H02H

Emergency protective circuit arrangements (indicating or signaling undesired working conditions G01R, e.g. G01R31/00, G08B; locating faults along lines G01R31/08; emergency protective devices H01H)

Definition statement

This subclass/group 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, disconnector, 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

Relationship between large subject matter areas

Boards, substations, or switching arrangements	H02B
Installation of electrical cables or lines	H02G

Circuit arrangements for supplying or distributing electric power	H02J
Dynamo-electric machines	H02K
Electric converters	H02M
Other electric machines	H02N
Control or regulation of motors, generators	H02P

References relevant to classification in this subclass

This subclass/group does not cover:

Protection involving charging/discharging batteries:	H02J 7/00
Structural association of protection devices with motors or generators	H02K 11/00
Protecting converters by control	H02M 1/32
Protecting electric motors (e.g. providing protection against - overload) by control	H02P

Vehicles	B60R
Electrically propelled vehicles	B60L, B60M
Aircrafts	B64D
Household appliances	A47, D06F
Computers	G06F
Regulators	G05F
Circuit arrangements only comprising a combination of mechanical switches, static switches and	H01H 9/541

overvoltage limiting devices for the purpose of special switching applications, e.g. DC	
Electronic switching	H03K
Amplifiers	H03F

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

Special rules of classification within this subclass

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 subclass/group 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).

Informative references

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

Detection means per se	G01, e.g. G01R
Means for detecting the presence of an arc structurally associated with emergency protective devices: for switches in generalfor HV circuit breakers	H01H 9/50H01H33/26
Means for detecting or reacting to mechanical or electrical defects (structurally associated with Gas-insulated switchgear)	H02B 13/065

Special rules of classification within this group

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 [N: (power

supply arrangements in general G05F, H02M)]

Informative references

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

Power supply arrangements in general	G05F, H02M

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 of line systems H02H7/00; systems for change-over to standby supply H02J9/00) [N: integrated protection (for motors H02H7/0822)]

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group does not cover:

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	H02J 9/00

supply	
Load shedding, e.g. maintaining supply	H02J 1/14 or H02J 3/14

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	G01R 31/2827
Protective switch with testing means	H01H 83/04

Special rules of classification within this group

- 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 (H02H3/033, H02H3/06 take precedence; [N: timing in overcurrent protection circuitsH02H3/093; in undervoltage protection circuits H02H3/247; staggered disconnection H02H7/30])

References relevant to classification in this group

This subclass/group does not cover:

Several disconnections in a preferential order	H02H 3/033
Automatic reconnection	H02H 3/06

Informative references

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

Timing in overcurrent protection circuits	H02H 3/093
Timing in undervoltage protection circuits	H02H 3/247
Staggered disconnection	H02H 7/30

H02H 3/04

with warning or supervision in addition to disconnection, e.g. for indicating that protective apparatus has functioned [N: (watching of pilot wires H02H1/0084; protection of protective arrangements H02H7/008; indication of the state of electronic switches H03K17/18)]

Informative references

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

Watching of pilot wires	H02H 1/0084
Protection of protective arrangements	H02H 7/008
Indication of the state of electronic switches	H03K 17/18

H02H 3/05

with means for increasing reliability, e.g. redundancy arrangements [N: (for logic circuits H03K19/003)]

References relevant to classification in this group

This subclass/group does not cover:

Logic circuits	H03K 19/003

H02H 3/08

responsive to excess current (responsive to abnormal temperature caused by excess current H02H5/04)

Informative references

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

Responsive to abnormal temperature caused by excess current	H02H 5/04

H02H 3/093

with timing means [N: (in general H02H3/027; thermal delay H02H3/085; timing means for undervoltage protection H02H3/247)]

Informative references

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

Timing means in general	H02H 3/027
Thermal delay	H02H 3/085
Timing means for undervoltage protection	H02H 3/247

H02H 3/12

responsive to underload or no-load [N: (for motors H02H7/0827)]

References relevant to classification in this group

This subclass/group does not cover:

