CERTIFICATE

ATTESTATION
CERTIFICATE OF LOW VOLTAGE DIRECTIVE

Technical file of the company mentioned below has been observed and audit has been completed successfully.
2014/35/EU Low Voltage Directive has been taken as references for these processes

Company Name : Yueqing Langir Electric Co., Ltd

Company Address : No.16, Lane 79, Xixing Road, Liushi Town, Yueqing City, Zhejiang Province, China

Related Directives and Annex : Low Voltage Directive 2014/35/EU

Related Standards : EN IEC 61058-1:2018

Product Name : Push button switch

Report No and Date : PTSTCF0929-LVD

Product Brand/Model/Type : langir V12,V16,V19,VS19,V22,L12,L12U,L16,LS16, L16T,L16U,L19,LF19,LS19,L19A,L19M,L19B, L19T,L19U,L19Y,L22,L22A,L22B,L22M,L22O, L22S,L22T,L22U,L25,L25U,L28,L29S,L30,L30B,L40,PZ12,PZ16,PZ19, PZ22,PZ25,PZ30,PZ35,PZ40,PP22,CP16,CP19,CP22,CP25,CP30

Certificate Number : M.2022.206.C78075
Initial Assessment Date : 09.10.2022
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Expiry Date : 09.10.2027

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PTSTCF0929-LVD

LVD Technical Construction File

For

Yueqing Langir Electric Co.,Ltd

Push button switch

Model:

V12,V16,V19,VS19,V22,L12,L12U,L16,LS16,L16T,L16U,L19,LF19,LS19,L19A,L19M,L19B,L19T, L19U,L19Y,L22,L22A,L22B,L22M,L22O,L22S,L22T,L22U,L25,L25U,L28,L29S,L30,L30B,L40,PZ 12,PZ16,PZ19,PZ22,PZ25,PZ30,PZ35,PZ40,PP22,CP16,CP19,CP22,CP25,CP30

Prepared For : **Yueqing Langir Electric Co.,Ltd**
No.16, Lane 79, Xixing Road, Liushi Town, Yueqing City, Zhejiang Province, China

Prepared By : **China Ceprei (Sichuan) Laboratory**

No.45 Wenming Dong Road Longquanyi District, Chengdu, Sichuan

Report Number: **PTSTCF0929-LVD**

Date of Test: **Oct.06, 2022**

Date of Report: **Oct.06, 2022**

PTSTCF0929-LVD

TEST REPORT DECLARATION

Applicant	:	Yueqing Langir Electric Co.,Ltd
Address	:	No.16, Lane 79, Xixing Road, Liushi Town, Yueqing City, Zhejiang Province, China
Manufacturer	:	Yueqing Langir Electric Co.,Ltd
Address	:	No.16, Lane 79, Xixing Road, Liushi Town, Yueqing City, Zhejiang Province, China
EUT Description	:	Push button switch
Model No.	:	L19A
Remark	:	N/A

Test Procedure Used:
EN IEC 61058-1:2018

The test results of this report relate only to the tested sample identified in this report.

Date of Test : Oct.06, 2022

Prepared by : (Jack)

Checked by : (Gina)

Approved by : (Johnson)

