IEC 60669-2-3

Edition 4.0 2024-03
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Switches for household and similar fixed electrical installations – Part 2-3: Particular requirements – Time-delay switches (TDS)

IEC 60669-2-3:2024-03 RLV(en)

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SWITCHES FOR HOUSEHOLD AND SIMILAR FIXED ELECTRICAL INSTALLATIONS –

Part 2-3: Particular requirements – Time-delay switches (TDS)

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60669-2-3:2006. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60669-2-3 has been prepared by subcommittee 23B: Plugs, socket-outlets and switches, of IEC technical committee 23: Electrical accessories. It is an International Standard.

This fourth edition cancels and replaces the third 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) Revision of the present edition with reference to IEC 60669-1:2017 (Edition 4);
b) Introduction of a revision to Annex E "Additional requirements and tests for switches intended to be used at a temperature lower than −5 °C".

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

Draft	Report on voting
23B/1487/FDIS	23B/1501/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/publications.

This part of IEC 60669-2 is to be used in conjunction with IEC 60669-1:2017. It lists the changes necessary to convert that standard into a specific standard for time-delay switches.

When a particular subclause of IEC 60669-1:2017 is not mentioned in this document, that subclause applies as far as reasonable.

In this document, the following print types are used:

– requirements proper: in roman type;
– *test specifications: in italic type;*
– notes: in smaller roman type.

Subclauses, figures or tables which are additional to those in IEC 60669-1:2017 are numbered starting from 101.

A list of all parts of IEC 60669 series, under the general title *Switches for household and similar fixed electrical installations*, 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, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SWITCHES FOR HOUSEHOLD AND SIMILAR FIXED ELECTRICAL INSTALLATIONS –

Part 2-3: Particular requirements – Time-delay switches (TDS)

1 Scope

IEC 60669-1:2017, Clause 1 is applicable except as follows:

Replacement of the first paragraph with the following:

This part of IEC 60669 applies to time-delay switches (hereinafter referred to as TDS) with a rated voltage not exceeding 440 V AC and a rated current not exceeding 63 A, intended for household and similar fixed electrical installations, either indoors or outdoors, operated by hand and/or by remote control. For the control circuit, the rated control voltage does not exceed 440 V AC or 220 V DC.

TDS are provided with a time-delay device operated by mechanical, thermal, pneumatic, hydraulic or electrical means or by a combination of them.

Electronic TDS are within the scope of IEC 60669-2-1 but not of this document.

TDS including only passive components such as resistors, capacitors, positive temperature coefficient (PTC) and negative temperature coefficient (NTC) components and printed ~~wiring~~ circuit boards are not considered to be electronic TDS.

2 Normative references

IEC 60669-1:2017, Clause 2 is applicable with the following additions:

IEC 60317 (all parts), *Specifications for particular types of winding wires*

IEC 60445:~~1999~~2021, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals ~~and of terminations of certain designated conductors, including general rules for an alphanumerical system~~, conductor terminations and conductors*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply 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 60669-2-1:2002, *Switches for household and similar fixed-electrical installations – Part 2-1: Particular requirements – Electronic switches*~~

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

~~IEC 61558-2-6:1997, *Safety of power transformers, power supply units and similar – Part 2-6: Particular requirements for safety isolating transformers for general use*~~

IEC 61558-2-6:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

3 Terms and definitions

IEC 60669-1:2017, Clause 3 is applicable with the following ~~additions~~ modifications:

3.~~14~~8
thread-cutting screw

Addition of the following note:

Note 101 to entry: This definition is ~~only~~ applicable to the switching circuit only.

3.~~15~~9
mechanical time-delay device

Addition of the following note:

Note 101 to entry: This definition is ~~only~~ applicable to the switching circuit only.

Addition of the following new ~~definitions~~ terminological entries:

3.101
time-delay switch
TDS
switch provided with a time-delay device which operates for a certain time (the delay time)

Note 101 to entry: Time-delay switches may be either manually actuated and/or remotely electrically initiated.

3.101.1
electronic TDS
TDS containing electronic component(s)

3.102
rated control voltage
voltage assigned to the control circuit by the manufacturer

3.103
switching circuit
circuit which contains the parts which allow the rated current to flow through the TDS

3.104
control circuit
circuit which includes electrical parts to control the switching circuit in an electrically controlled TDS

3.105
control mechanism
all parts which are intended for the operation of the TDS

3.106
incorporated hand-operated device
device ~~incorporated in the switch~~ which allows the switching circuit to be operated, directly or indirectly

Note 101 to entry: An incorporated hand-operated device is not intended for the normal operation of the TDS.

3.107
delay time
period during which the switching circuit(s) is (are) kept closed

Note 101 to entry: Any time taken for the decreasing of the voltage (e.g. to reduce the light) at the end of the delay period is included within the delay time.

3.108
delay device
all components which have an influence on the delay time

Note 101 to entry: The delay device is energized by means of an impulse into the control circuit in an electrically controlled TDS.

Note 102 to entry: The delay time may be adjustable.

3.109
disconnectable TDS
TDS consisting of two parts, the first being used as a base and including the terminals, the other being removable and including the switching and the control circuits, the two parts being resiliently connected together using a means which allows joining and/or separating with or without the use of a tool

4 General requirements

IEC 60669-1:2017, Clause 4 is applicable with the following addition:

Addition of the following after the first paragraph:

The operation of a TDS shall not be impaired when it is mounted at an angle deviating by not more than 5° from the specified position of use.

5 General ~~notes~~ remarks on tests

IEC 60669-1:2017, Clause 5 is applicable with the following additions:

~~***5.4 Addition after the last paragraph:***~~

~~*For the tests of subclause 101, three additional specimens are necessary.*~~

Addition to Table 1:

Table 1 – Number of specimens needed for the tests

Clauses and subclauses	Number of specimens	Number of additional specimens for dual current rating
101 Abnormal operation of the control circuit	PQR	

Addition of the following subclauses:

5.101 Incorporated hand-operated device

If a TDS is provided with an incorporated hand-operated device, actuating the switching circuit directly, it shall be tested as specified in 19.101.

5.102 Operated by hand

For a TDS operated by hand, the requirements relating to the control voltage do not apply.

5.103 Control and switching circuits without common point

In the case of a TDS for which the control and the switching circuits have no common point, the test is made with the circuits supplied with the rated voltages which are specified in this document.

6 Ratings

IEC 60669-1:2017, Clause 6 is applicable except as follows:

6.1 Rated voltage

Replacement of the first paragraph with the following:

Preferred values of rated voltage are:

– AC: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V and 240 V;

NOTE These rated voltages are aligned with the rated control voltages specified in 6.101 to simplify the tests on TDS having a common point between the control and switching circuits.

~~**6.2** *Addition of the following note:*~~

~~NOTE In certain TDS, auxiliary contacts designed for a current lower than the rated current of the switching circuit may be added. Relevant ratings and requirements are under consideration.~~

Addition of the following subclause:

6.101 Rated control voltage

Preferred values of rated control voltage are:

– AC: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V and 240 V;
– DC: 6V, 9 V, 12 V, 24 V, 48 V, 60 V, 110 V and 220 V.

7 Classification

IEC 60669-1:2017, Clause 7 is applicable except as follows:

7.~~1.~~1 ~~*Replacement:*~~

According to the possible connections (see Figure 8 of IEC 60669-1:2017):

Replace the existing nine-dash list with the following:

Pattern number

– single-pole switches 1
– double-pole switches 2
– three-pole switches 3
– three-pole plus switched neutral switches 03
– two-way switches 6

7.~~1.~~5 according to the method of actuating a switch:

Addition of the following:

– time-delay switches (TDS):
  - manually operated;
  - remotely operated;
  - manually and remotely operated.

NOTE The above methods of operation ~~may~~ can be combined with a complementary method of operation allowing permanent ON and/or permanent OFF. These possibilities are given by a complementary device acting either directly on the switching circuit, or on the control circuit.

7.~~1.~~7 according to the method of installation, as a consequence of the design of the switch

Addition of the following:

– disconnectable TDS;

Addition of the following subclause:

7.~~1~~.101 according to the type of control mechanism:

– mechanical;
– thermal;
– pneumatic;
– hydraulic;
– electrical;
– combination(s) of the above.

