

## 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](#)}; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers [H04R](#); thermomagnetic devices [H10N 15/00](#))**

### Definition statement

*This place covers:*

Magnets or magnetic bodies characterised by the magnetic materials therefor. Selection of materials for their magnetic properties ([H01F 1/00](#)).

Thin magnetic films ([H01F 10/00](#)).

Permanent magnets ([H01F 7/00](#)).

Electromagnets ([H01F 7/00](#)) including, for example, superconductive magnets ([H01F 6/00](#)); details thereof such as coils ([H01F 5/00](#)), cores, yokes, and armatures ([H01F 3/00](#)).

Fixed and variable transformers including, for example, superconductive or cryogenic transformers; adaptations thereof for specific applications or functions; details thereof ([H01F 19/00](#), [H01F 21/00](#), [H01F 27/00](#), [H01F 29/00](#), [H01F 30/00](#), [H01F 36/00](#), [H01F 38/00](#)).

Fixed and variable inductances; adaptations thereof for specific applications or functions; details thereof ([H01F 17/00](#), [H01F 21/00](#), [H01F 27/00](#), [H01F 29/00](#), [H01F 37/00](#), [H01F 38/00](#)).

Apparatus or processes for magnetising or demagnetising ([H01F 13/00](#)).

Apparatus or processes specially adapted for manufacturing or assembling devices covered by this subclass ([H01F 41/00](#)).

Further information:

Groups [H01F 17/00](#) - [H01F 38/00](#) (with the exception of groups [H01F 27/42](#) and [H01F 38/32](#)) cover only structural or constructional aspects of transformers, inductive reactors, chokes or the like. These groups do not cover circuit arrangement of such devices, which are covered by the appropriate functional places.

### References

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Magnets used to separate solid materials from other solid materials or fluids	<a href="#">B03C 1/00</a>
Magnetic work holders	<a href="#">B23Q 3/00</a> , <a href="#">B25B 11/00</a>
Apparatus or processes for degaussing ships	<a href="#">B63G 9/06</a>
Lifting magnets	<a href="#">B66C 1/00</a>
Magnets or electromagnets in electric meters	<a href="#">G01R</a>
Devices for demagnetising parts of clocks and watches	<a href="#">G04D 9/00</a>
Magnetic record carriers	<a href="#">G11B 5/00</a>

## Application-oriented references

Apparatus or processes specially adapted for manufacturing magnetic record carriers	<a href="#">G11B 5/84</a>
Thin-film magnetic stores	<a href="#">G11C</a>
Apparatus or processes for threading magnetic cores in digital storage elements	<a href="#">G11C 5/12</a>
Magnets or electromagnets in relays	<a href="#">H01H</a>
Magnets or electromagnets in dynamo-electric machines	<a href="#">H02K</a>
Methods or apparatus specially adapted for manufacturing, assembling, maintaining or repairing dynamo-electric machines, e.g. forming windings prior to mounting into the machine	<a href="#">H02K 15/00</a>
Arrangements for controlling transformers, reactors or choke coils for the purpose of obtaining a desired output	<a href="#">H02P 13/00</a>
Magnetic amplifiers	<a href="#">H03F</a>
Impedance networks	<a href="#">H03H</a>
Demagnetising arrangements for color television	<a href="#">H04N 9/29</a>
Acoustic electromechanical transducers having coils or permanent magnets	<a href="#">H04R</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Powder metallurgy	<a href="#">B22F</a>
Iron oxides (not sintered)	<a href="#">C01G 49/02</a>
Ferrite based ceramics	<a href="#">C04B 35/26</a>
Ferrous alloys	<a href="#">C22C</a>
Coating by evaporation or sputtering	<a href="#">C23C 14/00</a>
Refrigeration machines using magnetic effects	<a href="#">F25B 21/00</a>
Magneto-optical devices	<a href="#">G02F 1/09</a>
Sensing record carriers using inductive or magnetic sensors	<a href="#">G06K 7/08</a>
Semiconductor devices having potential barriers controllable by variation of the magnetic field applied to the devices	<a href="#">H01L 29/82</a>
Screening of electric apparatus against magnetic fields	<a href="#">H05K 9/00</a>
Thermomagnetic devices	<a href="#">H10N 15/00</a>
Magnetostrictive devices	<a href="#">H10N 35/00</a>
Devices using galvano-magnetic or similar magnetic effects	<a href="#">H10N 50/00</a> , <a href="#">H10N 52/00</a>

**Special rules of classification**

- Groups [H01F 17/00](#) - [H01F 38/00](#) (with the exception of groups [H01F 27/42](#) and [H01F 38/32](#)) cover only structural or constructional aspects of transformers, inductive reactors, chokes or the like. These groups do not cover circuit arrangement of such devices, which are covered by the appropriate functional places.
- Documents are classified with a CPC symbol according to the invention information mainly found in the claims with due regard given to the description and the figures. Additional information found in the claims and in the description and figures, which might be relevant for future searches is given an Indexing Code symbol.

## Special rules of classification

- Main groups [H01F 1/00](#), [H01F 10/00](#) and subgroups [H01F 41/14-H01F 41/34](#):

Classification proceeds by assigning the most restricted possible CPC symbol to the document, followed by additional knowledge tagging using Indexing Code symbols. This implies that CPC head subgroups (corresponding to IPC subgroups) should only be used if no other possibility could be found for classifying the document in a more restricted subgroup.

If the set of claims comprises product or article and method claims an CPC symbol should be assigned to each of these categories. However if the most suitable subgroup for a claim of a given category, e.g. product, does not exist in the main group of the same category, e.g. product group, and can only be found in groups of another corresponding category, e.g. a group for a method to manufacture the product, this latter subgroup should be assigned to the claim e.g. method subgroup assigned to a product claim. For example a document with no method claims dealing with a magnetic tunnel junction in which the spacer has been processed in such a way that its material structure becomes inventive, would still be given the method CPC symbol [H01F 41/307](#) as product CPC symbol [H01F 10/3254](#) is silent over any material inventive features.

Another use of Indexing Codes can be made for particular cases where the invention is a specific property of a given type of material or article and this property is classified only in subgroups of another specific material type. In this case the corresponding CPC symbol cannot be given. Consequently the Indexing Code should be given together with an CPC symbol corresponding to the material described in the document. For example: a sintered nanocomposite exchange spring magnet of SmCo/Fe cannot be given [H01F 1/0579](#) as CPC symbol since the latter symbol belongs to NdFeB magnets classification subtree. Therefore the combination [H01F 1/0557](#) and [H01F 1/0579](#) should be used.

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

compound	homogenous substance comprising at least two elements, having a non-metallic character and a specific (fixed) composition ratio, including also intermetallic compounds.
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## H01F 1/00

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

#### Definition statement

*This place covers:*

Bulk magnetic materials: antiferromagnetic, diamagnetic, paramagnetic, hard and soft ferromagnetic materials.

0D, 1D and 2D magnetic (nano)structures.

Materials cover metallic materials, compounds (i.e. mainly non-metallic materials) or organic materials. Selected types of magnetic materials are highlighted within specific subgroups.

[H01F 1/00](#) is mainly concerned with bulk materials except for some specific subgroups.

[H01F 1/0009](#) covers antiferromagnetic bulk material.

[H01F 1/0018](#) covers diamagnetic or paramagnetic bulk material.

[H01F 1/0027](#) covers thick magnetic films formed with methods classified under [H01F 41/16](#).

