

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Circuit-breakers for equipment (CBE)

Disjoncteurs pour équipement (DPE)





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INTERNATIONAL STANDARD

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Circuit-breakers for equipment (CBE)

Disjoncteurs pour équipement (DPE)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CIRCUIT-BREAKERS FOR EQUIPMENT (CBE)

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International Standard IEC 60934 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
23E/1084/FDIS	23E/1104/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This fourth edition cancels and replaces the third edition published in 2000, Amendment 1:2007 and Amendment 2:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) clarifications for type testing purposes.

In this standard, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

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- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

CIRCUIT-BREAKERS FOR EQUIPMENT (CBE)

1 Scope

This document is applicable to mechanical switching devices designed as "circuit-breakers for equipment" (CBE) for household and similar applications. CBEs according to this document are intended to provide protection to circuits within electrical equipment including its components (e.g. motors, transformers, internal wiring). This document covers also CBEs applicable for protection of electrical equipment in case of undervoltage and/or overvoltage. This document also covers CBEs which are suitable for isolation.

NOTE The term "equipment" includes appliances.

CBEs are not applicable for overcurrent protection of wiring installations of buildings.

CBEs according to this document have:

- a rated voltage not exceeding 440 V AC (between phases) and/or DC not exceeding 250 V;
- a rated current not exceeding 125 A;
- a short-circuit capacity (I_{cn}) of at least $6 \times I_n$ (AC types) and $4 \times I_n$ (DC types) but not exceeding 3 000 A.

CBEs may have a conditional short-circuit current (I_{nc}) rating in association with a specified short-circuit protective device (SCPD). A guide for coordination of a CBE associated in the same circuit with a SCPD is given in Annex F.

For CBEs having a degree of protection higher than IP20 according to IEC 60529, for use in locations where hazardous environmental conditions prevail (e.g. excessive humidity, heat or cold or deposition of dust) and in hazardous locations (e.g. where explosions are liable to occur), special constructions may be required.

This document contains all the requirements necessary to ensure compliance with the operational characteristics required for these devices by type tests. It also contains the details relative to test requirements and methods of testing necessary to ensure reproducibility of test results.

This document states:

- a) the characteristics of CBEs;
- b) the conditions with which CBEs shall comply, with reference to:
 - 1) their operation and behaviour in normal service;
 - 2) their operation and behaviour in case of overload;
 - 3) their operation and behaviour in case of short-circuits up to their rated short-circuit capacity;
 - 4) their dielectric properties;
- c) the tests intended for confirming that these conditions have been met and the methods to be adopted for the tests;
- d) the data to be marked on the devices;
- e) the test sequences to be carried out and the number of samples to be submitted for certification purposes (see Annex C);

- f) the routine tests to be carried out to reveal unacceptable variations in material or manufacture, likely to affect safety (see Annex I).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60898-1:2015, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial and light-industrial environments*

CISPR 32, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Definitions related to protection and switching devices

3.1.1

circuit-breaker

mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified duration and breaking currents under specified abnormal conditions such as those of short circuit

[SOURCE: IEC 60050-441:1984, 441-14-20]

3.1.2

circuit-breaker for equipment

CBE

circuit-breaker specifically designed for the protection of equipment

Note 1 to entry: These CBEs are intended for:

- automatic interruption and non-automatic or automatic resetting;
- automatic interruption and non-automatic or automatic resetting and manual switching operation.

3.1.3

E-type CBE

void

3.1.4

fuse

device that, by the fusing of one or more of its specially designed and proportioned components, opens the circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time. The fuse comprises all of the parts that form the complete device

[SOURCE: IEC 60050-441:1984, 441-18-01]

3.1.5

switching device

device designed to make or break the current in one or more electric circuits

[SOURCE: IEC 60050-441:1984, 441-14-01]

3.1.6

mechanical switching device

switching device designed to close and open one or more electric circuits by means of separable contacts

[SOURCE: IEC 60050-441:1984, 441-14-02, modified – The note has been deleted.]

