IEC 60947-6-2

Edition 3.0 2020-12

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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IEC 60947-6-2:2020-12(en-fr)

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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

SIST Preview
(https://ecommerce.sist.si)
IEC 60947-6-2:2020
https://ecommerce.sist.si/standards/sist/8f56fcf3-cece-4284-8e33-fb49daf3ec7/iec-60947-6-2-2020

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

SIST Preview
(https://ecommerce.sist.si)
https://ecommerce.sist.si/catalog/standards/sist/9da6e3ec7/iec-60947-6-2-2020

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

SIST Preview
(https://ecommerce.sist.si)
IEC 60947-6-2:2020
https://ecommerce.sist.si/standards/sist/8f56fbf3-cace-4284-8c33-fb49dafc3ec7/iec-60947-6-2-2020

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

SIST Preview
(https://ecommerce.sist.si)
IEC 60947-6-2:2020
https://ecommerce.sist.si/catalog/standards/sist/8f56fcf3-cace-4284-8c33-fb49dafc3ec7/iec-60947-6-2-2020

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

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https://standards.iec.ch/catalog/standards/sist/...-iec-60947-6-2-2020

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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

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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 drive[1];

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.

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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*

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

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

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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

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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.

https://ecommerce.sist.si/catalog/standards/sist/8f56fcf3-cace-4284-8c33-fb49dafc3ec7/iec-60947-6-2-2020

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)

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3.3 Terms and definitions concerning characteristic quantities

IEC 60947-6-2:2020
https://standards.iteh.ai/catalog/standards/sist/8f56fcf3-cace-4284-8e33-fb49dafc3ec7/iec-60947-6-2-2020

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