## References

### Limiting references

*This place does not cover:*

Methods to manufacture magnetic hard or soft articles out of said materials	<a href="#">H01F 41/00-</a> <a href="#">H01F 41/0293</a>
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### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Working metallic powder; manufacturing powder (related to <a href="#">H01F 1/0045</a> ; <a href="#">H01F 1/06</a> ; <a href="#">H01F 1/20- H01F 1/28</a> )	<a href="#">B22F 1/00</a> , <a href="#">B22F 1/16</a> , <a href="#">B22F 9/00</a>
Iron oxides carriers (related to <a href="#">H01F 1/342</a> , <a href="#">H01F 1/36</a> )	<a href="#">C01G 49/02</a>
Making alloys by powder metallurgy (related to <a href="#">H01F 1/0045</a> ; <a href="#">H01F 1/06</a> ; <a href="#">H01F 1/20- H01F 1/28</a> ; <a href="#">H01F 1/14766</a> ; <a href="#">H01F 1/14708</a> )	<a href="#">C22C 1/04</a>
Non-ferrous alloys containing 5-50% by weight of oxides, carbides, borides, nitrides, silicides etc. (related to <a href="#">H01F 1/09</a> , <a href="#">H01F 1/33</a> , <a href="#">H01F 1/14708</a> , <a href="#">H01F 1/14766</a> )	<a href="#">C22C 32/00</a>
Making ferrous alloys (related to <a href="#">H01F 1/14708</a> , <a href="#">H01F 1/14766</a> )	<a href="#">C22C 33/00</a>
Cast iron alloys (related to <a href="#">H01F 1/14708</a> , <a href="#">H01F 1/14766</a> )	<a href="#">C22C 37/00</a>
Ferrous alloys (related to <a href="#">H01F 1/14708</a> , <a href="#">H01F 1/14766</a> )	<a href="#">C22C 38/00</a>
Amorphous alloys and related processes (related to <a href="#">H01F 1/153</a> )	<a href="#">C22C 45/00</a>
Single crystal growth, unidirectional solidification (related to <a href="#">H01F 1/0072</a> )	<a href="#">C30B</a>
Electromagnetic interference suppressing, shielding (related to <a href="#">H01F 1/26</a> , <a href="#">H01F 1/28</a> )	<a href="#">H05K 9/0073</a>

### Special rules of classification

Treatment of the materials, e.g. compacting, sintering, bonding are also classified into this group.

## H01F 1/0027

**{Thick magnetic films (forming thick magnetic films [H01F 41/16](#))}**

### Definition statement

*This place covers:*

Thick magnetic films characterized by being manufactured with methods associated under [H01F 41/16](#). This subgroup encompasses single layers and multiple layers of thick films. This subgroup primarily includes soft magnetic thick films but also includes hard magnetic thick films meeting the above requirements.

Thick magnetic films can be distinguished from thin magnetic films by assessing their respective manufacturing methods:

Thick magnetic films are typically obtained from magnetic particles and bonding agent, according to manufacturing methods of groups [H01F 41/16](#) thereby forming a composite film.

Thin magnetic films are typically obtained by deposition or plating of magnetic material, according to manufacturing methods of groups [H01F 41/18-H01F 41/34](#).

## References

### Limiting references

*This place does not cover:*

Forming thick magnetic films	<a href="#">H01F 41/16</a>
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### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Magnetic record carriers	<a href="#">G11B 5/70</a>
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## Special rules of classification

Hard magnetic thick films applied in magnetic record carriers are classified under [G11B 5/70](#).

Hard magnetic thick films forming permanent magnets are classified according to the composition of the magnetic particles; i.e. under [H01F 1/047](#) and its subgroups, primarily under [H01F 1/0533](#), [H01F 1/0558](#) or [H01F 1/0578](#). When the composition of the magnetic particles is nominal, i.e. not a restriction, classification will usually fall under [H01F 1/08](#) and its subgroups, i.e. [H01F 1/083](#).

## 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 [H10N 50/10](#))}

## Definition statement

*This place covers:*

These subgroups cover:

0D, 1D and 2D magnetic (nano)structures wherein the size and carriers confinement alters the magnetic properties. Embedded magnetic nanostructures.

## References

### Limiting references

*This place does not cover:*

Hard magnetic particles	<a href="#">H01F 1/06</a> - <a href="#">H01F 1/09</a> and <a href="#">H01F 1/11</a> - <a href="#">H01F 1/117</a>
Nanosized particles used in magnetic cores, electromagnetic noise suppressing sheets	<a href="#">H01F 1/20</a> - <a href="#">H01F 1/33</a> and <a href="#">H01F 1/36</a> - <a href="#">H01F 1/38</a>
Magnetorheological fluids	<a href="#">H01F 1/44</a> - <a href="#">H01F 1/447</a>

**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Nuclear magnetic resonance imaging: preparations for testing in vivo including magnetic particles	<a href="#">A61K 49/06</a>
Magnetic separation process including magnetic particles	<a href="#">B03C 1/01</a>

**Special rules of classification**

1. Nanoparticles used in bioscreening (diagnostic, separation) are classified in these subgroups irrelevant of their composition and size effect.
2. If a strong effect of the size of the nanoparticles belonging to the groups cited in the above table is shown on the magnetic properties, then it is also classified in [H01F 1/0036-H01F 1/0063](#)

**H01F 1/01**

of inorganic materials ([H01F 1/44](#) takes precedence)

**Definition statement**

*This place covers:*

Magnetocaloric materials. Subdivided in metallic or compounds materials.

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Cryogenic machines using magnetic effects based on a magnetocaloric material	<a href="#">F25B 21/00</a>
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**H01F 1/03**

characterised by their coercivity {([H01F 1/40](#) takes precedence)}

**Definition statement**

*This place covers:*

Materials with specific coercivity; Laves phases or magnetic shape memory materials. Mainly those latter examples are classified in these subgroups.

**H01F 1/032**

of hard-magnetic materials

**Definition statement**

*This place covers:*

Hard magnetic metals or alloys characterised by composition, by shape and by the process or treatments to obtain articles including these materials.

Subgroup [H01F 1/0579](#) is concerned with nanocomposite exchange spring magnets.

[H01F 1/057](#) covers so-called R-T-B magnets (Nd<sub>2</sub>Fe<sub>14</sub>B phase).

[H01F 1/059](#) covers magnets with a  $\text{Sm}_2\text{Fe}_{17}\text{N}_2$  phase.

## References

### Limiting references

*This place does not cover:*

Permanent magnets with emphasis on the structure or use rather than the material	<a href="#">H01F 7/02</a>
Method claims directed at manufacturing or treating magnets	<a href="#">H01F 41/0253</a> - <a href="#">H01F 41/0293</a>
Actuators, dynamo-electric rotating machines, motors (related to <a href="#">H01F 1/053</a> - <a href="#">H01F 1/059</a> )	<a href="#">H02K 1/00</a>

### Special rules of classification

Magnets obtained from the corresponding materials are classified in the same subgroups according to method criteria (process or treatments undergone by the material forming the magnet) on which part of the classification refinement is based.

## H01F 1/06

in the form of particles, e.g. powder ([H01F 1/047](#) takes precedence {; record carriers [G11B 5/70605](#)})

### Definition statement

*This place covers:*

Hard magnetic metallic particles characterised by shape and by treatments to obtain articles including these materials.

The subgroups are generally concerned with particles used in magnetic recording or under subgroup [H01F 1/08](#) metallic particles for permanent magnets when composition is not specifically mentioned in the claims.

