

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Appareillage à basse tension –
Partie 6-2: Matériels à fonctions multiples – Appareils (ou matériel) de connexion
de commande de protection (ACP)



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Part 6-2: Multiple function equipment – Control and protective switching devices
(or equipment) (CPS)**

[IEC 60947-6-2:2020](#)

**Appareillage à basse tension –
Partie 6-2: Matériels à fonctions multiples – Appareils (ou matériel) de connexion
de commande de protection (ACP)**

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CONTENTS

FOREWORD	7
1 Scope	10
2 Normative references	10
3 Terms and definitions	11
3.1 General	11
3.2 Terms and definitions related to the equipment	12
3.3 Terms and definitions concerning characteristic quantities	13
3.4 Terms and definitions concerning safety aspects	14
4 Classification	15
5 Characteristics	15
5.1 Summary of characteristics	15
5.2 Type of equipment	15
5.2.1 Number of poles	15
5.2.2 Kind of current (alternating current or direct current)	15
5.2.3 Method of operation	15
5.2.4 Method of control	16
5.2.5 Method of resetting after overload	16
5.2.6 Method of rearming after short-circuit	16
5.3 Rated and limiting values of the main circuit	16
5.3.1 Rated voltages	16
5.3.2 Currents and powers	16
5.3.3 Rated frequency	16
5.3.4 Rated duties	16
5.3.5 Normal load and overload characteristics – Rated making and breaking capacities	17
5.3.6 Short circuit characteristics – Rated service short-circuit breaking capacity (I_{CS})	17
5.3.7 Pole impedance of a CPS (Z)	17
5.4 Utilization categories	17
5.4.1 General	17
5.4.2 Assignment of utilization categories based on the results of tests	18
5.4.3 Application of utilization categories for motor control duty	19
5.5 Control circuits	19
5.6 Auxiliary circuits	20
5.7 Relays or releases	20
5.7.1 Summary of characteristics	20
5.7.2 Types of relays or releases	20
5.7.3 Characteristic values	21
5.7.4 Designation and current setting of overload relays or releases	21
5.7.5 Time-current characteristics of over current relays or releases	21
5.7.6 Influence of ambient air temperature	22
6 Product information	22
6.1 Nature of information	22
6.1.1 Identification	22
6.1.2 Characteristics	22
6.2 Marking	23
6.3 Instructions for installation, operation and maintenance	24

6.4	Environmental information	24
7	Normal service, mounting and transport conditions	24
8	Constructional and performance requirements	25
8.1	Constructional requirements	25
8.1.1	General	25
8.1.2	Materials	25
8.1.3	Current-carrying parts and their connections	26
8.1.4	Clearances and creepage distances	26
8.1.5	Actuator	26
8.1.6	Indication of the contact position	27
8.1.7	Additional requirements for equipment suitable for isolation	27
8.1.8	Terminals	27
8.1.9	Additional requirements for equipment provided with a neutral pole	27
8.1.10	Provisions for protective earthing	27
8.1.11	Enclosures for equipment	27
8.1.12	Degrees of protection of enclosed equipment	28
8.1.13	Conduit pull-out, torque and bending with metallic conduits	28
8.1.14	Limited energy source	28
8.1.15	Stored charge energy circuit	30
8.1.16	Fault and abnormal conditions	30
8.1.17	Short-circuit and overload protection of ports	31
8.2	Performance requirements	31
8.2.1	Operating conditions	31
8.2.2	Temperature-rise	37
8.2.3	Dielectric properties	39
8.2.4	Performance under no load, normal load and overload conditions	39
8.2.5	Ability to make, carry and break short-circuit currents	45
8.2.6	Pole impedance	46
8.2.7	Leakage currents of equipment suitable for isolation	46
8.2.8	Coil power consumption	46
8.2.9	Co-ordination between a CPS and another short-circuit protective device	46
8.3	Electromagnetic compatibility (EMC)	46
8.3.1	General	46
8.3.2	Immunity	47
8.3.3	Emission	47
9	Tests	48
9.1	Kind of tests	48
9.1.1	General	48
9.1.2	Type test	48
9.1.3	Routine tests	48
9.1.4	Sampling tests	48
9.1.5	Special tests	48
9.2	Compliance with constructional requirements	49
9.2.1	General	49
9.2.2	Electrical performance of screwless-type clamping units	49
9.2.3	Ageing test for screwless-type clamping units	50
9.2.4	Limited energy source test	50
9.2.5	Breakdown of components	51