3.1.7 switch

mechanical switch

mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions which may include specified operating overload conditions and also carrying for a specified time currents under specified abnormal circuit conditions such as those of short circuit

[SOURCE: IEC 60050-441:1984, 441-14-10, modified – The note has been deleted.]

3.1.8 disconnecter

mechanical switching device which in the open position complies with the requirements specified for the isolating function

[SOURCE: IEC 60050-441:1984, 441-14-05, modified – The wording of the definition has been changed and the note deleted.]

3.1.9 disconnection

interruption of an electrical circuit in a pole so as to provide insulation between the supply and those parts intended to be disconnected from the supply

3.1.10 full-disconnection

disconnection that provides the equivalent of basic insulation by contact separation

3.1.11 micro-disconnection

disconnection that provides compliance of performance by contact separation

3.1.12 isolation isolating function

function intended to cut off the supply from all or a discrete section of the installation by separating the installation from every source of electrical energy for reasons of safety

3.2 General terms

3.2.1 ambient air temperature

temperature, determined under prescribed conditions, of the air surrounding the complete CBE

Note 1 to entry: For example, for an enclosed CBE, it is the air outside the enclosure.

[SOURCE: IEC 60050-441:1984, 441-11-13, modified – "complete switching device or fuse" has been replaced by "CBE".]

3.2.2 applied voltage

voltage which exists across the terminals of a pole of a CBE just before the making of the current

Note 1 to entry: In the case of AC, it is the RMS value.

[SOURCE: IEC 60050-441:1984, 441-17-24, modified – "switching device" has been replaced by "CBE". Note 1 to entry has been added.]

**3.2.3
main circuit**

<of a CBE> all the conductive parts of a CBE included in the circuit which it is designed to close and to open

[SOURCE: IEC 60050-441:1984, 441-15-02, modified – "switching device" has been replaced by "CBE".]

**3.2.4
control circuit**

<of a CBE> circuit (other than a path of the main circuit) intended for the closing operation or opening operation, or both, of a CBE

[SOURCE: IEC 60050-441:1984, 441-15-03, modified – "switching device" and "device" have been replaced by "CBE".]

**3.2.5
auxiliary circuit**

<of a CBE> all the conductive parts of a CBE intended to be included in a circuit other than the main circuit and the control circuit of the CBE

[SOURCE: IEC 60050-441:1984, 441-15-04, modified – "switching device" and "device" have been replaced by "CBE" and the note has been deleted.]

**3.2.6
pole**

<of a CBE> part of a CBE associated exclusively with one, electrically separated, conducting path of its main circuit provided with contacts intended to connect and disconnect the main circuit itself and excluding those portions which provide a means for mounting and operating the poles together

[SOURCE: IEC 60050-441:1984, 441-15-01, modified – "provided with contacts intended to connect and disconnect the main circuit itself" has been added, "switching device" has been replaced by "CBE" and the note has been deleted.]

**3.2.7
protected pole**

pole provided with an overcurrent release

Note 1 to entry: For the definition of overcurrent release, see 3.6.2.

**3.2.8
unprotected pole**

pole without overcurrent release but otherwise generally capable of the same performance as a protected pole of the same CBE

Note 1 to entry: For the definition of overcurrent release, see 3.6.2.