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
1	Scope		P
	1.1 This International Standard applies to switches (mechanical or electronic) for appliances actuated by hand, by foot or by other human activity, to operate or control electrical appliances and other equipment for household or similar purposes with a rated voltage not exceeding 440 V and a rated current not exceeding 63 A. These switches are intended to be operated by a person, via an actuating member or by actuating a sensing unit. The actuating member or sensing unit can be integral with or arranged separately, either physically or electrically, from the switch and may involve transmission of a signal, for example electrical, optical, acoustic or thermal, between the actuating member or sensing unit and the switch. Switches which incorporate additional control functions governed by the switch function are within the scope of this standard. This standard also covers the indirect actuation of the switch when the operation of the actuating member or sensing unit is provided by a remote control or a part of an appliance or equipment such as a door.		P
	1.2 This standard applies to switches intended to be incorporated in, on or with an appliance.		P
	1.3 This standard also applies to switches incorporating electronic devices.		P
	1.4 This standard also applies to switches for appliances such as – switches intended to be connected to a flexible cable (cord switches); NOTE In this document, the word "cable" means "cable or cord". – switches integrated in an appliance (integrated switches); – switches intended to be mounted apart from the appliance (independently mounted switches) other than those within the scope of IEC 60669-1;		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	– change-over selectors for which, however, particular requirements are given in IEC 61058-2.		
	1.5 This standard does not contain requirements for isolating switches		P
	1.6 This standard does not apply to devices which control appliances and equipment not actuated intentionally by a person. These are covered by IEC 60730.		P
2	Normative references		P
	The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.		P
3	Definitions		P
	For the purpose of this International Standard, the following definitions apply.		P
4	General requirements		P
	Switches shall be designed and constructed so that in normal use they function safely so as to cause no danger to persons or surroundings even in the event of such careless use as may occur in normal use, as specified in this part 1 of IEC 61058 and any appropriate part 2. In general, compliance is checked by carrying out all the relevant tests.		P
5	General notes on tests		P
	5.1 Tests according to this standard are type tests. 5.2 Unless otherwise specified in this standard, the specimens are tested as delivered, at an ambient temperature of 25 °C ± 10 °C. The specimens are mounted as declared by the manufacturer, but, if significant, using the most unfavourable method if more than one method is declared.		P
	5.3 Switches to be used with a non-detachable conductor are tested with the appropriate conductor connected. 5.4 If the switches are provided with tabs, for the tests according to clauses 16 and 17, new female connectors shall be used. The envelope dimensions of female connectors for flat quick-connect terminations used for tests shall be in accordance with figure 8.		P
	5.5 Unless otherwise specified the tests are carried out in the order of the clauses of this standard. The number of test specimens required and the relevant clauses are as follows.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	5.5.1 Switches with the following ratings: – d.c. only; – both a.c. and d.c., the tests being carried out on d.c., provided that the d.c. voltage and current ratings are equal to, or greater than, the a.c. ratings. For these ratings, the following specimens are used: – clauses 6 to 12 and 23: specimen No. 1; – clauses 19 to 22: specimen No. 2; where clearances according to 20.1 are tested in accordance with annex M, three additional specimens are used; – clauses 13 to 18: •with polarity marking: specimens Nos. 3 to 5; •without polarity marking: specimens Nos. 3 to 5 with one polarity and specimens Nos. 6 to 8 with the opposite polarity; – clause 25: three additional specimens.		P
	5.5.2 Switches with the following ratings: – a.c. only; – both a.c. and d.c., but not meeting the provisions of 5.5.1. For these ratings, the following specimens are used: – clauses 6 to 12 and 23: specimen No. 1; – clauses 19 to 22: specimen No. 2; where clearances according to 20.1 are tested in accordance with annex M, three additional specimens are used; – clauses 13 to 18: •for a.c. rating: specimens Nos. 3 to 5; •for d.c. rating with marked polarity: specimens Nos. 6 to 8; •for d.c. rating without marked polarity: specimens Nos. 6 to 8 with one polarity and specimens Nos. 9 to 11 with the opposite polarity; – clause 25: three additional specimens.		P
	5.5.3 Switches with more than one rated voltage and/or rated current combination within one nature of supply For these ratings, the following specimens are used: – clauses 6 to 12 and 23: specimen No. 1; – clauses 19 to 22: specimen No. 2; where clearances according to 20.1 are tested in accordance with annex M, three additional specimens are used; – clauses 13 to 18: •for the combination with the highest current rating: specimens Nos. 3 to 5; •for the second combination: specimens Nos. 6 to		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	8; •for further combinations: specimens Nos. 9 to 11, etc.		
	Table 1 – Test specimens **Clause** / **Specimens to be tested[1)]** / **Notes** 6 Rating — 1 7 Classification — 1 8 Marking and documentation — 1 9 Protection against electric shock — 1 10 Provision for earthing — 1 11 Terminals and terminations — 1 — 2) 12 Construction — 1 13 Mechanism — 3 4 5 6 7 8 — 3) 14 Protection against solid foreign objects, ingress of dust, water and humid conditions — 3 4 5 6 7 8 — 3) 15 Insulation resistance and dielectric strength — 3 4 5 6 7 8 — 2) 3) 16 Heating — 3 4 5 6 7 8 17 Endurance — 3 4 5 6 7 8 — 3) 18 Mechanical strength — 3 4 5 19 Screws, current-carrying parts and connections — 2 20 Clearances, creepage distances solid, insulation and coatings of rigid printed board assemblies — 2 — 4) 5) 21 Resistance to heat and fire — 2 22 Resistance to rusting — 2 23 Abnormal operation and fault conditions for electronic switches — 1 25 EMC requirements — three additional samples 1) For the purpose of selection of female test connectors according to annex H, additional specimens may be necessary. 2) Three additional new specimens may be required according to 11.1.1.3.4 or table 12, note 2). 3) The further specimens 9 to 11, etc., are tested in the same combination of clauses as specimens 6 to 8. 4) Three additional new specimens may be required according to 20.1 for the test according to annex M. 5) For testing coatings on printed boards according to 20.4, the following number of printed boards are needed: – 13 specimens for type A coating; – 17 specimens for type B coating.		P
	5.6 Switches with a rated frequency are tested at that frequency. Switches without a rated frequency are tested at 50 Hz. Switches with a rated frequency range are tested at the most unfavourable frequency within that range. 5.7 If not more than one specimen fails during the tests of clauses 13 to 18 inclusive such as to cause non-compliance with the appropriate clause, the tests which caused the failure, and those preceding, which may have influenced the result of that test, are repeated on another set of identical specimens, all of which shall then comply with the repeated tests. No failure shall occur during the tests of clauses 6 to 12 inclusive and 19 to 22 inclusive.		P
	5.8 If it is necessary to have parts with double		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	insulation or reinforced insulation in switches for Class 0 or Class I appliances, such parts are checked for compliance with the requirements specified for switches for Class II appliances. Similarly, if it is necessary to have parts in switches operating at SELV, such parts are also checked for compliance with the requirements specified for switches for Class III appliances. 5.9 For the tests of this standard, actuation may be performed by test equipment. Tests at high speed, however, have to be performed according to 17.2.4. For switches with electronic actuating members, actuation shall be performed according to the manufacturer¢s declarations.		
	5.10 As far as possible, signal indicators shall be tested together with the switches. With the exception of the luminosity which can be disregarded, the lamp shall function unless otherwise specified. The test may be performed with test samples simulating the electrical, mechanical and thermal influences of the original indicator lamp. Replaceable indicator lamps may be replaced during the tests. Signal indicators, the function of which is independent from the function of the switch, are operated continuously. The results of the tests for switches with indicator lamps shall be considered to apply to switches of equivalent construction without indicator lamps, or to indicator lamps of equivalent construction without the switching mechanism. 5.11 Switches intended to be operated from a specific supply, are tested with that specific supply. 5.12 In all tests, the measuring instruments or the measuring means shall be such as not to affect appreciably the quantity being measured. 5.13 For electronic switches, it may be necessary to disconnect or short-circuit electronic components for the purpose of the tests. 5.14 For the tests of 23.1.1.1, additional specimens may be necessary.		P
6	Rating		P
	6.1 The maximum rated voltage is 440 V. 6.2 Switches with signal indicators may have different rated voltages for the signal indicators. 6.3 The maximum rated current is 63 A. Compliance with the requirements of 6.1 to 6.3 is checked by inspection of marking and		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	documentation		
7	Classification		P
	7.1 Classification of switches 7.1.1 According to nature of supply: 7.1.1.1 – switches for a.c. only; 7.1.1.2 – switches for d.c. only; 7.1.1.3 – switches for both a.c. and d.c.		P
	7.1.2 According to type of load to be controlled by each circuit of the switch: 7.1.2.1 – circuit for a substantially resistive load with a power factor of not less than 0,9; 7.1.2.2 – circuit for either a resistive load, a motor load with a power factor not less than 0,6, or a combination of both; 7.1.2.3 – circuit for a combination of resistive and capacitive a.c. loads; 7.1.2.4 – circuit for ordinary tungsten filament lamp load; 7.1.2.5 – circuit for a declared specific load; 7.1.2.6 – circuit for a current not exceeding 20 mA; 7.1.2.7 – circuit for specific lamp load; 7.1.2.8 – circuit for an inductive load with a power factor of not less than 0,6; 7.1.2.9 – circuit for specific load of motor with a locked rotor and with a power factor not less than 0,6. 7.1.2.10 – minimum load for electronic switches.		P
	7.1.3 According to ambient temperature: 7.1.3.1 – switches at which the complete switch, including the actuating member, is intended to be used in an ambient temperature between a minimum value of 0 °C and a maximum value of 55 °C; 7.1.3.2 – switches at which the complete switch, including the actuating member, is intended to be used in an ambient temperature higher than 55 °C or lower than 0 °C, or both; 7.1.3.3 – switches intended to be used with the actuating member and other accessible parts in an ambient temperature between 0 °C and 55 °C, and the remainder of the switch in an ambient temperature higher than 55 °C: – preferred values of maximum ambient temperature are 85 °C, 100 °C, 125 °C and 150 °C; – preferred values of minimum ambient air temperature are –10 °C, –25 °C and –40 °C;		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	– values differing from these preferred values are allowed, as long as the values are multiples of 5 °C.		
	7.1.3.4 Electronic cord switches and electronic independently mounted switches are classified for a maximum ambient temperature of 35 °C. 7.1.3.4.1 – electronic cord switches and electronic independently mounted switches, in which the complete switch, including the actuating member, is intended to be used in an ambient air temperature between a minimum value of 0 °C and a maximum value of 35 °C. 7.1.3.4.2 – electronic cord switches and electronic independently mounted switches, in which the complete switch including the actuating member is intended to be used in an ambient air temperature higher than 35 °C, or a minimum value lower than 0 °C, or both: – preferred values of maximum ambient air temperature are 55 °C, 85 °C, 100 °C and 125 °C; – preferred values of minimum ambient air temperature are –10 °C, – 25 °C and – 40 °C; – values differing from these preferred values are allowed, as long as the values are multiples of 5 °C.		P
	7.1.4 According to number of operating cycles: 7.1.4.1 – 100 000 operating cycles; 7.1.4.2 – 50 000 operating cycles; 7.1.4.3 – 25 000 operating cycles; 7.1.4.4 – 10 000 operating cycles; 7.1.4.5 – 6 000 operating cycles; 7.1.4.6 – 3 000 operating cycles; 7.1.4.7 – 1 000 operating cycles; 7.1.4.8 – 300 operating cycles.		P
	7.1.5According to degree of protection provided by the switch, when mounted as declared, as part of an appliance enclosure 7.1.5.1 Degree of protection against solid foreign objects (according to IEC 60529): 7.1.5.1.1 – non-protected against solid foreign objects (IP0X); 7.1.5.1.2 – protected against solid foreign objects of 50 mm diameter and greater (IP1X); 7.1.5.1.3 – protected against solid foreign objects of 12,5 mm diameter and greater (IP2X); 7.1.5.1.4 – protected against solid foreign objects of 2,5 mm diameter and greater (IP3X);		P