## References

### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Magnetic record carriers	<a href="#">G11B 5/00</a>
Magnetic record carriers (metal or alloy material, related to <a href="#">H01F 1/06+</a> )	<a href="#">G11B 5/70605</a>
Magnetic record carriers (non-metallic material, related to <a href="#">H01F 1/11</a> )	<a href="#">G11B 5/70626</a>
Apparatus or processes specially adapted for manufacturing magnetic record carriers	<a href="#">G11B 5/84</a>

## H01F 1/09

**mixtures of metallic and non-metallic particles; metallic particles having oxide skin**

### Definition statement

*This place covers:*

Hard magnetic non-metallic particles characterised by shape and by treatments to obtain articles including these materials.

[H01F 1/09](#) can cover hard metallic particles covered with an oxide layer

### Special rules of classification

For rare earth containing particles covered with an oxide layer, subgroups [H01F 1/0552](#) and [H01F 1/0572](#) would take precedence except if the oxide layer is the core of the invention.

## 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}**

### Definition statement

*This place covers:*

Hard non-metallic magnets such as Ba-ferrite type of magnets

## H01F 1/12

**of soft-magnetic materials**

### Definition statement

*This place covers:*

Soft magnetic metals or alloys characterised by composition, by shape and treatments to obtain articles including these materials.

### Special rules of classification

Fe-Ni and Fe-Si alloys and their shape are classified in the subgroups [H01F 1/14708-H01F 1/14791](#).

Other compositions than Fe-Ni, Fe-Si must be classified according to a shape criterion: subgroups [H01F 1/16](#) and onwards for sheets, [H01F 1/20](#) and onwards for particles and [H01F 1/143](#) for wires or for no specific shape given: subgroup [H01F 1/147](#). If no specific shape or composition criterion is given, the [H01F 1/14](#) symbol should be given.

## H01F 1/153

**Amorphous metallic alloys, e.g. glassy metals {(making ferrous amorphous alloys [C22C 33/003](#))}**

### Definition statement

*This place covers:*

Soft magnetic amorphous metals, also including nanocrystallites, characterised by composition and by methods to obtain articles including these materials.



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Security coding	<a href="#">G07D 7/00</a>
Alarms using amorphous ferromagnetic tags	<a href="#">G08B 13/2408</a>

## Special rules of classification

The method section of these subgroups has to be used in combination with the method subgroups [H01F 41/0206-H01F 41/0246](#).

### H01F 1/16

in the form of sheets ([H01F 1/147](#) takes precedence)

#### Definition statement

*This place covers:*

Soft magnetic sheet of metals or alloys.

[H01F 1/18](#) covers insulated sheets

### H01F 1/20

in the form of particles, e.g. powder ([H01F 1/147](#) takes precedence)

#### Definition statement

*This place covers:*

Soft magnetic particles of metals or alloys characterised by shape and by treatments or methods to obtain articles including these materials.

[H01F 1/20](#) covers particles

[H01F 1/22](#) covers compacted particles.

[H01F 1/24](#) covers insulated compacted particles.

[H01F 1/26](#) covers compacted particles wherein insulator are organic macromolecules.

Subgroup [H01F 1/28](#) concerns non compacted bodies.

## Special rules of classification

Soft magnetic particles compacted in a bonded body (magnetic core or noise suppressing sheet) are classified in [H01F 1/26](#) in combination with [H01F 41/0246](#) for magnetic cores only.

### H01F 1/33

mixtures of metallic and non-metallic particles; metallic particles having oxide skin

#### Definition statement

*This place covers:*

Soft metallic particles covered with an oxide layer.

## H01F 1/34

**non-metallic substances, e.g. ferrites**

### Definition statement

*This place covers:*

Soft non-metallic materials characterised by composition, by shape and treatments to obtain articles including these materials.

[H01F 1/34](#) covers bulk non metallic material such as ferrite.

[H01F 1/36](#) covers non-metallic particles.

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Ferrite based ceramics described only by chemical composition	<a href="#">C04B 35/26</a>
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### Special rules of classification

Subgroup [H01F 1/24](#) would take precedence in the case of oxide insulated particles being part of a compacted body.

## H01F 1/40

**of magnetic semiconductor materials, e.g. CdCr<sub>2</sub>S<sub>4</sub> (devices using galvanomagnetic or similar effects [H10N 50/00](#))**

### Definition statement

*This place covers:*

Magnetic semiconductors and half-metals (Heusler).

### Special rules of classification

Perovskites ([H01F 1/407](#)) and half-metals ([H01F 1/408](#)) are classified under the arborescence of magnetic semiconductors even if they might not be necessarily a semiconducting material.

## H01F 1/42

**of organic or organo-metallic materials {, e.g. graphene} ([H01F 1/44](#) takes precedence)**

### Definition statement

*This place covers:*

Organic or organo-metallic materials.

## H01F 1/44

of magnetic liquids, e.g. ferrofluids (particles in a bonding agent [H01F 1/28](#), [H01F 1/36](#), {[H01F 1/37](#)})

### Definition statement

*This place covers:*

Magnetic and magnetorheologic fluids.

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Nuclear magnetic resonance imaging: preparations for testing in vivo including magnetic particles	<a href="#">A61K 49/06</a>
Magnetorheological fluid dampers including a ferrofluid	<a href="#">F16F 9/535</a>

## H01F 3/00

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

### Definition statement

*This place covers:*

Cores, yokes and armatures which are single parts or arrangements of several parts of ferromagnetic material used to guide magnetic flux.

Further information:

- Cores, yokes and armatures are covered by [H01F 3/00](#) if:- no specific application is mentioned,- a special application is mentioned for which no specific subgroup exists elsewhere,- they comprise specific features for which no subgroups exist in the specific subgroup for the application (e.g. transformer cores which are normally classified in [H01F 27/24](#) have to be classified in [H01F 3/10](#) if they are made from a combination of materials and in [H01F 3/14](#) if they comprise air gaps).
- [H01F 3/02](#) and [H01F 3/04](#):A core made from a stack of strips is covered by [H01F 3/02](#) although this subgroup refers to sheets.The subgroup [H01F 3/04](#) for strips and ribbons predominantly covers cores which are fabricated by winding the strips on a mandrel.

### References

#### Limiting references

*This place does not cover:*

Magnetic materials per se	<a href="#">H01F 1/00</a>
Permanent magnets	<a href="#">H01F 7/02</a>

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Magnet cores of signal inductances	<a href="#">H01F 17/04</a>
Details of magnet cores of transformers or inductances in general	<a href="#">H01F 27/24</a>

Application-oriented references

Magnetic shunt path in the case of transformers/inductances ( related to <a href="#">H01F 3/12</a> )	<a href="#">H01F 27/38</a>
Apparatus or processes for manufacturing magnet cores	<a href="#">H01F 41/0206</a>
Magnetic cores for electric motors/generators	<a href="#">H02K 1/00</a>

## H01F 5/00

**Coils (superconducting coils [H01F 6/06](#); fixed inductances of the signal type [H01F 17/00](#))**

### Definition statement

*This place covers:*

Printed coils.

Wound electric conductors.

Further information:

- Coils are covered by [H01F 5/00](#), if:- no specific application is mentioned,- a special application is mentioned for which no specific subgroups exist elsewhere,- they comprise specific features for which no subgroups exist in the specific subgroup for the application (e.g. a bobbin for an electromagnet is classified in [H01F 5/02](#) although electromagnets are normally classified in [H01F 7/06](#)).
- [H01F 5/04](#):This subgroup predominantly refers to terminals attached to bobbins.Bobbins characterised by details for attaching terminals are classified here and not in the subgroup [H01F 5/02](#) for bobbins.

