

Low-voltage switchgear and controlgear —

Part 6: Multiple function equipment —

Section 2: Control and protective switching devices (or equipment) (CPS)

The European Standard EN 60947-6-2:1993 with the inclusion of amendments A11:1997, A1:1997 and A2:1999 has the status of a British Standard

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Cooperating organizations

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National foreword

This British Standard has been prepared by Technical Committee PEL/17/2 (formerly PEL/10) and is the English language version of EN 60947-6-2:1992 *Low-voltage switchgear and controlgear Part 6. Multiple function equipment Section 2. Control and protective switching devices (or equipment) (CPS)* including amendment A11:1997, corrigendum:1997 and amendments A1:1997 and A2:1999, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived by CENELEC from IEC 60947-6-2:1992 including amendments 1:1997 and 2:1998, published by the International Electrotechnical Commission (IEC).

CENELEC amendment A1:1997 supersedes CENELEC amendment A11:1997.

A CENELEC editorial change has been implemented in the note to **9.4.4.2**, and the original IEC text has been moved to Annex ZA.

This British Standard should be read in conjunction with BS EN 60947-1:1992 *Specification for low-voltage switchgear and controlgear Part 1 General rules*, which it supplements.

The BS EN 60947 series comprises the following publications.

- *Part 1: General rules;*
- *Part 2: Circuit-breakers;*
- *Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units;*
- *Part 4: Contactors and motor-starters;*
- *Section 1: Electromechanical contactors and motor-starters;*
- *Part 5: Control circuit devices and switching elements;*
- *Section 1: Electromechanical control circuit devices;*
- *Section 2: Proximity switches;*
- *Part 6: Multiple function equipment;*
- *Section 1: Automatic transfer switching equipment;*
- *Section 2: Control and protective switching devices (or equipment) (CPS);*
- *Part 7: Ancillary equipment;*
- *Section 1: Terminal blocks for copper conductors.*

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index” or by using the “Find” facility of the BSI Standards Electronic Catalogue.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 48, an inside back cover and a back cover.

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English version

Low-voltage switchgear and controlgear —
Part 6: Multiple function equipment —
Section 2: Control and protective switching devices
(or equipment) (CPS)

(includes amendments A11:1997, A1:1997 and A2:1999)
(IEC 60947-6-2:1992 + A1:1997 + A2:1998)

Appareillage à basse tension —
Partie 6: Matériels à fonctions multiples —
Section deux: Appareils (ou matériel) de
connexion de commande de protection (ACP)
(inclut les amendements A11:1997,
A1:1997 et A2:1999)
(CEI 60947-6-2:1992 + A1:1997 + A2:1998)

Niederspannung-Schaltgeräte —
Teil 6: Mehrfunktion Schaltgeräte —
Hauptabschnitt zwei: Steuer- und
Schutz-Schaltgeräte
(enthält Änderungen A11:1997, A1:1997
und A2:1999)
(IEC 60947-6-2:1992 + A1:1997 + A2:1998)

This European Standard was approved by CENELEC on 1992-12-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 17B(CO)192, as prepared by Sub-Committee 17B: Low-voltage switchgear and controlgear of IEC Technical Committee No. 17: Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote in September 1991.

The reference document was approved by CENELEC as EN 60947-6-2 on 9 December 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-12-01
- latest date of withdrawal of conflicting national standards (dow) 1997-10-01

For products which have complied with the relevant national standard before 1993-08-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1998-08-01.

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information. In this standard, Annex ZA is informative and Annex ZB is normative.

Foreword to amendment A11

This amendment was prepared by the Technical Committee CENELEC TC 17B, Low-voltage switchgear and controlgear including dimensional standardization.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 60947-6-2:1993 on 1996-07-02.

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- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-10-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1997-10-01

This amendment covers the requirements of EMC for control and protective switching devices. It contains additional requirements corresponding to subclause 7.3 of EN 60947-1.

Foreword to amendment A1

The text of document 17B/813/FDIS, future amendment 1 to IEC 60947-6-2:1992, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60947-6-2:1993 on 1997-10-01.

This amendment supersedes EN 60947-6-2:1993/A11:1997.

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- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1998-07-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative. Annex ZA has been added by CENELEC.

