..... | Flexible bodies  |
| H01F 1/12  | ...   | of soft-magnetic materials   |
| H01F 1/14  | ....  | Metals or alloys   |
| H01F 1/143 | ..... | { in the form of wires ( <a href="#">H01F 1/147</a> takes precedence ) }   |
| H01F 1/147 | ..... | Alloys characterised by their composition { ( treatment thereof for enhancing their electromagnetic properties <a href="#">C21D 8/12</a> ) } |

**NOTE**

In groups [H01F 1/14708](#) to [H01F 1/15391](#) , an alloy is classified in the last appropriate place

|                              |       |   |
|------------------------------|-------|---|
| <a href="#">H01F 1/14708</a> | ..... | { Fe-Ni based alloys ( pure Fe or Ni <a href="#">H01F 1/14</a> , <a href="#">H01F 1/16</a> or <a href="#">H01F 1/20</a> ) }                             |
| <a href="#">H01F 1/14716</a> | ..... | { in the form of sheets }   |
| <a href="#">H01F 1/14725</a> | ..... | { with insulating coating }   |
| <a href="#">H01F 1/14733</a> | ..... | { in the form of particles }  |
| <a href="#">H01F 1/14741</a> | ..... | { pressed, sintered or bonded together }  |
| <a href="#">H01F 1/1475</a>  | ..... | { the particles being insulated }   |
| <a href="#">H01F 1/14758</a> | ..... | { by macromolecular organic substances }  |
| <a href="#">H01F 1/14766</a> | ..... | { Fe-Si based alloys }  |
| <a href="#">H01F 1/14775</a> | ..... | { in the form of sheets }   |
| <a href="#">H01F 1/14783</a> | ..... | { with insulating coating }   |
| <a href="#">H01F 1/14791</a> | ..... | { Fe-Si-Al based alloys, e.g. Sendust }   |
| <a href="#">H01F 1/153</a>   | ..... | Amorphous metallic alloys, e.g. glassy metals { ( making ferrous amorphous alloys <a href="#">C22C 33/003</a> ) }                                       |
| <a href="#">H01F 1/15308</a> | ..... | { based on Fe/Ni ( <a href="#">H01F 1/15325</a> takes precedence ) }  |
| <a href="#">H01F 1/15316</a> | ..... | { based on Co ( <a href="#">H01F 1/15325</a> takes precedence ) }   |
| <a href="#">H01F 1/15325</a> | ..... | { containing rare earths }  |
| <a href="#">H01F 1/15333</a> | ..... | { containing nanocrystallites, e.g. obtained by annealing }   |
| <a href="#">H01F 1/15341</a> | ..... | { Preparation processes therefor }  |
| <a href="#">H01F 1/1535</a>  | ..... | { by powder metallurgy, e.g. spark erosion }  |
| <a href="#">H01F 1/15358</a> | ..... | { Making agglomerates therefrom, e.g. by pressing }   |
| <a href="#">H01F 1/15366</a> | ..... | { using a binder }  |
| <a href="#">H01F 1/15375</a> | ..... | { using polymers }  |
| <a href="#">H01F 1/15383</a> | ..... | { Applying coatings thereon ( <a href="#">H01F 1/15366</a> takes precedence ) }   |
| <a href="#">H01F 1/15391</a> | ..... | { Elongated structures, e.g. wires }  |
| <a href="#">H01F 1/16</a>    | ..... | in the form of sheets ( <a href="#">H01F 1/147</a> takes precedence )   |
| <a href="#">H01F 1/18</a>    | ..... | with insulating coating   |
| <a href="#">H01F 1/20</a>    | ..... | in the form of particles, e.g. powder ( <a href="#">H01F 1/147</a> takes precedence )   |
| <a href="#">H01F 1/22</a>    | ..... | pressed, sintered, or bound together  |
| <a href="#">H01F 1/24</a>    | ..... | the particles being insulated   |
| <a href="#">H01F 1/26</a>    | ..... | by macromolecular organic substances  |
| <a href="#">H01F 1/28</a>    | ..... | dispersed or suspended in a bonding agent   |
| <a href="#">H01F 1/33</a>    | ....  | Mixtures of metallic and non-metallic particles ; Metallic particles having oxide skin  |
| <a href="#">H01F 1/34</a>    | ....  | Non-metallic substances, e.g. ferrites  |
| <a href="#">H01F 1/342</a>   | ..... | { Oxides ( <a href="#">H01F 1/36</a> and <a href="#">H01F 1/38</a> take precedence ) }  |
| <a href="#">H01F 1/344</a>   | ..... | { Ferrites, e.g. having a cubic spinel structure (X <sub>2</sub> +O)(Y <sub>23</sub> +O <sub>3</sub> ); e.g. magnetite Fe <sub>3</sub> O <sub>4</sub> } |
| <a href="#">H01F 1/346</a>   | ..... | { Garnets, e.g. having a cubic nesosilicates-based structure }  |

|                            |       |   |
|----------------------------|-------|---|
|                            |       | [X <sub>2</sub> +3Y <sub>3</sub> +2 ] [ ( TO <sub>4</sub> ) <sup>3</sup> ] with T= Si, Al, Fe, Ga ( <a href="#">H01F 10/24</a> takes precedence; Faraday rotators <a href="#">G02F 1/09</a> ) ] |
| <a href="#">H01F 1/348</a> | ..... | { Hexaferrites with decreased hardness or anisotropy, i.e. with increased permeability in the microwave (GHz) range, e.g. having a hexagonal crystallographic structure }                       |
| <a href="#">H01F 1/36</a>  | ..... | in the form of particles { ( <a href="#">H01F 1/346</a> , <a href="#">H01F 1/348</a> and <a href="#">H01F 1/38</a> take precedence ) }  |
| <a href="#">H01F 1/37</a>  | ..... | in a bonding agent  |
| <a href="#">H01F 1/375</a> | ..... | Flexible bodies   |
| <a href="#">H01F 1/38</a>  | ..... | amorphous, e.g. amorphous oxides  |
| <a href="#">H01F 1/40</a>  | ..    | of magnetic semiconductor materials, e.g. CdCr <sub>2</sub> S <sub>4</sub> ( devices using galvano-magnetic or similar effects <a href="#">H01L 43/00</a> )                                     |
| <a href="#">H01F 1/401</a> | ...   | { diluted }   |

