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Solid-state relays - Safety requirements

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>See Eesti standard EVS-EN IEC 62314:2024 sisaldab Euroopa standardi EN IEC 62314:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 22.11.2024.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN IEC 62314:2024 consists of the English text of the European standard EN IEC 62314:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 22.11.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
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English Version

**Solid-state relays - Safety requirements  
(IEC 62314:2022)**Relais statiques - Exigences de sécurité  
(IEC 62314:2022)Halbleiterrelais - Sicherheitsanforderungen  
(IEC 62314:2022)

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## European foreword

The text of document 94/670/FDIS, future edition 2 of IEC 62314, prepared by TC 94 "Electrical relays" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62314:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2025-11-30 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-11-30 document have to be withdrawn

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IEC 60947 series	NOTE	Approved as EN IEC 60947 series
IEC 60947-4-3:2020	NOTE	Approved as EN IEC 60947-4-3:2020 (not modified)
IEC 61000-4 series	NOTE	Approved as EN 61000-4 series
IEC 61058 series	NOTE	Approved as EN IEC 61058 series
IEC 61058-1:2016	NOTE	Approved as EN IEC 61058-1:2018 (not modified)
IEC 61810-7:2006	NOTE	Approved as EN 61810-7:2006 (not modified)
ISO 12100:2010	NOTE	Approved as EN ISO 12100:2010 (not modified)
ISO 14971	NOTE	Approved as EN ISO 14971

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Solid-state relays – Safety requirements**

**Relais statiques – Exigences de sécurité**



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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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**Solid-state relays – Safety requirements**

**Relais statiques – Exigences de sécurité**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**SOLID-STATE RELAYS – SAFETY REQUIREMENTS****FOREWORD**

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IEC 62314 has been prepared by IEC technical committee 94: All-or-nothing electrical relays. It is an International Standard.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

- a) addition of load categories for DC load;
- b) addition of load category for self-ballasted lamp load;
- c) addition of "sockets" terminal;
- d) update of references;
- e) introduction of the requirement of EMC;
- f) restructuring of the whole document.

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

Draft	Report on voting
94/670/FDIS	94/701/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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

## SOLID-STATE RELAYS – SAFETY REQUIREMENTS

### 1 Scope

This document applies to particular all-or-nothing electrical relays denominated solid-state relays intended for performing electrical operations by single step function changes to the state of electric circuits between the OFF-state and the ON-state and vice versa.

This document deals with solid-state relays which are intended for incorporation in other products or equipment. As such, solid-state relays are considered to be components and this document defines the basic safety-related and functional requirements for solid-state relays as stand-alone components.

Such solid-state relays are incorporated in products or equipment which themselves comply with the relevant product and/or application standard(s) to meet their intended application.

NOTE The following are examples of such applications:

- general industrial equipment;
- electrical facilities;
- electrical machines;
- electrical appliances;
- office communications;
- building automation and environmental control;
- automation and process control;
- electrical installation engineering;
- medical engineering;
- telecommunications;
- vehicle engineering;
- transportation engineering;
- lighting control.

Solid state relay as apparatus:

Where the solid-state relay is specified as apparatus with a function to the end-user, requirements on EMC are given in this document.

Solid state relay as component:

There are no EMC requirements for solid-state relays intended for incorporation into the equipment by the equipment manufacturer, because the performance strongly depends on the application into the equipment.

The object of this document is to state:

- the characteristics of solid-state relays
- the requirements which apply to solid-state relays with reference to
  - a) electrical safety;
  - b) their operation and behaviour;
  - c) their dielectric properties;
  - d) EMC;

- the tests verifying that the requirements have been met, and the test methods to be adopted;
- the information to be given with the solid-state relay or in the product documentation.

Solid-state switching devices with monolithic structures fall within the scope of IEC sub-committee 47E and are not covered in this document.

Semiconductor controllers and contactors fall within the scope of the IEC 60947 series of standards – low-voltage switchgear and controlgear – developed by IEC subcommittee 121A and are not covered in this document.

## 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.

IEC 60038:2009, *IEC standard voltages*

IEC 60050-444:2002, *International Electrotechnical Vocabulary (IEV) – Part 444: Elementary relays* (available at [www.electropedia.org](http://www.electropedia.org))

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-20:2021, *Environmental testing – Part 2-20: Tests – Test Ta and Tb: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60112:2020, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60669-1:2017, *Switches for household and similar fixed-electrical installations – Part 1: General requirements*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-12:2021, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60747-5-5:2020, *Semiconductor devices – Part 5-5: Optoelectronic devices – Photocouplers*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*  
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*  
IEC 61000-4-34:2005/AMD1:2009

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

IEC 61210:2010, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61760-1:2020, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General and safety requirements*  
IEC 61810-1:2015/AMD1:2019

IEC 61984:2008, *Connectors – Safety requirements and tests*

IEC 62368-1:2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC TS 62993:2017, *Guidance for determination of clearances, creepage distances and requirements for solid insulation for equipment with a rated voltage above 1 000 V AC and 1 500 V DC, and up to 2 000 V AC and 3 000 V DC*

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 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-444 and the following 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 Terms and definitions related to relays

##### 3.1.1

##### **electrical relay**

device designed to produce sudden and predetermined changes in one or more output circuits when certain conditions are fulfilled in the electric input circuits controlling the device

[SOURCE: IEC 60050-444:2002, 444-01-01]

##### 3.1.2

##### **solid-state relay**

electrical relay in which the intended response is produced by electronic, magnetic, optical or other components without mechanical motion

[SOURCE: IEC 60050-444:2002, 444-01-06]

##### 3.1.3

##### **rated operational voltage**

$U_e$

value of voltage which determines the application of the solid-state relay and to which the relevant tests and the load categories are referred

##### 3.1.4

##### **rated insulation voltage**

$U_i$

value of voltage to which dielectric tests and creepage distances are referred

##### 3.1.5

##### **rated impulse withstand voltage**

$U_{imp}$

peak value of an impulse voltage of prescribed form and polarity which the solid-state relay is capable of withstanding without failure under specified conditions of test and to which the values of the clearances are referred

##### 3.1.6

##### **ON-state**

specified condition of the solid-state relay when the output semiconductor is in the conducting state