Foreword to amendment A2

The text of document 17B/943/FDIS, future amendment 2 to IEC 60947-6-2:1992, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60947-6-2:1993 on 1999-01-01.

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1 Scope and object

This section of IEC 947-6 applies to control and protective switching devices (or equipment) (CPS), the main contacts of which are intended to be connected to circuits of rated voltage not exceeding 1 000 V a.c. or 1 500 V d.c.

CPSs are intended to provide both protective and control functions for circuits and are operated otherwise than by hand. They may also fulfill additional functions, such as isolation.

The object of this section is to state:

- The characteristics of CPS's;
- The conditions with which CPS's shall comply with reference to their operation and behaviour, their dielectric properties, the degree of protection provided by their enclosure where applicable;
- The tests intended to verify that these conditions have been met, and the methods to be adopted for these tests;
- The information to be marked on or given with the CPS's.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this section of IEC 947-6. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this section of IEC 947-6 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

34-1:1983, *Rotating electrical machines.*

Part 1: Rating and performance.

85:1984, *Thermal evaluation and classification of electrical insulation.*

410:1973, *Sampling plans and procedures for inspection by attributes.*

947-1:1988, *Low-voltage switchgear and controlgear. Part 1: General rules.*

947-6-1:1989, *Low-voltage switchgear and controlgear. Part 6: Multiple function equipment. Section One — Automatic transfer switching equipment.*

IEC 61000-4-1:1992, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 1: Overview of immunity tests — Basic EMC publication.*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test — Basic EMC publication.*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test.*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test — Basic EMC publication.*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity tests.*

IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances, induced by radio-frequency fields.*

CISPR 11:1990, *Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.*

3 Definitions

Clause 2 of part 1 applies with the following additional definitions.

3.1

control and protective switching device (or equipment) (CPS)

a switching device (or equipment) capable of operation other than by hand, but with or without local manual operating means

NOTE 1 The term "capable of operation other than by hand" means that the device is intended to be controlled and kept in working position from one or more external supplies.

A CPS is capable of making, carrying and breaking currents under normal conditions, including specified operating overload conditions and of making, carrying for a specified time and breaking currents under specified abnormal conditions such as those of short-circuits.

A CPS has overload and short-circuit protection, these functions being associated and coordinated so as to permit continuity of service at all currents up to its rated service short-circuit breaking capacity I_{cs} . A CPS may or may not consist of a single device but is always rated as a unit. Coordination may be either inherent or obtained by correct selection of releases in accordance with the manufacturer's instructions.

NOTE 2 A CPS may have more than one position of rest.

NOTE 3 In the context of this standard, the term “manufacturer” means any person, company or organization with ultimate responsibility as follows:

- to verify compliance with this standard;
- to provide the product information according to clause 6 (marking, identification, characteristics).

NOTE 4 In the context of this standard “continuity of service” means that CPS can be returned to service after occurrence of an over-current under the conditions specified of this section.

3.2

CPS suitable for isolation

a CPS which in the open position complies with the requirements specified for the isolating function (see 8.1.6)

3.3 CPS for motor control and protection

3.3.1

direct-on-line CPS

a CPS which connects the line voltage across the motor terminals in one step

3.3.2

reversing CPS

a CPS for starting a motor, intended to cause a motor to reverse the direction of rotation by reversing the motor primary connections while the motor may be running

3.3.3

two-direction CPS

a CPS for starting a motor, intended to cause a motor to reverse the direction of rotation by reversing the motor primary connections only when the motor is not running

3.4

opening time

sub-clause 2.5.39 of part 1 applies, with the following additions:

- in the case of a CPS tripped by an over-current relay or release, the instant of initiation of the opening time is the instant when the current reaches a value large enough to cause the CPS to operate.
- in the case of a CPS operated by any form of auxiliary power, the instant of initiation of the opening time is the instant of application of the auxiliary power to or its removal from the opening release.

NOTE For CPS’s “opening time” is commonly referred to as “tripping time”, although strictly speaking, tripping time applies to the time between the instant of initiation of the opening time and the instant when the opening command becomes irreversible.

3.5

phase loss sensitive relay or release (for motor protection)

a multipole relay or release for motor protection which operates in case of loss of phase in accordance with specified requirements

4 Classification

Data which may be used as criteria for classification are given in 5.2.