8 Marking

IEC 60669-1:2017, Clause 8 is applicable with the following additions:

8.1 General

~~*Addition after the last dashed text:*~~

~~– rated control voltage in volts, if different from the rated voltage;~~
~~– symbol for the adjustment of the delay time, if applicable;~~
~~– symbols for the positions "Permanent on" and "Permanent off", if applicable;~~
~~– symbol for "Delay time".~~

Replacement of list item b) with the following:

b) rated voltage(s) in volts and rated control voltage(s) in volts, if different from the rated voltage(s);

Addition of the following after list item m):

Switches shall be also marked with

n) symbol for the adjustment of the delay time, if applicable;

o) symbols for the positions "Permanent ON" and "Permanent OFF", if applicable;

p) symbol for "Delay time".

Addition after Note ~~2~~5:

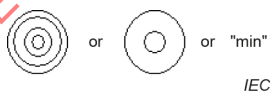
NOTE ~~3~~ 101 If a delay time value is indicated, it ~~should~~ can be expressed in seconds, minutes and hours.

8.2 *Addition of the following symbols:*

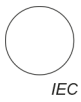
Permanent ON

NOTE – If the TDS may also be remote controlled, the symbol | is not to be used.

Delay time



Permanent OFF but only if the air gap of the switching contact of the TDS is not less than 3 mm

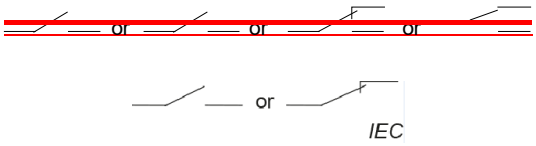


Adjustment of delay time

Control mechanism

IEC 60417-6457:2023-08

Switch



NOTE 101 In ~~UK~~ the following country, the symbol consisting of 2 concentric circles is not used to indicate time delay: UK.

8.3 Visibility of markings

Replace the second paragraph with the following:

Markings as given in 8.1 a), b), c), d), e) and, if applicable, f), g), h), k), l), n), o) and p) shall be placed on the main part of the TDS.

8.4 Marking on terminals for phase conductors

Addition of the following after the fourth paragraph and before the notes of this Subclause 8.4:

If necessary, the wiring diagram on which the terminal reference is clearly indicated shall be fixed to the accessory or put inside the protective cover for the terminals.

The terminals of the control circuit shall be marked according to either IEC 60445 ~~and/~~or with the symbols according to 8.2, or both.

~~**8.7 This subclause of part 1 does not apply.**~~

9 Checking of dimensions

IEC 60669-1:2017, Clause 9 is applicable.

10 Protection against electric shock

IEC 60669-1:2017, Clause 10 is applicable.

11 Provision for earthing

IEC 60669-1:2017, Clause 11 is applicable.

12 Terminals

IEC 60669-1:2017, Clause 12 is applicable.

13 Constructional requirements

IEC 60669-1:2017, Clause 13 is applicable with the following ~~additions~~ modifications:

Addition of the following subclauses:

13.101 Reset function

All TDS shall be resettable; this means TDS revert to the full-time delay when the operating means is actuated during a previously started time delay.

13.102 Transformers intended for SELV circuits

Transformers intended for SELV circuits shall be of the safety isolating type and shall comply with the relevant requirements of IEC 61558-2-6.

NOTE 101 For the use of SELV ~~and PELV~~, see IEC 61140 and IEC 60364-4-41.*

14 Mechanism

IEC 60669-1:2017, Clause 14 is applicable with the following ~~addition~~ modifications:

Addition of the following subclause:

---

* ~~IEC 60364-4-41:1992, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*~~

14.101 Hand-operated device with position indicator

If a TDS is equipped with an incorporated hand-operated device, and if a position indicator is used, it shall indicate the position of the switching circuit clearly and without ambiguity.

15 Resistance to ageing, protection provided by enclosures of switches and resistance to humidity

IEC 60669-1:2017, Clause 15 is applicable.

16 Insulation resistance and electric strength

IEC 60669-1:2017, Clause 16 is applicable with the following ~~addition~~ modifications:

~~**16.2** *Addition of the following items to Table 14:*~~

~~101 Between switching circuit(s) and control circuit(s) if they are separated~~	~~5~~	~~2 000~~	~~3 000~~
~~102 Between SELV/PELV circuits and other circuit(s) having a higher voltage than SELV/PELV~~	~~7~~	~~2 500~~	~~4 000~~
~~103 Between two SELV/PELV circuits~~	~~5~~	~~500~~	~~500~~

16.3 Electric strength test

Addition to Table 15:

Table 15 – Test voltage, points of application and minimum values of insulating resistance for the verification of electric strength

Insulation to be tested		Minimum value of insulation resistance MΩ	Test voltage V	
			Switches having a rated voltage not exceeding 130 V	Switches having a rated voltage exceeding 130 V
101	Between switching circuit(s) and control circuit(s) if they are separated	5	2 000	3 000
102	Between SELV/PELV circuits and other circuit(s) having a higher voltage than SELV/PELV	7	3 000	3 750
103	Between two SELV/PELV circuits	5	500	500

17 Temperature rise

IEC 60669-1:2017, Clause 17 is applicable with the following ~~addition~~ modifications:

17.1 General

Addition of the following after ~~Note 1~~ the fifth paragraph:

TDS are adjusted to the longest delay time indicated by the manufacturer. During the test the TDS is reclosed at the end of each delay time, within a time of (2 ± 0,5) s.

Electrically operated TDS are operated by means of the control circuit.

18 Making and breaking capacity

IEC 60669-1:2017, Clause 18 is applicable except as follows:

18.~~1~~2 Overload

Replacement of the first ~~paragraph and of the dashed texts by~~ four paragraphs including the dashed list with the following:

TDS are tested at 1,1 times rated voltage and 1,1 times rated control voltage and 1,25 times rated current. The tolerance for the test voltage and test current is $^{+5}_{0}$ %.

TDS are subjected to 200 operations specified as follows:

- *if adjustable, they are adjusted to the shortest delay time, but not shorter than 50 s. The time interval between switching OFF and ON is adjusted as specified in Clause 17;*
- *if the maximum adjustable time delay is less than 50 s, the TDS are adjusted to the longest possible delay time;*
- *if not adjustable they are tested as delivered.*

18.~~2~~3 Overload test with filament lamps

Addition of the following after the first paragraph:

The operation of the TDS is as specified in 18.~~1~~2.

19 Normal operation

IEC 60669-1:2017, Clause 19 is applicable except as follows:

19.1 Test for switches intended for inductive loads

Replacement of the first six paragraphs with the following:

TDS shall withstand, without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use.

Compliance is checked by the following test.

TDS are tested at rated voltage, rated control voltage and rated current with the connections specified in 18.~~1~~2.

The circuit details and the manner of operation of the selector switch S are as described in 18.~~1~~2, unless otherwise specified.

For adjustable TDS, the delay time is adjusted to approximately midway and the time interval between switching OFF and ON is adjusted as specified in Clause 17.

The number of operations is indicated in Table ~~16~~ 18; however, for TDS having a long time delay, the delay time may be reduced to perform the test. In any case, the maximum test duration is 1 000 h for adjustable and non-adjustable TDS.

For TDS equipped with an incorporated hand-operated device, acting directly on the switching circuit, 10 % of the operations indicated in Table ~~16~~ 18 are made by hand or in an equivalent manner and for those for AC only the test is followed by that of 14.3.

During the normal operation test, failures of correct operation are allowed to occur within 1 %, but, no more than three consecutive failures.

Addition of the following subclauses:

19.101 TDS control voltage test

TDS shall operate as intended ~~at the control voltages~~ between 0,9 times and 1,1 times the rated ~~value~~ control voltages.

Compliance is checked by the following test.

Under no-load conditions, 20 operations are carried out on each of the three specimens, under a control voltage of 0,9 times the rated value and 20 operations under a control voltage of 1,1 times the rated value.

TDS shall operate as intended during the test; however, differences in delay times are permitted according to 19.102.

19.102 TDS delay time accuracy

TDS shall have an adequate repetitive accuracy of delay time.

Compliance is checked by applying the rated control voltage ten times and measuring the delay time after each application, the TDS not being loaded.

For adjustable TDS the delay time is set to 2,5 min approximately if possible, otherwise, the test is made with the delay time specified by the manufacturer.

The maximum and minimum values of delay time shall not deviate by more than 15 % from the mean value of the test.

19.103 TDS delay after revert operation

A TDS shall revert to the full delay time when the operating means is actuated during the delay time period.

