

## H02H

**EMERGENCY PROTECTIVE CIRCUIT ARRANGEMENTS** (indicating or signalling undesired working conditions [G01R](#), e.g. [G01R 31/00](#), [G08B](#); locating faults along lines [G01R 31/08](#); emergency protective devices [H01H](#))

### Definition statement

*This place covers:*

Emergency electric circuit arrangements for the automatic protection of electric equipment used for generation, conversion, transmission or distribution of electric power in the event of an abnormal operating condition.

Thus the scope of this subclass is limited to protective circuits for the protection of power systems for: generating electric power (alternators, generators), converting electric power (power convertors in HVDC links, power motors for industrial applications, power transformers), transmission of electric power (High Voltage AC or HVDC lines or cables) or distribution of electric power (Medium voltage lines, cables and distribution switchgear and Low Voltage lines, cables and switchgear up to the sockets of secondary customers)

In this subclass, the protective circuit arrangements are classified :

A. according to the measures taken:

- Automatic disconnection by means of any type of switch (circuit-breaker, disconnecter, interrupter, fuse or static switches) directly responsive to an undesired change from normal electric or non-electric operating conditions with or without subsequent reconnection.
- Limiting excess current or voltage without disconnection.
- Preventing the switching-on in case an undesired working condition might result.

B. or/and by the device being protected, e.g. transformer, motor...

C. or/and by the model used to simulate the device

D. by details of one of the above, e.g. detection means

### Relationships with other classification places

Boards, substations, or switching arrangements	<a href="#">H02B</a>
Installation of electrical cables or lines	<a href="#">H02G</a>
Circuit arrangements for supplying or distributing electric power	<a href="#">H02J</a>
Dynamo-electric machines	<a href="#">H02K</a>
Electric converters	<a href="#">H02M</a>
Other electric machines	<a href="#">H02N</a>
Control or regulation of motors, generators	<a href="#">H02P</a>

### References

#### Limiting references

*This place does not cover:*

Protection involving charging/discharging batteries:	<a href="#">H02J 7/00</a>
Structural association of protection devices with motors or generators	<a href="#">H02K 11/00</a>

Protecting converters by control	<a href="#">H02M 1/32</a>
Protecting electric motors (e.g. providing protection against - overload) by control	<a href="#">H02P</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:*

Household appliances	<a href="#">A47</a> , <a href="#">D06F</a>
Electrically propelled vehicles	<a href="#">B60L</a> , <a href="#">B60M</a>
Vehicles	<a href="#">B60R</a>
Aircrafts	<a href="#">B64D</a>
Regulators	<a href="#">G05F</a>
Computers	<a href="#">G06F</a>
Circuit arrangements only comprising a combination of mechanical switches, static switches and overvoltage limiting devices for the purpose of special switching applications, e.g. DC	<a href="#">H01H 9/541</a>
Amplifiers	<a href="#">H03F</a>
Electronic switching	<a href="#">H03K</a>

### **Informative references**

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

Electric devices on electrically-propelled vehicles for safety purposes	<a href="#">B60L 3/00</a>
Electric circuits specially adapted for vehicles	<a href="#">B60R 16/02</a>
Safety devices in conjunction with control or operation of a machine	<a href="#">F16P 3/00</a>
Arrangements for testing electrical properties; arrangements for locating electric faults; arrangements for electric testing characterized by what is being tested	<a href="#">G01R 31/00</a>
Electrical safety arrangements for controlling or regulating in general	<a href="#">G05B 9/00</a> , <a href="#">G05B 19/00</a>
Constructive details of emergency protective devices	<a href="#">H01C</a> , <a href="#">H01T</a>
Emergency protective devices	<a href="#">H01H 9/54</a> , <a href="#">H01H 33/59</a>
Modifications for protecting electronic switching circuits	<a href="#">H03K 17/00</a> , <a href="#">H03K 19/00</a>

### **Special rules of classification**

Subgroups and head group:

If the subject-matter of a document relates to a protective circuit having different functionalities for each of which a sub-group exists, then the document is to be classified in the head-group unless a sub-group exists for this particular combination of functionalities (e.g. [H02H 3/10](#), [H02H 3/207](#)).