### References

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Superconducting coils	<a href="#">H01F 6/06</a>
Printed coils for signal inductances	<a href="#">H01F 17/0006</a>
Coils for transformers/inductances	<a href="#">H01F 27/28</a>
Printed coils for transformers/inductances	<a href="#">H01F 27/2804</a>
Bobbins for transformers/inductances (related to <a href="#">H01F 5/02</a> )	<a href="#">H01F 27/325</a>
Bobbins in relation with apparatus or processes for manufacturing coils (related to <a href="#">H01F 5/02</a> )	<a href="#">H01F 41/098</a>
Loop aerials (antennae)	<a href="#">H01Q 7/00</a>
Coils for electric motors/generators	<a href="#">H02K 3/00</a>
Coil arrangements for induction heating	<a href="#">H05B 6/36</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Apparatus or processes for manufacturing coils	<a href="#">H01F 41/04</a>
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## Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "former" and "bobbin, spool, (coil/winding) support, (coil/winding) body, tube, sleeve"
- "coil" and "winding, solenoid"

## H01F 6/00

**Superconducting magnets; Superconducting coils {(magnetic resonance assemblies using superconducting coil systems [G01R 33/3815](#))}**

### Definition statement

*This place covers:*

Superconducting magnets and coils and accessories necessary to operate them.

Further information:

- Superconducting magnets can be superconducting bulk pieces cooled below the critical temperature in a magnetic field or superconducting coils. For use as magnets, the coils are often shorted ("persistent mode" or "persistent current mode").
- Constructive details of inductive superconducting current limiters are covered by [H01F 6/00](#).

## References

### Limiting references

*This place does not cover:*

Superconductive cables	<a href="#">H01B 12/00</a>
Devices using superconductivity in general	<a href="#">H10N 60/00</a>
Resistive superconducting current limiters (related to <a href="#">H01F 6/00</a> )	<a href="#">H10N 60/30</a>

### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Superconducting transformers	<a href="#">H01F 36/00</a>
Superconducting coils used in magnetic separation of materials (related to <a href="#">H01F 6/06</a> )	<a href="#">B03C 1/0337</a> , <a href="#">B03C 1/0355</a>
Magnet systems for NMR using superconducting coils (related to <a href="#">H01F 6/06</a> )	<a href="#">G01R 33/3815</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Apparatus or processes for manufacturing superconductive coils	<a href="#">H01F 41/048</a>
Emergency protective circuits for limiting excessive current using superconducting elements (related to <a href="#">H01F 6/00</a> )	<a href="#">H02H 9/023</a>

## 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](#))

### Definition statement

*This place covers:*

Magnets in general.

Further information:

- The two principal subgroups are [H01F 7/02](#) for permanent magnets and [H01F 7/06](#) for electromagnets.
- Electromagnets comprising permanent magnets in any part of the magnetic circuit are covered as follows:- by [H01F 7/1615](#) or [H01F 7/1646](#) if they comprise a rectilinearly movable armature,- by [H01F 7/122](#) if the armature is not or not only rectilinearly movable,- by [H01F 7/20](#) if they do not comprise a movable armature.

### References

#### Limiting references

*This place does not cover:*

Superconducting magnets	<a href="#">H01F 6/00</a>
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#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

#### [H01F 7/00](#) in general:

Magnets or electromagnets for electric meters	<a href="#">G01R</a>
Magnets or electromagnets for relays	<a href="#">H01H</a>
Magnets or electromagnets for dynamo-electric machines	<a href="#">H02K</a>

#### Permanent magnets ([H01F 7/02](#)):

Magnets for fastening garments	<a href="#">A41F 1/002</a>
Magnetic fasteners for bags	<a href="#">A45C 13/1069</a>
Magnets used to separate solid materials from other solid materials or fluids	<a href="#">B03C 1/00</a>
Chucks using magnetic means	<a href="#">B23B 31/28</a>
Devices for holding work using magnetic or electric force acting directly on the work	<a href="#">B23Q 3/15</a>

## Application-oriented references

Magnetic work holders	<a href="#">B25B 11/002</a>
Screwdrivers using magnetic means	<a href="#">B25B 23/12</a>
Gripping heads with magnetic holding means	<a href="#">B25J 15/0608</a>
Load-engaging elements for cranes attached by magnetic means	<a href="#">B66C 1/04</a>
Treatment of water by magnetic fields using permanent magnets	<a href="#">C02F 1/481</a>

**Electromagnets (H01F 7/06):**

Load engaging elements: electromagnetic means (related to <a href="#">H01F 7/20</a> )	<a href="#">B66C 1/06</a>
Magnet systems for NMR using electromagnets (related to <a href="#">H01F 7/20</a> )	<a href="#">G01R 33/381</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

**Permanent magnets (H01F 7/02):**

Demagnetization of permanent magnets by coils	<a href="#">H01F 13/006</a>
Fastening by use of magnets (jewellery, haberdashery)	<a href="#">A44D 2203/00</a>
Devices for hanging or supporting pictures, mirrors, or the like using magnetism	<a href="#">A47G 1/17</a>
Magnetic cleaning implements	<a href="#">A47L 13/41</a>
Magnetic dental implant retention systems	<a href="#">A61C 8/0081</a>
Magnetic fastening of teeth prostheses in mouth	<a href="#">A61C 13/235</a>
Toys: building blocks comprising magnetic interaction means	<a href="#">A63H 33/046</a>
Magnetic mixers/stirrers	<a href="#">B01F 33/45</a>
Securing wings by magnetic or electromagnetic attraction	<a href="#">E05C 19/16</a>
Devices for securing together, or preventing relative movement between, constructional elements or machine parts by the use of a magnetic material	<a href="#">F16B 2200/83</a>
Electromagnetic valve actuated using a permanent magnet	<a href="#">F16K 31/08</a>
Fastening of component parts of lighting devices using magnets	<a href="#">F21V 17/105</a>
Supporting, suspending, or attaching arrangements for lighting: magnetic devices	<a href="#">F21V 21/096</a>
Faraday rotators (magnetic field generation)	<a href="#">G02F 1/09</a>
Educational appliances having elements to be mounted on a support by means of magnets	<a href="#">G09B 1/08</a>
Educational appliances comprising elements to be used without a special support, the elements being connectible magnetically	<a href="#">G09B 1/38</a>
Planning boards using magnetic elements	<a href="#">G09B 29/002</a>

**Electromagnets (H01F 7/06):**

MEMS with flexible or deformable elements (related to <a href="#">H01F 7/08</a> )	<a href="#">B81B 3/00</a>
Valve-gear or valve arrangements actuated by electric means	<a href="#">F01L 9/20</a>

Electrical control of supply of combustible mixture or its constituents: output circuits, e.g. for controlling currents in command coils (related to <a href="#">H01F 7/18</a> )	<a href="#">F02D 41/20</a>
Fuel injectors using electromagnetic operating means	<a href="#">F02M 51/061</a>
Fuel injectors with movable windings (related to <a href="#">H01F 7/066</a> )	<a href="#">F02M 51/0696</a>
Control or regulating systems: automatic controllers (related to <a href="#">H01F 7/18</a> )	<a href="#">G05B 11/00</a>
Magnetic circuit arrangements for electromagnetic relays (related to <a href="#">H01F 7/081</a> )	<a href="#">H01H 50/16</a>
Electromagnetic relays in general	<a href="#">H01H 51/00</a>
Motors with reciprocating/oscillating/vibrating magnet/armature/coil	<a href="#">H02K 33/00</a>
Propulsion systems (e.g. linear motors)	<a href="#">H02K 41/00</a>
Acoustic electromechanical transducers having coils or permanent magnets	<a href="#">H04R</a>
Actuators based on magnetostriction	<a href="#">H10N 35/00</a>

### Special rules of classification

Although magnets are normally classified in the respective subgroups of an application when provided for, the presence of features for which an appropriate subgroup does not exist in the application main group but in [H01F 7/00](#), requires the respective subgroup in [H01F 7/00](#) to be allocated.