9.3	Compliance with performance requirements	51
9.3.1	Test sequences	51
9.3.2	General test conditions	52
9.3.3	Performance under no load, normal load and overload conditions.....	52
9.3.4	Performance under short-circuit conditions	61
9.4	EMC tests	63
9.4.1	General	63
9.4.2	Immunity.....	64
9.4.3	Emission.....	69
9.5	Test sequences	70
9.5.1	General	70
9.5.2	Test sequence I: temperature-rise, operating limits, dielectric properties	71
9.5.3	Test sequence II: performance under normal load and overload conditions	75
9.5.4	Test sequence III: operational performance before and after operating sequences at conventional prospective current I_{Cr} and conventional prospective current "r" test	76
9.5.5	Test sequence IV: operational performance before and after operating sequences at I_{CS}	77
9.5.6	Test sequence V: additional breaking capacity	78
9.5.7	Test sequence VI: additional test sequence for four-pole CPS's.....	78
9.5.8	Test sequence VII: additional test sequence for CPS's intended for use in an individual enclosure	79
9.5.9	Test sequence VIII: EMC	79
9.6	Routine tests.....	79
9.6.1	General.....	79
9.6.2	Operation and operating limits.....	80
9.6.3	Dielectric tests.....	80
Annex A (normative)	Special tests	81
A.1	General.....	81
A.2	Mechanical durability	81
A.2.1	General	81
A.2.2	Verification of mechanical durability.....	81
A.3	Electrical durability	83
Annex B (xxx)	Vacant	84
Annex C (normative)	Marking and identification of CPS terminals	85
C.1	General.....	85
C.2	Marking and identification of terminals of main circuits.....	85
C.2.1	General	85
C.2.2	Marking and identification of terminals of auxiliary circuits	85
Annex D (informative)	Items subject to agreement between manufacturer and user	86
Annex E (xxx)	Vacant	87
Annex F (normative)	Requirements for auxiliary contact linked with power contact (mirror contact)	88
F.1	Application and object.....	88
F.1.1	Application.....	88
F.1.2	Object.....	88
F.2	Terms and definitions.....	88
F.3	Characteristics.....	88

F.4	Product information.....	88
F.5	Normal service, mounting and transport conditions	89
F.6	Constructional and performance requirements	89
F.7	Tests	89
F.7.1	General	89
F.7.2	Tests on products in a new condition	89
F.7.3	Test after conventional operational performance (defined under Table 10)	90
Annex G (normative)	Test sequence for CPS's for IT systems	91
G.1	General.....	91
G.2	Individual pole short circuit	91
G.3	Verification of dielectric withstand	92
G.4	Verification of overload releases	92
G.5	Marking.....	92
Annex H (xxx)	Vacant	93
Annex I (informative)	Glossary of symbols and graphical representation of characteristics	94
Annex J (xxx)	Vacant	95
Annex K (normative)	Procedure to determine data for electromechanical CPS used in functional safety applications	96
K.1	General.....	96
K.2	Test requirements.....	96
K.3	Characterization of a failure mode.....	96
K.4	Failure ratios of a CPS.....	96
Annex L (xxx)	Vacant.....	98
Annex M (informative)	Load monitoring indicators.....	99
M.1	General.....	99
M.2	Indicators list	99
M.3	Uncertainty	101
M.4	Tests	102
M.4.1	Routine tests	102
M.4.2	Type tests.....	102
Annex N (normative)	Additional requirements and tests for equipment with protective separation.....	104
N.1	General.....	104
N.2	Terms and definitions.....	104
N.3	Requirements	104
N.3.1	Test method for implementing protective impedance.....	104
N.3.2	Touch current measurement	105
Bibliography	107
Figure 1	Multiple of current setting limits for ambient air temperature time-delay overload relays or releases (see 8.2.1.5.1)	34
Figure 2	Thermal memory test	36
Figure 3	Voltage drop measurement at contact point of the clamping terminal	50
Figure 4	Example of a pole impedance measurement for a three-pole CPS.....	59
Figure 5	Representation of test current produced by back-to-back thyristors.....	67
Figure 6	Test current for the verification of the influence of the current dips and interruptions.....	68