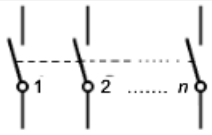
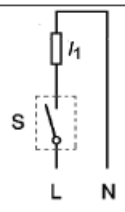
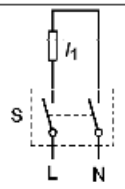
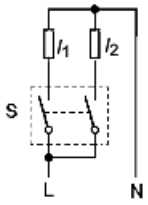
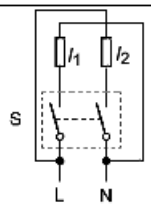
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	7.1.5.1.5 – protected against solid foreign objects of 1,0 mm diameter and greater (IP4X); 7.1.5.1.6 – dust-protected (IP5X); 7.1.5.1.7 – dust-tight (IP6X).		
	7.1.5.2 Degree of protection against ingress of water (according to IEC 60529): 7.1.5.2.1 – non-protected against ingress of water (IPX0); 7.1.5.2.2 – protected against vertically falling water drops (IPX1); 7.1.5.2.3 – protected against vertically falling water drops when enclosure tilted up to 15° (IPX2); 7.1.5.2.4 – protected against spraying water (IPX3); 7.1.5.2.5 – protected against splashing water (IPX4); 7.1.5.2.6 – protected against water jets (IPX5); 7.1.5.2.7 – protected against powerful water jets (IPX6); 7.1.5.2.8 – protected against the effects of temporary immersion in water (IPX7).		P
	7.1.5.3 Degree of protection against electric shock for an incorporated switch for use in: 7.1.5.3.1 – a Class 0 appliance; 7.1.5.3.2 – a Class I appliance; 7.1.5.3.3 – a Class II appliance; 7.1.5.3.4 – a Class III appliance.		P
	7.1.6 According to degree of pollution: 7.1.6.1 – pollution degree 1; 7.1.6.2 – pollution degree 2; 7.1.6.3 – pollution degree 3.		P
	7.1.7 According to the method of actuating the switch: 7.1.7.1 – rotary switch; 7.1.7.2 – lever switch; 7.1.7.3 – rocker switch; 7.1.7.4 – push-button switch; 7.1.7.5 – cord-operated switch; 7.1.7.6 – push-pull switch; 7.1.7.7 – electronic switches operated via a sensing unit (for example touching, approaching, turning, optical, acoustic, thermal or any other influences).		P
	7.1.8 According to marking: 7.1.8.1 – switch with limited marking U.T. (Unique Type Reference, U.T.);		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	7.1.8.2 – switch with full marking C.T. (Common Type Reference, C.T.).		
	7.1.9 According to application level for resistance to heat and fire: 7.1.9.1 – level 1 switch; 7.1.9.2 – level 2 switch; 7.1.9.3 – level 3 switch.		P
	7.1.10 According to the rated impulse withstand voltage: 7.1.10.1 – 330 V; 7.1.10.2 – 500 V; 7.1.10.3 – 800 V; 7.1.10.4 – 1 500 V; 7.1.10.5 – 2 500 V; 7.1.10.6 – 4 000 V.		P
7.2	Classification of terminals		P
	7.2.1 – terminals intended for the connection of unprepared conductors and not requiring the use of any special purpose tool; 7.2.2 – terminals intended for the connection of prepared conductors and/or requiring the use of a special purpose tool; 7.2.3 – terminals suitable for the connection of supply cables or cords with unprepared conductors and not requiring the use of any special purpose tool; 7.2.4 – terminals suitable for the connection of supply cables or cords with prepared conductors and/or requiring the use of a special purpose tool; 7.2.5 – terminals suitable for the interconnection of two or more conductors; 7.2.6 – terminals intended for the connection of rigid, solid conductors; 7.2.7 – terminals intended for the connection of rigid, solid and stranded conductors; 7.2.8 – terminals intended for the connection of flexible conductors; 7.2.9 – terminals suitable for the connection of both flexible and rigid (solid and stranded) conductors; 7.2.10 – solder terminals intended for soldering		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	by hand with a soldering iron; 7.2.11 – solder terminals intended for soldering with a solder bath; 7.2.12 – solder terminals with provisions for securing the conductor by mechanical means and providing circuit continuity by soldering; 7.2.13 – solder terminals without provisions for securing the conductor by mechanical means. The circuit continuity is ensured by soldering solely. 7.2.14 According to the resistance to soldering heat: 7.2.14.1 – solder terminals type 1; 7.2.14.2 – solder terminals type 2.		