For example, an electromagnetically actuated valve which is normally classified in [F16K 31/06](#), should also be classified in [H01F 7/10](#) for details concerning the use of alternating current for powering the actuator.

## H01F 10/00

**Thin magnetic films, e.g. of one-domain structure (magnetic record carriers [G11B 5/00](#); thin-film magnetic stores [G11C](#))**

### Definition statement

*This place covers:*

Hard and soft ferromagnetic thin films. Antiferromagnetic thin films. Single layers and (spin-exchanged coupled) multilayers are both considered as thin films.

Thin film materials cover metallic materials, compounds or organic materials.

[H01F 10/00](#) is concerned with ferromagnetic or antiferromagnetic materials in the form of thin films.

A thin film is generally less than a couple of microns thick and can be defined as being manufactured by the methods classified in subgroups [H01F 41/18-H01F 41/34](#).

[H01F 10/002](#) covers antiferromagnetic, single layer, thin films.

[H01F 10/005](#) covers organic or organo-metallic thin films. Graphene thin films are also given this symbol in case magnetic properties are claimed.

[H01F 10/007](#) covers granular thin films.



## References

### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Measuring magnetic variables: magnetoresistive sensors (related to <a href="#">H01F 10/324</a> )	<a href="#">G01R 33/093</a>
Magnetic recording heads (related to <a href="#">H01F 10/324</a> )	<a href="#">G11B 5/127</a>

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Alloys based on Ni; alloys based on Co (related to <a href="#">H01F 10/14</a> ; <a href="#">H01F 10/16</a> )	<a href="#">C22C 19/00</a>
Ferrous alloys (related to <a href="#">H01F 10/14</a> )	<a href="#">C22C 38/00</a>
Amorphous alloys and related processes (related to <a href="#">H01F 10/13</a> )	<a href="#">C22C 45/00</a>
Single crystal growth of garnets (related to <a href="#">H01F 10/24</a> )	<a href="#">C30B 29/28</a>
Magneto-optic materials (related to <a href="#">H01F 10/24</a> )	<a href="#">G02F 1/0036</a>
Semiconductor devices with potential-jump barrier or surface barrier controllable by variation of the magnetic field applied to the devices, e.g. spin (valve) transistor, spin injection device (related to <a href="#">H01F 10/324</a> , <a href="#">H01F 10/1936</a> )	<a href="#">H01L 29/82</a>
Devices using magnetic effects; Selection of materials for (related to <a href="#">H01F 10/324</a> )	<a href="#">H10N 50/00</a> , <a href="#">H10N 50/85</a>

## H01F 10/06

characterised by the coupling or physical contact with connecting or interacting conductors

### Definition statement

*This place covers:*

Thin films characterised by contact with conductors.

## H01F 10/08

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

### Definition statement

*This place covers:*

Single layer thin films characterised by properties or composition.

## H01F 10/10

characterised by the composition

### Definition statement

*This place covers:*

Metallic single layer thin films characterised by their composition, e.g. amorphous, crystalline.

## H01F 10/18

being compounds

### Definition statement

*This place covers:*

Compounds single layer thin films characterised by their composition. Further divided in amorphous, magnetic semiconductors, half-metals (Heusler), perovskites and ferrites.

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Photonic crystals	<a href="#">G02B 6/1225</a>
Magneto-optic devices (Faraday-rotator)	<a href="#">G02F 1/09</a>

## H01F 10/26

characterised by the substrate or intermediate layers {([H01F 10/06](#) and [H01F 10/32](#) take precedence)}

### Definition statement

*This place covers:*

Multilayers characterised by intermediate layers.

[H01F 10/30](#) covers specific seed, template and cap layers.

## H01F 10/32

Spin-exchange-coupled multilayers, e.g. nanostructured superlattices {(applying spin-exchange-coupled multilayers to substrates [H01F 41/302](#))}

### Definition statement

*This place covers:*

Spin-exchanged-coupled multilayers characterised by the interaction between the different layers and refined by composition of the single interacting layers.

### Special rules of classification

Multilayers with perpendicular magnetic anisotropy of the type of (Co/Pt)<sub>n</sub> are also classified in [H01F 10/3236](#) but [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}

### Definition statement

*This place covers:*

Spin-exchanged-coupled multilayers characterised by having a thin non-magnetic spacer between magnetic layers.

Typical TMR and GMR structures.

### References

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Magnetic record carriers	<a href="#">G11B 5/00</a>
Magnetic storage elements, non volatile memories, MRAM	<a href="#">G11C 11/15</a> , <a href="#">G11C 11/16</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Magnetostrictive devices;	<a href="#">H10N 35/00</a>
Selection of materials therefor	<a href="#">H10N 35/85</a>

### Special rules of classification

Tunnel magnetic junctions (a tunnel barrier sandwiched between two magnetic layers) are classified in [H01F 10/3254](#).

However TMR junctions with additional pinning of one of the magnetic layers (by an AF layer or a SAF/AAF multilayer) do not have a subgroup of [H01F 10/3254](#) where they can be classified. Therefore an Indexing Code of [H01F 10/3268-H01F 10/3281](#) is generally additionally given.

Spin valves (GMR structures) with no specificity of the magnetic layers are generally classified under [H01F 10/325](#).

If no subgroup in [H01F 10/00](#) can reflect the invention of a product claim for a spin-exchanged-coupled multilayer, subgroup from the corresponding method subgroups [H01F 41/302-H01F 41/309](#) is assigned when appropriate.

## 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](#))

### Definition statement

*This place covers:*

Apparatus or processes for magnetising permanent magnets or for demagnetising magnetic bodies.

### References

#### Limiting references

*This place does not cover:*

Apparatus or processes for degaussing ships	<a href="#">B63G 9/06</a>
Demagnetising devices for clocks or watches	<a href="#">G04D 9/00</a>
Recording or erasing of information on magnetic record carriers	<a href="#">G11B 5/00</a>
Demagnetizing arrangements for colour televisions	<a href="#">H04N 9/29</a>

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Imparting anisotropy to permanent magnet material (e.g. aligning magnetic grains in a magnetic field)	<a href="#">H01F 41/0273</a>
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## 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](#))}

### Definition statement

*This place covers:*

Inductances of fixed value not used /useable for high power.

Further information:

"Signal type" means that these inductances are not used/useable for high power.

### References

#### Limiting references

*This place does not cover:*

Coils in general	<a href="#">H01F 5/00</a>
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Fixed inductances used/useable for high power	<a href="#">H01F 37/00</a>
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### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Adaptations of transformers for special applications or functions	<a href="#">H01F 38/00</a>
Inductive arrangements for semiconductor devices not otherwise provided for (related to <a href="#">H01F 17/0006</a> )	<a href="#">H01L 23/645</a>
Inductors for integrated circuits and corresponding multistep methods of manufacture (related to <a href="#">H01F 17/0006</a> )	<a href="#">H01L 28/10</a>
Loop aerials with ferromagnetic core (related to <a href="#">H01F 17/04</a> )	<a href="#">H01Q 7/06</a>
Impedance networks	<a href="#">H03H</a>
Printed circuits incorporating printed inductors (related to <a href="#">H01F 17/0006</a> )	<a href="#">H05K 1/165</a>

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Inductive arrangements or effects between of or between wiring layers of semiconductor devices (related to <a href="#">H01F 17/0006</a> )	<a href="#">H01L 23/5227</a>
Integrated circuits comprising only passive thin-film elements (related to <a href="#">H01F 17/0006</a> )	<a href="#">H01L 27/01</a>
Thin- or thick-film solid state devices (related to <a href="#">H01F 17/0006</a> )	<a href="#">H10N 97/00</a>

### Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "inductance" and "inductor, choke, reactor, reactance"

## H01F 19/00

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

### Definition statement

This place covers:

Transformers or coupled inductances.