**NOTE**

In group [H01F 1/401](#) , a diluted magnetic semiconductor (DMS) is classified in the last appropriate place

|                            |      |  |
|----------------------------|------|--|
| <a href="#">H01F 1/402</a> | .... | { of II-VI type, e.g. Zn <sub>1-x</sub> Cr <sub>x</sub> Se }   |
| <a href="#">H01F 1/404</a> | .... | { of III-V type, e.g. In <sub>1-x</sub> Mn <sub>x</sub> As }   |
| <a href="#">H01F 1/405</a> | .... | { of IV type, e.g. Ge <sub>1-x</sub> Mn <sub>x</sub> }   |
| <a href="#">H01F 1/407</a> | .... | { Diluted non-magnetic ions in a magnetic cation-sublattice, e.g. perovskites, La <sub>1-x</sub> (Ba,Sr) <sub>x</sub> MnO <sub>3</sub> }                                       |
| <a href="#">H01F 1/408</a> | ...  | { half-metallic, i.e. having only one electronic spin direction at the Fermi level, e.g. CrO <sub>2</sub> , Heusler alloys ( <a href="#">H01F 10/1936</a> takes precedence ) } |
| <a href="#">H01F 1/42</a>  | .    | of organic or organo-metallic materials, { e.g. graphene } ( <a href="#">H01F 1/44</a> takes precedence )  |
| <a href="#">H01F 1/44</a>  | .    | of magnetic liquids, e.g. ferrofluids ( particles in a bonding agent <a href="#">H01F 1/28</a> , <a href="#">H01F 1/36</a> , { <a href="#">H01F 1/37</a> } )                   |
| <a href="#">H01F 1/442</a> | ..   | { the magnetic component being a metal or alloy, e.g. Fe ( <a href="#">H01F 1/447</a> takes precedence ) }   |
| <a href="#">H01F 1/445</a> | ..   | { the magnetic component being a compound, e.g. Fe <sub>3</sub> O <sub>4</sub> ( <a href="#">H01F 1/447</a> takes precedence ) }   |
| <a href="#">H01F 1/447</a> | ..   | { characterised by magnetoviscosity, e.g. magnetorheological, magnetorheotaxotropic, magnetodilatant liquids ( electrorheological fluids <a href="#">C10M 171/001</a> ) }      |

**[H01F 3/00](#) Cores, Yokes, or armatures ( magnetic materials [H01F 1/00](#) ; permanent magnets [H01F 7/02](#) )**

|                               |   |  |
|-------------------------------|---|--|
| <a href="#">H01F 2003/005</a> | . | Magnetic cores for receiving several windings with perpendicular axes, e.g. for antennae or inductive power transfer |
| <a href="#">H01F 3/02</a>     | . | made from sheets   |
| <a href="#">H01F 3/04</a>     | . | made from strips or ribbons  |
| <a href="#">H01F 3/06</a>     | . | made from wires  |

- H01F 3/08
  - made from powder ( powder coatings on sheets [H01F 3/02](#) ; on strips or ribbons [H01F 3/04](#) ; on wires [H01F 3/06](#) )
- H01F 3/10
  - Composite arrangements of magnetic circuits
- H01F 2003/103
  - .. Magnetic circuits with permanent magnets
- H01F 2003/106
  - .. Magnetic circuits using combinations of different magnetic materials
- H01F 3/12
  - .. Magnetic shunt paths
- H01F 3/14
  - .. Constrictions ; Gaps, e.g. air-gaps ( in magnetic shunt paths [H01F 3/12](#) )
- H01F 5/00**
  - Coils** ( superconducting coils [H01F 6/06](#) ; fixed inductances of the signal type [H01F 17/00](#) )
- H01F 5/003
  - { Printed circuit coils }
- H01F 2005/006
  - with conical spiral form
- H01F 5/02
  - wound on non-magnetic supports, e.g. formers
- H01F 2005/022
  - .. wound on formers with several winding chambers separated by flanges, e.g. for high voltage applications
- H01F 2005/025
  - .. wound on coaxial arrangement of two or more formers
- H01F 2005/027
  - .. wound on formers for receiving several coils with perpendicular winding axes, e.g. for antennae or inductive power transfer
- H01F 5/04
  - Arrangements of electric connections to coils, e.g. leads
- H01F 2005/043
  - .. having multiple pin terminals, e.g. arranged in two parallel lines at both sides of the coil
- H01F 2005/046
  - .. Details of formers and pin terminals related to mounting on printed circuits
- H01F 5/06
  - Insulation of windings
- H01F 6/00**
  - Superconducting magnets ; Superconducting coils** { ( magnetic resonance assemblies using superconducting coil systems [G01R 33/3815](#) ) }
- H01F 2006/001
  - Constructive details of inductive current limiters
- H01F 6/003
  - { Methods and means for discharging superconductive storage ( superconducting alloys [C22C](#) ; static memories with superconducting elements [G11C 11/44](#) ; superconducting circuit breakers with contacts [H01H 33/004](#) ; superconducting material [H01L 39/00](#) ; power cryotons [H01L 39/20](#) ; superconducting switches for low power [H03K 17/92](#) ) }
- H01F 6/005
  - { Methods and means for increasing the stored energy in superconductive coils by increments ( flux pumps ) }
- H01F 6/006
  - { Supplying energising or de-energising current; Flux pumps }
- H01F 6/008
  - .. { Electric circuit arrangements for energising superconductive electromagnets }
- H01F 6/02
  - Quenching ; Protection arrangements during quenching { ( protection circuits [H02H 7/001](#) ) }

- H01F 6/04 . Cooling
- H01F 6/06 . Coils, e.g. winding, insulating, terminating or casing arrangements therefor
- H01F 6/065 . . { Feed-through bushings, terminals and joints ( leading of conductors or axles through casings of transformers [H01F 27/04](#) ) }
- H01F 7/00** **Magnets** ( superconducting magnets [H01F 6/00](#) ; for separation of solid materials or fluids [B03C 1/00](#) ; for bench or like work-holders [B23B 31/28](#) , [B23Q 3/00](#) ; work-holding devices [B25B 11/00](#) ; lifting magnets [B66C 1/00](#) ; { operating or controlling locks using permanent magnets [E05B 47/0038](#) ; devices for holding a wing, e.g. door or window, by magnetic or electromagnetic attraction [E05C 19/16](#) ; relieving load or bearings using magnetic means [F16C 39/06](#) } ; for electric meters [G01R](#) ; for relays [H01H](#) ; { for electric discharge tubes [H01J](#) , e.g. [H01J 3/24](#) , [H01J 23/10](#) , [H01J 29/68](#) } ; for dynamo-electric machines [H02K](#) )
  - H01F 7/02 . Permanent magnets { (PM) }
  - H01F 7/0205 . . { Magnetic circuits with PM in general }
  - H01F 7/021 . . . { Construction of PM ( [H01F 7/0278](#) takes precedence; PM compositions [H01F 1/032](#) ) }
  - H01F 7/0215 . . . . { Flexible forms, sheets }
  - H01F 7/0221 . . . { Mounting means for PM, supporting, coating, encapsulating PM }
  - H01F 7/0226 . . . { PM with variable field strength ( [H01F 7/0284](#) takes precedence ) }
  - H01F 7/0231 . . { Magnetic circuits with PM for power or force generation }
  - H01F 7/0236 . . . { Magnetic suspension or levitation ( for vehicles [B60L 13/04](#) ; magnetic bearings [F16C 39/063](#) ) }
  - H01F 7/0242 . . . { Magnetic drives, magnetic coupling devices }
  - H01F 7/0247 . . . { Orientating, locating, transporting arrangements }
  - H01F 7/0252 . . . { PM holding devices ( [H01F 7/021](#) , [H01F 7/0215](#) , [H01F 7/0226](#) take precedence ) }
  - H01F 7/0257 . . . . { Lifting, pick-up magnetic objects }
  - H01F 7/0263 . . . . { Closures, bags, bands, engagement devices with male and female parts }
  - H01F 7/0268 . . . . { Magnetic cylinders }
  - H01F 7/0273 . . { Magnetic circuits with PM for magnetic field generation }
  - H01F 7/0278 . . . { for generating uniform fields, focusing, deflecting electrically charged particles ( for magnetic separation by Lorentz force [B03C 1/023](#) ; specially adapted for NMR applications [G01R 33/383](#) ) }
  - H01F 7/0284 . . . . { using a trimmable or adjustable magnetic circuit, e.g. for a symmetric dipole or quadrupole magnetic field }
  - H01F 7/0289 . . . { Transducers, loudspeakers, moving coil arrangements }
  - H01F 7/0294 . . . { Detection, inspection, magnetic treatment }
  - H01F 7/04 . . Means for releasing the attractive force
  - H01F 7/06 . Electromagnets ; Actuators including electromagnets { ( electric coils [H01F 5/00](#) ; devices for holding workpieces using electric force [B23Q 3/15](#) ; load-engaging elements for lifting articles electromagnetically [B66C 1/06](#) ; electromagnetic couplings [F16D 27/00](#) ; magnetic brakes [F16D 63/002](#) ; electromagnetically operated valves [F16K 11/24](#) , [F16K 31/00](#) ; magnetically locked mine lamps [F21L 11/00](#) ; analysing materials by magnetic means [G01N 27/72](#) , [G01N 27/80](#) to [G01N 27/88](#) ; electromagnets for winding mechanical clocks [G04C 1/02](#) ; electromagnetic relays



