INTERNATIONAL STANDARD

IEC 62314

First edition
2006-05

Solid-state relays

Reference number
IEC 62314:2006(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/online_news/ justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 62314

First edition
2006-05

Solid-state relays

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE W

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOLID-STATE RELAYS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

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

FDIS	Report on voting
94/232/FDIS	94/235/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

A bilingual version of this publication may be issued at a later date.

SOLID-STATE RELAYS

1 Scope and object

This International Standard 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. It is applicable to solid-state relays with rated voltages up to 750 V and with a.c. output current up to 160 A.

NOTE Requirements for solid-state relays with d.c. output circuits are under consideration.

This standard 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 standard 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 have to comply with the relevant product and/or application standard(s) to meet their intended application. 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 relays are components (not stand alone devices) and as such do not perform a direct function. Therefore, no EMC requirements are included in this standard.

NOTE This is in line with the European EMC Directive.

Where the application of a solid-state relay determines additional requirements such as EMC and overcurrent protection, the solid-state relay shall be assessed in accordance with the relevant IEC standard(s).

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

Semiconductor controllers and contactors fall within the scope of the IEC 60947 series of standards – *Low-voltage switchgear and controlgear* – developed by IEC subcommittee 17B and are not covered in this standard.

Compliance with the requirements of this standard is verified by the type tests indicated.

The object of this standard is to state:

– the characteristics of solid-state relays;
– the requirements which solid-state relays shall comply with reference to
  a) their operation and behaviour;
  b) their dielectric properties;
  c) the degrees of protection provided by their enclosures, where applicable;
– 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 manufacturer's documentation.

2 Normative references

The following referenced documents are indispensable for the application 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 60038:1983, *IEC standard voltages*
Amendment 1 (1994)
Amendment 2 (1997)

IEC 60050-195:1998, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60050-444:2002, *International Electrotechnical Vocabulary (IEV) – Part 444: Elementary relays*

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 60068-2-14:1984, *Environmental testing – Part 2: Tests. Test N: Change of temperature*
Amendment 1 (1986)

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests. Test T: Soldering*
Amendment 2 (1987)

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

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

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

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-10-2:2003, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60695-11-10:2003, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

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 mm² up to 35 mm² (included)*

IEC 61210:1993, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61760-1:1998, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 60050(444) and the following apply. .

3.1 Terms and definitions related to relays

3.1.1
solid-state relay
electrical relay in which the intended response is produced by electronic, magnetic, optical or other components without mechanical motion

[IEV 444-01-06]

3.1.2
electrical relay
device designed to produce sudden and predetermined changes in one or more output circuits when certain conditions are fulfilled in the electrical input circuits controlling the device

[IEV 444-01-01]

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
rated operational current
I_e
normal operating current when the solid-state relay is in the ON-state and takes into account the rated operating voltage, the rated frequency (see 4.3), the load category (see 4.4) and the overload characteristics at 40 °C ambient temperature unless otherwise specified

3.1.7
rated uninterrupted current
I_u
value of current, stated by the manufacturer, which the solid-state relay can carry in uninterrupted duty

3.1.8
rated frequency
supply frequency for which a solid-state relay is designed and to which the other characteristic values correspond

NOTE The same solid-state relay may be assigned a number or a range of rated frequencies or be rated for both a.c. and d.c.

3.1.9
overload current profile
gives the current/time coordinates for the controlled overload current

3.1.10
operating capability
represents the combined capabilities of

– current-commutation and current-carrying in the ON-state, and
– establishing and sustaining the OFF-state (blocking),

at maximum rated voltage under specified load and overload conditions in accordance with load category, overload current profile and specified duty cycles

3.1.11
rated conditional short-circuit current
value of prospective current, stated by the manufacturer, which the solid-state relay, protected by a short-circuit protective device specified by the manufacturer, can withstand satisfactorily for the operating time of this device under the test conditions specified in the relevant product standard

3.1.12
leakage current
I_l
r.m.s. value of maximum current, stated by the manufacturer, which the solid-state relay can carry in OFF-state condition

3.1.13
ON-state voltage drop
U_d
peak value of voltage, stated by the manufacturer, between solid-state relay terminals in the ON-state condition

3.2 Terms and definitions related to insulation coordination (see Annex A)

3.2.1
clearance
shortest distance in air between two conductive parts

(IEC 60664-1, 1.3.2)

3.2.2
creepage distance
shortest distance along the surface of the insulating material between two conductive parts

(IEC 60664-1, 1.3.3)

3.2.3
functional insulation
insulation between conductive parts which is necessary only for the proper functioning of the equipment

(IEC 60664-1, 1.3.17.1)

3.2.4
solid insulation
solid insulating material interposed between two conductive parts

(IEC 60664-1, 1.3.4)

3.2.5
basic insulation
insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

(IEC 60664-1, 1.3.17.2)

3.2.6
supplementary insulation
independent insulation applied in addition to basic insulation, in order to provide protection against electric shock in the event of a failure of basic insulation

(IEC 60664-1, 1.3.17.3)

3.2.7
double insulation
insulation comprising both basic insulation and supplementary

(IEC 60664-1, 1.3.17.4)

3.2.8
reinforced insulation
single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in the relevant IEC standard

NOTE A single insulation system does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as basic or supplementary insulation.

(IEC 60664-1, 1.3.17.5)

3.2.9
overvoltage
any voltage having a peak value exceeding the corresponding peak value of the steady-state voltage at normal operating conditions

(IEC 60664-1, 1.3.7)

3.2.10
overvoltage category
numeral defining a transient overvoltage condition

NOTE Overvoltage categories I, II, III and IV are used, see 2.2.2.1 of IEC 60664-1.

(IEC 60664-1, 1.3.10)

3.2.11
pollution
any addition of foreign matter, solid, liquid or gaseous that can result in a reduction of electric strength or surface resistivity of the insulation

(IEC 60664-1, 1.3.11)

3.2.12
micro-environment
immediate environment of the insulation which particularly influences the dimensioning of the creepage distances

(IEC 60664-1, 1.3.12.2)

3.2.13
macro-environment
environment of the room or other location in which the equipment is installed or used

(IEC 60664-1, 1.3.12.1)

3.2.14
pollution degree
numeral characterising the expected pollution of the micro-environment

NOTE Pollution degrees 1, 2, 3 and 4 are used, see 2.5.1 of IEC 60664-1.

(IEC 60664-1, 1.3.13)

3.2.15
type 1 protection
protection against pollution by the use of coating, potting or moulding assuming Pollution degree 1 under the protection

NOTE 1 Requirements and tests are given in IEC 60664-3.

NOTE 2 Pollution degree 1 is specified in A.2.3.