Responsive to underload or no-load for motors	H02H 7/0827

H02H 3/14

responsive to occurrence of voltage on parts normally at earth potential [N: (monitoring earth connection H02H5/105)]

Informative references

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

Monitoring earth connection	H02H 5/105

H02H 3/16

responsive to fault current to earth, frame or mass (with balanced or differential arrangement H02H3/26; [N: monitoring earth connection H02H5/105])

References relevant to classification in this group

This subclass/group does not cover:

Balanced or differential arrangement	H02H 3/26

Informative references

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

Monitoring earth connection	H02H 5/105

H02H 3/17

by means of an auxiliary voltage injected into the installation to be protected [N: (using summation current transformers H02H3/33)]

References relevant to classification in this group

This subclass/group does not cover:

Using summation current transformers	H02H 3/33

H02H 3/24

responsive to undervoltage or no-voltage [N: (H02H3/207 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Responsive to under-voltage	H02H 3/207

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 [N: (for transformers H02H7/045)]

References relevant to classification in this group

This subclass/group does not cover:

Transformers	H02H 7/045

H02H 3/33

using summation current transformers (H02H3/347 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Three-phase systems using summation current transformers	H02H 3/347

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 H02H6/00; specially adapted for specific types of electric machines or apparatus or for sectionalised protection of cable or line systems H02H7/00)

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group 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	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
Smoke alarm power shut-off devices (if disconnection is a prevention measure)	G08B 17/10

Informative references

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

Radiation detectors	G01T
Nuclear explosion detection	G21J 5/00
Moisture alarm	G08B 21/00B1
Temperature detectors	G01K

H02H 5/04

responsive to abnormal temperature [N: specially adapted for electric machines H02H7/0852]

References relevant to classification in this group

This subclass/group does not cover:

Circuits specially adapted for electric machines	H02H 7/0852

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 subclass/group 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 subclass/group 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 extend possible when abnormal electrical conditions occur (e.g. through protective device coordination).

References relevant to classification in this group

This subclass/group does not cover:

Structural association of protective devices with specific machines or apparatus and their protection without automatic disconnection e.g. by control	see the relevant subclass for the machine or the apparatus e.g. H02M, H02K, H02P H02J

Informative references

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

Structurally associated protection of superconducting magnets or coils in case of quenching	H01F 6/02
Structural association of measuring or protecting means in transformers	H01F 27/402
Special means for preventing or reducing unwanted electric or magnetic effects in transformers or coils	H01F 27/34
Structurally associated protection in motors or generators	H02K 11/00
Measuring of mechanical vibrations	G01H
Monitoring dynamo-electrical machines in operation	G01R 31/343
Means providing protection of motors against overload without automatic disconnection	H02P 29/02
Safety arrangements for control or regulation in general	G05B 9/02

Power operated mechanism for wings	E05F 15/00
Means for protecting converters other than disconnection	H02M 1/32
Safety devices for circuit arrangements for charging or depolarizing batteries	H02J 7/0029
Batteries in electrical vehicles	B60L 11/18
Circuit arrangements for solar cells for maintenance or in case of fire	H01L 31/02021
HVDC Links	H02J 3/36
Locating faults in cables	G01R 31/08

H02H 7/085

against excessive load [N: (H02H6/00 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Emergency protective circuit arrangements responsive to undesired changes from normal non-electric working conditions using simulators of the apparatus being protected	H02H 6/00

H02H 7/0851

[N: for motors actuating a movable member between two end positions, e.g. detecting an end position or obstruction by overload signal]

Definition statement

This subclass/group covers:

This group covers :

H02H 7/0856

[N: characterised by the protection measure taken]

References relevant to classification in this group

This subclass/group does not cover:

Providing protection against overload without automatic interruption of supply (for electric motors or generators)	H02P 29/02.