## H02H 1/00

### Details of emergency protective circuit arrangements

#### Definition statement

*This place covers:*

All details of emergency protective circuit arrangements covering the detection means, the connection of the detection means, the transmission of signals, the data processing means, the arrangements for preventing response to transient abnormal conditions and the arrangements for supplying operative power to the circuit arrangements (e.g monitoring of power supply for trip energy, backup supply, avoid failure due to high voltage testing).

#### References

##### Informative references

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

Detection means per se	<a href="#">G01</a> , e.g. <a href="#">G01R</a>
Means for detecting the presence of an arc structurally associated with emergency protective devices: for switches in general for HV circuit breakers	<a href="#">H01H 9/50</a> , <a href="#">H01H 33/26</a>
Means for detecting or reacting to mechanical or electrical defects (structurally associated with Gas-insulated switchgear)	<a href="#">H02B 13/065</a>

#### Special rules of classification

As this group concerns details of emergency protective circuits, it is normally combined with a group symbol or an Indexing Code the aspect it is a detail of. Example: WO 2009123615 (Hewlett Packard Development company) is classified in [H02H 1/0007](#) and in [H02H 3/087](#). In exceptional cases is inventive information classified here only.

## H02H 1/06

### Arrangements for supplying operative power {(power supply arrangements in general [G05F](#), [H02M](#))}

#### References

##### Informative references

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

Power supply arrangements in general	<a href="#">G05F</a> , <a href="#">H02M</a>
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## H02H 3/00

**Emergency protective circuit arrangements for automatic disconnection directly responsive to an undesired change from normal electric working condition with or without subsequent reconnection (specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems [H02H 7/00](#); systems for change-over to standby supply [H02J 9/00](#) )**; integrated protection (for motors [H02H 7/0822](#))

### Definition statement

*This place covers:*

This group is subdivided according to the electric parameter it is responsive to (e.g. overcurrent, overvoltage) and comprises all kinds of protective circuits comprising detection means for the detection of electrical variables of the power equipment to be protected (e.g. current transformers or sensors, voltage transformers or sensors), analog or digital circuits for converting, analysing or comparing the detected electrical values with pre-determined threshold levels and initiating a tripping signal to a disconnecting device to automatically disconnect the equipment to be protected from the power source to avoid or to limit damages to the equipment. These circuits may also be provided with reclosing features.

.Various types of protection are covered: overcurrent, overvoltage, undervoltage, earth fault, differential protection, distance protection, phase loss, unbalance...

### References

#### Limiting references

*This place does not cover:*

Specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems	<a href="#">H02H 7/00</a>
Balancing load and power generation in DC networks	<a href="#">H02J 1/14</a>
Arrangements for adjusting voltage in AC networks by switching loads on to, or off from, the networks	<a href="#">H02J 3/14</a>
Systems for change-over to standby supply	<a href="#">H02J 9/00</a>

#### Informative references

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

Testing of protective devices, e.g. with a separate device	<a href="#">G01R 31/2827</a>
Protective switch with testing means	<a href="#">H01H 83/04</a>

### Special rules of classification

- Protective circuits protecting against the effects of geomagnetic induced current (GIC) are classified in the head group [H02H 3/00](#)
- Protective circuits responsive to more than two electric variables or to electric variables not covered by the subgroups are classified in [H02H 3/00](#).