5 Characteristics

5.1 Summary of characteristics

The characteristics of a CPS shall be stated in terms of the following, as applicable:

- type of CPS (5.2);
- rated and limiting values of the main circuit (5.3);
- utilization categories (5.4);
- control circuits (5.5);
- auxiliary circuits (5.6);
- relays and releases (5.7);
- switching over-voltages (5.8).

5.2 Type of CPS

The following shall be stated:

5.2.1 Number of poles

5.2.2 Kind of current (a.c. or d.c.)

5.2.3 Method of operation

For example:

- electromagnetic, manual, motor operated.

5.2.4 Method of control

For example:

- automatic (by pilot switch or sequence control);
- non automatic (such as by handle or by push-buttons).

5.2.5 Method of resetting after overload

The following types are recognized:

- self resetting;
- local manual resetting;
- remote resetting.

5.2.6 Method of re-arming after short-circuit

The following types are recognized:

- CPS capable of remote re-arming after operation;
- CPS incapable of remote re-arming after operation;

— Those not requiring replacement of a renewable short-circuit protective element, for example a normally operated circuit-breaker.

— Those requiring replacement of a renewable short-circuit protective element, for example a fuse-link.

5.3 Rated and limiting values of the main circuit

These values shall be stated in accordance with 5.3.1 to 5.3.6 but it may not be necessary to establish all the values listed.

5.3.1 Rated voltages

Sub-clause 4.3.1 of part 1 applies.

5.3.2 Currents and powers

A CPS is defined by the following currents and powers:

- conventional free air thermal current (I_{th}): 4.3.2.1 of part 1 applies;
- conventional enclosed thermal current (I_{the}): 4.3.2.2 of part 1 applies;
- rated operational currents (I_e) or, if applicable, rated operational powers): 4.3.2.3 of part 1 applies.

5.3.3 Rated frequency

Sub-clause 4.3.3 of part 1 applies.

5.3.4 Rated duties

Sub-clause 4.3.4 of part 1 applies with the following addition to 4.3.4.3 of part 1 (intermittent periodic duty or intermittent duty): In case of utilization categories AC-42 and AC-43, an operating cycle comprises starting, running to full speed and switching off the supply to the motor.

NOTE In the case of a CPS controlling a motor for intermittent duty, the difference between the thermal time-constant of the overload relay and that of the motor may render a thermal relay unsuitable for over-load protection. It is recommended that, in this case, the question of overload protection be subject to an agreement between manufacturer and user.

5.3.5 Normal load and overload characteristics

5.3.5.1 Rated making and breaking capacities

Sub-clauses 4.3.5.2 and 4.3.5.3 of part 1 apply with the following additions:

Requirements for the various utilization categories (5.4) are given in 8.2.4.1.

The rated making and breaking capacities are only valid when the CPS is operated in accordance with the requirements of 8.2.1.1 and 8.2.1.2.

5.3.6 Short circuit characteristics

5.3.6.1 Rated service short-circuit breaking capacity (I_{cs})

Sub-clause 4.3.6.3 of part 1 applies with the following additions:

A rated short-circuit breaking capacity requires that the CPS shall be able to break any value of short-circuit current up to and including the value corresponding to the rated capacity at a power-frequency recovery voltage corresponding to the prescribed test voltage values and,

— for a.c., at any power-factor not less than that of Table 16 of part 1;

— for d.c., with a time constant up to that of Table 16 of part 1.

The rated service short-circuit breaking capacity of a CPS is the value of service short-circuit breaking capacity assigned to that CPS by the manufacturer for the corresponding rated operational voltage, under the conditions specified in 9.4.4.2. It is expressed as a value of prospective breaking current. I_{cs} shall be equal to or greater than I_{cr} (see 8.2.5 a).

NOTE For a.c., the short-circuit making capacity of a CPS shall be not less than its rated service short-circuit breaking capacity, multiplied by the factor n of Table 16 of part 1.

For d.c., the short-circuit making capacity of a CPS shall be not less than its rated service short-circuit breaking capacity.