**3.2.9
neutral conductor**

N
conductor electronically connected to the neutral point and capable of contributing to the transmission of electrical energy

[SOURCE: IEC 60050-826:2004, 826-14-07]

**3.2.10
closed position**

position in which the predetermined continuity of the main circuit of a CBE is secured

[SOURCE: IEC 60050-441:1984, 441-16-22, modified – “device” has been replaced by “CBE”]

3.2.11

open position

position in which the predetermined clearance between open contacts in the main circuit of a CBE is provided

[SOURCE: IEC 60050-441:1984, 441-16-23, modified – “device” has been replaced by “CBE”]

3.2.12

incorporated mounting

method of mounting where the user provides in his or her equipment a cavity to fix the CBE in its position

3.3 Definitions related to current

3.3.1

current

flow of electric charge through a conductor

3.3.2

rated current

current assigned by the manufacturer for a specified operating condition of the CBE

3.3.3

overcurrent

current exceeding the rated current

[SOURCE: IEC 60050-441:1984, 441-11-06]

3.3.4

overload current

overcurrent that occurs in an electrically undamaged circuit

3.3.5

short-circuit current

overcurrent resulting from a fault of negligible impedance between points intended to be at different potentials in normal service

Note 1 to entry: A short-circuit current may result from a fault or from an incorrect connection.

3.3.6

conventional tripping current

I_t

specified value of current which causes a CBE to operate within a specified time (conventional time)

3.3.7

conventional non-tripping current

I_{nt}

specified value of current which a CBE is capable of carrying for a specified time (conventional time) without tripping

3.3.8

instantaneous tripping current

I_i

value of current for which a CBE will operate automatically without intentional time-delay within a time less than 0,1 s

3.3.9 instantaneous non-tripping current

I_{ni}
value of current for which a CBE will not operate automatically without intentional time-delay within a time equal to or less than 0,1 s

3.4 Definitions related to voltage

3.4.1 rated voltage

value of voltage assigned by the manufacturer to a CBE or to its components and to which operation and performance characteristics are referred

Note 1 to entry: A CBE may have more than one rated voltage value or may have a rated voltage range.

3.4.2 working voltage

highest value of the AC or DC voltage across any particular insulation which can occur when a CBE is supplied at rated voltage

Note 1 to entry: Transients are disregarded.

Note 2 to entry: Both open-circuit and normal operating conditions are taken into account.

3.4.3 overvoltage

voltage having a peak value exceeding the corresponding peak value of maximum steady-state voltage at normal operating conditions

3.4.4 temporary overvoltage

overvoltage at power frequency of relatively long duration

3.4.5 transient overvoltage

overvoltage with a duration of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped

[SOURCE: IEC 60050-614:2016, 614-03-14]

3.4.6 temporary withstand voltage

highest value of a temporary overvoltage which does not cause breakdown of insulation under specified conditions

3.5 Definitions related to constructional elements of a CBE

3.5.1 accessible part

part which can be touched in normal use

3.5.2 conductive part

part which is capable of conducting current although it may not necessarily be used for carrying service current

[SOURCE: IEC 60050-441:1984, 441-11-09]

3.5.3

exposed conductive part

conductive part which can readily be touched and which is not normally alive, but which may become alive under fault conditions

Note 1 to entry: Typical exposed conductive parts are walls of metal enclosures, metal operating handles, etc.

[SOURCE: IEC 60050-441:1984, 441-11-10, modified – Note 1 to entry has been reworded.]

3.5.4

live part

conductor or conductive part intended to be energized in normal use, including a neutral conductor, but, by convention, not a PEN conductor or a PEM conductor or a PEL conductor

Note 1 to entry: This term does not necessarily imply a risk of electric shock.

[SOURCE: IEC 60050-826:2004, 826-12-08]

3.5.5

detachable part

part which can be removed without the aid of a general purpose tool

3.5.6

main contact

contact included in the main circuit of a CBE, intended to carry, in the closed position, the current of the main circuit

[SOURCE: IEC 60050-441:1984, 441-15-07, modified – "mechanical switching device" has been replaced by "CBE".]

3.5.7

auxiliary contact

contact included in an auxiliary circuit of a CBE and mechanically operated by the CBE

[SOURCE: IEC 60050-441:1984, 441-15-10, modified – "of a CBE" has been added and "the switching device" has been replaced by "the CBE".]