## H02H 3/027

with automatic disconnection after a predetermined time ([H02H 3/033](#), [H02H 3/06](#) take precedence {; timing in overcurrent protection circuits [H02H 3/093](#); in undervoltage protection circuits [H02H 3/247](#); staggered disconnection [H02H 7/30](#)}}

### References

#### Limiting references

*This place does not cover:*

Several disconnections in a preferential order	<a href="#">H02H 3/033</a>
Automatic reconnection	<a href="#">H02H 3/06</a>

#### Informative references

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

Timing in overcurrent protection circuits	<a href="#">H02H 3/093</a>
Timing in undervoltage protection circuits	<a href="#">H02H 3/247</a>
Staggered disconnection	<a href="#">H02H 7/30</a>

## H02H 3/04

with warning or supervision in addition to disconnection, e.g. for indicating that protective apparatus has functioned {(watching of pilot wires [H02H 1/0084](#); protection of protective arrangements [H02H 7/008](#); indication of the state of electronic switches [H03K 17/18](#))}

### References

#### Informative references

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

Watching of pilot wires	<a href="#">H02H 1/0084</a>
Protection of protective arrangements	<a href="#">H02H 7/008</a>
Indication of the state of electronic switches	<a href="#">H03K 17/18</a>

## H02H 3/05

with means for increasing reliability, e.g. redundancy arrangements {(for logic circuits [H03K 19/003](#))}

### References

#### Limiting references

*This place does not cover:*

Logic circuits	<a href="#">H03K 19/003</a>
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**H02H 3/08**

responsive to excess current (responsive to abnormal temperature caused by excess current [H02H 5/04](#))

**References****Informative references**

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

Responsive to abnormal temperature caused by excess current	<a href="#">H02H 5/04</a>
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**H02H 3/093**

with timing means {(in general [H02H 3/027](#); thermal delay [H02H 3/085](#); timing means for undervoltage protection [H02H 3/247](#))}

**References****Informative references**

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

Timing means in general	<a href="#">H02H 3/027</a>
Thermal delay	<a href="#">H02H 3/085</a>
Timing means for undervoltage protection	<a href="#">H02H 3/247</a>

**H02H 3/12**

responsive to underload or no-load {(for motors [H02H 7/0827](#))}

**References****Limiting references**

This place does not cover:

Responsive to underload or no-load for motors	<a href="#">H02H 7/0827</a>
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**H02H 3/14**

responsive to occurrence of voltage on parts normally at earth potential {(monitoring earth connection [H02H 5/105](#))}

**References****Informative references**

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

Monitoring earth connection	<a href="#">H02H 5/105</a>
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## H02H 3/16

responsive to fault current to earth, frame or mass (with balanced or differential arrangement [H02H 3/26](#) {; monitoring earth connection [H02H 5/105](#)})

### References

#### Limiting references

*This place does not cover:*

Balanced or differential arrangement	<a href="#">H02H 3/26</a>
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#### Informative references

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

Monitoring earth connection	<a href="#">H02H 5/105</a>
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## H02H 3/17

by means of an auxiliary voltage injected into the installation to be protected {(using summation current transformers [H02H 3/33](#))}

### References

#### Limiting references

*This place does not cover:*

Using summation current transformers	<a href="#">H02H 3/33</a>
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## H02H 3/24

responsive to undervoltage or no-voltage {([H02H 3/207](#) takes precedence)}

### References

#### Limiting references

*This place does not cover:*

Responsive to under-voltage	<a href="#">H02H 3/207</a>
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## H02H 3/28

involving comparison of the voltage or current values at two spaced portions of a single system, e.g. at opposite ends of one line, at input and output of apparatus {(for transformers [H02H 7/045](#))}

### References

#### Limiting references

*This place does not cover:*

Transformers	<a href="#">H02H 7/045</a>
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**H02H 3/33**

using summation current transformers ([H02H 3/347](#) takes precedence)

**References****Limiting references**

*This place does not cover:*

Three-phase systems using summation current transformers	<a href="#">H02H 3/347</a>
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**H02H 5/00**

**Emergency protective circuit arrangements for automatic disconnection directly responsive to an undesired change from normal non-electric working conditions with or without subsequent reconnection (using simulators of the apparatus being protected [H02H 6/00](#); specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems [H02H 7/00](#))**

