
Niskonapetostne stikalne in krmilne naprave – 5-3. del: Krmilne naprave in stikalni elementi – Zahteve za približevalne naprave z določenim obnašanjem ob okvarnih razmerah (PDF)

Low-voltage switchgear and controlgear - Part 5-3: Control circuit devices and switching elements - Requirements for proximity devices with defined behaviour under fault conditions (PDF)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60947-5-3:2000
https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000](https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60947-5-3:2000

<https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000>

English version

**Low-voltage switchgear and controlgear
Part 5-3: Control circuit devices and switching elements
Requirements for proximity devices with defined behaviour
under fault conditions (PDF)
(IEC 60947-5-3:1999)**

Appareillage à basse tension
Partie 5-3: Appareils et éléments
de commutation pour circuits de
commande
Prescriptions pour dispositifs de
détection de proximité
à comportement défini dans des
conditions de défaut (PDF)
(CEI 60947-5-3:1999)

Niederspannungsschaltgeräte
Teil 5-3: Steuergeräte und
Schaltelemente
Anforderungen für Näherungsschalter
mit definiertem Verhalten unter
Fehlerbedingungen (PDF)
(IEC 60947-5-3:1999)

This European Standard was approved by CENELEC on 1999-05-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000>

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 17B/963/FDIS, future edition 1 of IEC 60947-5-3, 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 EN 60947-5-3 on 1999-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2000-02-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2002-05-01

This standard is to be used in conjunction with EN 60947-1 and EN 60947-5-2.

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60947-5-3:1999 was approved by CENELEC as a European Standard without any modification.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60947-5-3:2000](https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000)
<https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000>

Annex ZA (normative)

**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-191	1990	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of service	-	-
IEC 60068-2-1	1990	Environmental testing Part 2: Tests - Tests A: Cold	EN 60068-2-1	1993
IEC 60068-2-2	1974	Part 2: Tests - Test B: Dry heat	EN 60068-2-2 ¹⁾	1993
IEC 60204-1	1997	Safety of machinery - Electrical equipment of machines Part 1: General requirements	EN 60204-1 + corr. May	1997 1994
IEC 60249-2	series	Base materials for printed circuits Part 2: Specifications	EN 60249-2	series
IEC 60446	1989 ²⁾	Identification of conductors by colours or numerals	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60664-1 (mod)	1992	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	HD 625.1 S1 + corr. November	1996 1996
IEC 60664-3	1992	Part 3: Use of coatings to achieve insulation coordination of printed board assemblies	HD 625.3 S1	1997
IEC 60742 (mod)	1983	Isolating transformers and safety isolating transformers - Requirements	EN 60742 ³⁾	1995

1) EN 60068-2-2 includes supplement A:1976 to IEC 60068-2-2.

2) IEC 60446:1999 is harmonized as EN 60446:1999.

3) EN 60742 includes A1:1992 to IEC 60742.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60812	1985	Analysis techniques for system reliability Procedure for failure mode and effects analysis (FMEA)	HD 485 S1	1987
IEC 60947-1 (mod)	1996	Low-voltage switchgear and controlgear Part 1: General rules	EN 60947-1 ⁴⁾	1997
IEC 60947-5-1	1997	Part 5-1: Control circuit devices and switching elements -- Section 1: Electromechanical control circuit devices	EN 60947-5-1	1997
IEC 60947-5-2 (mod)	1997	Part 5-2: Control circuit devices and switching elements - Proximity switches	EN 60947-5-2	1998
IEC 61025	1990	Fault tree analysis (FTA)	HD 617 S1	1992
IEC 61131-2	1992	Programmable controllers Part 2: Equipment requirements and tests	EN 61131-2	1994
IEC 61496-1	1997	Safety of machinery - Electro-sensitive protective equipment Part 1: General requirements and tests	EN 61496-1	1997
IEC 61508	series	Functional safety of electrical/electronic/programmable electronic safety-related systems	-	-
ISO 9000-3	1997	Quality management and quality assurance standards Part 3: Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software	EN ISO 9000-3	1997
ISO 9001	1994	Quality systems - Model for quality assurance in design/ development, production, installation and servicing	EN ISO 9001	1994
ISO/TR 12100-1	1992	Safety of machinery - Basic concepts, general principles for design Part 1: Basic terminology, methodology	-	-
ISO/DIS 13849-1		Safety of machinery - Safety-related parts of control systems Part 1: General principles for design	-	-
ISO/TR 14119	1998	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection	-	-

4) EN 60947-1 is superseded by EN 60947-1:1999, which is based on IEC 60947-1:1999.

NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC

60947-5-3

Première édition
First edition
1999-03

Appareillage à basse tension –

**Partie 5-3:
Appareils et éléments de commutation
pour circuits de commande –
Prescriptions pour dispositifs de détection
de proximité à comportement défini
dans des conditions de défaut (PDF)**

Low-voltage switchgear and controlgear –

**Part 5-3:
Control circuit devices and switching elements –
Requirements for proximity devices with defined
behaviour under fault conditions (PDF)**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

© IEC 1999 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé électronique ou mécanique, y compris la photo-copie et les microfilms, sans l'accord écrit de l'éditeur. SIST EN 60947-5-3:2000
<https://standards.iteh.ai/catalog/standards/sist/en-60947-5-3-2000>

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission
Telefax: +41 22 919 0300

e-mail: inmail@iec.ch

3, rue de Varembeé Geneva, Switzerland
IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