|                                |       |  |
|--------------------------------|-------|--|
|                                |       | <a href="#">H01H 51/00</a> ; windings for salient poles of dynamo-electric machines <a href="#">H02K 3/18</a> ; electromagnets for telegraphic communication <a href="#">H04L</a> ; for arc lamps <a href="#">H05B 31/28</a> ) }   |
| <a href="#">H01F 2007/062</a>  | ..    | Details of terminals or connectors for electromagnets  |
| <a href="#">H01F 7/064</a>     | ..    | { <a href="#">Circuit arrangements for actuating electromagnets</a> ( <a href="#">circuit arrangements for obtaining special operating characteristics</a> <a href="#">H01F 7/18</a> ; <a href="#">driving circuits for electromagnets making use of a switching regulator</a> <a href="#">H01H 47/325</a> ) } |
| <a href="#">H01F 7/066</a>     | ..    | { <a href="#">Electromagnets with movable winding</a> }  |
| <a href="#">H01F 2007/068</a>  | ..    | using printed circuit coils  |
| <a href="#">H01F 7/08</a>      | ..    | with armatures   |
| <a href="#">H01F 7/081</a>     | ...   | { <a href="#">Magnetic constructions</a> }   |
| <a href="#">H01F 2007/083</a>  | ....  | External yoke surrounding the coil bobbin, e.g. made of bent magnetic sheet  |
| <a href="#">H01F 2007/085</a>  | ....  | Yoke or polar piece between coil bobbin and armature having a gap, e.g. filled with nonmagnetic material   |
| <a href="#">H01F 2007/086</a>  | ....  | Structural details of the armature   |
| <a href="#">H01F 7/088</a>     | ...   | { <a href="#">provided with means for absorbing shocks</a> }   |
| <a href="#">H01F 7/10</a>      | ...   | specially adapted for alternating current  |
| <a href="#">H01F 7/11</a>      | ....  | reducing or eliminating the effects of eddy currents   |
| <a href="#">H01F 7/12</a>      | ....  | having anti-chattering arrangements  |
| <a href="#">H01F 7/1205</a>    | ..... | { <a href="#">having short-circuited conductors</a> ( <a href="#">electromagnetic relays provided with short-circuited conducting sleeves</a> <a href="#">H01H 47/00</a> ) }   |
| <a href="#">H01F 7/121</a>     | ...   | Guiding or setting position of armatures, e.g. retaining armatures in their end position   |
| <a href="#">H01F 7/122</a>     | ....  | by permanent magnets { ( <a href="#">H01F 7/1615</a> , <a href="#">H01F 7/1646</a> take precedence ) }   |
| <a href="#">H01F 7/123</a>     | ....  | by ancillary coil  |
| <a href="#">H01F 7/124</a>     | ....  | by mechanical latch, e.g. detent   |
| <a href="#">H01F 7/126</a>     | ...   | Supporting or mounting   |
| <a href="#">H01F 7/127</a>     | ...   | Assembling   |
| <a href="#">H01F 7/128</a>     | ...   | Encapsulating, encasing or sealing   |
| <a href="#">H01F 7/129</a>     | ....  | of armatures   |
| <a href="#">H01F 7/13</a>      | ...   | characterised by pulling-force characteristics   |
| <a href="#">H01F 7/14</a>      | ...   | Pivoting armatures ( <a href="#">H01F 7/17</a> takes precedence )  |
| <a href="#">H01F 7/145</a>     | ....  | { <a href="#">Rotary electromagnets with variable gap</a> ( <a href="#">with fixed gap or torque motors</a> <a href="#">H02K 26/00</a> ) }   |
| <a href="#">H01F 7/16</a>      | ...   | Rectilinearly-movable armatures ( <a href="#">H01F 7/17</a> takes precedence )   |
| <a href="#">H01F 7/1607</a>    | ....  | { <a href="#">Armatures entering the winding</a> }   |
| <a href="#">H01F 7/1615</a>    | ..... | { <a href="#">Armatures or stationary parts of magnetic circuit having permanent magnet</a> }  |
| <a href="#">H01F 7/1623</a>    | ..... | { <a href="#">Armatures having T-form</a> }  |
| <a href="#">H01F 2007/163</a>  | ..... | with axial bearing   |
| <a href="#">H01F 7/1638</a>    | ....  | { <a href="#">Armatures not entering the winding</a> }   |
| <a href="#">H01F 7/1646</a>    | ..... | { <a href="#">Armatures or stationary parts of magnetic circuit having permanent magnet</a> }  |
| <a href="#">H01F 7/1653</a>    | ....  | { <a href="#">Magnetic circuit having axially spaced pole-pieces</a> }   |
| <a href="#">H01F 2007/1661</a> | ....  | Electromagnets or actuators with anti-stick disc   |