Compliance is checked by the following test.

For a TDS, where the delay time is adjustable, the delay time is adjusted to a time between 2 min and 3 min.

Three specimens are initiated at the rated control voltage.

After 1 min the specimens are again initiated at the rated control voltage.

The total delay time resulting for each of these specimens shall be between 3 min and 4 min.

For a TDS, where the delay time is not adjustable, the specimens are initiated twice at the rated control voltage, the time difference between the first and the second initiation being 1 min. The total delay time shall be the delay time (declared by the manufacturer) ±5 % of the delay time plus 1 min.

For a TDS, where the delay time is not adjustable when the delay time of the TDS is less than 1 min, the second initiation of the TDS shall be after half the delay time declared by the manufacturer has passed. The total delay time shall be 1,5 times the delay time ±5 %.

20 Mechanical strength

IEC 60669-1:2017, Clause 20 is applicable.

21 Resistance to heat

IEC 60669-1:2017, Clause 21 is applicable with the following addition:

21.1 General

Addition of the following ~~note~~ sentence at the end of 21.1 after ~~the first paragraph~~ list item b):

~~NOTE~~ The requirements of 21.1 are applicable to both switching circuits and control circuits.

22 Screws, current-carrying parts and connections

IEC 60669-1:2017, Clause 22 is applicable.

23 Creepage distances, clearances and distances through sealing compound

IEC 60669-1:2017, Clause 23 is applicable with the following ~~additions~~ modifications:

23.1 General

~~*Addition of the following items to Table 20:*~~

~~Description~~	~~mm~~
~~*Creepage distances*~~	
~~101 For creepage distances across which nominal voltages up to 50 V a.c. or d.c. occur [a) b)], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply separated from the mains supply in an equally effective manner:~~ ~~- on printed wiring material – pollution degree 1;~~ ~~- on printed wiring material - pollution degree 2;~~ ~~- on other insulating material – across insulating material Group I;~~ ~~- on other insulating material – across insulating material Group II;~~ ~~- on other insulating material – across insulating material Group III.~~	 ~~0,025~~ ~~0,04~~ ~~0,6~~ ~~0,85~~ ~~1,2~~
~~*Clearances*~~	
~~102 For clearance distances across which nominal voltages up to 50 V a.c. or d.c. occur [a)], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply electrically separated from the mains supply in an equally effective manner:~~ ~~- pollution degree 1;~~ ~~- pollution degree 2.~~	 ~~0,1 mm~~ ~~0,2 mm~~
~~NOTE 1 The values for the clearances are based on IEC 60664-1, Table 2, using as input~~ ~~– the rated impulse voltage of 800 V derived from IEC 60664-1, Table 1, for a line to neutral voltage of 50 V a.c. or d.c. and overvoltage category III and Case A (inhomogeneous field);~~ ~~– pollution degrees 1 and 2.~~ ~~The values for creepage distances are based on IEC 60664-1, Table 4 with the input of voltage rationalized for Table 4 of 50 V r.m.s from IEC 60664-1, Table 3, for a supply system having a nominal voltage of 50 V.~~ ~~NOTE 2 For the definition of nominal voltage see IEC 60050-601 (IEV 601-01-21).~~	

[a] For the purposes of this standard the following applies (taken from IEC 60664-1):

micro environment: the immediate environment of the insulation which particularly influences the dimensioning of creepage distances (IEC 60664-1, 1.3.12.2).

Pollution degree: a numeral characterizing the expected pollution of the micro environment (IEC 60664-1, 1.3.13).

Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence

On printed wiring boards of TDS, it is acceptable to use pollution degree 1, if the printed wiring board is protected against any occurrence of condensation and deposition of conductive, hydroscopic, or soluble dust. This usually can be achieved only if the printed wiring board and/or circuits are coated and the coating complies with the specifications of IEC 60664-3 and an additional encapsulation, or by sealing of the whole printed wiring board assembly by a protective coating.

Pollution degree 2: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected (see IEC 60664-1, 2.5.1).

On printed wiring boards of TDS, it is acceptable to use pollution degree 2, if the printed wiring board and/or circuit is coated and the coating complies with the specifications of IEC 60664-3.

This standard classifies insulating materials according to their PTI values into four groups:

Material Group I 600 ≤ PTI

Material Group II 400 ≤ PTI < 600

Material Group IIIa 175 ≤ PTI < 400

Material Group IIIb 100 ≤ PTI < 175

Material Group III includes Material Group IIIa and Material Group IIIb

A material shall be included in one of the four groups above on the basis that its PTI, established by the method of IEC 60112 using solution A is equal to or greater than the lower value specified for the group.

[b] Values of creepage distances for printed wiring boards are given for pollution degrees 1 and 2. For other insulating materials, only the values for creepage distances for pollution degree 2 are allowed.

Addition of the following items to Table 23:

Table 23 – Creepage distances, clearances and distances through insulating sealing compound

	Description	mm		
		normal gap	**mini-gap**	**micro-gap**
Creepage distances				
101	For creepage distances across which nominal voltages up to 50 V AC or 50 V DC occur [f] [g], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply separated from the mains supply in an equally effective manner:			
	– on printed wiring material – pollution degree 1	0,025	0,025	0,025
	– on printed wiring material – pollution degree 2	0,04	0,04	0,04
	– on other insulating material – across insulating material Group I	0,6	0,6	0,6
	– on other insulating material – across insulating material Group II	0,85	0,85	0,85
	– on other insulating material – across insulating material Group III	1,2	1,2	1,2
102	For clearance distances across which nominal voltages up to 50 V AC or DC occur [f], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply electrically separated from the mains supply in an equally effective manner:			
	– pollution degree 1	0,1	0,1	0,1
	– pollution degree 2	0,2	0,2	0,2

NOTE 101 The values for the clearances are based on IEC 60664-1:2020, Table F.2, using as input:

– the rated impulse voltage of 800 V derived from IEC 60664-1:2020, Table F.1, for a line-to-neutral voltage of 50 V AC or 50 V DC and overvoltage category III and Case A (inhomogeneous field);

– pollution degrees 1 and 2.

The values for creepage distances are based on IEC 60664-1:2020, Table F.5 with the input of voltage rationalized for Table F.5 of 50 V RMS from IEC 60664-1:2020, Table F.4, for a supply system having a nominal voltage of 50 V.

NOTE 102 For the definition of nominal voltage, see IEV 601-01-21.

[f] For the purposes of this document, the following applies (taken from IEC 60664-1):

Micro-environment: the immediate environment of the insulation which particularly influences the dimensioning of creepage distances. Ambient conditions which immediately influence the dimensioning of the clearance and creepage distances (IEC 60664-1:2020, 3.1.23).

Pollution degree: a numeral characterizing the expected pollution of the micro-environment (IEC 60664-1:2020, 3.1.25).

Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

On printed wiring boards of TDS, it is acceptable to use pollution degree 1, if the printed wiring board is protected against any occurrence of condensation and deposition of conductive, hydroscopic, or soluble dust. This can usually be achieved only if the printed wiring board and/or circuits are coated and the coating complies with the specifications of IEC 60664-3 and an additional encapsulation, or by sealing of the whole printed wiring board assembly with a protective coating.

Pollution degree 2: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected. This condensation may occur during periods of ON-OFF load cycles of the equipment (see IEC 60664-1:2020, 4.5.2).

On printed wiring boards of TDS, it is acceptable to use pollution degree 2, if the printed wiring board and/or circuit is coated and the coating complies with the specifications of IEC 60664-3.

This document classifies insulating materials according to their PTI values into four groups:

Material Group I 600 ≤ PTI

Material Group II 400 ≤ PTI < 600

Material Group IIIa 175 ≤ PTI < 400

Material Group IIIb 100 ≤ PTI < 175

Material Group III includes Material Group IIIa and Material Group IIIb

A material shall be included in one of the four groups above on the basis that its PTI, established by the method of IEC 60112 using solution A is equal to or greater than the lower value specified for the group.

[g] Values of creepage distances for printed wiring boards are given for pollution degrees 1 and 2. For other insulating materials, only the values for creepage distances for pollution degree 2 are allowed.

Addition of the following new subclauses:

23.101 Control circuits for connections to a SELV

For TDS having a control circuit suitable for connection to a SELV supply, the switching circuit being supplied with a voltage greater than the SELV, creepage distances and clearances between the control and switching circuits shall be not less than 6 mm.