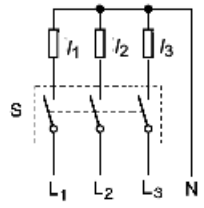
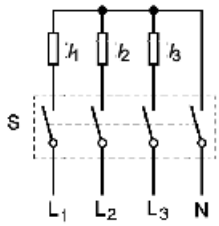
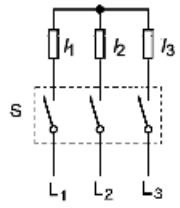
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 2 – Type and connection of switches

Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
		One-way switch		
7.1.13.1		Principle of one-way switches with one to *n* poles		
7.1.13.1.1	1.1	The number of poles, type of connection and load as declared		
7.1.13.1.2	1.2	Single pole	Single load (single-pole disconnection)	 S = Specimen
7.1.13.1.3	1.3	Double pole	Single load (all-pole disconnection)	 S = Specimen
7.1.13.1.4	1.4 [1.2]	Double pole	Double load (single-pole disconnection)	 S = Specimen
7.1.13.1.5	1.5 [1.2] [1.4]	Double pole	Double load (single-pole disconnection, load connected to opposite polarity)	 S = Specimen

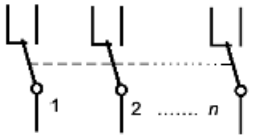
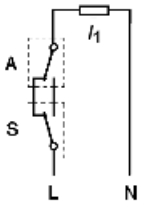
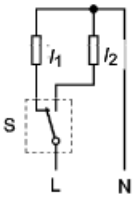
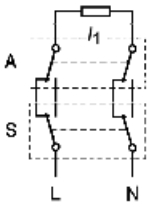
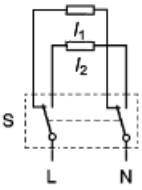
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 2 *(continued)*

Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
7.1.13.1.6	1.6	Three pole	Three loads unswitched neutral, (three-pole disconnection)	 S = Specimen
7.1.13.1.7	1.7	Four pole	Three loads switched neutral (four-pole disconnection)	 S = Specimen
7.1.13.1.8	1.8	Three pole	Three loads (three-pole disconnection)	 S = Specimen

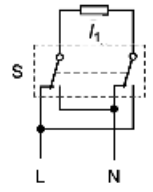
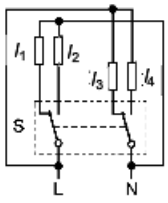
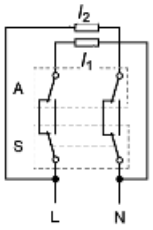
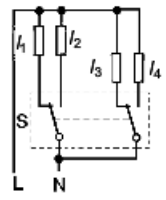
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 2 *(continued)*

Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
		Two-way switch		
7.1.13.2		Principle of two-way switches with one to *n* poles		
7.1.13.2.1	2.1	The number of poles, type of connection and load as declared		
7.1.13.2.2	2.2 [1.2]	Single pole	Single load (single-pole disconnection)	 S = Specimen, A = Auxiliary switch
7.1.13.2.3 [2)]	2.3	Single pole	Double load (single-pole disconnection)	 S = Specimen
7.1.13.2.4	2.4 [1.3]	Double pole	Single load (all-pole disconnection)	 S = Specimen, A = Auxiliary switch
7.1.13.2.5 [2)]	2.5	Double pole	Double load (all-pole disconnection)	 S = Specimen

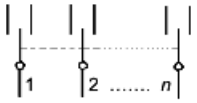
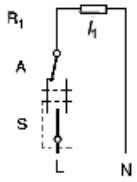
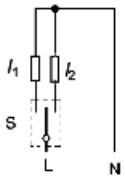
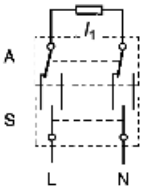
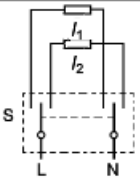
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 2 (*continued*)

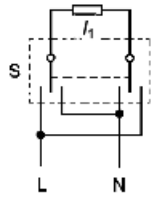
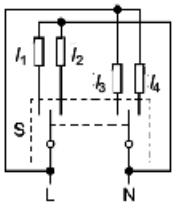
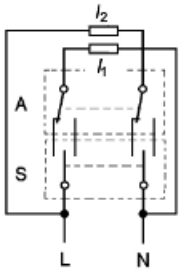
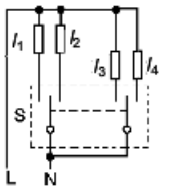
Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
7.1.13.2.6 [2)]	2.6	Double pole	Single load with polarity reversal	 S = Specimen
7.1.13.2.7 [2)]	2.7	Double pole	Four load (single-pole disconnection, load connected to opposite polarity)	 S = Specimen
7.1.13.2.8	2.8	Double pole	Double load (single-pole disconnection, load connected to opposite polarity)	 S = Specimen, A = Auxiliary switch
7.1.13.2.9 [2)]	2.9	Double pole	Four load (single-pole disconnection)	 S = Specimen