Figure F.1 – Mirror contact.....	89
Figure M.1 – Example of quantification of a process change	101
Figure N.1 – Protection by means of protective impedance	105
Figure N.2 – Measuring instrument	106
Table 1 – Utilization categories	18
Table 20 – Limits for limited energy sources without an over-current protective device	29
Table 21 – Limits for limited energy sources with an over-current protective device	29
Table 22 – Limits for limited energy source with current limiting impedance	30
Table 2 – Limits of operation of inverse time-delay overload relays or releases when energized on all poles	33
Table 3 – Trip classes of overload relays or releases for utilization categories AC-2, AC-3, AC-3e, AC-4, DC-3, DC-5	34
Table 4 – Limits of operation of three-pole inverse time-delay overload relays or releases when energized on two poles only	35
Table 5 – Temperature-rise limits of terminals	37
Table 6 – Temperature-rise limits for insulated coils in air.....	38
Table 7 – Intermittent duty test cycle data.....	38
Table 8 – Rated making and breaking capacities – Making and breaking conditions corresponding to the utilization categories	40
Table 9 – Relationship between current broken I_c and OFF-time for the verification of rated making and breaking capacities	41
Table 10 – Conventional operational performance after making/breaking capacity tests – Making and breaking conditions according to utilization category	43
Table 11 – Operational performance before and after short-circuit tests at I_{cr} and I_{cs} – Making and breaking conditions according to utilization category	44
Table 12 – Value of the prospective test current according to the rated operational current	45
Table 13 – Value of the prospective test current according to the rated operational current (harmonized table).....	46
Table 14 – Performance criteria when EM disturbances are present	47
Table 15 – EMC immunity tests.....	64
Table 16 – Test parameters for harmonics and interruptions	68
Table 17 – Terminal disturbance voltage limits for conducted radio-frequency emission (for mains ports)	69
Table 18 – Radiated emission test limits	70
Table 19 – Test sequences	70
Table F.1 – Test voltage according to altitude.....	90
Table G.1 – Individual pole	91
Table K.1 – Failure mode of CPS.....	96
Table K.2 – Typical failure ratios for CPS.....	97
Table M.1 – AC monitoring indicators list.....	100
Table M.2 – Different possibilities authorized for verification of indicators	102
Table M.3 – Reference for verification conditions	103
Table M.4 – Harmonic levels.....	103

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 6-2: Multiple function equipment –
Control and protective switching devices (or equipment) (CPS)**

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International Standard IEC 60947-6-2 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low-voltage.

This third edition cancels and replaces the second edition published in 2002 and its Amendment 1:2007. This edition constitutes a technical revision.

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

- editorial changes according to ISO/IEC directives Part 2,
- alignments with IEC 60947-1:2020:
 - markings ("s", "sol", "r" or "f");
 - constructional requirements including material requirements;
 - requirements for screwless terminals;

- measurement method of the pole impedance;
- EMC requirement and testing;
- procedure to determine data for electromechanical CPS's used in functional safety applications;
- harmonisation with IEC 60947-2:2016:
 - operation tests of under-voltage relays and shunt releases;
 - CPS for IT systems (Annex G);
 - coordination with other short-circuit protective devices;
- alignments with IEC 60947-4-1:2018:
 - test at the rated conditional short-circuit current I_q of protected switching devices;
 - short-circuit tests harmonisation with North America;
 - reliability data for functional safety applications (new Annex K);
 - safety aspects related to electronic circuits and protective impedance (new Annex N);
 - introduction of provisions covering the impact of higher locked rotor current to achieve high efficiency class;
 - mention of dedicated wiring accessories;
 - definitions and measurement method of the power consumption of the control circuit during holding and pick-up operations;
 - load monitoring indicators (new Annex M);

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

FDIS	Report on voting
121A/384/FDIS	121A/392/RVD

<https://standards.itec.ai/catalog/standards/sist/8566f13-cace-4284-8c33-fb49dafc3ec7/iec-60947-6-2-2020>

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.

A list of all the parts in the IEC 60947 series, under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

This document shall be read in conjunction with IEC 60947-1, *Low voltage switchgear and controlgear – Part 1: General rules*.

The provisions of the general rules are applicable to this part of IEC 60947-6, where specifically called for. General rules clauses and subclauses thus applicable as well as tables, figures and annexes are identified by reference to IEC 60947-1, for example, 1.2.3, Table 4, or Annex A of IEC 60947-1:2020.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS)

1 Scope

This document 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 AC or 1 500 V DC.

It covers control and protective switching device (CPS):

- which provides protective and control functions for circuits and motors;
- where its control function is operated exclusively otherwise than by hand;
- which provides continuity of service after over-current conditions; and
- which can have additional functions, such as isolation or communication.

This document does not apply to:

- auxiliary contacts, covered by IEC 60947-5-1;
- CPS used downstream to frequency drive¹;

NOTE Additional requirements for CPS used downstream to frequency drive are under consideration for the next maintenance cycle.

- the use of the product with additional measure within explosive atmospheres, covered by IEC 60079 (all parts);
- embedded software design rules, covered by IEC TR 63201;
- cyber security aspects, covered by IEC TS 63208.