23.102 Use of enamel wires

If the enamel of the wire is at least grade 1 according to IEC 60317 (all parts), the clearances between the wire of the control coil, the live parts of different polarity and exposed conductive parts may be reduced to a value equal to two-thirds of the clearances required in the absence of enamel.

24 Resistance of insulating material to abnormal heat, to fire and to tracking

IEC 60669-1:2017, Clause 24 is applicable with the following ~~addition~~ modification:

Add the following ~~note before 24.1~~ sentence at the beginning of 24.1 and at the beginning of 24.2:

~~NOTE~~ The requirements of this subclause are applicable to both switching circuits and control circuits.

25 Resistance to rusting

IEC 60669-1:2017, Clause 25 is applicable.

26 EMC requirements

IEC 60669-1:2017, Clause 26 is applicable.

Addition of the following clause:

101 Abnormal operation of the control circuit

TDS shall be so constructed that their behaviour during abnormal operation of the control circuit (e.g. when the push-button is jammed) is not dangerous to their surroundings ~~and~~ or to the user.

Compliance is checked by the following test which is made on three additional specimens of TDS which have complied with the requirements of Clause 15 and Clause 16.

TDS are mounted, as in normal use, on a matt black painted pine plywood support having a thickness of approximately 20 mm.

The control circuit is continuously energized at its rated voltage, the switching circuit being loaded with rated current (at rated voltage) for 6 h. Adjustable TDS are adjusted to the shortest delay time.

Immediately after this test, the TDS shall still operate and meet the following conditions:

– *the temperature rise of any part of the TDS enclosure and plywood support, which may be touched by the standard test finger, test probe B of IEC 61032, shall not exceed 75 K;*

– *the temperature rise of the plywood support which cannot be touched by the test finger, test probe B of IEC 61032, shall not exceed 100 K;*

– *the TDS shall not emit flames, melted material, glowing particles or burning drops of insulating material.*

After cooling down to ambient temperature:

– *the TDS shall withstand a dielectric test between switching and control circuits as specified in Clause 16, the test voltage being reduced to 75 % of the values specified in Table ~~14~~ 15 of IEC 60669-1:2017;*

– *the TDS shall still meet the requirements of 10.1.*

Annexes

Annexes of IEC 60669-1:2017 apply except as follows:

Annex B
(informative)

Changes planned for the future in order to align IEC 60669-1 with the requirements of IEC 60998 (all parts), IEC 60999 (all parts) and IEC 60228

IEC 60669-1:2017, Annex B does not apply.

Annex E
(informative)

Additional requirements and tests for switches intended to be used at a temperature lower than −5 °C

IEC 60669-1:2017, Annex E applies with the following modifications.

Replace 19.4 with the following text:

19.4 Test for TDS intended to be used in ambient temperature below −5 °C

The following additional test shall be carried out on TDS intended to be used below the normal temperature ranges if marking for low temperature is used:

– *wire the TDS with a signal circuit including an indicator to easily evaluate that the TDS is working as intended during the test;*

– *the TDS are then kept for 24 h at a temperature of (−25 ± 2) °C;*

– *the tests of 19.101, 19.102 and 19.103 as applicable are then performed at (−25 ± 2) °C. For 19.101, 20 operations are performed at rated voltage;*

– *after these tests the TDS shall show no visible harmful deformation, cracks or similar damage which would lead to non-compliance with this document;*

– *verification of operation is checked by the test described in 19.4, immediately followed by the measurement of the insulation resistance of 16.2 and the electric strength test specified in 16.3.*

Addition:

Bibliography

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

IEC 60364-4-41:2005, *Low voltage electrical installation – Part 4-41 – Protection for safety – Protection against electric shock*
IEC 60364-4-41:2005/AMD1:2017

IEC 60669-2-1:2021, *Switches for household and similar fixed electrical installations – Part 2-1: Particular requirements – Electronic control devices*

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IEC 60669-2-3

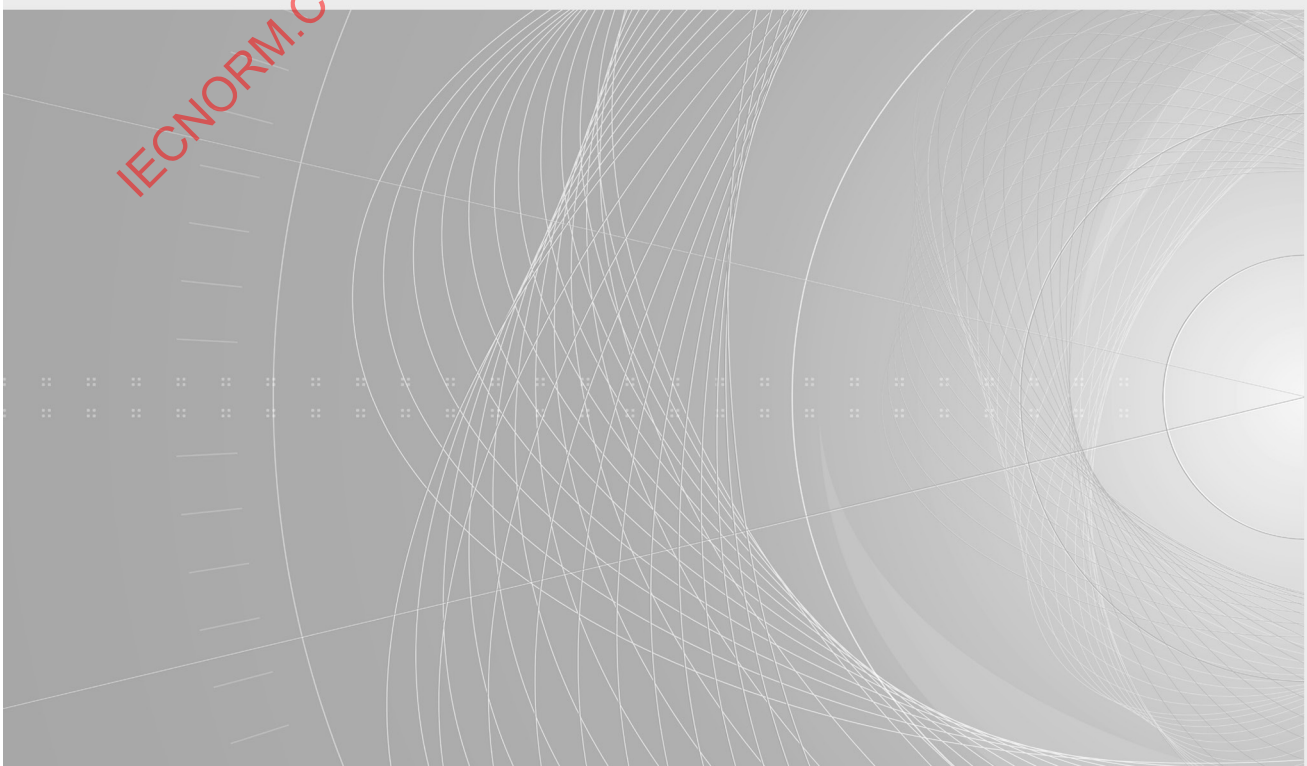
Edition 4.0 2024-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Switches for household and similar fixed electrical installations – Part 2-3: Particular requirements – Time-delay switches (TDS)

Interrupteurs pour installations électriques fixes domestiques et analogues – Partie 2-3 : Exigences particulières – Interrupteurs temporisés (minuteries)



IEC 60669-2-3:2024-03(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SWITCHES FOR HOUSEHOLD AND SIMILAR FIXED ELECTRICAL INSTALLATIONS –

Part 2-3: Particular requirements – Time-delay switches (TDS)

FOREWORD

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IEC 60669-2-3 has been prepared by subcommittee 23B: Plugs, socket-outlets and switches, of IEC technical committee 23: Electrical accessories. It is an International Standard.

This fourth edition cancels and replaces the third 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) Revision of the present edition with reference to IEC 60669-1:2017 (Edition 4);
b) Introduction of a revision to Annex E "Additional requirements and tests for switches intended to be used at a temperature lower than −5 °C".

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

Draft	Report on voting
23B/1487/FDIS	23B/1501/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/publications.

This part of IEC 60669-2 is to be used in conjunction with IEC 60669-1:2017. It lists the changes necessary to convert that standard into a specific standard for time-delay switches.