3.5.8

control contact

contact included in a control circuit of a CBE and mechanically operated by the CBE

[SOURCE: IEC 60050-441:1984, 441-15-09, modified – "mechanical switching device" and "device" have been replaced by "CBE".]

3.5.9

form A contact

make contact

control or auxiliary contact which is closed when the main contacts of a CBE are closed and open when they are open

[SOURCE: IEC 60050-441:1984, 441-15-12, modified – The term "'a" contact" has been replaced by "form A contact". "mechanical switching device" has been replaced by "CBE".]

3.5.10

form B contact

break contact

control or auxiliary contact which is open when the main contacts of a CBE are closed and closed when they are open

[SOURCE: IEC 60050-441:1984, 441-15-13, modified – The term "“b” contact" has been replaced by "form B contact". "mechanical switching device" has been replaced by "CBE".]

3.5.11

form C contact

make-break contact

control or auxiliary contact which has a make-break three-terminal changeover element

3.5.12

actuator

part of the actuating system to which an external actuating force is applied

[SOURCE: IEC 60050-441:1984, 441-15-22, modified – The note has been deleted.]

3.5.13

actuating system

<of a CBE> all the operating means of a CBE which transmit the actuating force to the contacts

3.5.14

actuating force (moment)

force (moment) applied to an actuator necessary to complete the intended operation

[SOURCE: IEC 60050-441:1984, 441-16-17, modified – "(moment)" has been added.]

3.6 Definitions related to releases in CBEs

3.6.1

release

device, mechanically connected to or integrated into a CBE, which releases the holding means and permits the automatic opening of the CBE

[SOURCE: IEC 60050-441:1984, 441-15-17, modified – "or integrated into" has been added and "mechanical switching device" has been replaced by "CBE".]

3.6.2

overcurrent release

release which causes a CBE to open, with or without time-delay, when the current in the release exceeds a predetermined value

Note 1 to entry: In some cases, this value can depend upon the rate of rise of current.

[SOURCE: IEC 60050-441:1984, 441-16-33, modified – "permits" has been replaced by "causes" and "mechanical switching device" has been replaced by "CBE".]

3.6.3

inverse time-delay overcurrent release

overcurrent release which causes a CBE to open after a time-delay inversely dependent upon the value of the overcurrent

Note 1 to entry: Such a release may be designed so that the time-delay approaches a definite minimum for high values of overcurrent.

3.6.4

direct overcurrent release

overcurrent release directly energized by the current in the main circuit of a CBE

3.6.5**instantaneous overcurrent release**

overcurrent release which operates without any intentional time-delay

3.6.6**overload release**

overcurrent release intended for protection against overloads

[SOURCE: IEC 60050-441:1984, 441-16-38]

3.6.7**short-circuit release**

overcurrent release intended for protection against short circuits

3.6.8**shunt release**

release energized by a source of voltage

Note 1 to entry: The source of voltage may be independent of the voltage of the main circuit.

Note 2 to entry: For CBEs, shunt releases independent of the main circuit may be called "relay releases".

[SOURCE: IEC 60050-441:1984, 441-16-41, modified – Note 2 to entry has been added.]

3.6.9**undervoltage release**

shunt release which causes a CBE to open, with or without time-delay, when the voltage across the terminals of the release falls below a predetermined value

[SOURCE: IEC 60050-441:1984, 441-16-42, modified – "mechanical switching device" has been replaced by "CBE".]

3.6.10**zero-voltage release**

shunt release which causes a CBE to open if the supply voltage falls below 0,1 times the rated voltage

3.6.11**over-voltage release**

shunt release which causes a CBE to open, with or without time-delay, when the voltage across the terminals of the release rises above a predetermined value

3.6.12**thermal overload release**

inverse time-delay overload release depending for its operation, including its time-delay, on the thermal action of the current flowing in the release

[SOURCE: IEC 60050-441:1984, 441-16-39]

3.6.13**magnetic overload release**

overload release depending for its operation on the force exerted by the current in the main circuit exciting the coil of an electromagnet

Note 1 to entry: Such a release usually has an inverse time-delay/current characteristic.