Further information:

"Signal type" means that these transformers or inductances are not used/useable for high power.

The subgroups basically define different frequency ranges.

### References

#### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Transformers with superconductive windings	<a href="#">H01F 36/00</a>
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Adaptations of transformers or inductances for special applications or functions	<a href="#">H01F 38/00</a>
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## H01F 21/00

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

### Definition statement

*This place covers:*

Transformers or inductances which are variable and not used/useable for high power.

Further information:

- "Signal type" means that these transformers or inductances are not used/useable for high power.

### References

#### Limiting references

*This place does not cover:*

Variable inductances/transformers not being of the signal type (i.e. variable inductances/transformers used/useable for high power)	<a href="#">H01F 29/00</a>
Transformers with superconductive windings	<a href="#">H01F 36/00</a>
Magnetic amplifiers	<a href="#">H03F</a>

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Adaptations of transformers or inductances for special applications or functions	<a href="#">H01F 38/00</a>
Means for converting output of a sensing member to another variable: varying inductance	<a href="#">G01D 5/20</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Variable inductances including MEMS (related to <a href="#">H01F 21/04</a> or <a href="#">H01F 21/06</a> )	<a href="#">B81B 3/00</a>
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## H01F 27/00

**Details of transformers or inductances, in general**

### Definition statement

*This place covers:*

Constructional features of transformers or inductances in general.

Further information:

## Definition statement

In this group no distinction is made between "signal type" and "power type" applications except for the cases mentioned below. "Power type" means that these transformers or inductances are used/useable for high power.

[H01F 27/00](#) covers constructional features of transformers and inductances falling under the titles of [H01F 17/00](#) - [H01F 21/00](#) and [H01F 29/00](#) - [H01F 38/00](#). If a subgroup for a specific detail exists under [H01F 17/00](#) - [H01F 21/00](#) and [H01F 29/00](#) - [H01F 38/00](#), this subgroup takes precedence over [H01F 27/00](#).

[H01F 27/00](#) also covers details of cores, coils and magnetising arrangements in [H01F 3/00](#) - [H01F 7/00](#) and [H01F 13/00](#) if there is no appropriate subgroup for the respective constructional features in the [H01F 3/00](#) - [H01F 7/00](#) and [H01F 13/00](#).

- Example: cooling of coils: For superconducting coils ([H01F 6/00](#)), there is a subgroup for cooling covered by [H01F 6/04](#). For normal-conducting coils, however, which are classified generally in [H01F 5/00](#) and in [H01F 7/20](#) when used as electromagnet, no subgroups for cooling exist. Therefore, applications related to the cooling of normal-conducting coils or electromagnets, in addition to [H01F 5/00](#) or [H01F 7/20](#), have to be classified in an appropriate subgroup of [H01F 27/08](#).
- Although in general, no difference is made between "signal type" and "power type" applications in [H01F 27/00](#), this is not true for the mounting of transformers/inductances; [H01F 27/027](#) covers the mounting of "signal type" applications; [H01F 27/06](#) covers the mounting of "power type" applications.
- Details related to cooling: Cooling arrangements only for coils are covered by [H01F 27/2876](#); Cooling channels in the insulation of coils are covered by [H01F 27/322](#); Cooling of transformers/inductances, in general, is covered by [H01F 27/08](#) and subgroups; [H01F 27/14](#) covers a wide variety of accessories used for oil-cooled transformers/inductances like oil expansion chambers, gas cushions, oil filters.
- Details related to encapsulation: Devices encapsulated as a whole are covered by [H01F 27/022](#); Encapsulation only of a winding is covered by [H01F 27/327](#).
- Details related to electric/magnetic shields: Shields in general are covered by [H01F 27/36](#); Shields of the winding arrangement are covered by [H01F 27/288](#); Shields of pancake coils are covered by [H01F 27/2871](#).

## References

### Limiting references

*This place does not cover:*

Cooling of superconducting coils (related to <a href="#">H01F 27/08</a> )	<a href="#">H01F 6/04</a>
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### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Buchholz relays (for protecting oil-cooled transformers, related to <a href="#">H01F 27/14</a> and <a href="#">H01F 27/402</a> )	<a href="#">H01H 33/555</a>
Buchholz relays (for protecting oil-cooled transformers, related to <a href="#">H01F 27/14</a> and <a href="#">H01F 27/402</a> )	<a href="#">H02H 5/08</a>
Emergency protective circuits for transformers (related to <a href="#">H01F 27/402</a> )	<a href="#">H02H 7/04</a>
Arrangements for controlling transformers, reactors or choke coils for the purpose of obtaining a desired output (field not active anymore)	<a href="#">H02P 13/00</a>
Cooling of electrical devices in general (related to <a href="#">H01F 27/08</a> )	<a href="#">H05K 7/20</a>

## H01F 29/00

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

### Definition statement

*This place covers:*

Variable transformers or inductances of the "power type", i.e. used/useable for high power.

### References

#### Limiting references

*This place does not cover:*

Variable transformers or inductances of the signal type	<a href="#">H01F 21/00</a>
Details of tap change devices regarding the construction, opening mechanism and contact arrangement of the selector switches (related to <a href="#">H01F 29/02</a> )	<a href="#">H01H 9/0005</a>

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Adaptations of transformers or inductances for special applications or functions	<a href="#">H01F 38/00</a>
Use of variable transformers or inductances in automatic systems for regulating voltage or current	<a href="#">G05F 1/10</a>
Amplitude modulation by means of variable impedance element (related to <a href="#">H01F 29/14</a> )	<a href="#">H03C 1/08</a>
Magnetic amplifiers (related to <a href="#">H01F 29/14</a> )	<a href="#">H03F</a>

## H01F 30/00

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

### Definition statement

*This place covers:*

Fixed transformers of the "power type", i.e. used/useable for high power.

Further information:

- The subgroups define different general transformer structures.

### References

#### Limiting references

*This place does not cover:*

Fixed transformers of signal type	<a href="#">H01F 19/00</a>
Transformers with superconductive windings	<a href="#">H01F 36/00</a>



**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Adaptations of transformers for special applications or functions	<a href="#">H01F 38/00</a>
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**H01F 36/00**

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

**Definition statement**

*This place covers:*

Transformers with superconducting windings.

Transformers with windings operating at cryogenic temperature.

**References****Limiting references**

*This place does not cover:*

Superconducting magnets or coils	<a href="#">H01F 6/00</a>
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**Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Cooling of transformers in general	<a href="#">H01F 27/08</a>
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**H01F 37/00**

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

**Definition statement**

*This place covers:*

Fixed inductances of "power type", i.e. used/useable for high power.

**References****Limiting references**

*This place does not cover:*

Fixed inductances of signal type	<a href="#">H01F 17/00</a>
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**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Adaptations of inductances for special applications or functions	<a href="#">H01F 38/00</a>
Impedance networks	<a href="#">H03H</a>

## Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "inductance" and "inductor, choke, reactor, reactance"

## H01F 38/00

### Adaptations of transformers or inductances for specific applications or functions

#### Definition statement

*This place covers:*

Transformers or inductances for specific applications or functions.

Welding transformers and discharge lamp ballasts are covered by [H01F 38/08](#)

even if they do not explicitly have a high leakage (i.e. gap in magnetic flux path).

