IEC 61812-1

Edition 3.0 2023-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Time relays and coupling relays for industrial and residential use – Part 1: Requirements and tests

Relais temporisés et relais de couplage pour applications industrielles et résidentielles – Partie 1: Exigences et essais



IEC 61812-1:2023-06(en-fr)



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INTERNATIONAL STANDARD

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Time relays and coupling relays for industrial and residential use – Part 1: Requirements and tests

Relais temporisés et relais de couplage pour applications industrielles et résidentielles – Partie 1: Exigences et essais

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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TIME RELAYS AND COUPLING RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –

Part 1: Requirements and tests

FOREWORD

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IEC 61812-1 has been prepared by IEC technical committee 94: Electrical relays. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

a) update of references;
b) addition of requirements for risk assessment;
c) addition of requirements for routine test;
d) renumbering of clauses to bring them into a more logical order;
e) clarification of the requirement for shock;
f) addition of cybersecurity requirements for industrial automation and control systems;

g) addition of environmentally conscious design requirement;

h) addition of common data dictionary reference;

i) addition of terms and definitions of relay types;

j) addition of coupling relays in title;

k) addition of coupling relays in scope.

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

FDIS	Report on voting
94/843/FDIS	94/889/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 parts of the IEC 61812 series can be found, under the general title *Time relays and coupling relays for industrial and residential use*, on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

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

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TIME RELAYS AND COUPLING RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –

Part 1: Requirements and tests

1 Scope

This part of IEC 61812 applies to time relays and coupling relays for industrial applications (for example control, automation, signal and industrial equipment) and for automatic electrical controls for use in, on, or in association with equipment for residential and similar use.

The term “relay” as used in this document comprises all types of time relays and coupling relays, other than measuring relays.

NOTE 1 Time relays and coupling relays can be used for industrial application (for example control, automation, signal and industrial equipment) and for automatic electrical controls for use in, on, or in association with equipment for residential and similar use.”

NOTE 2 Measuring relays are handled by the IEC TC95.

This document defines type test and routine test to confirm the service condition. Subclause 3.2 provides definitions for different types of time relays in use in the IEC 61812 series.

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

IEC 60050-445:2010, *International Electrotechnical Vocabulary (IEV) – Part 445: Time relays*

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

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 60085:2007, *Electrical insulation – Thermal evaluation and designation*

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

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 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

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

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

IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit devices and switching elements – Method of assessing the performance of low-energy contacts – Special tests*
IEC 60947-5-4:2002/AMD1:2019

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^2 up to 35 mm^2 (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 mains current more than 16 A per phase*
IEC 61000-4-34:2005/AMD1:2009

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

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 62314:2022, *Solid-state relays – Safety requirements*

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

ISO 9223:2012, *Corrosion of metals and alloys – Corrosivity of atmospheres – Classification, determination and estimation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-444 and IEC 60050-445 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Terms and definitions related to general terms

3.1.1
time relay
specified-time relay
all-or-nothing relay (IEV 444-01-02) with one or more time functions

[SOURCE: IEC 60050-445:2010, 445-01-01, modified – in the definition, the reference to the IEV entry has been added.]

3.1.2
coupling relay
all-or-nothing electrical relay incorporated into a housing or mounted on a socket (for example IEC 60715 mounting rail) with no specified time or logic function for industrial or residential use intended for incorporation into cabinets.

Note 1 to entry: Typically this is a relay according to the IEC 61810 series or IEC 62314 incorporated into a housing or mounted on a socket (for example IEC 60715 mounting rail) for installation in industrial or residential cabinets.

3.1.3
specified time
specified characteristic of the time relay at given type of function, for example operate time, release time, pulse on time, interval time

[SOURCE: IEC 60050-445:2010, 445-05-01, modified – the note has been removed.]

3.1.4
setting accuracy
difference between the measured value of the specified time and the reference value set on the scale

Note 1 to entry: For analogue setting this value relates to the maximum setting value.

[SOURCE: IEC 60050-445:2010, 445-06-07]

3.1.5
effect of influence (on specified time)
degree with which the influence quantity within its nominal range has an effect on the specified time

[SOURCE: IEC 60050-445:2010, 445-06-02]

3.1.6
recovery time
minimum time interval for which the power supply is removed or control signal is applied or removed before the specified function can be performed again

[SOURCE: IEC 60050-445:2010, 445-05-04, modified – “must be removed” and “must be applied” have been replaced by “is removed” and “is applied”, respectively.]