|                   |       |  |
|-------------------|-------|--|
| H01F 2007/1669    | ....  | Armatures actuated by current pulse, e.g. bistable actuators   |
| H01F 2007/1676    | ....  | Means for avoiding or reducing eddy currents in the magnetic circuit, e.g. radial slots  |
| H01F 2007/1684    | ....  | Armature position measurement using coils  |
| H01F 2007/1692    | ....  | Electromagnets or actuators with two coils   |
| H01F 7/17         | ...   | Pivoting and rectilinearly-movable armatures   |
| H01F 7/18         | ...   | Circuit arrangements for obtaining desired operating characteristics, e.g. for slow operation, for sequential energisation of windings, for high-speed energisation of windings  |
| H01F 7/1805       | ....  | { Circuit arrangements for holding the operation of electromagnets or for holding the armature in attracted position with reduced energising current ( for holding relay armature in attracted position with reduced energising current <a href="#">H01H 47/04</a> ; quick energising of electro-dynamic machines <a href="#">H02P 9/08</a> ; for quickly de-energising of dynamo-electric generators <a href="#">H02P 9/123</a> ) } |
| H01F 7/1811       | ..... | { demagnetising upon switching off, removing residual magnetism }  |
| H01F 7/1816       | ..... | { making use of an energy accumulator ( for relays <a href="#">H01H 47/043</a> ) }   |
| H01F 2007/1822    | ..... | using a capacitor to produce a boost voltage   |
| H01F 7/1827       | ..... | { by changing number of serially-connected turns or windings ( for relays <a href="#">H01H 47/06</a> ) }   |
| H01F 7/1833       | ..... | { by changing number of parallel-connected turns or windings ( for relays <a href="#">H01H 47/08</a> ) }   |
| H01F 7/1838       | ..... | { by switching-in or -out impedance ( for relays <a href="#">H01H 47/10</a> ) }  |
| H01F 7/1844       | ....  | { Monitoring or fail-safe circuits ( for relays <a href="#">H01H 47/002</a> ) }  |
| H01F 2007/185     | ..... | with armature position measurement   |
| H01F 2007/1855    | ..... | using a stored table to deduce one variable from another   |
| H01F 2007/1861    | ..... | using derivative of measured variable  |
| H01F 2007/1866    | ..... | with regulation loop   |
| H01F 7/1872       | ....  | { Bistable or bidirectional current devices ( relays <a href="#">H01H 47/226</a> ) }   |
| H01F 7/1877       | ....  | { controlling a plurality of loads }   |
| H01F 7/1883       | ....  | { by steepening leading and trailing edges of magnetisation pulse, e.g. printer drivers }  |
| H01F 2007/1888    | ....  | using pulse width modulation   |
| H01F 2007/1894    | ....  | minimizing impact energy on closure of magnetic circuit  |
| H01F 7/20         | ..    | without armatures ( cores <a href="#">H01F 3/00</a> ; coils <a href="#">H01F 5/00</a> ; { shaping metal by applying magnetic forces <a href="#">B21D 26/14</a> ; analysing methods using magnetic fields <a href="#">G01N 24/06</a> ; electromagnets specially adapted for NMR applications <a href="#">G01R 33/381</a> } )  |
| H01F 7/202        | ...   | { Electromagnets for high magnetic field strength ( for superconducting electromagnets <a href="#">H01F 6/00</a> ; for transformers or inductances without a magnetic core <a href="#">H01F 30/08</a> ) }  |
| H01F 7/204        | ..... | { Circuits for energising or de-energising }   |
| H01F 7/206        | ...   | { Electromagnets for lifting, handling or transporting of magnetic pieces or material ( electromagnets for guidance of vehicles, workpieces <a href="#">B61B 31/08</a> , <a href="#">B65G 21/2009</a> ; for magnetic suspension or levitation <a href="#">H02N 15/00</a> ) }   |
| H01F 2007/208     | ....  | combined with permanent magnets  |
| <b>H01F 10/00</b> |       | <b>Thin magnetic films, e.g. of one-domain structure ( magnetic record carriers <a href="#">G11B 5/00</a> ; thin-film magnetic stores <a href="#">G11C</a> )</b>   |

- H01F 10/002 . { Antiferromagnetic thin films, i.e. films exhibiting a Néel transition temperature ( [H01F 10/3218](#) and [H01F 10/3268](#) take precedence ) }

### **WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/00](#) - [H01F 10/30](#)

- H01F 10/005 . { organic or organo-metallic films, e.g. monomolecular films obtained by Langmuir-Blodgett technique, graphene }

- H01F 10/007 . { ultrathin or granular films ( [H01F 10/005](#) and [H01F 10/3227](#) take precedence; applying ultrathin or granular layers to substrates [H01F 41/301](#) ) }

- H01F 10/06 . characterised by the coupling or physical contact with connecting or interacting conductors

- H01F 10/08 . characterised by magnetic layers ( { [H01F 10/32](#) takes precedence } ; applying thin magnetic films to substrates [H01F 41/14](#) )

- H01F 10/10 . . . characterised by the composition

- H01F 10/12 . . . . . being metal or alloys ( intermetallic compounds [H01F 10/18](#) )

- H01F 10/123 . . . . . { having a L10 crystallographic structure, e.g. [Co,Fe] [Pt,Pd] thin films }

### **WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/16](#)

- H01F 10/126 . . . . . { containing rare earth metals ( [H01F 10/133](#) takes precedence ) }

- H01F 10/13 . . . . . Amorphous metallic alloys, e.g. glassy metals { ( [H01F 10/3204](#) takes precedence ) }

### **NOTE**

In this group, amorphous metallic alloys are classified in the last appropriate place

- H01F 10/131 . . . . . { containing iron or nickel }

- H01F 10/132 . . . . . { containing cobalt }

- H01F 10/133 . . . . . { containing rare earth metals }

- H01F 10/135 . . . . . { containing transition metals }

- H01F 10/136 . . . . . { containing iron }

- H01F 10/137 . . . . . { containing cobalt }

- H01F 10/138 . . . . . { containing nanocrystallites, e.g. obtained by annealing }

- H01F 10/14 . . . . . containing iron or nickel ( { [H01F 10/126](#) , [H01F 10/13](#) , [H01F 10/16](#) take precedence )

### **NOTE**

In this group, alloys containing iron or nickel are classified in the last appropriate place

|              |       |  |
|--------------|-------|--|
| H01F 10/142  | ..... | { containing Si }  |
| H01F 10/145  | ..... | { containing Al, e.g. SENDUST }  |
| H01F 10/147  | ..... | { with lattice under strain, e.g. expanded by interstitial nitrogen ( <a href="#">H01F 10/26</a> to <a href="#">H01F 10/30</a> take precedence ) } |
| H01F 10/16   | ....  | containing cobalt ( { <a href="#">H01F 10/126</a> } , <a href="#">H01F 10/13</a> take precedence )   |
| H01F 10/18   | ...   | being compounds  |
| H01F 10/187  | ....  | Amorphous compounds { ( <a href="#">H01F 10/3204</a> takes precedence ) }  |
| H01F 10/193  | ....  | Magnetic semiconductor compounds { ( in general <a href="#">H01F 1/40</a> ; multilayers, e.g. superlattices <a href="#">H01F 10/3213</a> ) }       |
| H01F 10/1933 | ..... | { Perovskites }  |

**WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/193](#)

|              |       |   |
|--------------|-------|---|
| H01F 10/1936 | ..... | { Half-metallic, e.g. epitaxial CrO <sub>2</sub> or NiMnSb films }  |
| H01F 10/20   | ....  | Ferrites  |
| H01F 10/205  | ..... | { Hexagonal ferrites }  |
| H01F 10/22   | ..... | Orthoferrites { e.g. RFeO <sub>3</sub> ( R= rare earth element ) with orthorhombic structure }  |
| H01F 10/24   | ..... | Garnets { ( in general <a href="#">H01F 1/346</a> ; multilayers, e.g. superlattices <a href="#">H01F 10/3209</a> ; applying magnetic garnet films to substrates by sputtering <a href="#">H01F 41/186</a> ) } |
| H01F 10/245  | ..... | { Modifications for enhancing interaction with electromagnetic wave energy }  |
| H01F 10/26   | .     | characterised by the substrate or intermediate layers { ( <a href="#">H01F 10/06</a> and <a href="#">H01F 10/32</a> take precedence ) }   |
| H01F 10/265  | ..    | { Magnetic multilayers non exchange-coupled ( <a href="#">H01F 10/32</a> takes precedence ) }   |

**WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/00](#) - [H01F 10/30](#)

|              |    |   |
|--------------|----|---|
| H01F 10/28   | .. | characterised by the composition of the substrate   |
| H01F 10/30   | .. | characterised by the composition of the intermediate layers { e.g. seed, buffer, template, diffusion preventing, cap layers ( <a href="#">H01F 10/06</a> and <a href="#">H01F 10/32</a> take precedence ) } |
| H01F 10/32   | .  | Spin-exchange-coupled multilayers, e.g. nanostructured superlattices { ( applying spin-exchange-coupled multilayers to substrates <a href="#">H01F 41/302</a> ) }   |
| H01F 10/3204 | .. | { Exchange coupling of amorphous multilayers }  |
| H01F 10/3209 | .. | { Exchange coupling of garnet multilayers }   |
| H01F 10/3213 | .. | { Exchange coupling of magnetic semiconductor multilayers, e.g. MnSe/ZnSe superlattices ( semiconductor materials for use in semiconductor devices <a href="#">H01L 29/12</a> ) }                           |

- H01F 10/3218 .. { Exchange coupling of magnetic films via an antiferromagnetic interface ( [H01F 10/3268](#) takes precedence ) }
- H01F 10/3222 .. { Exchange coupled hard/soft multilayers, e.g. CoPt/Co or NiFe/CoSm ( nanocomposite spring magnets [H01F 1/0579](#) ) }
- H01F 10/3227 .. { Exchange coupling via one or more magnetisable ultrathin or granular films }
- H01F 10/3231 ... { via a non-magnetic spacer }
- H01F 10/3236 .... { made of a noble metal, e.g. ( Co/Pt ) n multilayers having perpendicular anisotropy ( [H01F 10/3286](#) takes precedence ) }
- H01F 10/324 .. { Exchange coupling of magnetic film pairs via a very thin non-magnetic spacer, e.g. by exchange with conduction electrons of the spacer }
- H01F 10/3245 ... { the spacer being superconductive }
- H01F 10/325 ... { the spacer being noble metal }
- H01F 10/3254 ... { the spacer being semiconducting or insulating, e.g. for spin tunnel junction (STJ) }
- H01F 10/3259 .... { Spin-exchange-coupled multilayers comprising at least a nano-oxide layer (NOL), e.g. with a NOL spacer }
- H01F 10/3263 ... { the exchange coupling being symmetric, e.g. for dual spin valve, e.g. NiO/Co/Cu/Co/Cu/Co/NiO }
- H01F 10/3268 ... { the exchange coupling being asymmetric, e.g. by use of additional pinning, by using antiferromagnetic or ferromagnetic coupling interface, i.e. so-called spin-valve (SV) structure, e.g. NiFe/Cu/NiFe/FeMn }
- H01F 10/3272 .... { by use of anti-parallel coupled (APC) ferromagnetic layers, e.g. artificial ferrimagnets (AFI), artificial (AAF) or synthetic (SAF) anti-ferromagnets }
- H01F 10/3277 ..... { by use of artificial ferrimagnets (AFI) only }
- H01F 10/3281 .... { only by use of asymmetry of the magnetic film pair itself, i.e. so-called pseudospin valve (PSV) structure, e.g. NiFe/Cu/Co }
- H01F 10/3286 ... { Spin-exchange coupled multilayers having at least one layer with perpendicular magnetic anisotropy }
- H01F 10/329 ... { Spin-exchange coupled multilayers wherein the magnetisation of the free layer is switched by a spin-polarised current, e.g. spin torque effect }
- H01F 10/3295 ... { Spin-exchange coupled multilayers wherein the magnetic pinned or free layers are laminated without anti-parallel coupling within the pinned and free layers }
  
- H01F 13/00** **Apparatus or processes for magnetising or demagnetising** ( { devices for holding workpieces using magnetic or electric force acting directly on the workpieces [B23Q 3/15](#) } ; for degaussing ships [B63G 9/06](#) ; for clocks or watches [G04D 9/00](#) ; { recording or erasing of information on magnetic record carriers [G11B 5/00](#) } ; demagnetising arrangements for colour television [H04N 9/29](#) )
  
- H01F 13/003 . { Methods and devices for magnetising permanent magnets ( permanent magnets [H01F 7/02](#) ) }
  
- H01F 13/006 . { Methods and devices for demagnetising of magnetic bodies, e.g. workpieces, sheet material ( for erasing of information on magnetic record carriers [G11B 5/00](#) ) }
  
- H01F 17/00** **Fixed inductances of the signal type** ( coils in general [H01F 5/00](#) { inductors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof and multistep manufacturing processes therefor [H01L 28/10](#) } )
  
- H01F 17/0006 . { Printed inductances ( printed coils for dynamo-electric machines [H02K 3/26](#) ; printed

- circuits [H05K](#) ) }
- H01F 17/0013 . . { with stacked layers ( [H01F 27/2804](#) takes precedence ) }
  - H01F 2017/002 . . . Details of via holes for interconnecting the layers
  - H01F 2017/0026 . . . Multilayer LC-filter
  - H01F 17/0033 . . { with the coil helically wound around a magnetic core }
  - H01F 2017/004 . . with the coil helically wound around an axis without a core
  - H01F 2017/0046 . . with a conductive path having a bridge
  - H01F 2017/0053 . . with means to reduce eddy currents
  - H01F 2017/006 . . flexible printed inductors
  - H01F 2017/0066 . . with a magnetic layer
  - H01F 2017/0073 . . with a special conductive pattern, e.g. flat spiral
  - H01F 2017/008 . . Electric or magnetic shielding of printed inductances
  - H01F 2017/0086 . . on semiconductor substrate ( inductors for integrated circuits [H01L 28/10](#) )
  
  - H01F 2017/0093 . Common mode choke coil
  
  - H01F 17/02 . without magnetic core
  - H01F 17/03 . . with ceramic former
  
  - H01F 17/04 . with magnetic core
  - H01F 17/041 . . { Means for preventing rotation or displacement of the core }
  - H01F 17/043 . . { with two, usually identical or nearly identical parts enclosing completely the coil ( pot cores ) }
  - H01F 17/045 . . { with core of cylindric geometry and coil wound along its longitudinal axis, i.e. rod or drum core }
  - H01F 2017/046 . . . helical coil made of flat wire, e.g. with smaller extension of wire cross section in the direction of the longitudinal axis
  - H01F 2017/048 . . with encapsulating core, e.g. made of resin and magnetic powder
  - H01F 17/06 . . with core substantially closed in itself, e.g. toroid
  - H01F 17/062 . . . { Toroidal core with turns of coil around it }
  - H01F 2017/065 . . . Core mounted around conductor to absorb noise, e.g. EMI filter
  - H01F 2017/067 . . . Core with two or more holes to lead through conductor
  - H01F 17/08 . . . Loading coils for telecommunication circuits
  
  - H01F 19/00** **Fixed transformers or mutual inductances of the signal type ( [H01F 36/00](#) takes precedence )**
  
  - H01F 19/02 . Audio-frequency transformers or mutual inductances, i.e. not suitable for handling frequencies considerably beyond the audio range
  
  - H01F 19/04 . Transformers or mutual inductances suitable for handling frequencies considerably beyond the audio range ( resonant circuits [H03H](#) )
  - H01F 19/06 . . Broad-band transformers, e.g. suitable for handling frequencies well down into the audio range
  - H01F 19/08 . . Transformers having magnetic bias, e.g. for handling pulses