When a particular subclause of IEC 60669-1:2017 is not mentioned in this document, that subclause applies as far as reasonable.

In this document, the following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type;*

– notes: in smaller roman type.

Subclauses, figures or tables which are additional to those in IEC 60669-1:2017 are numbered starting from 101.

A list of all parts of IEC 60669 series, under the general title *Switches for household and similar fixed electrical installations*, 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, or
- revised.

SWITCHES FOR HOUSEHOLD AND SIMILAR FIXED ELECTRICAL INSTALLATIONS –

Part 2-3: Particular requirements – Time-delay switches (TDS)

1 Scope

IEC 60669-1:2017, Clause 1 is applicable except as follows:

Replacement of the first paragraph with the following:

This part of IEC 60669 applies to time-delay switches (hereinafter referred to as TDS) with a rated voltage not exceeding 440 V AC and a rated current not exceeding 63 A, intended for household and similar fixed electrical installations, either indoors or outdoors, operated by hand and/or by remote control. For the control circuit, the rated control voltage does not exceed 440 V AC or 220 V DC.

TDS are provided with a time-delay device operated by mechanical, thermal, pneumatic, hydraulic or electrical means or by a combination of them.

Electronic TDS are within the scope of IEC 60669-2-1 but not of this document.

TDS including only passive components such as resistors, capacitors, positive temperature coefficient (PTC) and negative temperature coefficient (NTC) components and printed circuit boards are not considered to be electronic TDS.

2 Normative references

IEC 60669-1:2017, Clause 2 is applicable with the following additions:

IEC 60317 (all parts), *Specifications for particular types of winding wires*

IEC 60445:2021, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply 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 61558-2-6:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

3 Terms and definitions

IEC 60669-1:2017, Clause 3 is applicable with the following modifications:

3.8
thread-cutting screw

Addition of the following note:

Note 101 to entry: This definition is applicable to the switching circuit only.

3.9
mechanical time-delay device

Addition of the following note:

Note 101 to entry: This definition is applicable to the switching circuit only.

Addition of the following new terminological entries:

3.101
time-delay switch
TDS
switch provided with a time-delay device which operates for a certain time (the delay time)

Note 101 to entry: Time-delay switches may be either manually actuated and/or remotely electrically initiated.

3.101.1
electronic TDS
TDS containing electronic component(s)

3.102
rated control voltage
voltage assigned to the control circuit by the manufacturer

3.103
switching circuit
circuit which contains the parts which allow the rated current to flow through the TDS

3.104
control circuit
circuit which includes electrical parts to control the switching circuit in an electrically controlled TDS

3.105
control mechanism
all parts which are intended for the operation of the TDS

3.106
incorporated hand-operated device
device which allows the switching circuit to be operated, directly or indirectly

Note 101 to entry: An incorporated hand-operated device is not intended for the normal operation of the TDS.

3.107
delay time
period during which the switching circuit(s) is (are) kept closed

Note 101 to entry: Any time taken for the decreasing of the voltage (e.g. to reduce the light) at the end of the delay period is included within the delay time.

3.108
delay device
all components which have an influence on the delay time

Note 101 to entry: The delay device is energized by means of an impulse into the control circuit in an electrically controlled TDS.

Note 102 to entry: The delay time may be adjustable.

3.109
disconnectable TDS
TDS consisting of two parts, the first being used as a base and including the terminals, the other being removable and including the switching and the control circuits, the two parts being resiliently connected together using a means which allows joining and/or separating with or without the use of a tool

4 General requirements

IEC 60669-1:2017, Clause 4 is applicable with the following addition:

Addition of the following after the first paragraph:

The operation of a TDS shall not be impaired when it is mounted at an angle deviating by not more than 5° from the specified position of use.

5 General remarks on tests

IEC 60669-1:2017, Clause 5 is applicable with the following additions:

Addition to Table 1:

Table 1 – Number of specimens needed for the tests

Clauses and subclauses	Number of specimens	Number of additional specimens for dual current rating
101 Abnormal operation of the control circuit	PQR	

Addition of the following subclauses:

5.101 Incorporated hand-operated device

If a TDS is provided with an incorporated hand-operated device, actuating the switching circuit directly, it shall be tested as specified in 19.101.

5.102 Operated by hand

For a TDS operated by hand, the requirements relating to the control voltage do not apply.

5.103 Control and switching circuits without common point

In the case of a TDS for which the control and the switching circuits have no common point, the test is made with the circuits supplied with the rated voltages which are specified in this document.

6 Ratings

IEC 60669-1:2017, Clause 6 is applicable except as follows:

6.1 Rated voltage

Replacement of the first paragraph with the following:

Preferred values of rated voltage are:

– AC: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V and 240 V;

NOTE These rated voltages are aligned with the rated control voltages specified in 6.101 to simplify the tests on TDS having a common point between the control and switching circuits.

Addition of the following subclause:

6.101 Rated control voltage

Preferred values of rated control voltage are:

– AC: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V and 240 V;
– DC: 6V, 9 V, 12 V, 24 V, 48 V, 60 V, 110 V and 220 V.

7 Classification

IEC 60669-1:2017, Clause 7 is applicable except as follows:

7.1 according to the possible connections (see Figure 8 of IEC 60669-1:2017):

Replace the existing nine-dash list with the following:

Pattern number

– single-pole switches 1
– double-pole switches 2
– three-pole switches 3
– three-pole plus switched neutral switches 03
– two-way switches 6

7.5 according to the method of actuating a switch:

Addition of the following:

– time-delay switches (TDS):
  - manually operated;
  - remotely operated;
  - manually and remotely operated.

NOTE The above methods of operation can be combined with a complementary method of operation allowing permanent ON and/or permanent OFF. These possibilities are given by a complementary device acting either directly on the switching circuit, or on the control circuit.

7.7 according to the method of installation, as a consequence of the design of the switch

Addition of the following:

– disconnectable TDS;

Addition of the following subclause:

7.101 according to the type of control mechanism:

– mechanical;
– thermal;
– pneumatic;
– hydraulic;
– electrical;
– combination(s) of the above.

8 Marking

IEC 60669-1:2017, Clause 8 is applicable with the following additions:

8.1 General

Replacement of list item b) with the following:

b) rated voltage(s) in volts and rated control voltage(s) in volts, if different from the rated voltage(s);

Addition of the following after list item m):

Switches shall be also marked with

n) symbol for the adjustment of the delay time, if applicable;
o) symbols for the positions "Permanent ON" and "Permanent OFF", if applicable;
p) symbol for "Delay time".

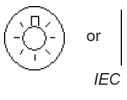
Addition after Note 5:

NOTE 101 If a delay time value is indicated, it can be expressed in seconds, minutes and hours.

8.2 *Addition of the following symbols:*

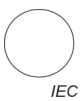
Permanent ON

If the TDS may also be remote controlled, the symbol | is not to be used.



Delay time

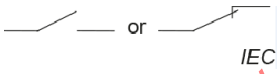
Permanent OFF but only if the air gap of the switching contact of the TDS is not less than 3 mm



Adjustment of delay time

Control mechanism

Switch



NOTE 101 In the following country, the symbol consisting of 2 concentric circles is not used to indicate time delay: UK.

8.3 Visibility of markings

Replace the second paragraph with the following:

Markings as given in 8.1 a), b), c), d), e) and, if applicable, f), g), h), k), l), n), o) and p) shall be placed on the main part of the TDS.

8.4 Marking on terminals for phase conductors

Addition of the following after the fourth paragraph and before the notes of this Subclause 8.4:

If necessary, the wiring diagram on which the terminal reference is clearly indicated shall be fixed to the accessory or put inside the protective cover for the terminals.

The terminals of the control circuit shall be marked according to either IEC 60445 or with the symbols according to 8.2, or both.

9 Checking of dimensions

IEC 60669-1:2017, Clause 9 is applicable.

10 Protection against electric shock

IEC 60669-1:2017, Clause 10 is applicable.

11 Provision for earthing

IEC 60669-1:2017, Clause 11 is applicable.

12 Terminals

IEC 60669-1:2017, Clause 12 is applicable.

13 Constructional requirements

IEC 60669-1:2017, Clause 13 is applicable with the following modifications:

Addition of the following subclauses:

13.101 Reset function

All TDS shall be resettable; this means TDS revert to the full-time delay when the operating means is actuated during a previously started time delay.