H02H 7/093

against increase beyond, or decrease below, a predetermined level of rotational speed (centrifugal switches H01H35/10)

Informative references

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

Centrifugal switches	H01H 35/10

H02H 7/10

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

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,	H02M

H02H 7/12

for static converters or rectifiers [N: (for discharge lamp power supplies using static converters H05B41/2851, H05B41/2921, H05B41/2981)]

Informative references

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

Discharge lamp power supplies using static converters	H05B 41/2851, H05B 41/2921, H05B 41/2981

H02H 7/16

for capacitors (for synchronous capacitors H02H7/06)

References relevant to classification in this group

This subclass/group does not cover:

Synchronous capacitors	H02H 7/06

H02H 7/20

for electronic equipment (for converters H02H7/10; for electric measuring instruments G01R1/36; for dc voltage or current semiconductor regulators G05F1/569; for amplifiers H03F1/52; for electronic switching circuits H03K17/08)

Definition statement

This subclass/group covers:

This group 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 relevant to classification in this group

This subclass/group does not cover:

Emergency protective circuit arrangements for converters	H02H 7/10
Emergency protective circuit arrangements for electric measuring instruments	G01R 1/36
Emergency protective circuit arrangements for dc voltage or	G05F 1/569

current semiconductor regulators	
Protective circuit arrangements for solar cells, e.g. effecting disconnecting upon fire or for maintenance, protection of personal, or those structurally integrated in the solar cells, e.g. by-passing diodes or switches	H01L 31/042, H01L 31/02021
Emergency protective circuit arrangements for amplifiers	H03F 1/52
Emergency protective circuit arrangements for electronic switching circuits	H03K 17/08

Informative references

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

Generation of electric power by conversion of infra-red radiation, visible light or ultraviolet light, e.g. using photovoltaic [PV] modules	H02S

H02H 7/22

for distribution gear, e.g. bus-bar systems; for switching devices [N: (detecting mechanical or electrical defects in gas-insulated switchgears H02B13/065)]

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	H02B 13/065

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 occured (locating faults in cables G01R31/08)

Informative references

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

Locating faults in cables	G01R 31/08

H02H 7/30

staggered disconnection

Definition statement

This subclass/group covers:

This group 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 (structural association of protective devices with specific machines or apparatus, see the relevant subclass for the machine or apparatus)

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group does not cover:

Structural association of protective	see the relevant subclass of the

devices with specific machines or apparatus	machine or the apparatus H02M, H02K, H02P H02J

Informative references

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

Superconductive current limiter (resistive type) superconductive current limiter (inductive type)	H01L 39/16H01F/00
Circuit arrangements for protecting logic circuits	H03K 19/003
Circuit arrangements for protecting electronic switches	H03K 17/08
Negative voltage protection in plug-in devices for data transfer (e.g. USB stick hot plugging)	G06F 13/4081
Electrostatic discharge (ESD) protection of Integrated Circuits when aspect of structural integration is important	H01L 27/0248
Protection of semiconductor devices against overvoltage by layout	H01L 23/62
Soft switching on or off of converters	H02M 1/36
Protective switch operated by excess voltage, e.g. for lightning protection	H01H 83/10

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

ESD	Electrostatic discharge

H02H 9/02

responsive to excess current [N: (current limitation for voltage regulators G05F1/573; disconnection after limiting H02H3/025)]

Informative references

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

Current limitation for voltage regulators	G05F 1/573
Disconnection after limiting	H02H 3/025

H02H 9/04

responsive to excess voltage (lightning arrestors H01C7/12, H01C8/04, H01G9/18, H01T)

Definition statement

This subclass/group covers:
This group covers :

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

Informative references

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

Lightning arrestors	H01C 7/12, H01C 8/04, H01G 9/18, H01T

H02H 9/041

[N: using a short-circuiting device]

Definition statement

This subclass/group covers:
This group covers :

Crowbars

H02H 9/046

[N: responsive to excess voltage appearing at terminals of integrated circuits (protection by specific structural integration design H01L27/0248)]

Definition statement

This subclass/group covers:

This group covers :

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

Informative references

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

Protection by specific structural integration design	H01L 27/0248

H02H 11/00

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

Definition statement

This subclass/group 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 within this group

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.