The object of this document is to state:

- the characteristics of CPS's;
- the conditions with which CPS's are complying with reference to their operation and behaviour, their dielectric properties, the degree of protection provided by their enclosure where applicable, its construction including safety measures against electric shock, fire hazard and mechanical hazard;
- 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 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.

¹ For this subject, the manufacturer is responsible to take additional safety measures.

IEC 60034-1:2017, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

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

IEC 60617, *Graphical symbols for diagrams* (available at <http://std.iec.ch/iec60617>)

IEC 60715:2017, *Dimensions of low-voltage switchgear and controlgear – Standardized mounting on rails for mechanical support of switchgear, controlgear and accessories*

IEC 60730-1, *Automatic electrical controls – Part 1: General requirements*

IEC 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-2:2016, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-2:2016/AMD1:2019

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61051-2, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*

<https://standards.iteh.ai/catalog/standards/sist/8f56fcf3-cace-4284-8c33-1c47ddc7ec7e/iec-60947-6-2-2020>

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 11:2015/AMD1:2016

CISPR 11:2015/AMD2:2019

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

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*

3 Terms and definitions

3.1 General

For the purposes of this document, the terms and definitions of Clause 3 of IEC 60947-1:2020, as well as the following terms, definitions, symbol and abbreviations 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>

3.2 Terms and definitions related to the equipment

3.2.1

control and protective switching device

CPS

mechanical switching device with a control function operated otherwise than by hand capable of:

- making, carrying and breaking currents under normal conditions;
- making, carrying for a specified time in overload condition;
- breaking currents under specified abnormal operating condition such as those of short-circuits;
- continuity of service,

with or without local manual operating means

Note 1 to entry The term "with a control function operated otherwise than by hand" means that the device is intended to be controlled and kept in working position from one or more external controls.

Note 2 to entry: A CPS can consist of a single device but is always rated as a unit. Coordination can be either inherent or obtained by correct selection of releases in accordance with the manufacturer's instructions.

3.2.2

direct-on-line CPS

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

3.2.3

reversing CPS

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

Note 1 to entry An application where reversing the motor primary connections while the motor is running is called plugging.

3.2.4

electronically controlled electromagnet

electromagnet in which the coil is controlled by a circuit with active electronic elements

[SOURCE IEC 60947-4-1:2018, 3.3.8]

3.2.5

dedicated wiring accessory

prefabricated connection wiring system specifically intended for identified switchgear or controlgear

Note 1 to entry A dedicated wiring accessory can be integrated in the switchgear or controlgear or delivered separately.

Note 2 to entry A typical dedicated wiring accessory is for example a connection link.

3.2.6

phase-loss sensitive relay or release

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

3.2.7

under-current relay or release

relay or release which operates automatically when the current through it is reduced below a predetermined value

3.2.8**under-voltage relay or release**

relay or release which operates automatically when the voltage applied to it is reduced below a predetermined value

3.2.9**stall relay or release**

electronic overload relay or release which operates when the current has not decreased below a predetermined value for a specific period of time during start-up or when the relay or the release receives the input indicating there is no rotation of the motor after a predetermined time in accordance with specified requirements

Note 1 to entry Explanation of stall: rotor locked during start.

Note 2 to entry With appropriate adjustment of the current and starting time settings, such relay or release can be used to detect starts requiring longer than specified times.

3.2.10**jam relay or release**

electronic overload relay or release which operates in the case of overload and also when the current has increased above a predetermined value for a specific period of time during operation in accordance with specified requirements

Note 1 to entry A jam is a high overload occurring after the completion of starting which causes the current to reach the locked rotor current value of the motor being controlled.

3.2.11**inhibit time**

time-delay period during which the tripping function of the relay is inhibited (may be adjustable)

3.3 Terms and definitions concerning characteristic quantities**3.3.1****continuity of service**

<of a control and protective switching device> capability to return into service after occurrence of an over-current fault in the circuit under control at all current up to the rated service short-circuit breaking capacity I_{CS} of the control and protective switching device

3.3.2**holding power**

power needed to maintain the operation of the electromagnet

[SOURCE: IEC 60947-4-1:2018, 3.3.9, modified – Without “(of a contactor)”.]

3.3.3**pick-up power**

power needed to operate the device from the de-energized state

[SOURCE: IEC 60947-4-1:2018, 3.3.10, modified – Deletion of “(of a contactor)” in the term and of “to the energized state” in the definition.]

3.3.4**O**

<operation> breaking operation by the device under short-circuit current

3.3.5**CO**

<operation> making operation under short-circuit current followed, after the appropriate opening time, by a breaking operation