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

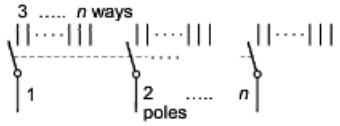
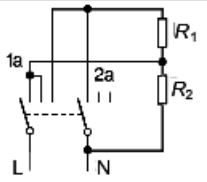
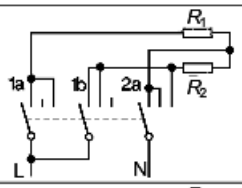
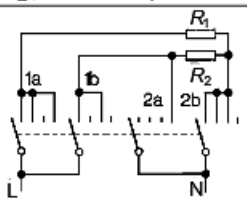
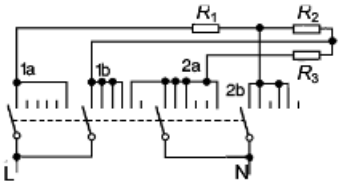
Table 2 *(continued)*

Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
		Two-way switch with centre position for disconnection		
7.1.13.3		Principle of two way switches with centre position and one to *n* poles		
7.1.13.3.1	3.1	The number of poles, type of connection and load as declared		
7.1.13.3.2	3.2	Single pole	Single load (single-pole disconnection)	 S = Specimen A = Auxiliary switch
7.1.13.3.3	3.3	Single pole	Double load (single-pole disconnection)	 S = Specimen
7.1.13.3.4	3.4	Double pole	Single load (all-pole disconnection)	 S = Specimen A = Auxiliary switch
7.1.13.3.5	3.5	Double pole	Double load (all-pole disconnection)	 S = Specimen

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 2 (*continued*)		P

Classification	Code[1)]	Type of switch	Type of connection	Test circuit[3)]
7.1.13.3.6	3.6	Double pole	Single load with polarity reversal (all-pole disconnection)	 S = Specimen
7.1.13.3.7	3.7 [3.3]	Double pole	Four load (single-pole disconnection, load connected to opposite polarity)	 S = Specimen
7.1.13.3.8	3.8	Double pole	Double load (single-pole disconnection, load connected to opposite polarity)	 S = Specimen A = Auxiliary switch
7.1.13.3.9	3.9 [3.3]	Double pole	Four load (single-pole disconnection)	 S = Specimen A = Auxiliary switch

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 2 *(continued)*		P

Classification	Code[1]	Type of switch / Type of connection	Test circuit[3]
		Multiway switches	
7.1.13.4		Principle of multiway switches with 3 to *n* ways and 1 to *n* poles	
7.1.13.4.1	4.1	The number of poles, type of connection and load as declared	
7.1.13.4.2	4.2	Single pole Four positions with polarity reversal (single-pole disconnection)	
7.1.13.4.3	4.3	Double pole Four positions with polarity reversal (all-pole disconnection)	
7.1.13.4.4	4.4	Double pole Five positions with polarity reversal (all-pole disconnection)	
7.1.13.4.5	4.5	Double pole Seven positions with polarity reversal (all-pole disconnection)	

[1] For switches of the same basic design, the test is considered to cover the tests for the code of switch given in square brackets.

Switches are considered to be of the same basic design if

– all parts are the same, except those which have to be different because of the different poles and number of contact paths;

– the basic dimensions and mechanical constructions are the same;

– multipole switches are either composed of single-pole switches or build up from the same components as the single-pole switches, having the same overall dimensions per pole.

A separate test on a switch with momentary action (monostable switch) is not necessary, if it can be shown that the contact function is equivalent to a bistable switch of equivalent construction.

[2] For specific circuits and loads only.

[3] The indication L and N only symbolizes the connection to the mains.

8	Marking and documentation		P
	8.1 The switch manufacturer shall provide adequate information to ensure that – the appliance manufacturer can select and install a switch; – the end-user can use a switch as intended by the switch manufacturer; – the corresponding tests can be performed in accordance with this standard. This information shall be provided in one or more		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	of the following ways, as detailed in table 3. 8.1.1 By Marking (Ma) The information shall be provided by marking on the switch itself. 8.1.2 By Documentation (Do) The information shall be provided by separate documentation, which may consist of a leaflet, a specification sheet, or a drawing, etc. The content of the documentation shall be made available to the appliance manufacturer or end-user as appropriate in any suitable format.		
	Table 3 – Switch information		P

No.	Characteristic	Subclause	Means of information	
			Common type reference C.T.	Unique type reference U.T.
1	**SWITCH IDENTIFICATION**			
1.1	Manufacturer's name or trade mark		Ma	Ma
1.2	Type reference		Ma	Ma
2	**SWITCH ENVIRONMENT/MOUNTING**			
2.1	Degree of protection provided for the switch when mounted according to documentation (IP code of IEC 60529) NOTE Additional letters listed in IEC 60529 are not used.	7.1.5.1 and 7.1.5.2	Do	Do
2.2	Degree of protection against electric shock, from outside an appliance	7.1.5.3	Do	Do
2.3	Method of mounting and actuating the switch and method of providing earthing if appropriate. The intended method(s) of mounting and the intended orientation(s) shall be declared. The declared methods of mounting, together with any earthing terminal, are deemed to be the methods of earthing conductive parts unless otherwise specified	7.1.7 and 7.1.7.7	Do	Do
2.4	Pollution degree	7.1.6	Do	Do
3	**TEMPERATURE**			
3.1	Ambient temperature limits if different from 0 °C to 55 °C	7.1.3	Ma	Do
3.2	Ambient air temperature for electronic switches – cord switches and independently mounted switches if different from 0 °C to 35 °C – other switches, if different from 0 °C to 55 °C	7.1.3.4.1 or 7.1.3.4.2 7.1.3.2 or 7.1.3.3	Ma Ma	Do Do
4	**ELECTRICAL LOAD/CONNECTION**			
4.1	Rated voltage or rated voltage range	6.1	Ma	Do
4.2	Nature of supply if the switch is not intended for both a.c. and d.c. or if the rating is different for a.c and d.c.	7.1.1	Ma	Do
4.3	Frequency or frequency range if different from 50 Hz or 50 Hz to 60 Hz		Ma	Do
4.4	For circuits of substantially resistive loads, the rated current of the rated load	7.1.2.1	Ma	Do
4.5	For circuits for resistive and motor load with a power factor not less than 0,6, the rated current and, for electronic switches, the minimum current (or power)	7.1.2.2	Ma/Do	Do
4.6	For circuits for resistive and capacitive load, the rated current and rated peak surge current and, for electronic switches, the minimum current (or power)	7.1.2.3	Ma/Do	Do
4.7	For circuits for tungsten filament lamp load, the rated current, and, for electronic switches, the minimum current (or power)	7.1.2.4	Ma/Do	Do
4.8	For circuits for declared specific loads, relevant details of the appliance to be controlled, or other specific load	7.1.2.5		Do
4.9	For switches for more than one circuit, the current applicable to each circuit and to each terminal. If these are different from each other, then it shall be made clear to which circuit or which terminal the information applies		Ma/Do	Do