H01F 2019/085 . . . Transformer for galvanic isolation

**H01F 21/00** **Variable inductances or transformers of the signal type ( [H01F 36/00](#) takes precedence )**

- H01F 21/005 . { Inductances without magnetic core }
- H01F 21/02 . continuously variable, e.g. variometers
- H01F 21/04 . . by relative movement of turns or parts of windings
- H01F 21/06 . . by movement of core or part of core relative to the windings as a whole
- H01F 21/065 . . . { Measures for obtaining a desired relation between the position of the core and the inductance }
- H01F 21/08 . . by varying the permeability of the core, e.g. by varying magnetic bias
- H01F 21/10 . . by means of a movable shield
- H01F 21/12 . discontinuously variable, e.g. tapped
- H01F 2021/125 . . Printed variable inductor with taps, e.g. for VCO

**H01F 27/00** **Details of transformers or inductances, in general**

- H01F 27/002 . { Arrangements provided on the transformer facilitating its transport }
- H01F 27/004 . { Arrangements for interchanging inductances, transformers or coils thereof }
- H01F 27/006 . { with special arrangement or spacing of turns of the winding(s), e.g. to produce desired self-resonance }
- H01F 27/008 . { with temperature compensation }
- H01F 27/02 . Casings
- H01F 27/022 . . { Encapsulation }
- H01F 27/025 . . { Constructional details relating to cooling }
- H01F 27/027 . . { specially adapted for combination of signal type inductors or transformers with electronic circuits, e.g. mounting on printed circuit boards }
- H01F 27/04 . . Leading of conductors or axles through casings, e.g. for tap-changing arrangements
- H01F 27/06 . Mounting, supporting or suspending transformers, reactors or choke coils { not being of the signal type }
- H01F 2027/065 . . Mounting on printed circuit boards
- H01F 27/08 . Cooling ( [heat-transfer elements F28F](#) ) ; Ventilating ( [structural details of casings H01F 27/02](#) )
- H01F 27/085 . . { Cooling by ambient air }
- H01F 27/10 . . Liquid cooling
- H01F 27/105 . . . { Cooling by special liquid or by liquid of particular composition }
- H01F 27/12 . . . Oil cooling
- H01F 27/125 . . . . { Cooling by synthetic insulating and incombustible liquid }

- H01F 27/14 . . . . Expansion chambers ; Oil conservators ; Gas cushions ; Arrangements for purifying, drying, or filling
- H01F 27/16 . . . Water cooling
- H01F 27/18 . . . by evaporating liquids
- H01F 27/20 . . Cooling by special gases or non-ambient air
- H01F 27/22 . . Cooling by heat conduction through solid or powdered fillings
- H01F 27/23 . Corrosion protection
- H01F 27/24 . Magnetic cores
- H01F 27/245 . . made from sheets, e.g. grain-oriented ( [H01F 27/26](#) takes precedence )
- H01F 27/2455 . . . { using bent laminations }
- H01F 27/25 . . made from strips or ribbons ( [H01F 27/26](#) takes precedence )
- H01F 27/255 . . made from particles ( [H01F 27/26](#) takes precedence )
- H01F 27/26 . . Fastening parts of the core together ; Fastening or mounting the core on casing or support ( on coil [H01F 27/30](#) )
- H01F 27/263 . . . { Fastening parts of the core together }
- H01F 27/266 . . . { Fastening or mounting the core on casing or support ( on coil [H01F 27/30](#) ) }
- H01F 27/28 . Coils ; Windings ; Conductive connections
- H01F 27/2804 . . { Printed windings }
- H01F 2027/2809 . . . on stacked layers
- H01F 2027/2814 . . . with only part of the coil or of the winding in the printed circuit board, e.g. the remaining coil or winding sections can be made of wires or sheets
- H01F 2027/2819 . . . Planar transformers with printed windings, e.g. surrounded by two cores and to be mounted on printed circuit
- H01F 27/2823 . . { Wires ( [H01F 27/2866](#) takes precedence ) }
- H01F 27/2828 . . . { Construction of conductive connections, of leads }
- H01F 2027/2833 . . . using coaxial cable as wire
- H01F 2027/2838 . . . using transposed wires
- H01F 2027/2842 . . . Wire coils wound in conical zigzag to reduce voltage between winding turns
- H01F 27/2847 . . { Sheets; Strips ( [H01F 27/2866](#) takes precedence ) }
- H01F 27/2852 . . . { Construction of conductive connections, of leads }
- H01F 2027/2857 . . . Coil formed from wound foil conductor
- H01F 2027/2861 . . . Coil formed by folding a blank
- H01F 27/2866 . . { Combination of wires and sheets }
- H01F 27/2871 . . { Pancake coils }
- H01F 27/2876 . . { Cooling ( cooling transformers and inductances in general [H01F 27/08](#) ) }
- H01F 27/288 . . { Shielding }
- H01F 27/2885 . . . { with shields or electrodes ( shields or electrodes for pancake coils [H01F 27/2871](#) ; construction of electric or magnetic shields or screens [H01F 27/36](#) ) }
- H01F 27/289 . . . { with auxiliary windings ( for pancake coils [H01F 27/2871](#) ) }
- H01F 27/2895 . . { Windings disposed upon ring cores }
- H01F 27/29 . . Terminals ; Tapping arrangements { for signal inductances }



- H01F 27/292 . . . { Surface mounted devices }
- H01F 2027/295 . . . . with flexible terminals
- H01F 2027/297 . . . with pin-like terminal to be inserted in hole of printed path
- H01F 27/30 . . Fastening or clamping coils, windings, or parts thereof together ; Fastening or mounting coils or windings on core, casing, or other support
- H01F 27/303 . . . { Clamping coils, windings or parts thereof together }
- H01F 27/306 . . . { Fastening or mounting coils or windings on core, casing or other support }
- H01F 27/32 . . Insulating of coils, windings, or parts thereof
- H01F 27/321 . . . { using a fluid for insulating purposes only }
- H01F 27/322 . . . { the insulation forming channels for circulation of the fluid }
- H01F 27/323 . . . { Insulation between winding turns, between winding layers }
- H01F 27/324 . . . { Insulation between coil and core, between different winding sections, around the coil; Other insulation structures }
- H01F 27/325 . . . . { Coil bobbins ( formers for coils in general [H01F 5/02](#) ) }
- H01F 27/326 . . . . { specifically adapted for discharge lamp ballasts }
- H01F 27/327 . . . { Encapsulating or impregnating ( encapsulating coil and core [H01F 27/022](#) ) }
- H01F 2027/328 . . . . Dry-type transformer with encapsulated foil winding, e.g. windings coaxially arranged on core legs with spacers for cooling and with three phases
- H01F 2027/329 . . . Insulation with semiconducting layer, e.g. to reduce corona effect
- H01F 27/33 . Arrangements for noise damping
- H01F 27/34 . Special means for preventing or reducing unwanted electric or magnetic effects, e.g. no-load losses, reactive currents, harmonics, oscillations, leakage fields
- H01F 27/341 . . { Preventing or reducing no-load losses or reactive currents }
- H01F 27/343 . . { Preventing or reducing surge voltages; oscillations }
- H01F 27/345 . . . { using auxiliary conductors }
- H01F 27/346 . . { Preventing or reducing leakage fields ( using magnetic shields [H01F 27/365](#) ; using auxiliary windings [H01F 27/38](#) ) }
- H01F 2027/348 . . Preventing eddy currents
- H01F 27/36 . . Electric or magnetic shields or screens ( movable for varying inductance [H01F 21/10](#) )
- H01F 27/362 . . . { Electric shields or screens }
- H01F 27/365 . . . { Magnetic shields or screens }
- H01F 27/367 . . . . { using non-magnetic screens }
- H01F 27/38 . . Auxiliary core members ; Auxiliary coils or windings
- H01F 27/385 . . . { for reducing harmonics }
- H01F 27/40 . Structural association with built-in electric component, e.g. fuse
- H01F 27/402 . . { Association of measuring or protective means }
- H01F 2027/404 . . . Protective devices specially adapted for fluid filled transformers
- H01F 2027/406 . . . Temperature sensor or protection
- H01F 2027/408 . . Association with diode or rectifier
- H01F 27/42 . Circuits specially adapted for the purpose of modifying, or compensating for, electric characteristics of transformers, reactors, or choke coils ( circuits for controlling transformers, reactors or choke coils, for the purpose of obtaining a desired output