13.102 Transformers intended for SELV circuits

Transformers intended for SELV circuits shall be of the safety isolating type and shall comply with the relevant requirements of IEC 61558-2-6.

NOTE 101 For the use of SELV, see IEC 61140 and IEC 60364-4-41.

14 Mechanism

IEC 60669-1:2017, Clause 14 is applicable with the following modifications:

Addition of the following subclause:

14.101 Hand-operated device with position indicator

If a TDS is equipped with an incorporated hand-operated device, and if a position indicator is used, it shall indicate the position of the switching circuit clearly and without ambiguity.

15 Resistance to ageing, protection provided by enclosures of switches and resistance to humidity

IEC 60669-1:2017, Clause 15 is applicable.

16 Insulation resistance and electric strength

IEC 60669-1:2017, Clause 16 is applicable with the following modifications:

16.3 Electric strength test

Addition to Table 15:

Table 15 – Test voltage, points of application and minimum values of insulating resistance for the verification of electric strength

Insulation to be tested		Minimum value of insulation resistance MΩ	Test voltage V	
			Switches having a rated voltage not exceeding 130 V	Switches having a rated voltage exceeding 130 V
101	Between switching circuit(s) and control circuit(s) if they are separated	5	2 000	3 000
102	Between SELV/PELV circuits and other circuit(s) having a higher voltage than SELV/PELV	7	3 000	3 750
103	Between two SELV/PELV circuits	5	500	500

17 Temperature rise

IEC 60669-1:2017, Clause 17 is applicable with the following modifications:

17.1 General

Addition of the following after the fifth paragraph:

TDS are adjusted to the longest delay time indicated by the manufacturer. During the test the TDS is reclosed at the end of each delay time, within a time of (2 ± 0,5) s.

Electrically operated TDS are operated by means of the control circuit.

18 Making and breaking capacity

IEC 60669-1:2017, Clause 18 is applicable except as follows:

18.2 Overload

Replacement of the first four paragraphs including the dashed list with the following:

TDS are tested at 1,1 times rated voltage and 1,1 times rated control voltage and 1,25 times rated current. The tolerance for the test voltage and test current is $^{+5}_{0}$ %.

TDS are subjected to 200 operations specified as follows:

– *if adjustable, they are adjusted to the shortest delay time, but not shorter than 50 s. The time interval between switching OFF and ON is adjusted as specified in Clause 17;*
– *if the maximum adjustable time delay is less than 50 s, the TDS are adjusted to the longest possible delay time;*
– *if not adjustable they are tested as delivered.*

18.3 Overload test with filament lamps

Addition of the following after the first paragraph:

The operation of the TDS is as specified in 18.2.

19 Normal operation

IEC 60669-1:2017, Clause 19 is applicable except as follows:

19.1 Test for switches intended for inductive loads

Replacement of the first six paragraphs with the following:

TDS shall withstand, without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use.

Compliance is checked by the following test.

TDS are tested at rated voltage, rated control voltage and rated current with the connections specified in 18.2.

The circuit details and the manner of operation of the selector switch S are as described in 18.2, unless otherwise specified.

For adjustable TDS, the delay time is adjusted to approximately midway and the time interval between switching OFF and ON is adjusted as specified in Clause 17.

The number of operations is indicated in Table 18; however, for TDS having a long time delay, the delay time may be reduced to perform the test. In any case, the maximum test duration is 1 000 h for adjustable and non-adjustable TDS.

For TDS equipped with an incorporated hand-operated device, acting directly on the switching circuit, 10 % of the operations indicated in Table 18 are made by hand or in an equivalent manner and for those for AC only the test is followed by that of 14.3.

During the normal operation test, failures of correct operation are allowed to occur within 1 %, but, no more than three consecutive failures.

Addition of the following subclauses:

19.101 TDS control voltage test

TDS shall operate as intended between 0,9 times and 1,1 times the rated control voltages.

Compliance is checked by the following test.

Under no-load conditions, 20 operations are carried out on each of the three specimens, under a control voltage of 0,9 times the rated value and 20 operations under a control voltage of 1,1 times the rated value.

TDS shall operate as intended during the test; however, differences in delay times are permitted according to 19.102.

19.102 TDS delay time accuracy

TDS shall have an adequate repetitive accuracy of delay time.

Compliance is checked by applying the rated control voltage ten times and measuring the delay time after each application, the TDS not being loaded.

For adjustable TDS the delay time is set to 2,5 min approximately if possible, otherwise, the test is made with the delay time specified by the manufacturer.

The maximum and minimum values of delay time shall not deviate by more than 15 % from the mean value of the test.

19.103 TDS delay after revert operation

A TDS shall revert to the full delay time when the operating means is actuated during the delay time period.

Compliance is checked by the following test.

For a TDS, where the delay time is adjustable, the delay time is adjusted to a time between 2 min and 3 min.

Three specimens are initiated at the rated control voltage.

After 1 min the specimens are again initiated at the rated control voltage.

The total delay time resulting for each of these specimens shall be between 3 min and 4 min.

For a TDS, where the delay time is not adjustable, the specimens are initiated twice at the rated control voltage, the time difference between the first and the second initiation being 1 min. The total delay time shall be the delay time (declared by the manufacturer) ±5 % of the delay time plus 1 min.

For a TDS, where the delay time is not adjustable when the delay time of the TDS is less than 1 min, the second initiation of the TDS shall be after half the delay time declared by the manufacturer has passed. The total delay time shall be 1,5 times the delay time ±5 %.

20 Mechanical strength

IEC 60669-1:2017, Clause 20 is applicable.

21 Resistance to heat

IEC 60669-1:2017, Clause 21 is applicable with the following addition:

21.1 General

Addition of the following sentence at the end of 21.1 after list item b):

The requirements of 21.1 are applicable to both switching circuits and control circuits.

22 Screws, current-carrying parts and connections

IEC 60669-1:2017, Clause 22 is applicable.

23 Creepage distances, clearances and distances through sealing compound

IEC 60669-1:2017, Clause 23 is applicable with the following modifications:

23.1 General

Addition of the following items to Table 23:

Table 23 – Creepage distances, clearances and distances through insulating sealing compound

	Description	mm		
		normal gap	**mini-gap**	**micro-gap**
Creepage distances				
101	For creepage distances across which nominal voltages up to 50 V AC or 50 V DC occur [f g], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply separated from the mains supply in an equally effective manner:			
	– on printed wiring material – pollution degree 1	0,025	0,025	0,025
	– on printed wiring material – pollution degree 2	0,04	0,04	0,04
	– on other insulating material – across insulating material Group I	0,6	0,6	0,6
	– on other insulating material – across insulating material Group II	0,85	0,85	0,85
	– on other insulating material – across insulating material Group III	1,2	1,2	1,2
102	For clearance distances across which nominal voltages up to 50 V AC or DC occur [f], and which voltages are generated in a circuit by supply from a safety isolating transformer according to IEC 61558-2-6 or by a supply electrically separated from the mains supply in an equally effective manner:			
	– pollution degree 1	0,1	0,1	0,1
	– pollution degree 2	0,2	0,2	0,2

NOTE 101 The values for the clearances are based on IEC 60664-1:2020, Table F.2, using as input:

– the rated impulse voltage of 800 V derived from IEC 60664-1:2020, Table F.1, for a line-to-neutral voltage of 50 V AC or 50 V DC and overvoltage category III and Case A (inhomogeneous field);

– pollution degrees 1 and 2.

The values for creepage distances are based on IEC 60664-1:2020, Table F.5 with the input of voltage rationalized for Table F.5 of 50 V RMS from IEC 60664-1:2020, Table F.4, for a supply system having a nominal voltage of 50 V.

NOTE 102 For the definition of nominal voltage, see IEV 601-01-21.

[f] For the purposes of this document, the following applies (taken from IEC 60664-1):

Micro-environment: the immediate environment of the insulation which particularly influences the dimensioning of creepage distances. Ambient conditions which immediately influence the dimensioning of the clearance and creepage distances (IEC 60664-1:2020, 3.1.23).

Pollution degree: a numeral characterizing the expected pollution of the micro-environment (IEC 60664-1:2020, 3.1.25).

Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

On printed wiring boards of TDS, it is acceptable to use pollution degree 1, if the printed wiring board is protected against any occurrence of condensation and deposition of conductive, hydroscopic, or soluble dust. This can usually be achieved only if the printed wiring board and/or circuits are coated and the coating complies with the specifications of IEC 60664-3 and an additional encapsulation, or by sealing of the whole printed wiring board assembly with a protective coating.