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 3 *(continued)*

No.	Characteristic	Subclause	Means of information	
			Common type reference C.T.	Unique type reference U.T.
4.10	Rated impulse withstand voltage	7.1.10	Do	Do
4.11	For electronic switches, the thermal current	8.4.7	Ma	Do
4.12	For electronic switches, the duty-type	7.1.16	Do	Do
4.13	For electronic switches, the ON/OFF-time for the relevant duty-type		Do	Do
4.14	Type and/or connection of switch	7.1.13	Do	Do
4.15	For circuits for specific lamp load, the rated current and the inrush current	7.1.2.7	Do	Do
4.16	For circuits for an inductive load with a power factor not less than 0,6	7.1.2.8	Ma	Do
4.17	For circuits for specific load of motor with a locked rotor and with a power factor not less than 0,6	7.1.2.9	Ma	Do
5	**TERMINALS/CONDUCTORS**			
5.1	All terminals shall be suitably identified, or their purpose self-evident, or the switch circuitry visually apparent. For terminals intended for the connection of supply conductors, the identification may take the form of a letter L, a number or of an arrow		Ma	Ma
5.2	Terminals for the connection of earthing conductors shall be marked with the earth symbol		Ma	Ma
5.3	Information for the connection of a conductor to the terminal if this needs prepared conductors or the use of a special-purpose tool	7.2	Do	Do
5.4	The method of connection and disconnection for screwless terminals		Do	Do
5.5	The type of conductor to be connected to the terminal	7.2.6 to 7.2.9	Do	Do
5.6	The suitability of the terminal for interconnection of two or more conductors	7.2.5	Do	Do
5.7	The type of solder terminal	7.2.10 to 7.2.14	Do	Do
5.8	The suitability of the terminal for connection of unprepared supply conductors	7.2.3	Do	Do
5.9	The suitability of the terminal for connection of prepared supply conductors	7.2.4	Do	Do
6	**OPERATING CYCLES/SEQUENCE**			
6.1	Number of operating cycles	7.1.4	Ma	Do
6.2	Operating sequence for switches with more than one circuit, if significant. For multi-circuit switches the operating sequence of the pairs of contacts shall be declared if this is of importance for the safety of the user. Contacts which "make before break" or "break before make" are examples		Do	Do
6.3	Forces applied to end stops or full travel of actuating member	17.2.3.4	Do	Do

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 3 *(continued)*

No.	Characteristic	Subclause	Means of information	
			Common type reference C.T.	Unique type reference U.T.
7	**SIGNAL INDICATORS**			
7.1	Maximum power of tungsten filament signal lamps. The marking shall be visible when replacing the lamp		Ma	Ma
7.2	Intended function or operation of the signal indicator		Do	Do
8	**CIRCUIT DISCONNECTION**			
8.1	Electronic disconnection	7.1.11.1	Ma	Do
8.2	Micro-disconnection	7.1.11.2	Ma	Do
8.3	Full disconnection	7.1.11.3	Do	Do
9	**INSULATING MATERIALS**			
9.1	Proof tracking index PTI	20.2	Do	Do
9.2	Level of glow-wire test	7.1.9	Do	Do
10	**COOLING CONDITION**			
10.1	Not requiring forced cooling	7.1.15.1	Do	Do
10.2	Requiring cooling	7.1.15.2	Do	Do
10.3	Direction of air for forced cooling		Do	Do
10.4	Speed of air for forced cooling		Do	Do
10.5	Thermal resistance of heat sink		Do	Do
10.6	Incoming temperature, density and other details of the air stream		Do	Do
11	**PROTECTIVE DEVICE**			
11.1	Rated current/fusing characteristic/breaking capacity of replaceable built-in protection	7.1.18.1	Ma	Do
11.2	Type/function of non-replaceable built-in protection	7.1.18.1	Do	Do
11.3	External protective device rated current, fusing characteristic, breaking capacity	7.1.18.2	Do	Do
12	**TEST CONDITIONS**	7.1.17	Do	Do

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	8.3 When symbols are used, they shall be as follows (see note 1):		P

Amperes ..... A
Volts V
Watts ..... W
Volt-amperes ..... VA
Alternating current (single-phase) ..... ~
or a.c.
or ~ a.c.

Alternating current (three-phase) ..... 3~
or 3 a.c.
or 3~ a.c.

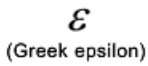
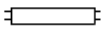
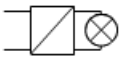
Alternating current (three-phase with neutral) ..... 3 N~
or 3 Na.c.
or 3 N~ a.c.

Direct current ..... ⎓
or d.c.
or ⎓ d.c.

Earth symbol (see note 2) .....

Protective earth symbol (see note 2) .....

Non-protected against solid foreign solid objects IP0X
Protected against solid foreign objects of 50 mm ∅ and greater IP1X
Protected against solid foreign objects of 12 mm ∅ and greater IP2X
Protected against solid foreign objects of 2,5 mm ∅ and greater IP3X
Protected against solid foreign objects of 1,0 mm ∅ and greater IP4X
Dust-protected IP5X
Dust-tight IP6X
Non-protected against ingress of water IPX0
Protected against vertically falling water drops IPX1
Protected against vertically falling water drops when enclosure tilted up to 15° IPX2
Protected against spraying water IPX3
Protected against splashing water IPX4
Protected against water jets IPX5
Protected against powerful water jets IPX6
Protected against the effects of temporary immersion of water IPX7
Ambient temperature limit(s) of switch ..... *T*
Frequency of supply ..... Hz
Number of operating cycles ..... See 8.7
Symbol for micro-disconnection ..... μ