[SOURCE: IEC 60050-441:1984, 441-16-40]

3.7 Definitions related to insulation coordination

3.7.1

functional insulation

insulation between live parts which is necessary only for the proper functioning of the equipment

3.7.2

basic insulation

insulation applied to live parts to provide basic protection against electric shock

Note 1 to entry: Basic insulation does not necessarily include insulation used for functional purposes.

3.7.3

supplementary insulation

independent insulation applied in addition to basic insulation to provide protection against electric shock in the event of failure of basic insulation

3.7.4

reinforced insulation

single insulation system, applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation

Note 1 to entry: A single insulation system does not imply that the insulation must be one homogeneous piece. It may comprise several layers which can not be tested singly as basic or supplementary or reinforced insulation.

3.7.5

double insulation

insulation comprising both basic insulation and supplementary insulation

3.7.6

clearance

shortest distance in air between two conductive parts

3.7.7

clearance to earth

clearance between any conductive parts and any parts which are earthed or intended to be earthed

[SOURCE: IEC 60050-441:1984, 441-17-33]

3.7.8

clearance between open contacts

gap

total clearance between the contacts, or any conductive parts connected thereto, of a pole of a CBE in the open position

[SOURCE: IEC 60050-441:1984, 441-17-34, modified – "mechanical switching device" has been replaced by "CBE".]

3.7.9

isolating distance

<of a pole of a CBE> clearance between contacts meeting the safety requirements specified for disconnectors

[SOURCE: IEC 60050-441:1984, 441-17-35, modified – "mechanical switching device" has been replaced by "CBE".]

3.7.10**creepage distance**

shortest distance along the surface of a solid insulating material between two conductive parts

[SOURCE: IEC 60050-151:2001, 151-15-50]

3.7.11**insulation coordination**

mutual correlation of insulation characteristics of electrical equipment taking into account the expected micro-environment and other influencing stresses

3.7.12**impulse withstand voltage**

highest peak value of an impulse voltage of prescribed form and polarity, which does not cause breakdown under specified conditions

3.7.13**power-frequency withstand voltage**

RMS value of a power-frequency sinusoidal voltage which does not cause insulation breakdown under specified conditions

3.7.14**pollution**

addition of foreign matter, solid, liquid or gaseous (for example, ionized gases) that may affect dielectric strength or surface resistivity of the insulation

3.7.15**pollution degree**

numeral characterizing the expected pollution of the micro-environment

Note 1 to entry: Pollution degrees 1, 2, 3 and 4 are used (see 4.6.2 of IEC 60664-1:2007).

3.7.16**overvoltage category**

conventional number based on limiting or controlling the values of prospective overvoltages occurring in a circuit and depending on the means employed to influence the overvoltages

3.7.17**homogeneous field**

electric field which has an essentially constant voltage gradient between electrodes (uniform field) such as that between two spheres where the radius of each sphere is greater than the distance between them

3.7.18**inhomogeneous field**

electric field which does not have an essentially constant voltage gradient between electrodes (non-uniform field)

3.7.19**macro-environment**

environment of the room or other location in which the equipment is installed or used

3.7.20**micro-environment**

immediate environment of the insulation which particularly influences the dimensioning of creepage distances

3.8 Definitions related to operation of CBEs

3.8.1 operation

transfer of the moving contact(s) from the open position to the closed position or vice versa

Note 1 to entry: If a distinction is necessary, an operation in the electrical sense (for example, make or break) is referred to as a switching operation and an operation in the mechanical sense (for example, close or open) is referred to as a mechanical operation.

SOURCE: IEC 60050-441:1984, 441-16-01, modified – "from one position to an adjacent position" has been replaced by "from the open position to the closed position or vice versa" and Note 1 has been deleted.]