U

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

	Page
FOREWORD	5
Clause	
1 General.....	7
1.1 Scope	7
1.2 Normative references.....	7
2 Definitions.....	11
2.1 Basic definitions.....	11
2.2 Parts of a PDF	11
2.3 Operation of a PDF	13
3 Classification	15
4 Characteristics	17
5 Product information.....	17
5.1 Nature of information	17
5.2 Marking.....	17
5.3 Instructions for installation, operation and maintenance.....	19
6 Normal service, mounting and transport conditions.....	19
6.1 Normal service conditions	19
6.2 Conditions during transport and storage	19
6.3 Mounting.....	19
7 Constructional and performance requirements.....	19
7.1 Constructional requirements.....	19
7.2 Performance requirements	27
7.3 Physical dimensions.....	29
7.4 Shock and vibration.....	29
7.5 Functional requirements	29
8 Tests	31
8.1 Kind of tests.....	31
8.2 Compliance with constructional requirements	33
8.3 Performances	33
8.4 Verification of operating distances.....	35
8.5 Verification of resistance to vibration and shock	35
8.6 Verification of electromagnetic compatibility	35
8.7 Verification of the defined behaviour under fault conditions.....	35
8.8 Validation of programmable or complex integrated circuits.....	37
Annex A (normative) Catalogue of single faults affecting the electrical equipment of a PDF to be applied as specified in 8.7 and 8.8.....	43

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 5-3: Control circuit devices and switching elements –
Requirements for proximity devices with defined behaviour
under fault conditions (PDF)**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60947-5-3 has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

It should be read in conjunction with IEC 60947-1 and IEC 60947-5-2.

The text of this standard is based on the following documents:

SIST EN 60947-5-3:2000	
FDIS	Report on voting
17B/963/FDIS	17B/979/RVD

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

Annex A forms an integral part of this standard.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 5-3: Control circuit devices and switching elements – Requirements for proximity devices with defined behaviour under fault conditions (PDF)

1 General

The provisions of General Rules in IEC 60947-1 and IEC 60947-5-2 are only applicable to this international Standard where specifically called for.

General rules, clauses and subclauses thus applicable, as well as tables, figures and annexes are identified by references to those standards.

The types of PDF referred to in this standard are intended to form the basis for the selection of devices with appropriate characteristics for the application. They take into account the general principles of ISO/DIS 13849-1, but they are not directly equivalent to the categories defined in clause 6 of that standard.

1.1 Scope

This part of IEC 60947 applies to proximity devices with an enhanced resistance to failure (PDF).

It specifies requirements for four different types of PDF.

NOTE – Due to their enhanced resistance to failure, PDFs apply for instance to:

- interlocking devices (see ISO 14119);
- the detection of the presence or absence of protective devices (see ISO/TR 12100-1).

For a PDF used in applications where additional characteristics, dealt with in other standards, are required, it will be necessary to satisfy the requirements of all relevant standards.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60947. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60947 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

<https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-1bc2610a274/sist-en-60947-5-3-2000>

IEC 60050(191):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service*

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests. Tests A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests. Tests B: Dry heat*

IEC 60204-1:1997, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60249-2 (all specifications), *Base materials for printed circuits – Part 2: Specifications*

IEC 60446:1989, *Identification of conductors by colours or numerals*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:1992, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coatings to achieve insulation coordination of printed board assemblies*

IEC 60742:1983, *Isolating transformers and safety isolating transformers – Requirements*

IEC 60812:1985, *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*

IEC 60947-1:1996, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-5-1:1997, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60947-5-2:1997, *Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches*

IEC 61025:1990, *Fault tree analysis (FTA)*

IEC 61131-2:1992, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61496-1:1997, *Safety of machinery – Electrosensitive protective equipment – Part 1: General requirements and tests*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*¹⁾

ISO 9000-3:1997, *Quality management and quality assurance standards – Part 3: Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software*

ITeH STANDARD PREVIEW
(standards.iteh.ai)

SIST-EN 60947-5-3:2000
<https://standards.iteh.ai/catalog/standards/sist/e68b120a-e991-42d2-844e-bacf26d0a354/sist-en-60947-5-3-2000>

1) To be published

ISO 9001:1994, *Quality systems – Model for quality assurance in design, development, production, installation and servicing*

ISO/TR 12100-1:1992, *Safety of machinery – Basic concept, general principles for design – Part 1: Basic terminology, methodology*

ISO/DIS 13849-1, *Safety of machinery – Safety related parts of control systems – Part 1: General principles for design*¹⁾

ISO/TR 14119:1998, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection*

2 Definitions

Clause 2 of IEC 60947-5-2 applies, with the following additions or modifications.

2.1 Basic definitions

2.1.1.5

PDF

proximity device with defined behaviour under fault conditions

2.1.1.5.1

PDF with designed reliability (PDF-D)

proximity device with an enhanced reliability of achieving its defined behaviour

2.1.1.5.2

PDF with test capability (PDF-T)

proximity device in which the defined behaviour is verified by simulating the absence of the specified target. The simulation is initiated by external means

2.1.1.5.3

PDF with single fault tolerance (PDF-S)

proximity device with no loss of the defined behaviour in spite of a single fault

2.1.1.5.4

PDF with self-monitoring (PDF-M)

proximity device with no loss of the defined behaviour in spite of more than one fault

2.2 Parts of a PDF

2.2.16

sensing means

part of the PDF which detects the presence or absence of a defined target

2.2.17

output signal switching device (OSSD)

component of the PDF which goes to the OFF-state according to the defined behaviour

¹⁾ To be published