Pollution degree 2: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected. This condensation may occur during periods of ON-OFF load cycles of the equipment (see IEC 60664-1:2020, 4.5.2).

On printed wiring boards of TDS, it is acceptable to use pollution degree 2, if the printed wiring board and/or circuit is coated and the coating complies with the specifications of IEC 60664-3.

This document classifies insulating materials according to their PTI values into four groups:

Material Group I	600 ≤ PTI
Material Group II	400 ≤ PTI < 600
Material Group IIIa	175 ≤ PTI < 400
Material Group IIIb	100 ≤ PTI < 175

Material Group III includes Material Group IIIa and Material Group IIIb

A material shall be included in one of the four groups above on the basis that its PTI, established by the method of IEC 60112 using solution A is equal to or greater than the lower value specified for the group.

[g] Values of creepage distances for printed wiring boards are given for pollution degrees 1 and 2. For other insulating materials, only the values for creepage distances for pollution degree 2 are allowed.

Addition of the following new subclauses:

23.101 Control circuits for connections to a SELV

For TDS having a control circuit suitable for connection to a SELV supply, the switching circuit being supplied with a voltage greater than the SELV, creepage distances and clearances between the control and switching circuits shall be not less than 6 mm.

23.102 Use of enamel wires

If the enamel of the wire is at least grade 1 according to IEC 60317 (all parts), the clearances between the wire of the control coil, the live parts of different polarity and exposed conductive parts may be reduced to a value equal to two-thirds of the clearances required in the absence of enamel.

24 Resistance of insulating material to abnormal heat, to fire and to tracking

IEC 60669-1:2017, Clause 24 is applicable with the following modification:

Add the following sentence at the beginning of 24.1 and at the beginning of 24.2:

The requirements of this subclause are applicable to both switching circuits and control circuits.

25 Resistance to rusting

IEC 60669-1:2017, Clause 25 is applicable.

26 EMC requirements

IEC 60669-1:2017, Clause 26 is applicable.

Addition of the following clause:

101 Abnormal operation of the control circuit

TDS shall be so constructed that their behaviour during abnormal operation of the control circuit (e.g. when the push-button is jammed) is not dangerous to their surroundings or to the user.

Compliance is checked by the following test which is made on three additional specimens of TDS which have complied with the requirements of Clause 15 and Clause 16.

TDS are mounted, as in normal use, on a matt black painted pine plywood support having a thickness of approximately 20 mm.

The control circuit is continuously energized at its rated voltage, the switching circuit being loaded with rated current (at rated voltage) for 6 h. Adjustable TDS are adjusted to the shortest delay time.

Immediately after this test, the TDS shall still operate and meet the following conditions:

– *the temperature rise of any part of the TDS enclosure and plywood support, which may be touched by the standard test finger, test probe B of IEC 61032, shall not exceed 75 K;*
– *the temperature rise of the plywood support which cannot be touched by the test finger, test probe B of IEC 61032, shall not exceed 100 K;*
– *the TDS shall not emit flames, melted material, glowing particles or burning drops of insulating material.*

After cooling down to ambient temperature:

– *the TDS shall withstand a dielectric test between switching and control circuits as specified in Clause 16, the test voltage being reduced to 75 % of the values specified in Table 15 of IEC 60669-1:2017;*
– *the TDS shall still meet the requirements of 10.1.*

Annexes

Annexes of IEC 60669-1:2017 apply except as follows:

Annex B
(informative)

Changes planned for the future in order to align IEC 60669-1 with the requirements of IEC 60998 (all parts), IEC 60999 (all parts) and IEC 60228

IEC 60669-1:2017, Annex B does not apply.

Annex E
(informative)

Additional requirements and tests for switches intended to be used at a temperature lower than −5 °C

IEC 60669-1:2017, Annex E applies with the following modifications.

Replace 19.4 with the following text:

19.4 Test for TDS intended to be used in ambient temperature below −5 °C

The following additional test shall be carried out on TDS intended to be used below the normal temperature ranges if marking for low temperature is used:

– *wire the TDS with a signal circuit including an indicator to easily evaluate that the TDS is working as intended during the test;*

– *the TDS are then kept for 24 h at a temperature of (−25 ± 2) °C;*

– *the tests of 19.101, 19.102 and 19.103 as applicable are then performed at (−25 ± 2) °C. For 19.101, 20 operations are performed at rated voltage;*

– *after these tests the TDS shall show no visible harmful deformation, cracks or similar damage which would lead to non-compliance with this document;*

– *verification of operation is checked by the test described in 19.4, immediately followed by the measurement of the insulation resistance of 16.2 and the electric strength test specified in 16.3.*

Addition:

Bibliography

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

IEC 60364-4-41:2005, *Low voltage electrical installation – Part 4-41 – Protection for safety – Protection against electric shock*
IEC 60364-4-41:2005/AMD1:2017

IEC 60669-2-1:2021, *Switches for household and similar fixed electrical installations – Part 2-1: Particular requirements – Electronic control devices*

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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INTERRUPTEURS POUR INSTALLATIONS ÉLECTRIQUES FIXES DOMESTIQUES ET ANALOGUES –

Partie 2-3: Exigences particulières – Interrupteurs temporisés (minuteries)

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L'IEC 60669-2-3 a été établie par le sous-comité 23B: Prises de courant et interrupteurs, du comité d'études 23 de l'IEC: Petit appareillage. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2006. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) révision de la présente édition avec référence à l'IEC 60669-1:2017 (Édition 4);
b) introduction d'une révision de l'Annexe E "Exigences et essais supplémentaires pour les interrupteurs à utiliser à une température inférieure à −5 °C".

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
23B/1487/FDIS	23B/1501/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

La présente partie de l'IEC 60669-2 est destinée à être utilisée conjointement avec l'IEC 60669-1:2017. Elle énumère les modifications nécessaires pour transformer cette norme en une norme spécifique pour les interrupteurs temporisés.

Lorsqu'un paragraphe particulier de l'IEC 60669-1:2017 n'est pas mentionné dans le présent document, ce paragraphe s'applique pour autant que cela soit raisonnable.

Dans le présent document, les caractères d'imprimerie suivants sont utilisés:

– exigences proprement dites: caractères romains;
– *modalités d'essais: caractères italiques;*
– notes: petits caractères romains.

Les paragraphes, figures ou tableaux qui sont ajoutés à ceux de l'IEC 60669-1:2017 sont numérotés à partir de 101.

Une liste de toutes les parties de la série IEC 60669, publiées sous le titre général *Interrupteurs pour installations électriques fixes domestiques et analogues*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

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INTERRUPTEURS POUR INSTALLATIONS ÉLECTRIQUES FIXES DOMESTIQUES ET ANALOGUES –

Partie 2-3: Exigences particulières – Interrupteurs temporisés (minuteries)

1 Domaine d'application

L'Article 1 de l'IEC 60669-1:2017 s'applique, avec l'exception suivante:

Remplacement du premier alinéa par le suivant:

La présente partie de l'IEC 60669 s'applique aux interrupteurs temporisés (désignés ci-après minuteries) de tension assignée qui ne dépasse pas 440 V en courant alternatif et de courant assigné qui ne dépasse pas 63 A, prévus pour installations électriques fixes domestiques et analogues intérieures ou extérieures, commandés à la main ou à distance. Pour le circuit de commande, la tension de commande assignée ne dépasse pas 440 V en courant alternatif ou 220 V en courant continu.

Les minuteries sont équipées d'un dispositif de temporisation mécanique, thermique, pneumatique, hydraulique ou électrique ou d'un dispositif qui met en œuvre une quelconque de leurs combinaisons.

Les minuteries électroniques sont couvertes par le domaine d'application de l'IEC 60669-2-1, mais pas par celui du présent document.

Les minuteries qui comportent uniquement des composants passifs tels que des résistances, des condensateurs, des composants à coefficient de température positif (CTP) et coefficient de température négatif (CTN) et des cartes de circuits imprimés ne sont pas considérées comme des minuteries électroniques.