3.8.2 operating cycle

succession of operations from one position to another and back to the first position

[SOURCE: IEC 60050-441:1984, 441-16-02, modified – "through all other positions, if any" has been deleted.]

3.8.3 operating sequence

succession of specified operations with specified time intervals

[SOURCE: IEC 60050-441:1984, 441-16-03]

3.8.4 temporary duty

duty in which the main contacts of an equipment remain closed for periods insufficient to reach thermal equilibrium, the on-load periods being separated by off-load periods of sufficient duration to restore equality of temperature with the cooling medium

3.8.5 uninterrupted duty

duty in which the main contacts of a CBE remain closed whilst carrying a steady current without interruption for long periods (which could be weeks, months or even years)

3.8.6 intermittent duty

duty with on-load periods, in which the main contacts of an equipment remain closed, having a definite relationship to off-load periods, both periods being too short to allow the equipment to reach thermal equilibrium

3.8.7 closing operation

operation by which a CBE is brought from the open position to the closed position

[SOURCE: IEC 60050-441:1984, 441-16-08, modified – "device" has been replaced by "CBE".]

3.8.8 opening operation

operation by which a CBE is brought from the closed position to the open position

[SOURCE: IEC 60050-441:1984, 441-16-09, modified – "device" has been replaced by "CBE".]

3.8.9

trip-free CBE

CBE, the contacts of which return to, and remain in, the open position when the automatic opening operation is initiated after the initiation of the closing operation even if the closing command is maintained

Note 1 to entry: CBEs of this design may be referred to as positively trip-free.

[SOURCE: IEC 60050-441:1984, 441-16-31, modified – "device" has been replaced by "CBE".]

3.8.10

cycling trip-free CBE

CBE, the moving contacts of which return to the open position when the automatic opening operation is initiated after the initiation of the closing operation, and which will then reclose repeatedly and momentarily, whilst the closing command is maintained

3.8.11

non-trip-free CBE

CBE, the moving contacts of which will not open when the automatic opening operation is initiated if the closing command is maintained

Note 1 to entry: For conditions of use of non-trip-free CBEs, see 4.8.3.

3.9 Definitions related to the operating characteristic of CBEs

3.9.1

tripping time

time interval from the instant at which the associated tripping current begins to flow in the main circuit to the instant when this current is interrupted (in all poles)

3.9.2

tripping characteristic

time-current characteristic above which a CBE must have tripped

3.9.3

non-tripping characteristic

time-current characteristic below which a CBE does not trip

3.9.4

tripping zone

time-current zone limited by the characteristics of 3.9.2 and 3.9.3

Note 1 to entry: This zone takes into account the manufacturing and performance tolerances of the CBE.

3.9.5

self-resetting time

time interval from the instant at which the contacts of the main circuit open to the instant when they reclose

3.10 Definitions related to characteristic quantities

3.10.1

rated value

stated value of any one of the characteristic quantities that serve to define the working conditions for which the CBE is designed and built

3.10.2

limiting value

<in a specification> greatest or smallest admissible value of a quantity

[SOURCE: IEC 60050-151:2001, 151-16-10, modified – "component, device, equipment or system" has been deleted.]

3.10.3 rating

set of rated values and operating conditions

[SOURCE: IEC 60050-151:2001, 151-16-11]

3.10.4 prospective current

current that would flow in a circuit if each pole of a CBE were replaced by a conductor of negligible impedance

[SOURCE: IEC 60050-441:1984, 441-17-01, modified – "the switching device or the fuse" has been replaced by "a CBE".]