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Symbol for the "OFF" position or the direction of actuation to the "OFF" position (a circle) .....  Symbol for the "ON" position or the direction of actuation to the "ON" position (a straight bar) ..... Electronic disconnection .....  (Greek epsilon) Type of load: Incandescent lamp load .....  Fluorescent lamp load .....  Transformer connection .....  Iron core transformer with low-voltage tungsten filament lamp load .....  Electronic step-down convertor with low-voltage tungsten filament lamp load .....  Direction of air for forced cooling .....  Speed of air for forced cooling ..... m/s Thermal resistance of heat sink ..... K/W Cyclic duration factor ..... % Terminal for regulated load ..... 		P
	8.4 Information about rated current and rated voltage may be provided by using figures alone, the figure for the rated current preceding or being placed above that for the rated voltage and separated from it by a line		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	8.4.1 For circuits for resistive load and for motor load, the rated current for motor load is placed between round brackets and immediately follows the rated current for resistive load. The symbol for the nature of the supply is placed before or after the current and voltage ratings. Current, voltage and nature of supply may accordingly be indicated as follows: 16(3) A 250 V ~ or 16(3) / 250 ~ or $\frac{16(3)}{250}$ ~ **8.4.2** For circuits for resistive load and for capacitive load, the marking of the peak surge current is separated from the marking of the rated current for resistive load by a stroke and follows immediately the rated current for resistive load. The symbol for the nature of the supply is placed after the current and voltage ratings. Resistive current, peak surge current, voltage and nature of supply may be indicated accordingly as follows: 2/8 A 250 V ~ or $\frac{2/8}{250}$ ~ **8.4.3** For circuits for resistive load and for tungsten filament lamp load, the peak surge current for tungsten filament lamp load is placed between square brackets and follows immediately the rated current for resistive load. The symbol for the nature of the supply is placed after the current and voltage ratings. Resistive current, peak surge current, voltage and nature of supply may be indicated accordingly as follows: 6[3] A 250 V ~ or 6[3] / 250 ~ or $\frac{6[3]}{250}$ ~ In cases where the switch is rated for more than one type of load as specified in 7.1.2.2, 7.1.2.3 and 7.1.2.4, several different current figures given in appropriate brackets are permitted. **8.4.4** Information concerning declared specific loads may be given by reference to drawings or to types, for example: "Electric motor, drawing number ....., parts list No. ....., made by.....", or "5 × 80 W fluorescent lamp load".		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

8.4.5 For circuits for inductive load according to 7.1.2.8, the rated current for inductive load is placed between double, pointed brackets. The symbol for the nature of the supply is placed before or after the current and voltage ratings.

Current, voltage and nature of supply may accordingly be indicated as follows:

"4 A" 250 V~

or "4" /250~

or $\frac{\text{"4"}}{250}$ ~

8.4.6 For circuits for specific load of motor (locked rotor) according to 7.1.2.9, the rated current of the motor shall be provided by adding the rated current of the motor (for example, 3 A) as a second value within round brackets, separated by a stroke.

Current, voltage and nature of supply may accordingly be indicated as follows:

6 (3/3) A 250 V~

or 6 (3/3) / 250~

or $\frac{6\,(3/3)}{250}$ ~

8.4.7 The thermal current, if applicable, as well as the test conditions for verifying the thermal current shall be specified.

Information concerning the thermal current shall be given, together with the maximum rated current and marked as the following example shows:

3 < 12 / 250 ~

If a minimum power is specified, it shall be indicated together with the maximum power and marked as the following example shows:

20 W / 100 W

NOTE In this example the number 3 indicates the thermal current.

8.5 Information about rated ambient temperature shall be provided by indicating the lower temperature value preceding the letter "T", the higher temperature value following the letter "T". If no lower temperature value is given, the lower temperature value is 0 °C:

25 T 85 (meaning –25 °C up to +85 °C)

T 85 (meaning 0 °C up to +85 °C)

If no information is given, the rated ambient temperature range is 0 °C up to 55 °C.

8.5.1 For switches only partially suitable for a rated ambient temperature higher than 55 °C (according to 7.1.3.3), the information shall be provided as follows:

T 85/55 (meaning up to 85 °C for the switch body and up to 55 °C for the actuating member).

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	8.5.2 For switches only partially suitable for a rated ambient temperature higher than 55 °C or 35 °C (see 7.1.3.3 and 7.1.3.4), the information shall be provided as follows: T 85/35 (meaning up to 85 °C for the switch body and up to 35 °C for the actuating member). **8.6** The symbol for Class II construction shall not be used for switches. **8.7** Information about the rated operating cycles shall be provided in a scientific manner by using symbol "E", indicating the exponent. For switches for 10 000 operating cycles according to 7.1.4.4, this information is not necessary: 1E3 = 1 000 25E3 = 25 000 1E5 = 100 000 **8.8** Required marking on a switch shall preferably be on the body of the switch. It may, however, be placed on non-detachable parts but not on screws, removable washers or other parts which might be removed when connecting conductors and during installation of the switch. The marking for characteristics of any replaceable fuse incorporated in an electronic switch shall be placed on the fuse-holder or in the proximity of the fuse. The characteristics may be indicated by symbols (see IEC 60127). For switches of small dimensions, the marking may be on different surfaces. **8.9** The required marking shall be legible and durable. *Compliance with the requirements of 8.1 to 8.8 is checked by inspection and by rubbing the marking by hand as follows:* *a) 15 back-and-forth movements in about 15 s with a piece of cloth soaked with distilled water, followed by* *b) 15 back-and-forth movements in about 15 s with a piece of cloth soaked with petroleum spirit.* *During the tests, the soaked piece of cloth shall be pressed on the marking with a pressure of about 2 N/cm².* *After these tests, the marking shall still be legible.* NOTE The petroleum spirit used is defined as an aliphatic solvent hexane with a content of aromatics of maximum 0,1 volume %, a kauributanol-value of 29, initial boiling point approximately 65 °C, dry point approximately 69 °C and specific gravity of 0,68. **8.10** For switches with their own enclosure and not intended to be incorporated in an appliance, the "OFF" position shall be clearly indicated. Switches with micro-disconnection or electronic disconnection shall not be marked with the symbol "O" for the "OFF" position. For switches where the marking of the switch position is impossible or leads to misunderstanding, for example rocker switches or push-button switches with more than one biased push-button, the direction of actuation(s) shall be marked. For switches having more than one actuating member, this marking shall indicate, for each of the actuating members, the effect achieved by its operation. For push-button switches with a single button the OFF position need not be marked. NOTE The symbol "O" is used only for full disconnection.		P
	8.11 For electronic cord switches and independently mounted switches if there are more than two terminals, the load terminal shall be marked with an arrow pointing away from the terminal or with one of the symbols mentioned in 8.3 and any other terminals shall be marked corresponding to the installation instructions. Unless the installation of the electronic switch is made clear by the markings of the terminals, a wiring diagram shall be provided with each switch.		P
9	Protection against electric shock		P
	9.1 Switches shall be constructed so that there is		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	adequate protection against contact with live parts in any position of use when the switch is mounted and operated as in normal use, and after any detachable parts have been removed, except lamps with caps. For switches for Class II appliances, this requirement applies also to contact with metal parts separated from live parts by basic insulation only, or with basic insulation itself. NOTE For the purpose of this standard, metal-sensing surfaces which are connected to live parts by means of protective impedance (see 9.1.1) are considered to offer protection against electric shock. Compliance is checked by inspection and by the following test: a)the test is applied to those parts of the switch which are accessible when it is mounted in any position in accordance with the manufacturer's documentation, with any detachable parts, except lamps with caps, removed; b)the jointed test finger of IEC 60529 is applied without force in every possible position. Openings preventing the entry of the finger are further tested by means of a straight unjointed test finger of the same dimensions as the jointed test finger of IEC 60529, which is applied with a force of 20 N. If the unjointed test finger then enters the opening, the test is repeated with the jointed finger in the angled position. An electrical contact indicator is used to show contact; c)in addition, openings in insulating material and in unearthed metal parts are tested by applying the test pin according to figure 13 without force in every possible position; d)in case of doubt the tests are repeated under the conditions for the test of 16.2.2. It shall not be possible with either the standard test finger or the test pin to touch bare live		