#### References

##### Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotary transformer for transmission of signals and/or power between stationary and moving part of an X-ray computed tomography (CT) apparatus (related to <a href="#">H01F 38/18</a> )	<a href="#">A61B 6/56</a>
Current collectors for power supply lines of electronically propelled vehicles without mechanical contact between collector and power supply line (related to <a href="#">H01F 38/14</a> )	<a href="#">B60L 5/005</a>
Charging electric vehicles by inductive power transfer (related to <a href="#">H01F 38/14</a> )	<a href="#">B60L 53/12</a>
For wireless supply or distribution of electric power using inductive coupling	<a href="#">H02J 50/10</a>
Near field transmission systems using inductive coupling (related to <a href="#">H01F 38/14</a> )	<a href="#">H04B 5/24</a>
Ignition circuits for discharge lamps (related to <a href="#">H01F 38/10</a> and <a href="#">H01F 38/12</a> )	<a href="#">H05B 41/00</a>

## H01F 41/00

### Apparatus or processes specially adapted for manufacturing or assembling magnets, inductances or transformers; Apparatus or processes specially adapted for manufacturing materials characterised by their magnetic properties

#### Definition statement

*This place covers:*

Apparatus or processes for manufacturing or assembling transformers, inductances, reactors or choke coils.

Apparatus or processes for manufacturing or assembling magnetic circuits, permanent magnets or coils.

Apparatus or processes for applying magnetic films to substrates and forming magnetic nanostructures.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Manufacturing articles from powder; (related to <a href="#">H01F 41/0246</a> )	<a href="#">B22F 3/00</a> , <a href="#">B22F 7/00</a>
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## H01F 41/005

{Impregnating or encapsulating (insulating of windings [H01F 41/12](#))}

### Definition statement

*This place covers:*

Methods for encapsulating/impregnating. Refers to cases where a whole device (e.g. coil and core of a transformer or a choke) is encapsulated.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Injection moulding incorporating preformed parts	<a href="#">B29C 45/14</a>
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### Special rules of classification

Encapsulation only of a winding is to be classified in [H01F 41/127](#).

## H01F 41/02

for manufacturing cores, coils, or magnets ([H01F 41/14](#) takes precedence; for dynamo-electric machines [H02K 15/00](#))

### Definition statement

*This place covers:*

Manufacturing of hard or soft magnetic articles. Manufacturing of coils.

## H01F 41/0206

{Manufacturing of magnetic cores by mechanical means (magnetic cores per se [H01F 27/24](#))}

### Definition statement

*This place covers:*

Methods and apparatus for manufacturing soft magnetic articles characterised by the shape of the magnetic material composing those articles. [H01F 41/14](#) takes precedence.

## References

### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Manufacturing of coils, cores or magnets for dynamo-electric machines	<a href="#">H02K 15/00</a>
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## H01F 41/0253

{for manufacturing permanent magnets}

### Definition statement

*This place covers:*

Methods and apparatus for manufacturing permanent magnets characterised by process steps performed on the magnetic material or on the magnets.

## References

### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Manufacturing of coils, cores or magnets for dynamo-electric machines	<a href="#">H02K 15/00</a>
---	----------------------------

## H01F 41/04

for manufacturing coils {(coils for transformer or inductances [H01F 27/28](#))}

### Definition statement

*This place covers:*

Methods and apparatus for manufacturing coils.

Further information:

The most important subgroups are related to:

- printed circuit coils ([H01F 41/041](#)),
- superconducting coils ([H01F 41/048](#)),
- winding ([H01F 41/06](#))
- insulating of windings ([H01F 41/12](#)).

## References

### Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Manufacturing of coils cores or magnets for dynamo-electric machines	<a href="#">H02K 15/00</a>
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## H01F 41/06

### Coil winding

#### Definition statement

*This place covers:*

Processes or apparatus for manufacturing coils by winding.

#### References

##### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

Winding or coil filamentary material	<a href="#">B65H 54/00</a>
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#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Former	Frame, e.g. composed of electrically insulating material, around which a coil is wound. Examples of former are bobbins, spools or winding supports
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## H01F 41/063

### with insulation

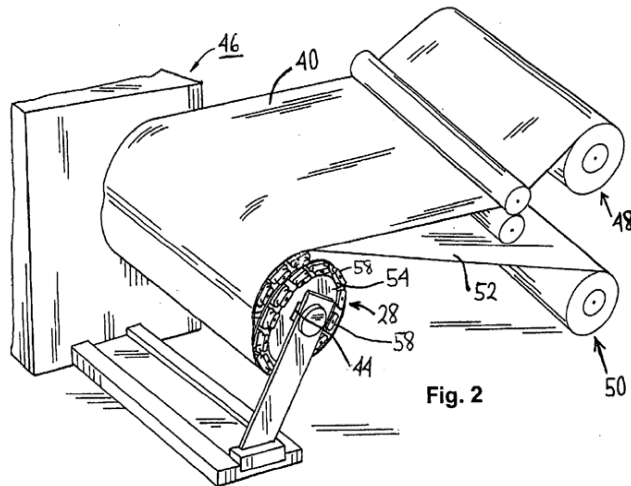
#### Definition statement

*This place covers:*

Processes or apparatus for winding flat conductive wires or sheets with insulation.

To be classified here, the conductive wires or sheets and the insulation must initially be separate, and must be wound simultaneously.

The figure below is an example of material classified in this subgroup. In the figure, the conductive sheet 40 and the insulating sheet 52 are wound simultaneously to form an insulated coil.



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Insulation of windings	<a href="#">H01F 5/06</a>
Insulating of coils, windings, or parts thereof	<a href="#">H01F 27/32</a>
Winding non-flat conductive wires with insulation	<a href="#">H01F 41/066</a>
Insulation of windings	<a href="#">H01F 41/12</a>

## H01F 41/066

### with insulation

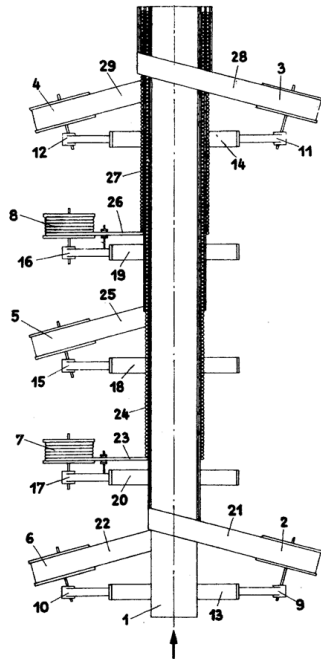
#### Definition statement

*This place covers:*

Processes or apparatus for winding non-flat conductive wires with insulation.

To be classified here, the conductive wires or sheets and the insulation must initially be separate and must be wound simultaneously.

The figure below is an example of material classified in this subgroup. In the figure, for example, the conductive wire 24 and the insulation tapes 21 and 22 are wound simultaneously to form an insulated coil.