3.1.7
minimum control impulse time
shortest duration of the power supply or control signal to fulfil the specified function

[SOURCE: IEC 60050-445:2010, 445-05-02]

3.1.8
repeatability
difference between the upper and lower limits of the specified confidence range determined from several time measurements of the time relay under identical conditions

Note 1 to entry: Preferably the repeatability is indicated as a percentage of the mean value of all measured values.

[SOURCE: IEC 60050-445:2010, 445-06-08]

3.1.9
power supply
electrical quantity (for example electric current, voltage) which has to be applied or removed from the input circuit of the time relay or coupling relay in order to enable it to fulfil its purpose

[SOURCE: IEC 60050-445:2010, 445-03-01, modified – in the definition, “or coupling relay” has been added.]

3.1.10
input voltage
electrical quantity that can be applied to (or removed from) the power supply, the control signal or both

3.1.11
control signal
DEPRECATED: trigger signal
input signal which has to be applied or removed in addition to the power supply in order to ensure a function of the time relay

Note 1 to entry: The control signal is provided by a separate device designed to close or open an electrical circuit.

[SOURCE: IEC 60050-445:2010, 445-02-05]

3.1.12
conditional short-circuit current of an output circuit
prospective electric current that a contact circuit, protected by a specified short-circuit protective device, can satisfactorily withstand for the total breaking time of that protective device under specified conditions of use and behaviour

[SOURCE: IEC 60050-445:2010, 445-04-03]

3.1.13
on-state voltage drop of a solid-state output circuit
DEPRECATED: voltage drop of a solid-state output circuit
voltage measured across the effectively conducting solid-state output of the time relay or coupling relay, when carrying the given load current

[SOURCE: IEC 60050-445:2010, 445-04-04, modified – in the definition, “or coupling relay” has been added.]

3.1.14
leakage current of a solid-state output
DEPRECATED: off-state current of a solid-state output
electric current which flows through the effectively non-conducting solid-state output of the time relay or coupling relay at a specified voltage

[SOURCE: IEC 60050-445:2010, 445-04-05, modified – in the definition “or coupling relay” has been added.]

3.1.15
power port
port at which the supply voltage (either AC or DC) is connected to the time relay or coupling relay

[SOURCE: IEC 60050-445:2010, 445-07-01, modified – in the definition “or coupling relay” has been added.]

3.1.16
control port
additional port for the starting of functions whilst supply voltage is applied, or for the connection of a remote potentiometer, control signal, etc.

Note 1 to entry: There are control ports for floating (potential-free) and non-floating control.

[SOURCE: IEC 60050-445:2010, 445-07-02]

3.1.17
output port
port at which a load is connected to the time relay or coupling relay

Note 1 to entry: The output port could consist of electromechanical contacts or be a solid-state output.

[SOURCE: IEC 60050-445:2010, 445-07-03, modified – in the definition “or coupling relay” has been added.]

3.1.18
enclosure port
physical boundary of the time relay or coupling relay through which electromagnetic fields can radiate or impinge

Note 1 to entry: See Figure 1.

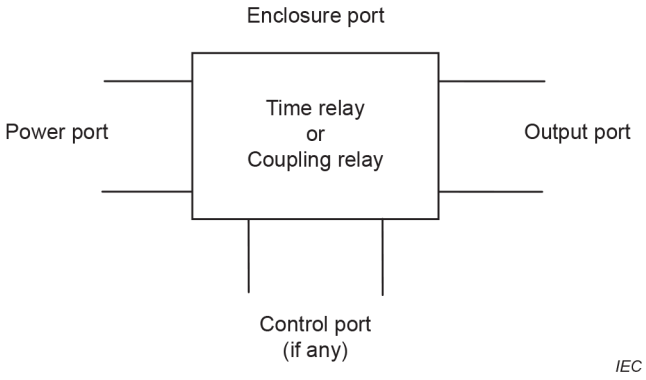


Figure 1 – Definition of ports

[SOURCE: IEC 60050-445:2010, 445-07-04, modified – in the definition “or coupling relay” and the note and reference to Figure 1 have been added.]