3.10.5 switching capacity making and breaking capacity

value of current that a CBE is capable of making and breaking at a stated voltage under prescribed conditions of use and operation

3.10.6 short-circuit making and breaking capacity

prospective current expressed as its RMS value, which a CBE is designed to make, to carry for its opening time and to break under specified conditions

3.11 Definitions concerning coordination of CBEs and SCPDs associated in the same circuit

3.11.1 short-circuit protective device SCPD

overcurrent protective means intended to protect a circuit or parts of a circuit against short-circuit currents by interrupting them

3.11.2 back-up protection

overcurrent coordination of two overcurrent protective devices in series where an SCPD ensures the overcurrent protection with or without the assistance of the CBE and prevents any excessive stress on the CBE under prescribed conditions

3.11.3 overcurrent discrimination selectivity

coordination of the relevant characteristics of a CBE and its SCPD such that on the incidence of overcurrents within stated limits the CBE opens the circuit while the SCPD does not operate

[SOURCE: IEC 60050-441:1984, 441-17-15, modified – "overcurrent protective device" has been replaced by "CBE" and "SCPD".]

3.11.4 selectivity limit current

I_s
limiting value of current

- below which the CBE completes its breaking operation in time to prevent the SCPD from starting its operation (i.e. selectivity is ensured), and
- above which the CBE may not complete its breaking operation in time to prevent the SCPD from starting its operation (i.e. selectivity is not ensured)

SEE: Figure F.1.

3.11.5

conditional short-circuit current

value of short-circuit current which a CBE protected by an SCPD in series can withstand under specified conditions of use and behaviour

3.11.6

electrodynamic contact separation

lowest value of peak current which causes a contact separation while the mechanism remains closed

3.11.7

short-time withstand current

<of a CBE> value of current which a CBE can satisfactorily withstand for a specified time without suffering any damage impairing its further use

3.11.8

take-over current

current coordinate of the intersection between the tripping characteristics of two overcurrent protective devices in series for operating times greater than or equal to 0,05 s

Note 1 to entry: For operating times less than 0,05 s, the two overcurrent devices in series are considered as an association (see Annex F).

[SOURCE: IEC 60050-441:1984, 441-17-16, modified – "time-current characteristics of two overcurrent protective devices" has been replaced by "tripping characteristics of two overcurrent protective devices in series for operating times greater than or equal to 0,05 s" and Note 1 to entry has been added.]

3.12 Definitions related to terminals and terminations

3.12.1

termination

connection between two or more conductive parts which can only be made by a special process

Note 1 to entry: The special process may be welding, soldering or the preparation of the conductors by a special purpose tool.

3.12.2

terminal

conductive part of a device provided for re-usable electrical connection without the use of a special process

3.12.2.1

terminal for unprepared conductors

terminal which does not require a special preparation of the conductor other than stripping and reshaping the conductor before its introduction into the terminal or the twisting of a stranded conductor to consolidate the end

3.12.2.2

terminal for prepared conductors

terminal which requires special preparation of the conductor such as the use of cable lugs, eyelets or similar devices

3.12.2.3
terminal for internal conductors
factory-wiring terminal

terminal for the connection of internal conductors of the equipment

Note 1 to entry: CBEs are normally, but not necessarily, provided with terminals for internal conductors.

3.12.3
screw-type terminal

terminal for the connection and subsequent disconnection of a conductor or the interconnection of two or more conductors capable of being dismantled, the connection being made, directly or indirectly, by means of screws or nuts of any kind

3.12.4
pillar terminal

screw-type terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw(s)

Note 1 to entry: The clamping pressure may be applied direct by the shank of the screw or through an intermediate clamping element to which pressure is applied by the shank of the screw.

Note 2 to entry: Examples of pillar terminals are shown in Annex E.

3.12.5
screw terminal

screw-type terminal in which the conductor is clamped under the head of the screw

Note 1 to entry: The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, a clamping plate or an anti-spread device.

Note 2 to entry: Examples of screw terminals are shown in Annex E.

3.12.6
stud terminal

screw-type terminal in which the conductor is clamped under a nut

Note 1 to entry: The clamping pressure may be applied direct by a suitably shaped nut or through an intermediate part, such as a washer, a clamping plate or an anti-spread device.

Note 2 to entry: Examples of stud terminals are shown in Annex E.