**Definition statement**

*This place covers:*

This group is subdivided according to the non-electric parameter it is responsive to (e.g. temperature, fluid pressure) and comprises all kinds of protective circuits comprising detection means for the detection of non-electrical variables of the power equipment to be protected (e.g. temperature sensor, fluid pressure sensor, sensor to detect mechanical injury), analogue or digital circuits for converting, analysing or comparing the detected electrical values with pre-determined threshold levels and initiating a tripping signal to a disconnecting device to automatically disconnect the equipment to be protected from the power source to avoid or to limit damages to the equipment or to protect living beings. These circuits may also be provided with reclosing features

**References****Limiting references**

*This place does not cover:*

Emergency protective circuit arrangements responsive to undesired changes from normal non-electric working conditions using simulators of the apparatus being protected, e. g. thermal images	<a href="#">H02H 6/00</a>
Specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems	<a href="#">H02H 7/00</a>
Smoke alarm power shut-off devices (if disconnection is a prevention measure)	<a href="#">G08B 17/10</a>

**Informative references**

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

Temperature detectors	<a href="#">G01K</a>
Radiation detectors	<a href="#">G01T</a>
Moisture alarm	<a href="#">G08B 21/20</a>
Nuclear explosion detection	<a href="#">G21J 5/00</a>



## H02H 5/04

**responsive to abnormal temperature {(specially adapted for electric machines [H02H 7/0852](#))}**

### References

#### Limiting references

*This place does not cover:*

Circuits specially adapted for electric machines	<a href="#">H02H 7/0852</a>
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## H02H 6/00

**Emergency protective circuit arrangements responsive to undesired changes from normal non-electric working conditions using simulators of the apparatus being protected, e.g. using thermal images**

### Definition statement

*This place covers:*

Protective circuits comprising simulation or modelling means for the determination of non-electrical variables of the power equipment to be protected (e.g. temperature), and comparing the simulated non-electric variables with pre-determined threshold levels and initiating a tripping signal to a disconnecting device to automatically disconnect the equipment to be protected from the power source to avoid or to limit damages to the equipment or to protect living beings. These circuits may also be provided with reclosing features.

## H02H 7/00

**Emergency protective circuit arrangements specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems, and effecting automatic switching in the event of an undesired change from normal working conditions**

### Definition statement

*This place covers:*

Emergency protective circuit arrangements specially adapted for protecting specific types of electric machines or apparatus (e.g. transformers, electric motors) and effecting automatic switching in the event of an undesired change from normal electric or non-electric working conditions.

This group covers also emergency protective circuit arrangements for sectionalised protection of cable or line systems, e.g. for disconnecting a section on which short-circuit, earth fault, or arc discharge has occurred. The objectives of these type of protective circuits is to keep the power system stable and/or to minimize an outage to the greatest extent possible when abnormal electrical conditions occur (e.g. through protective device coordination).

### References

#### Informative references

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

Batteries in electrical vehicles	<a href="#">B60L 50/50</a>
Power operated mechanism for wings	<a href="#">E05F 15/00</a>

Measuring of mechanical vibrations	<a href="#">G01H</a>
Locating faults in cables	<a href="#">G01R 31/08</a>
Monitoring dynamo-electrical machines in operation	<a href="#">G01R 31/343</a>
Safety arrangements for control or regulation in general	<a href="#">G05B 9/02</a>
Structurally associated protection of superconducting magnets or coils in case of quenching	<a href="#">H01F 6/02</a>
Special means for preventing or reducing unwanted electric or magnetic effects in transformers or coils	<a href="#">H01F 27/34</a>
Structural association of measuring or protecting means in transformers	<a href="#">H01F 27/402</a>
Arrangements for transfer of electric power between AC networks via high-voltage DC [HVDC] links; Arrangements for transfer of electric power between generators and networks via [HVDC] links	<a href="#">H02J 3/36</a>
Safety devices for circuit arrangements for charging or discharging batteries	<a href="#">H02J 7/60</a>
Structurally associated protection in motors or generators	<a href="#">H02K 11/00</a>
Means for protecting converters other than disconnection	<a href="#">H02M 1/32</a>
Means providing protection of motors against overload without automatic disconnection	<a href="#">H02P 29/02</a>
Circuit arrangements for photovoltaic devices	<a href="#">H10F 77/955</a>