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Insulation of windings	<a href="#">H01F 5/06</a>
Insulating of coils, windings, or parts thereof	<a href="#">H01F 27/32</a>
Winding flat conductive wires or sheets with insulation	<a href="#">H01F 41/063</a>
Insulation of windings	<a href="#">H01F 41/12</a>

## H01F 41/076

**Forming taps or terminals while winding, e.g. by wrapping or soldering the wire onto pins, or by directly forming terminals from the wire**

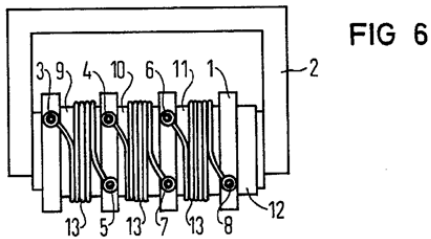
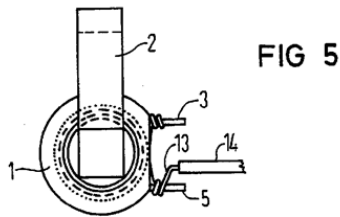
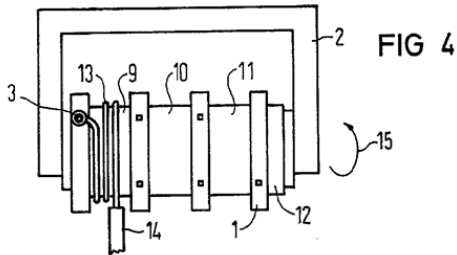
### Definition statement

*This place covers:*

Processes or apparatus for forming taps or terminals while, or in conjunction with winding.

The figure below is an example of material classified in this subgroup. In the figure, the first terminal 3 is wrapped, then the first section 9 of the bobbin 1 is wound. The wire is then wrapped around the

second terminal 5. The terminal connections are thus formed in conjunction with the winding of the bobbin.



## H01F 41/077

Deforming the cross section or shape of the winding material while winding

### Definition statement

*This place covers:*

Processes or apparatus for deforming the cross section or shape of the winding material in conjunction with winding.



The figure below is an example of material classified in this subgroup. In the figure, the circular material wire 50 is transformed into the deformed rectangular wire 52 just before winding.

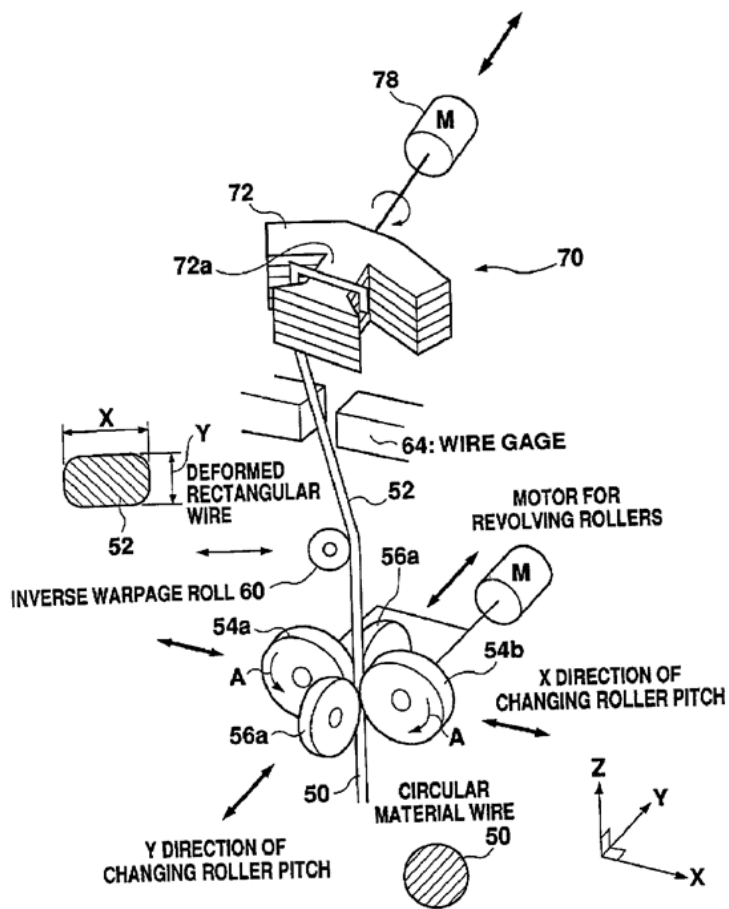


Fig. 13

## H01F 41/079

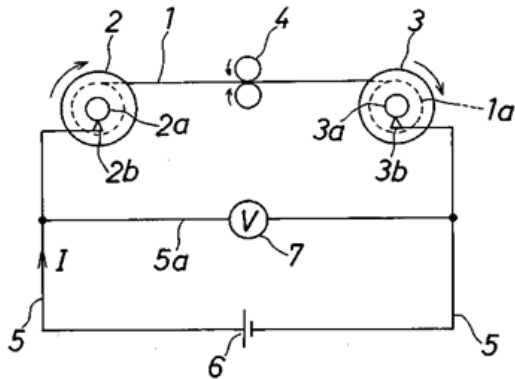
### Measuring electrical characteristics while winding

#### Definition statement

*This place covers:*

Processes or apparatus for winding coils while measuring electrical characteristics, e.g. resistance, inductance or capacitance.

The figure below is an example of material classified in this subgroup. In the figure, the existence of an electrical short circuit is detected by measuring voltage during winding.



## H01F 41/14

for applying magnetic films to substrates

### Definition statement

*This place covers:*

Thin films deposition methods not provided in subgroups below.

### References

#### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Manufacturing record carriers	<a href="#">G11B 5/84</a>
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#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Covering metals, or materials with metals	<a href="#">C23C</a>
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## H01F 41/16

the magnetic material being applied in the form of particles, e.g. by serigraphy {, to form thick magnetic films or precursors therefor} ([H01F 41/18](#) {-[H01F 41/24](#)} take precedence)

### Definition statement

*This place covers:*

Deposition methods and apparatus for forming thick magnetic films, usually performed by macroscopic methods.

The obtained material is a thick magnetic film or any precursor of thick magnetic film, generally in the form of magnetisable pastes, inks or glass frits.

## References

### Limiting references

*This place does not cover:*

Cathode sputtering	<a href="#">H01F 41/18</a>
Evaporation	<a href="#">H01F 41/20</a>
Heat treatment, thermal decomposition, Chemical vapour deposition	<a href="#">H01F 41/22</a>
Using liquids to apply magnetic films	<a href="#">H01F 41/24</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Thick films and precursors thereof	<a href="#">H01F 1/0027</a>
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## H01F 41/18

### by cathode sputtering

#### Definition statement

*This place covers:*

Deposition methods and apparatus for forming thin magnetic films characterised by deposition methods.

## H01F 41/22

### Heat treatment; Thermal decomposition; Chemical vapour deposition

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Coating by evaporation or sputtering	<a href="#">C23C 14/00</a>
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## H01F 41/24

### from liquids

#### Definition statement

*This place covers:*

Deposition from liquids.

[H01F 1/26](#) covers deposition from liquids using electric currents.

[H01F 1/28](#) covers deposition from liquids by liquid phase epitaxy.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Electrodeposition	<a href="#">C25D 3/00</a> , <a href="#">C25D 5/00</a>
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## H01F 41/30

for applying nanostructures, e.g. by molecular beam epitaxy [MBE]

### Definition statement

*This place covers:*

Deposition methods and apparatus for forming multilayered nanostructures, especially spin-exchange-coupled multilayers corresponding to product subgroups [H01F 10/324-H01F 10/3295](#), characterised by specific process steps leading to a specific change of properties of the grown superlattice ([H01F 41/303-H01F 41/304](#)) or to a given structure ([H01F 41/305-H01F 41/309](#)).

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Ion implantation	<a href="#">C23C 14/48</a>
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## H01F 41/32

for applying conductive, insulating or magnetic material on a magnetic film {, specially adapted for a thin magnetic film}

### Definition statement

*This place covers:*

Deposition methods and apparatus for applying a single layer on a magnetic thin film characterised by specific process steps.

[H01F 41/34](#) covers deposition in patterns (i.e. using lithography).

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Ion implantation	<a href="#">C23C 14/48</a>
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### Special rules of classification

Spin filters capping layers for TMR/GMR structures (products) are also classified within method subgroup [H01F 41/325](#).