

INTERNATIONAL STANDARD

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**Low-voltage switchgear and controlgear –
Part 8: Control units for built-in thermal protection (PTC) for rotating electrical
machines**

**Appareillage à basse tension –
Partie 8: Unités de commande pour la protection thermique incorporée (CTP)
aux machines électriques tournantes**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –**Part 8: Control units for built-in thermal protection (PTC)
for rotating electrical machines**

FOREWORD

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IEC 60947-8 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. It is an International Standard.

This second edition cancels and replaces the first edition published in 2003, Amendment 1:2006 and Amendment 2:2011. This edition constitutes a technical revision.

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

- a) safety aspects related to:
 - general aspects;
 - limited energy circuits;
 - electronic circuits;
- b) alignment to IEC 60947-1:2020;

- c) wire break detection function;
- d) the term detector is replaced by thermistor;
- e) reference to IEC 60738-1-4.

The provisions of the general rules dealt with IEC 60947-1 are applicable to this part of IEC 60947 series where specifically called for. Clauses and subclauses, tables, figures and annexes of the general rules thus applicable are identified by reference to IEC 60947-1:2020.

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

FDIS	Report on voting
121A/424/FDIS	121A/436/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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.

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

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

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INTRODUCTION

Thermal protection systems which are based on the principle of monitoring the temperature of the protected parts constitute a simple and effective means of protecting rotating electrical machines, called also electric motors, against excessive temperature rises, including those caused by faults in the cooling system, or excessively high ambient temperature, whereas systems of protection based only on monitoring the current absorbed do not ensure this type of protection in every circumstances.

Since the operating temperature and response times of thermal protection systems are fixed in advance, they are not often adjusted in relation to the conditions of use of the machine and, hence, they are not completely effective for all fault conditions, or improper use of the machine.

A thermal protection system in accordance with this document can consist of a characteristic change thermal detector which has an associated control unit to convert a point on the characteristic of the detector to a switching function. A very large number of thermal protection systems are in use and, in all cases, the machine manufacturer will fit the detectors in the machine. The machine manufacturer will either supply the control unit with the machine or specify particulars of the control unit to be used.

It is also customary for the control units to be considered as part of the control system and not necessarily supplied with the machine. For this reason, it is considered useful to have an interchangeable system, where the characteristics of association between the detector and the control unit are specified. This particular system is not considered superior in any way to other systems complying with the requirements of this document, but in some fields the practice is likely to be that this interchangeable system will be used, as indicated by the designation "Mark A".

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 8: Control units for built-in thermal protection (PTC) for rotating electrical machines

1 Scope

This part of IEC 60947 series specifies requirements for control units, which control a switching device in response to the PTC thermistors incorporated in rotating electrical machines and the industrial application.

It specifies requirements for that type of system comprising a positive temperature coefficient (PTC) thermistor having particular characteristics, and its associated control unit.

This document includes:

- the characteristics, construction, performance and tests of the control unit; and
- its association with a PTC thermistor designated “Mark A”.

This document does not cover:

- the incorporation of thermal protections into rotating machines and their maximum winding temperature. See IEC 60034-11;
- use of the product within explosive atmospheres (see IEC 60079 (all parts));
- software and firmware requirements;

NOTE 1 Guidance on embedded software is given in IEC TR 63201.

- cyber security aspects (see IEC TS 63208).

NOTE 2 It is not possible to specify all the requirements for the operating characteristics of a control unit, as they are dependent on some aspects of the PTC thermistors. Some aspects of the requirements of the thermal protector system can only be specified when account is taken of the characteristics of the rotating machine to be protected and the method of installation of the PTC thermistor within the machine.

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.

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

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

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

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

IEC 60738-1:2006, *Thermistors – Directly heated positive temperature coefficient – Part 1: Generic specification*

IEC 60738-1:2006/AMD1:2009

IEC 60738-1-4:2008, *Thermistors – Directly heated positive step-function temperature coefficient – Part 1-4: Blank detail specification – Sensing application – Assessment level EZ*

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

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

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-1:1999/AMD1:2011

3 Terms and definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60947-1:2020, as well as 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>

3.1.1

built-in thermal protection

protection of certain parts (called protected parts) of a rotating electrical machine against excessive temperatures resulting from certain conditions of thermal overload, achieved by means of a thermal protection system, the whole or part of which is a thermally sensitive device incorporated within the machine

3.1.2

thermal protection system

system intended to ensure the thermal protection of a rotating electrical machine by means of a built-in PTC thermistor together with a control unit

3.1.3

control system

system to translate a particular point on the characteristic of a PTC thermistor to a switching function on the supply to the rotating electrical machine

Note 1 to entry: The system is capable of being reset (either manually or automatically) when the temperature falls to the reset value.

3.1.4

protected part

part of a rotating electrical machine, the temperature of which is limited to a predetermined value by the action of the thermal protection system