**H02H 7/085**

against excessive load {([H02H 6/00](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

Emergency protective circuit arrangements responsive to undesired changes from normal non-electric working conditions using simulators of the apparatus being protected	<a href="#">H02H 6/00</a>
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**H02H 7/0851**

{for motors actuating a movable member between two end positions, e.g. detecting an end position or obstruction by overload signal}

**Definition statement**

*This place covers:*

Anti-pinching systems for car-window motors

**H02H 7/0856**

{characterised by the protection measure taken}

**References****Limiting references**

*This place does not cover:*

Providing protection against overload without automatic interruption of supply (for electric motors or generators)	<a href="#">H02P 29/02</a> .
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**H02H 7/093**

against increase beyond, or decrease below, a predetermined level of rotational speed (centrifugal switches [H01H 35/10](#))

**References****Informative references**

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

Centrifugal switches	<a href="#">H01H 35/10</a>
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**H02H 7/10**

for converters; for rectifiers {(forming part of the control circuit of the converter, see the relevant group in [H02M](#))}

**References****Informative references**

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

Arrangements forming part of the control circuit of the converter,	<a href="#">H02M</a>
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**H02H 7/12**

for static converters or rectifiers {(for discharge lamp power supplies using static converters [H05B 41/2851](#), [H05B 41/2921](#), [H05B 41/2981](#))}

**References****Informative references**

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

Discharge lamp power supplies using static converters	<a href="#">H05B 41/2851</a> , <a href="#">H05B 41/2921</a> , <a href="#">H05B 41/2981</a>
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**H02H 7/16**

for capacitors (for synchronous capacitors [H02H 7/06](#))

**References****Limiting references**

*This place does not cover:*

Synchronous capacitors	<a href="#">H02H 7/06</a>
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**H02H 7/20**

for electronic equipment (for converters [H02H 7/10](#); for electric measuring instruments [G01R 1/36](#); for DC voltage or current semiconductor regulators [G05F 1/569](#); for amplifiers [H03F 1/52](#); for electronic switching circuits [H03K 17/08](#))

**Definition statement**

*This place covers:*

Circuit arrangements responsive to, e.g. overcurrent, overvoltage, arc fault, for protecting solar cells used for power distribution or generation and effecting automatic protection of the solar cells array.

**References****Limiting references**

*This place does not cover:*

Emergency protective circuit arrangements for converters	<a href="#">H02H 7/10</a>
Emergency protective circuit arrangements for electric measuring instruments	<a href="#">G01R 1/36</a>
Emergency protective circuit arrangements for DC voltage or current semiconductor regulators	<a href="#">G05F 1/569</a>
Emergency protective circuit arrangements for amplifiers	<a href="#">H03F 1/52</a>
Emergency protective circuit arrangements for electronic switching circuits	<a href="#">H03K 17/08</a>

**Informative references**

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

Generation of electric power by conversion of infrared radiation, visible light or ultraviolet light, e.g. using photovoltaic [PV] modules	<a href="#">H02S</a>
Photovoltaic modules	<a href="#">H10F 19/00</a>
Circuit arrangements for photovoltaic devices	<a href="#">H10F 77/955</a>

## H02H 7/22

for distribution gear, e.g. bus-bar systems; for switching devices {(detecting mechanical or electrical defects in gas-insulated switchgears [H02B 13/065](#))}