5.4 Utilization categories

Sub-clause 4.4 of part 1 applies with the following additions:

5.4.1 Standard utilization categories

Utilization categories given in Table 1 are considered as standard. Any other type of utilization shall be based on an agreement between manufacturer and user, but information given in the manufacturer's catalogue or a tender may constitute such an agreement.

Each utilization category is characterized by the values of currents (including prospective conventional test current, see 8.2.5 a), voltages, power factors, or time constants and other data in Table 9, Table 10, Table 11, Table 12 and Table 13 and by the test conditions specified in this standard. For CPS's defined by their utilization categories, it is therefore unnecessary to specify separately the rated making and breaking capacities as these values depend directly on the utilization category as shown in Table 9.

The voltage for all utilization categories is the rated operational voltage of the CPS.

Table 1 — Utilization categories

Utilization categories ^b	Typical application
AC-40	Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance
AC-41	Non-inductive or slightly inductive loads, resistance furnaces
AC-42	Slip-ring motors: starting, switching off
AC-43	Squirrel-cage motors: starting, switching off motors during running ^a
AC-44	Squirrel-cage motors: starting, plugging, inching
AC-45a	Switching of electric discharge lamp controls
AC-45b	Switching of incandescent lamps
DC-40	Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance
DC-41	Non-inductive or slightly inductive loads, resistance furnaces
DC-43	Shunt-motors: starting, plugging, inching. Dynamic breaking of d.c. motors
DC-45	Series-motors: starting, plugging, inching. Dynamic breaking of d.c. motors
DC-46	Switching of incandescent lamps

^a AC-43 category may be used for occasional inching (jogging) or plugging for limited time periods such as machine set up; during such limited time periods the number of operations should not exceed five per minute nor 10 in a 10-min period.

^b The first digit designates a CPS.
The second digit designates a typical application.

5.4.2 Assignment of utilization categories based on the results of tests

a) A CPS which has been tested for one utilization category or at any combination of parameters (such as highest operational voltage and current, etc.) can be assigned other utilization categories without additional testing provided that the values of test current, voltages, power-factors or time-constants, number of operating cycles, the on and off times and the test circuit for the assigned utilization categories are not more severe than those at which the equipment has been tested and temperature rise has been verified at a current in continuous duty.

For example, when tested for utilization category AC-44, a CPS may be assigned utilization category AC-43 provided that I_e for AC-43 is not higher than 1,2 times I_e for AC-44 at the same rated operational voltage.

b) DC-43 or DC-45 CPS is assumed to be capable of opening and closing loads other than those on which they have been tested provided that:

- the voltage and current do not exceed the specified values of U_e and I_e ;
- the energy J stored in the actual load is equal to or less than the energy J_c stored in the load with which the CPS has been tested.

The values of the energy stored in the test circuit are as follows:

Utilization category	Stored energy J_c
DC-43	$0,00525 \times U_e \times I_e$
DC-45	$0,0315 \times U_e \times I_e$

The values of the constants 0,00525 and 0,0315 are derived from: $I_c = 1/2 LI^2$ where the time constant has been replaced by $2,5 \times 10^{-3}$ s for DC-43 and 15×10^{-3} s for DC-45 and where $U = 1,05 U_e$ and $I = 4 I_e$ (see Table 9).

5.4.3 Application of utilization categories for motor control duty

Typical service conditions are:

- rotation in one direction, the motor being switched off while running under normal service conditions (utilization categories AC-42, AC-43);
- rotation in two directions, but running of the motor in the second direction being started only after the CPS has been switched off and the motor completely stopped (utilization categories AC-42, AC-43);
- rotation in one direction, or in two directions as in the previous paragraph, but with the possibility of infrequent inching. For this service condition, a direct-on-line CPS is generally used (utilization category AC-43);
- rotation in one direction with frequent inching (jogging); a direct-on-line CPS is generally used (utilization category AC-44);

— rotation in one or two directions but with the possibility of infrequent plugging in order to stop the motor, the plugging being associated with rotor resistor braking if this is provided. In this case a CPS may be used in the stator circuit (utilization category AC-42);

— rotation in two direction but with the possibility of reversing the supply connections to the motor while it is running in the first direction (plugging), in order to obtain its rotation in the other direction while switching off the motor running under normal service conditions. A direct-on-line reversing CPS is generally used for this service condition (utilization category AC-44).