3.12.7
saddle terminal

screw-type terminal in which the conductor is clamped under a saddle by means of two or more screws or nuts

Note 1 to entry: Examples of saddle terminals are shown in Annex E.

3.12.8
lug terminal

screw terminal or a stud terminal, designed for clamping a cable lug or a bar by means of a screw or nut

Note 1 to entry: Examples of lug terminals are shown in Annex E.

3.12.9
screwless terminal

terminal for the connection and/or interconnection and subsequent disconnection of one or more conductors, the connection being made, directly or indirectly, by means other than screws

Note 1 to entry: The following are not regarded as screwless terminals:

- terminals requiring fixing of special devices to the conductors before clamping them into terminals, for example flat quick-connect terminals;

- terminals requiring wrapping of the conductors, for example those with wrapped joints;
- terminals providing direct contact to the conductors by means of edges or points penetrating the insulation.

Examples of screwless terminals are shown in Figures E.5 to E.14.

3.12.9.1

universal screwless terminal

screwless terminal intended for the connection of all types of conductors

3.12.9.2

non-universal screwless terminal

screwless terminal intended for the connection of certain types of conductors only

EXAMPLES push-wire clamping unit for solid conductors only; push-wire clamping unit for rigid solid and rigid stranded conductors only

3.12.10

flat quick-connect termination

electrical connection consisting of a male tab and a female connector which can be inserted and withdrawn without the use of a tool

3.12.11

male tab

portion of a quick-connect termination which receives the female connector

Note 1 to entry: Examples of male tabs are shown in Figure E.6.

3.12.12

female connector

portion of a quick-connect termination which is pushed onto the male tab

Note 1 to entry: An example of a female connector is shown in Figure E.14.

3.12.13

detent

dimple (depression) or hole in the male tab which engages a raised portion on the female connector to provide a latch for the mating parts

3.12.14

solder termination

conductive part of a CBE provided to enable a termination to be made by means of soldering

3.12.15

external conductor

field-wiring conductor

cable, cord, core or conductor, a part of which is external to equipment in or on which the CBE is mounted

3.12.16

integrated conductor

conductor which is used to permanently interconnect parts of a CBE

3.12.17

internal conductor

factory-wiring conductor

any cable, cord, core or conductor, which is internal to equipment but is neither an external nor an integrated conductor

3.12.18**tapping screw**

screw manufactured from a material having a greater resistance to deformation when applied by rotary insertion to a hole in a material having a lesser resistance to deformation

Note 1 to entry: The screw is made with a tapered thread, the taper being applied to the core diameter of the thread at the end section of the screw. The thread produced by application of the screw is formed securely only after sufficient revolutions have been made to exceed the number of threads on the tapered section.

3.12.19**thread-forming screw**

tapping screw having an uninterrupted thread

Note 1 to entry: It is not a function of this thread to remove material from the hole.

Note 2 to entry: An example of a thread-forming screw is shown in Figure 1.

3.12.20**thread-cutting screw**

tapping screw having an interrupted thread

Note 1 to entry: The thread is intended to remove material from the hole.

Note 2 to entry: An example of a thread-cutting screw is shown in Figure 2.

3.13 Definitions related to tests**3.13.1****type test**

test of one or more devices made to a certain design to show that the design meets certain specifications

3.13.2**routine test**

test to which each individual device is subjected during and/or after manufacture to check whether it complies with certain criteria

3.13.3**special test**

test, additional to type tests and routine tests, made either at the discretion of the manufacturer or according to an agreement between manufacturer and user

4 Classification**4.1 General**

CBEs are classified according to the criteria given in 4.2 to 4.11.

4.2 Quantity of poles

- the number of poles;
- the number of protected poles.

NOTE The pole which is not a protected pole can be an unprotected pole or a switched neutral.

4.3 Method of mounting

- surface type;
- flush type;
- panel-mounting type;
- integral-mounting type.