### References

#### Informative references

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

Detecting mechanical or electrical defects in gas-insulated switchgears	<a href="#">H02B 13/065</a>
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## H02H 7/26

Sectionalised protection of cable or line systems, e.g. for disconnecting a section on which a short-circuit, earth fault, or arc discharge has occurred (locating faults in cables [G01R 31/08](#))

### References

#### Informative references

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

Locating faults in cables	<a href="#">G01R 31/08</a>
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## H02H 7/30

### Staggered disconnection

#### Definition statement

*This place covers:*

all aspects of circuit arrangements regarding the device coordination in an electrical network with multiple layers in a hierarchical structure and back-up protection.

## H02H 9/00

### Emergency protective circuit arrangements for limiting excess current or voltage without disconnection

#### Definition statement

*This place covers:*

All types of protective circuit arrangements for protecting power systems, machines and apparatus covered by this subclass against the damaging effects of excess current or voltage without disconnection by limiting the speed of change of electric quantities, avoiding undesired transient conditions (e.g. with filters), by providing intrinsically safe conditions (limiting both voltage and current), by limiting excess current, by limiting excess voltage, or by limiting or suppressing of earth fault currents.

## References

### Informative references

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

Negative voltage protection in plug-in devices for data transfer (e.g. USB stick hot plugging)	<a href="#">G06F 13/4081</a>
Protective switch operated by excess voltage, e.g. for lightning protection	<a href="#">H01H 83/10</a>
Soft switching on or off of converters	<a href="#">H02M 1/36</a>
Circuit arrangements for protecting electronic switches	<a href="#">H03K 17/08</a>
Circuit arrangements for protecting logic circuits	<a href="#">H03K 19/003</a>
Electrostatic discharge (ESD) protection of Integrated Circuits when aspect of structural integration is important	<a href="#">H10D 89/60</a>
Superconductive current limiter (resistive type) superconductive current limiter (inductive type)	<a href="#">H10N 60/30</a> , <a href="#">H01F 6/00</a>
Protection of semiconductor devices against overvoltage by layout	<a href="#">H10W 42/80</a>

## Glossary of terms

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

ESD	Electrostatic discharge
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## H02H 9/02

responsive to excess current {(current limitation for voltage regulators [G05F 1/573](#); disconnection after limiting [H02H 3/025](#))}

## References

### Informative references

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

Disconnection after limiting	<a href="#">H02H 3/025</a>
Current limitation for voltage regulators	<a href="#">G05F 1/573</a>

## H02H 9/04

responsive to excess voltage (lightning arrestors [H01C 7/12](#), [H01C 8/04](#), [H01G 9/18](#), [H01T](#))

## Definition statement

This place covers:

- Lightning protection in general
- Avoiding failure due to high voltage testing.

## References

### Informative references

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

Lightning arrestors	<a href="#">H01C 7/12</a> , <a href="#">H01C 8/04</a> , <a href="#">H01G 9/18</a> , <a href="#">H01T</a>
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## H02H 9/041

{using a short-circuiting device}

### Definition statement

*This place covers:*

Crowbars

## H02H 9/046

{responsive to excess voltage appearing at terminals of integrated circuits}

### Definition statement

*This place covers:*

Overvoltage protection circuits, where the integrated circuits can be considered as a black box

## References

### Informative references

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

Protection by specific structural integration design	<a href="#">H10D 89/60</a>
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## H02H 11/00

Emergency protective circuit arrangements for preventing the switching-on in case an undesired electric working condition might result

### Definition statement

*This place covers:*

e.g. in case of incorrect or interrupted earth connection, in case of inverted polarity or connection, in case of incorrect phase sequence, in case of too high or too low isolation resistance, too high load, short-circuit or earth fault, in case of too high or too low voltage, or preventing unsafe switching conditions.

### Special rules of classification

Protective circuits for preventing connection of outlets to power source if no load and detection of human body should be classified in [H02H 5/12](#) and an Indexing Code given in [H01H 11/00](#).