[H02P 13/00](#) ; impedance networks [H03H](#) )

- H01F 27/422 . . { for instrument transformers }
- H01F 27/425 . . . { for voltage transformers }
- H01F 27/427 . . . { for current transformers }

**H01F 29/00** **Variable transformers or inductances not covered by group [H01F 21/00](#) { ( tap change devices [H01H 9/0005](#) ) }**

- H01F 29/02 . with tapings on coil or winding ; with provision for rearrangement or interconnection of windings
- H01F 29/025 . . { **Constructional details of transformers or reactors with tapping on coil or windings** }
- H01F 29/04 . . having provision for tap-changing without interrupting the load current
- H01F 29/06 . with current collector gliding or rolling on or along winding
- H01F 29/08 . with core, coil, winding, or shield movable to offset variation of voltage or phase shift, e.g. induction regulators
- H01F 29/10 . . having movable part of magnetic circuit { ( **high leakage transformers [H01F 38/08](#) ; dynamo-electric machines with movable part of magnetic circuit [H02K 23/44](#) , [H02K 23/48](#) ) }** }
- H01F 29/12 . . having movable coil, winding, or part thereof ; having movable shield
- H01F 29/14 . with variable magnetic bias ( { **amplitude modulation by means of variable impedance element [H03C 1/08](#) ; magnetic amplifiers [H03F](#) ; { circuits for automatic telephonic communication [H04M 3/00](#) }** } )
- H01F 29/143 . . with control winding for generating magnetic bias
- H01F 29/146 . . { **Constructional details** }

**H01F 30/00** **Fixed transformers not covered by group [H01F 19/00](#)**

- H01F 30/02 . Auto-transformers
- H01F 30/04 . having two or more secondary windings, each supplying a separate load, e.g. for radio set power supplies
- H01F 30/06 . characterised by the structure
- H01F 30/08 . . without magnetic core
- H01F 30/10 . . Single-phase transformers ( **[H01F 30/16](#) takes precedence** )
- H01F 30/12 . . Two-phase, three-phase or polyphase transformers
- H01F 30/14 . . . for changing the number of phases
- H01F 30/16 . . Toroidal transformers

**H01F 36/00** **Transformers with superconductive windings or with windings operating at cryogenic temperature ( **superconducting magnets or superconducting coils [H01F 6/00](#)** )**

**H01F 37/00** **Fixed inductances not covered by group [H01F 17/00](#)**

- H01F 37/005 . { without magnetic core }
- H01F 38/00 Adaptations of transformers or inductances for specific applications or functions**
- H01F 2038/003 . High frequency transformer for microwave oven
- H01F 2038/006 . matrix transformer consisting of several interconnected individual transformers working as a whole
- H01F 38/02 . for non-linear operation
- H01F 38/023 .. { of inductances }
- H01F 2038/026 ... non-linear inductive arrangements for converters, e.g. with additional windings
- H01F 38/04 .. for frequency changing
- H01F 38/06 .. for changing the wave shape
- H01F 38/08 . High-leakage transformers or inductances
- H01F 38/085 .. { Welding transformers }
- H01F 38/10 .. Ballasts, e.g. for discharge lamps
- H01F 38/12 . Ignition, e.g. for IC engines
- H01F 2038/122 .. with rod-shaped core
- H01F 2038/125 .. with oil insulation
- H01F 2038/127 .. with magnetic circuit including permanent magnet
- H01F 38/14 . Inductive couplings { ( for charging batteries from ac mains by converters [H02J 7/025](#) ) }
- H01F 2038/143 .. for signals
- H01F 2038/146 .. in combination with capacitive coupling
- H01F 38/16 . Cascade transformers, e.g. for use with extra high tension
- H01F 38/18 . Rotary transformers
- H01F 38/20 . Instruments transformers
- H01F 38/22 .. for single phase ac
- H01F 38/24 ... Voltage transformers
- H01F 38/26 .... Constructions
- H01F 38/28 ... Current transformers
- H01F 38/30 .... Constructions
- H01F 2038/305 ..... with toroidal magnetic core
- H01F 38/32 .... Circuit arrangements
- H01F 38/34 ... Combined voltage and current transformers
- H01F 38/36 .... Constructions
- H01F 38/38 .. for polyphase ac
- H01F 38/40 .. for dc

- H01F 38/42 . Flyback transformers
- H01F 2038/423 . . with adjusting potentiometers
- H01F 2038/426 . . with gap in transformer core

**H01F 41/00 Apparatus or processes specially adapted for manufacturing or assembling the devices covered by this subclass**