Unless otherwise stated CPS's used as starters are designed on the basis of the starting characteristics of the motors compatible with the making capacities of Table 9. When the starting current of a motor exceeds these values, a CPS having a suitably higher rated operational current should be used.

5.5 Control circuits

Sub-clause 4.5 of part 1 applies.

5.6 Auxiliary circuits

Sub-clause 4.6 of part 1 applies.

5.7 Relays or releases

Sub-clause 4.7 of part 1 applies with the following additions:

5.7.1 Types of relays or releases

5.7.1.1 Shunt release (2.4.33 of part 1)

5.7.1.2 Under-voltage and under-current relay or release (for opening) (2.4.34 of part 1).

5.7.1.3 Over-current relays or releases.

5.7.1.3.1 Overload relays or releases (2.4.25 and 2.4.30 of part 1):

- a) Instantaneous overload relay or release (2.4.24 and 2.4.30 of part 1).
- b) Definite time delay overload relay or release (2.4.26 of part 1).
- c) Inverse time delay overload relay or release (2.4.27 of part 1):
 - i) substantially independent of previous load (e.g. magnetic overload relay or release);
 - ii) dependent on previous load (e.g.: thermal overload relay or release);
 - iii) dependent on previous load and also sensitive to phase loss (see 3.5).

5.7.1.3.2 Short-circuit relays or releases:

- a) Instantaneous short-circuit relay or release (2.4.24 of part 1);
- b) Definite time delay short-circuit relay or release (2.4.26 of part 1).

NOTE A CPS has a combination of relays or releases from 5.7.1.3.1 and 5.7.1.3.2 above.

5.7.1.4 Other relays and releases (e.g. phase failure relay, control relay associated with devices for motor thermal protection, residual current relay).

NOTE Types referred to under 5.7.1.4 require consultation between manufacturer and user according to the particular application.

5.7.2 Characteristic values

Shunt release, under voltage (under current) relay or release:

- rated voltage (current);
- rated frequency;
- operating voltage (current).

Over-current relay or release:

- current setting (or range of settings);
- rated frequency, where necessary (e.g. in the case of a current transformer operated overload relay);
- time-current characteristics (or range of characteristics);
- trip class, where applicable (see Table 3);
- number of poles;
- nature of the relay or release: thermal, magnetic, solid-state.

5.7.3 Designation and current setting of overload relays or releases

Overload relays or releases are designated by their current setting (or the upper and lower limits of current setting range, if adjustable) and their trip class, where applicable. The current setting (or current setting range) shall be marked on the relay or release.

5.7.4 Time current characteristics of over current relays or releases

Time-delay relay or release:

- Definite time delay: the time delay of such relays or releases is independent of the over-current. The tripping time setting shall be stated as the duration in seconds of the opening time of the CPS if the time delay is not adjustable, or the minimum and maximum values of the opening time, if the time delay is adjustable.

— Inverse time delay: the time-current characteristics shall be given in the form of curves supplied by the manufacturer. These shall indicate how the opening time, starting from the cold state, varies with current within the range of operation of the relay or release. The manufacturer shall indicate, by suitable means, the tolerances applicable to these curves. These curves shall be given for the minimum and maximum values of the current setting and, if the time setting for a given current setting is adjustable, it is recommended that they be given in addition for each minimum and maximum values of the time setting.

NOTE Note of 4.8 of part 1 applies.

5.7.5 Influence of ambient air temperature

Unless otherwise specified, the operating value of over-current relays or releases other than those of the thermal type is independent of the ambient air temperature within the limits of -5 °C to $+40\text{ °C}$.

For relays or releases of the thermal type:

The time-current characteristics refer to a stated value of ambient air temperature and are based on no previous loading of the overload relay (i.e. from an initial cold state).

This value of the ambient air temperature shall be clearly given on the time curves; the preferred values are $+20\text{ °C}$ or $+40\text{ °C}$.

The overload-relays or releases shall be able to operate within the ambient air temperature range of -5 °C to $+40\text{ °C}$ and the manufacturer shall be prepared to state the effect of variation in ambient air temperature on the characteristics of overload relays or releases.