3.1.19
type test
test of one or more devices made to a certain design to show that the design meets certain specifications

[SOURCE: IEC 61810-1:2015, 3.1.7]

3.1.20
routine test
test to which each individual device is subjected during and/or after manufacture to ascertain whether it complies with certain criteria

[SOURCE: IEC 61810-1:2015, 3.1.8]

3.1.21
sampling test
test on a number of devices taken at random from a batch

[SOURCE: IEC 61810-1:2015, 3.1.9]

3.1.22
operative range
range of values of power supply for which the time relay or coupling relay is able to perform its specified function

[SOURCE: IEC 61810-1:2015, 3.4.5, modified – in the definition, “coil voltage” has been replaced with “power supply”, and “relay” has been replaced with “time relay or coupling relay”.]

3.1.23
rated input voltage range
range of input voltages used for specification purposes, established for a specified set of operating conditions

3.1.24
functional insulation
insulation between conductive parts which is necessary only for the proper functioning of the equipment

[SOURCE: IEC 60050-195:2021, 195-02-41, modified – "necessary" has been replaced with "which is necessary only".]

3.1.25
basic insulation
insulation of hazardous-live-parts which provides basic protection

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

[SOURCE: IEC 60050-195:2021, 195-06-06, modified – in the definition, “of hazardous live-parts” has been added.]

3.1.26
supplementary insulation
independent insulation applied in addition to basic insulation for fault protection

[SOURCE: IEC 60050-195:2021, 195-06-07]

3.1.27
double insulation
insulation comprising both basic insulation and supplementary insulation

[SOURCE: IEC 60050-195:2021, 195-06-08]

3.1.28
reinforced insulation
insulation of hazardous-live-parts which provides a degree of protection against electric shock equivalent to double insulation

Note 1 to entry: Reinforced insulation may comprise several layers which cannot be tested singly as basic insulation or supplementary insulation.

[SOURCE: IEC 60050-195:2021, 195-06-09, modified – in the definition “of hazardous-live parts” has been added.]

3.1.29
live part
conductive part intended to be energized under normal operating conditions, including the neutral conductor and mid-point conductor, but excluding the PEN conductor, PEM conductor and PEL conductor

Note 1 to entry: This concept does not necessarily imply a risk of electric shock.

[SOURCE: IEC 60050-195:2021, 195-02-19, modified – the note has been added.]

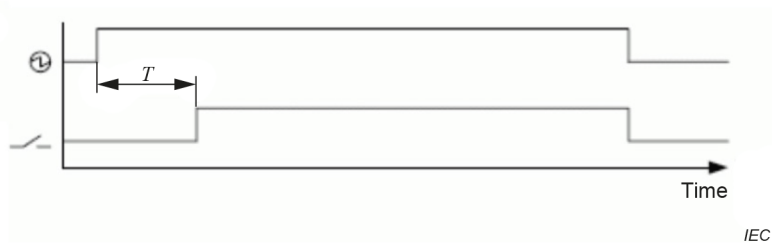
3.1.30
rated operating voltage
nominal voltage of the power supply intended to be used

3.1.31
rated operating current
nominal current of the power supply intended to be used

3.1.32
power consumption
electric energy a relay uses in or for operation, given in VA for AC and W for DC coils, and including other electric circuits

3.2 Terms and definitions of time relay types

3.2.1
power ON-delay relay
ON-delay relay
time relay in which the time delay starts when applying the power supply and the output switches to the operate condition after the setting time has elapsed (see Figure 2)



Key

Power supply

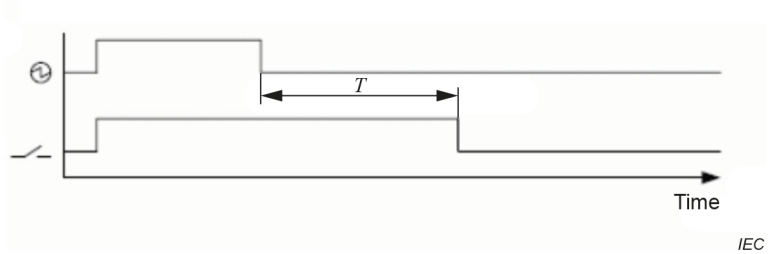
T Setting time

Make contact

Figure 2 – Power ON-delay relay

[SOURCE: IEC 60050-445:2010, 445-01-02]

3.2.2
power OFF-delay relay
true OFF-delay relay
time relay in which the output immediately switches to the operate condition when applying the power supply; the time delay starts when the power supply is removed; the output switches to the release condition after the setting time has elapsed (see Figure 3)



Key

Power supply

T Setting time

Make contact

Figure 3 – Power OFF-delay relay

[SOURCE: IEC 60050-445:2010, 445-01-03]