- H01F 41/005 . { Impregnating or encapsulating ( insulating of windings [H01F 41/12](#) ) }
- H01F 41/02 . for manufacturing cores, coils, or magnets ( [H01F 41/14](#) takes precedence; for dynamo-electric machines [H02K 15/00](#) )
- H01F 41/0206 . . { Manufacturing of magnetic cores by mechanical means ( magnetic cores per se [H01F 27/24](#) ) }
- H01F 41/0213 . . . { Manufacturing of magnetic circuits made from strip(s) or ribbon(s) ( magnetic cores made by winding a ribbon [H01F 27/25](#) ) }
- H01F 41/022 . . . . { by winding the strips or ribbons around a coil }
- H01F 41/0226 . . . . { from amorphous ribbons }
- H01F 41/0233 . . . { Manufacturing of magnetic circuits made from sheets ( magnetic cores made from sheets [H01F 27/245](#) ; soft magnetic alloys in the form of sheets [H01F 1/16](#) ) }
- H01F 41/024 . . . . { Manufacturing of magnetic circuits made from deformed sheets ( magnetic cores made from deformed sheets [H01F 27/2455](#) ) }
- H01F 41/0246 . . . { Manufacturing of magnetic circuits by moulding or by pressing powder ( magnetic cores made by moulding or by pressing powder [H01F 27/255](#) ; soft magnetic particles [H01F 1/20](#) , [H01F 1/36](#) ) }
- H01F 41/0253 . . { for manufacturing permanent magnets }
- H01F 41/026 . . . { protecting methods against environmental influences, e.g. oxygen, by surface treatment ( magnetic particles with skin [H01F 1/061](#) , [H01F 1/09](#) , [H01F 1/24](#) , [H01F 1/33](#) and [G11B 5/706](#) ) }
- H01F 41/0266 . . . { Moulding; Pressing ( [H01F 41/0273](#) takes precedence; hard magnetic particles [H01F 1/06](#) , [H01F 1/11](#) ) }
- H01F 41/0273 . . . { Imparting anisotropy ( methods and devices for magnetising permanent magnets [H01F 13/003](#) ) }
- H01F 41/028 . . . . { Radial anisotropy ( for rotor or stator bodies [H02K 15/02](#) ) }
- H01F 41/0286 . . . { Trimming }
- H01F 41/0293 . . . { diffusion of rare earth elements, e.g. Tb, Dy or Ho, into permanent magnets }
- H01F 41/04 . . for manufacturing coils { ( coils for transformer or inductances [H01F 27/28](#) ) }
- H01F 41/041 . . . { Printed circuit coils ( apparatus or processes for manufacturing printed circuits in general [H05K 3/00](#) ) }
- H01F 41/042 . . . . { by thin film techniques }
- H01F 41/043 . . . . { by thick film techniques }
- H01F 41/045 . . . . { Trimming }
- H01F 41/046 . . . . { structurally combined with ferromagnetic material }
- H01F 41/047 . . . . { structurally combined with superconductive material }
- H01F 41/048 . . . { Superconductive coils }
- H01F 41/06 . . . Winding

|                |       |  |
|----------------|-------|--|
| H01F 41/0604   | ....  | { Winding sheet material }   |
| H01F 41/0608   | ..... | { with insulation }  |
| H01F 41/0612   | ....  | { Winding wire material }  |
| H01F 41/0616   | ..... | { with insulation }  |
| H01F 41/062    | ..... | { the insulation being strip material }  |
| H01F 41/0625   | ..... | { Winding more than one wire }   |
| H01F 41/0629   | ..... | { Twisting }   |
| H01F 41/0633   | ....  | { Devices for guiding or positioning the winding material on the winding form }  |
| H01F 41/0637   | ..... | { forming pancake coils }  |
| H01F 41/0641   | ..... | { positioning the winding material in a special configuration on the winding form ( <a href="#">orthocyclic coils</a> , <a href="#">open mesh coils</a> ) }                                      |
| H01F 41/0645   | ..... | { using revolving flyers }   |
| H01F 41/065    | ....  | { Winding coils of special form }  |
| H01F 41/0654   | ..... | { Winding on elongate winding forms }  |
| H01F 41/0658   | ..... | { Winding flat coils }   |
| H01F 2041/0662 | ..... | Winding saddle or deflection coils   |
| H01F 41/0666   | ....  | { Winding with terminal wrapping or soldering; Winding while forming taps or terminals }   |
| H01F 41/067    | ....  | { Winding machines having a plurality of work holders or winding forms }   |
| H01F 41/0675   | ..... | { Turrets, turntables }  |
| H01F 41/0679   | ....  | { Tensioning or braking devices }  |
| H01F 41/0683   | ....  | { Dispensing or feeding devices }  |
| H01F 41/0687   | ....  | { Winding mandrels, winding forms }  |
| H01F 41/0691   | ....  | { Winding with deformation of the winding material section }   |
| H01F 41/0695   | ....  | { Winding while measuring electrical characteristics }   |
| H01F 41/08     | ....  | Winding conductors onto or threading conductors through cores or formers which are closed in themselves, e.g. toroids ( <a href="#">for interconnecting digital storage elements G11C 5/12</a> ) |
| H01F 41/10     | ...   | Connecting leads to windings ( <a href="#">making electric connections in general H01R 43/00</a> )   |
| H01F 41/12     | ...   | Insulating of windings ( { <a href="#">impregnating or encapsulating of transformers H01F 41/005</a> } ; of conductors in general <a href="#">H01B 13/06</a> )                                   |
| H01F 41/122    | ....  | { Insulating between turns or between winding layers }   |
| H01F 41/125    | ....  | { Other insulating structures; Insulating between coil and core, between different winding sections, around the coil }   |
| H01F 41/127    | ....  | { Encapsulating or impregnating ( <a href="#">encapsulating coil and core H01F 41/005</a> ) }  |
| H01F 41/14     | .     | for applying magnetic films to substrates ( <a href="#">covering metals, or materials with metals, in general C23C</a> ; <a href="#">manufacturing record carriers G11B 5/84</a> )               |

**NOTE**

Group [H01F 41/30](#) takes precedence over groups [H01F 41/16](#) to [H01F 41/24](#) , and over group [H01F 41/32](#)

- H01F 41/16 .. the magnetic material being applied in the form of particles, e.g. by serigraphy { i.e. forming thick magnetic films and precursors therefor, e.g. magnetisable pastes, inks, glass frits ( [H01F 41/18](#) to [H01F 41/24](#) take precedence; thick magnetic films [H01F 1/0027](#) ) }
- H01F 41/18 .. by cathode sputtering
- H01F 41/183 ... { Sputtering targets therefor }
- H01F 41/186 ... { for applying a magnetic garnet film ( magnetic garnet materials [H01F 1/346](#) ; magnetic garnet films [H01F 10/24](#) ) }
- H01F 41/20 .. by evaporation
- H01F 41/205 ... { by laser ablation, e.g. pulsed laser deposition (PLD) }
- H01F 41/22 .. Heat treatment ; Thermal decomposition ; Chemical vapour deposition
- H01F 41/24 .. from liquids
- H01F 41/26 ... using electric currents { e.g. electroplating }
- H01F 41/28 ... by liquid phase epitaxy
- H01F 41/30 .. for applying nanostructures, e.g. by molecular beam epitaxy (MBE)
- H01F 41/301 ... { for applying ultrathin or granular layers ( ultrathin or granular layers [H01F 10/007](#) ) }
- H01F 41/302 ... { for applying spin-exchange-coupled multilayers, e.g. nanostructured superlattices ( spin-exchange-coupled multilayers [H01F 10/32](#) ) }
- H01F 41/303 .... { with exchange coupling adjustment of magnetic film pairs, e.g. interface modifications by reduction, oxidation }
- H01F 41/304 ..... { using temporary decoupling, e.g. involving blocking, Néel or Curie temperature transitions by heat treatment in presence/absence of a magnetic field }
- H01F 41/305 .... { applying the spacer or adjusting its interface, e.g. in order to enable particular effect different from exchange coupling }
- H01F 41/306 ..... { conductive spacer }
- H01F 41/307 ..... { insulating or semiconductive spacer }
- H01F 41/308 .... { lift-off processes, e.g. ion milling, for trimming or patterning }
- H01F 41/309 .... { electroless or electrodeposition processes from plating solution }
- H01F 41/32 . for applying conductive, insulating or magnetic material on a magnetic film { , specially adapted for a thin magnetic film }
- H01F 41/325 .. { applying a noble metal capping on a spin-exchange-coupled multilayer e.g. spin filter deposition }

### **WARNING**

This groups is not complete pending the completion of reclassification; see provisionally also [H01F 41/32](#)

- H01F 41/34 .. in patterns, e.g. by lithography