5.8 Switching overvoltages

Sub-clause 4.9 of part 1 applies.

6 Product information

6.1 Nature of information

The following information shall be given by the manufacturer concerning:

6.1.1 Identification

- a) The manufacturer's name or trademark.
- b) Type designation or serial number.
- c) Number of this section of standard, if the manufacturer claims compliance.

6.1.2 Characteristics

- d) rated operational voltages (U_e).
- e) Utilization category and rated operational currents (or, where applicable, rated powers) at the rated-operational voltages.

- f) Either the rated frequency (e.g.: 50 Hz, 50 Hz/60 Hz) and/or the indication "d.c." (or the symbol ---).
- g) Rated duty with the indication of the class of intermittent duty, if any.
- h) Rated service short-circuit breaking capacity (I_{cs}) (see 5.3.6.1).
- i) Rated impulse withstand voltage (U_{imp}).
- j) Indication of the open and closed positions (see 8.1.4 and 8.1.5).
- k) Pollution degree (see 7.1.3.2).
- l) Rated control circuit voltage (U_c), nature of current and rated frequency (if a.c.).
- m) Switching overvoltage.
- n) IP code, for enclosed CPS's.
- o) If necessary, nature of current, rated frequency and rated control supply voltage (U_s).
- p) Ratings of auxiliary circuits.
- r) Current setting and identification of time-current characteristic of over current relays or releases.
- s) Other characteristics of over-current relays or releases according to 5.7.
- t) In the case of renewable short-circuit protective elements (see 5.2) current rating, type and characteristics in accordance with relevant standard.
- u) Suitability for isolation where applicable (see 5.2 of part 1).
- v) Environment 1 or 2 (see 8.3.1).
- w) Special requirements if applicable, for example shielded or twisted conductors.

NOTE Unshielded or untwisted conductors are considered as normal installation conditions.

6.2 Marking

Sub-clause 5.2 of part 1 applies with the following additions related to 6.1.1 and 6.1.2 above:

- Data a) and b) and relevant operational data under d), e), and f).
- Data a) and b) shall be marked on the CPS and preferably on the nameplate if any
- Data under c) and n) shall be preferably marked on the CPS
- Data under h) and t) and relevant operational data under d), e) and f) shall be marked on the CPS
- Data under r) shall be marked on the relay or release

— Data under u) shall be marked on the CPS, the global symbol being



— Any remaining data shall be marked on the CPS, or included in the manufacturer's published literature.

— Terminals shall be marked so as to clearly identify line and load terminals (see 8.1.7.4).

6.3 Instructions for installation, operation and maintenance

Sub-clause 5.3 of part 1 applies.

Information shall be provided by the manufacturer to advise the user on the measures to be taken with regard to the CPS, if any, concerning EMC.

7 Normal service, mounting and transport conditions

Clause 6 of part 1 applies with the following additions:

7.1.3.2 Degrees of pollution

Unless otherwise stated by the manufacturers, a CPS is for use in pollution degree 3 environmental conditions, as defined in 6.1.3.2 of part 1. However, other pollution degrees may be considered to apply depending upon the micro-environment.

8 Constructional and performance requirements

8.1 Constructional requirements

NOTE Further requirements concerning materials and current-carrying parts are under consideration for 7.1.1 and 7.1.2 of part 1. Their application to this standard will be subject to further consideration.

8.1.1 Materials

Sub-clause 7.1.1 of part 1 applies (see note of 8.1).

8.1.2 Current carrying parts and their connections

Sub-clause 7.1.2 of part 1 applies (see note of 8.1).

8.1.3 Clearances and creepage distances

Sub-clause 7.1.3 of part 1 applies.

8.1.4 Actuator

Sub-clause 7.1.4 of part 1 applies.

8.1.5 Indication of the contact position

Sub-clause 7.1.5 of part 1 applies.

8.1.6 Additional safety requirements for CPS's suitable for isolation

Sub-clause 7.1.6 of part 1 applies with the following addition:

CPS's suitable for isolation shall be provided with means for locking in the isolated position.

CPS's shall be designed so that the actuator, front plate or cover is fitted to the CPS in a manner which ensures correct contact position indication and locking, if provided.