2 Références normatives

L'Article 2 de l'IEC 60669-1:2017 s'applique, avec les ajouts suivants:

IEC 60317 (toutes les parties), *Spécifications pour types particuliers de fils de bobinage*

IEC 60445:2021, *Principes fondamentaux et de sécurité pour les interfaces homme-machines, le marquage et l'identification – Identification des bornes de matériels, des extrémités de conducteurs et des conducteurs*

IEC 60664-1:2020, *Coordination de l'isolement des matériels dans les réseaux d'énergie électrique à basse tension – Partie 1: Principes, exigences et essais*

IEC 60664-3:2016, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 3: Utilisation de revêtement, d'empotage ou de moulage pour la protection contre la pollution*

IEC 60669-1:2017, *Interrupteurs pour installations électriques fixes domestiques et analogues – Partie 1: Exigences générales*

IEC 61558-2-6:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications* (disponible en anglais uniquement)

3 Termes et définitions

L'Article 3 de l'IEC 60669-1:2017 s'applique, avec les modifications suivantes:

3.8
vis autotaraudeuse à découpe de matière

Ajout de la note suivante:

Note 101 à l'article: Cette définition s'applique au circuit de l'interrupteur seulement.

3.9
dispositif mécanique à action différée

Ajout de la note suivante:

Note 101 à l'article: Cette définition s'applique au circuit de l'interrupteur seulement.

Ajout des nouveaux articles terminologiques suivants:

3.101
interrupteur temporisé
minuterie
interrupteur équipé d'un dispositif de temporisation qui le fait fonctionner pendant un certain temps (la temporisation)

Note 101 à l'article: Les interrupteurs temporisés peuvent être commandés manuellement et/ou lancés électriquement à distance.

3.101.1
minuterie électronique
minuterie qui comporte un ou des composants électroniques

3.102
tension de commande assignée
tension assignée au circuit de commande par le fabricant

3.103
circuit de l'interrupteur
circuit qui comporte les parties qui permettent le passage du courant assigné dans la minuterie

3.104
circuit de commande
circuit qui comporte les parties électriques pour la commande du mécanisme de commutation dans une minuterie commandée électriquement

3.105
mécanisme de commande
toutes les parties destinées au fonctionnement de la minuterie

3.106
commande manuelle incorporée
dispositif qui permet de faire fonctionner le circuit de l'interrupteur directement ou indirectement

Note 101 à l'article: Une commande manuelle incorporée n'est pas prévue pour le fonctionnement normal de la minuterie.

3.107
temporisation
durée pendant laquelle le ou les circuits de l'interrupteur restent fermés

Note 101 à l'article: Toute durée prise pour la diminution de la tension (par exemple pour la réduction de la lumière) à la fin de la durée de la temporisation est comprise dans la temporisation.

3.108
dispositif de temporisation
ensemble des constituants qui influencent la temporisation

Note 101 à l'article: Le dispositif de temporisation est excité par une impulsion du circuit de commande dans les minuteries à commande électrique.

Note 102 à l'article: La temporisation peut être réglable.

3.109
minuterie débrochable
minuterie composée de deux parties, l'une servant de base et comportant les bornes, l'autre amovible comportant le circuit de l'interrupteur et le circuit de commande, les deux parties s'adaptant l'une dans l'autre par des connexions élastiques, en utilisant un moyen qui permet de les solidariser et/ou séparer avec ou sans l'aide d'un outil

4 Exigences générales

L'Article 4 de l'IEC 60669-1:2017 s'applique, avec l'ajout suivant:

Ajout de ce qui suit après le premier alinéa:

Le fonctionnement d'une minuterie ne doit pas être perturbé quand elle est montée avec un angle qui ne s'écarte pas de plus de 5° de la position spécifiée d'utilisation.

5 Généralités sur les essais

L'Article 5 de l'IEC 60669-1:2017 s'applique, avec les ajouts suivants:

Ajout au Tableau 1:

Tableau 1 – Nombre d'échantillons nécessaires pour les essais

Articles et paragraphes	Nombre d'échantillons	Nombre d'échantillons supplémentaires pour deux courants assignés
101 Fonctionnement anormal du circuit de commande	PQR	

Ajout des paragraphes suivants:

5.101 Commande manuelle incorporée

Si une minuterie est équipée d'une commande manuelle incorporée qui agit directement sur le circuit de l'interrupteur, elle doit être soumise à l'essai comme cela est spécifié en 19.101.

5.102 Commande manuelle

Pour les minuteries à commande manuelle, les exigences concernant la tension de commande ne s'appliquent pas.

5.103 Circuit de commande et circuit de l'interrupteur sans point commun

Dans le cas d'une minuterie où le circuit de commande et le circuit de l'interrupteur n'ont pas un point commun, l'essai est réalisé avec les circuits alimentés aux tensions assignées qui sont spécifiées dans le présent document.

6 Caractéristiques assignées

L'Article 6 de l'IEC 60669-1:2017 s'applique, avec les exceptions suivantes:

6.1 Tension assignée

Remplacement du premier alinéa par ce qui suit:

Les valeurs préférentielles de la tension assignée sont les suivantes:

– en courant alternatif: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V et 240 V;

NOTE Ces tensions assignées sont alignées sur les tensions de commande assignées, spécifiées en 6.101, pour simplifier les essais sur les minuteries qui ont un point commun entre le circuit de commande et le circuit de l'interrupteur.

Ajout du paragraphe suivant:

6.101 Tension de commande assignée

Les valeurs préférentielles de la tension de commande assignée sont les suivantes:

– en courant alternatif: 6 V, 8 V, 9 V, 12 V, 24 V, 42 V, 48 V, 110 V, 130 V, 220 V, 230 V et 240 V;
– en courant continu: 6 V, 9 V, 12 V, 24 V, 48 V, 60 V, 110 V et 220 V.

7 Classification

L'Article 7 de l'IEC 60669-1:2017 s'applique, avec les exceptions suivantes:

7.1 selon les connexions possibles (voir Figure 8 de l'IEC 60669-1:2017) en:

Remplacer la liste à neuf tirets existante par la liste suivante:

	Numéro de fonction
– interrupteur unipolaire	1
– interrupteur bipolaire	2
– interrupteur tripolaire	3
– interrupteur tripolaire avec neutre coupé	03
– interrupteur à deux directions	6

7.5 selon la méthode de commande d'un interrupteur:

Ajout de ce qui suit:

– interrupteurs temporisés (minuteries):
  - à commande manuelle;
  - à commande à distance;
  - à commande manuelle et à distance.

NOTE Les modes de commande ci-dessus peuvent être combinés avec un mode de commande complémentaire qui permet la fermeture et/ou l'ouverture permanentes. Ces possibilités sont données par un dispositif complémentaire qui agit soit directement sur le circuit de l'interrupteur soit sur le circuit de commande.

7.7 selon le procédé d'installation, qui est fonction de la conception de l'interrupteur:

Ajout de ce qui suit:

– minuterie débrochable;

Ajout du paragraphe suivant:

7.101 selon le type de mécanisme de commande:

– mécanique;
– thermique;
– pneumatique;
– hydraulique;
– électrique;
– combinaison(s) des types ci-dessus.

8 Marquage

L'Article 8 de l'IEC 60669-1:2017 s'applique, avec les ajouts suivants:

8.1 Généralités

Remplacement du point b) par le suivant:

b) la ou les tensions assignées en volts et la ou les tensions de commande assignées en volts, si celles-ci diffèrent de la ou des tensions assignées;

Ajout de ce qui suit après le point m):

Les interrupteurs doivent également porter

n) le symbole pour le réglage de la temporisation, s'il y a lieu;

o) les symboles pour les positions "Fermeture permanente" et "Ouverture permanente", s'il y a lieu;

p) le symbole pour "Temporisation".

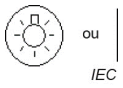
Addition après la Note 5:

NOTE 101 Si une valeur de temporisation est indiquée, elle peut être exprimée en secondes, en minutes et en heures.

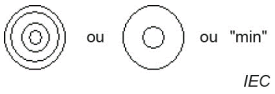
8.2 *Ajout des symboles suivants:*

Fermeture permanente

Si la minuterie peut être commandée aussi à distance, le symbole | n'est pas à utiliser.



Temporisation



Ouverture permanente uniquement si la distance d'ouverture des contacts de la minuterie n'est pas inférieure à 3 mm

Réglage de la temporisation

Mécanisme de commande

IEC 60417-6457:2023-08

Interrupteur

NOTE 101 Dans le pays suivant, le symbole qui consiste en 2 cercles concentriques n'est pas utilisé pour indiquer une temporisation: UK (ou RU).