NOTE The indicated open position is the only position in which the specified isolating distance between the contacts is ensured. If the tripped position is not the indicated open position, it should be clearly identified.

Further requirements are under consideration.

8.1.7 Terminals

Sub-clause 7.1.7 of part 1 applies with the following addition:

8.1.7.4 Terminal identification and marking

Sub-clause 7.1.7.4 of part 1 applies with additional requirements as given in Annex C with the following addition:

Line and load terminals of CPS for utilization categories AC-40 and DC-40 having trip units which are not removable or sealed against removal may not be identified, in which case control circuits shall not be internally connected to the main circuit.

8.1.8 Additional requirements for CPS's provided with a neutral pole

Sub-clause 7.1.8 of part 1 applies.

8.1.9 Provisions for protective earthing

Sub-clause 7.1.9.1 of part 1 applies.

8.1.10 Enclosures for CPS's

Sub-clause 7.1.10 of part 1 applies with the following addition:

In the case of enclosed CPS's provided with an externally manually operated actuator, the door or cover shall be interlocked so that they cannot be opened without the CPS being in the open position. However, provision may be made to open the door or cover with the CPS in the ON position by the use of a tool.

8.2 Performance requirements

8.2.1 Operating conditions

8.2.1.1 General

7.2.1.1 of part 1 applies with the following additions:

CPS's shall be so constructed that they are trip free (see 2.4.23 of part 1).

CPS's shall not trip due to the shock caused by their operation when tested according to 9.3.3.1 after having carried their maximum rated operational current at the reference ambient air temperature and reached thermal equilibrium at both minimum and maximum settings of the overload relay if adjustable.

Resetting of relays and releases shall not result in a closing operation of the CPS in the absence of a closing command.

8.2.1.2 Limits of operation of power operated CPS's

Sub-clause 7.2.1.2 of part 1 applies with the following addition:

The limits apply to d.c and a.c. at each rated frequency.

8.2.1.3 Limits of operation of under-voltage relays and releases

Sub-clause 7.2.1.3 of part 1 applies.

8.2.1.4 Limits of operation of shunt releases

Sub-clause 7.2.1.4 of part 1 applies.

8.2.1.5 Limits of operation of over-current relays or releases

8.2.1.5.1 Opening under overload conditions

a) *Instantaneous and definite time-delay overload relays or releases* [types a) and b) in 5.7.1.3.1]

For all values of the current setting the CPS shall trip with an accuracy of $\pm 10\%$ of the specified tripping current value corresponding to the current setting.

b) *Inverse time-delay overload relays or releases* (types c) in 5.7.1.3.1)

i) *Utilization categories AC-42, AC-43, AC-44, DC-43, DC-45.*

When all poles are energized

The relays or releases are classified for these utilization categories according to Table 3 and shall comply with the requirements of Table 2 and Table 3 when tested as follows:

— With the CPS in its enclosure, if normally fitted, and at A times the current setting, tripping shall not occur in less than 2 h starting from the cold state, at the value of reference ambient air temperature stated in Table 2. However, when the overload relay terminals have reached thermal equilibrium at the test current in less than 2 h, the test duration can be the time to reach such thermal equilibrium.

— When the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h.

— For trip class 10A overload relays or releases energized at C times the current setting, tripping shall occur in less than 2 min, starting from thermal equilibrium at 1.0 times the current setting, in accordance with 18.2 of IEC 34-1.

— For trip classes 10, 20 and 30 overload relays or releases energized at C times the current setting, tripping shall occur in less than 4 min, 8 min or 12 min respectively, starting from thermal equilibrium at 1.0 times the current setting.

— At D times the current setting, tripping time T_p shall lie within the limits given in Table 3 for the appropriate trip class starting from the cold state.

— In the case of overload relays or releases having a current setting range, the limits of operation shall apply both when the relay or release is carrying the current associated with the maximum setting and when the relay or release is carrying the current associated with the minimum setting.

— For non-compensated overload relays or releases the current multiple/ambient temperature characteristic shall be not greater than 1,2 %/K.

NOTE 1.2 %/K is the derating characteristic of PVC insulated cables.

An overload relay or release is regarded as compensated if it complies with the relevant requirements of Table 2 at 20 °C and is within the limits shown in Figure 1 at other temperatures.