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	parts. For switches which have any parts of double insulation construction, it shall not be possible to touch with the standard test finger unearthed metal parts which are only separated from live parts by basic insulation, or by the basic insulation itself. The insulating properties of lacquer, enamel, paper, cotton, oxide film on metal parts, beads and sealing compounds which soften in heat shall not be relied upon to give the required protection against contact with live parts. Unless otherwise specified, parts connected to a SELV supply not exceeding 24 V are not considered to be live parts.		
	9.1.1 Accessible metal parts which are needed for the operation of an electronic switch (for example, sensing surfaces) may be connected to live parts by means of a protective impedance. The protective impedance shall consist of resistors and/or capacitors and shall comply with one of the following: a)at least two independent resistors of the same nominal value in series. The resistors shall comply with the requirements given in 24.3; b)at least two independent capacitors in series, of the same value. The capacitors shall comply with the requirements for class Y2 according to IEC 60384-14; c)at least one resistor complying with 24.3 and one capacitor complying with the requirements for class Y2 according to IEC 60384-14 in series. The removal of protective impedances, or their short-circuiting, shall be possible only by destruction of the electronic switch or by rendering the electronic switch obviously unusable. Compliance is checked by inspection and by the tests in 24.3.		P
	9.1.2 If a cover or cover-plate or a fuse can be		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	removed without the use of a tool or if the instruction for use specifies that, for the purpose of maintenance, when replacing the fuse, covers and cover-plates fastened by means of a tool have to be removed, the protection against contact with live parts shall be assured even after removal of the cover or cover-plate.		
	9.1.3 If a switch is provided with a hole which is accessible to the user – when mounted as declared – for adjusting the setting of the switch and this hole is indicated as such, the adjustment shall not involve the risk of an electric shock. Compliance is checked by applying a test pin according to IEC 61032, figure 3, test probe C, through the hole. The pin shall not touch live parts.		P
	9.2 An actuating member shall be fixed adequately if the removal of the actuating member gives access to live parts. An actuating member is considered to be fixed adequately if access to live parts can be gained only by breaking or cutting or by dismantling with the aid of a special-purpose tool. Compliance is checked by inspection and by applying the jointed test finger according to IEC 60529 without force.		P
	9.3 For switches for appliances other than those of Class III, accessible parts of actuating members shall be of one of the following types: a) insulating material; b) metal separated from basic insulated parts by supplementary insulation; c) metal separated from live parts by double or reinforced insulation; d) for electronic switches, metal separated from live parts by protective impedances. Compliance for items a) to c) is checked by inspection, measurement and test as appropriate.		P
	9.4 Capacitors shall not be connected to unearthed metal parts which are accessible when		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	the switch is mounted in accordance with the manufacturer's declarations. Metal casing of capacitors shall be separated by supplementary insulation from accessible unearthed metal parts, when the switch is mounted in accordance with the manufacturer's declarations. Compliance is checked by inspection and according to the requirements in clauses 15 and 20.		
10	Provision for earthing		P
	10.1 Switches for Class II appliances shall have no provision for earthing the switch or parts thereof. Interconnections for maintaining the earthing circuit are permitted. Compliance is checked by inspection. 10.2 Earthing terminals, earthing terminations and other earthing means shall not be connected electrically to any neutral terminal. Compliance is checked by inspection. 10.3 Accessible metal parts of switches for Class I appliances which may become live in the event of an insulation fault shall have provision for earthing. Compliance is checked by inspection. 10.3.1 Parts separated from live parts by double insulation or reinforced insulation, and parts screened from live parts by metal parts connected to an earthing terminal, earthing termination or other earthing means are not regarded as likely to become live in the event of an insulation fault. 10.3.2 Accessible metal parts of switches may be connected to earth through their fixing means, provided that provision is made for clean metallic surfaces at the connection points.		P
	10.4 The connection between an earthing terminal, earthing termination or other earthing means and parts required to be connected thereto shall be of low resistance. Compliance is checked by the following test: a) a current of 1,5 times the rated current but not less than 25 A, derived from an a.c. source,		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	with a no-load voltage not exceeding 12 V, is passed between the earthing terminal, earthing termination, or other earthing means, and each of the parts in turn; b) the voltage drop between the earthing terminal, earthing termination, or other earthing means, and each part connected thereto is measured when steady-state conditions have been achieved, and the resistance is calculated on the basis of the current and this voltage drop. In no case shall the resistance exceed 50 mW.		
	10.5 Earthing terminals of all types for unprepared conductors shall be of a size equal to, or larger than, that required for the corresponding current-carrying terminal. It shall not be possible to loosen the clamping means without the aid of a tool, and they shall be adequately locked against unintentional loosening. Compliance is checked by inspection, by manual test and by the appropriate tests of clause 11. 10.5.1 In general, the designs commonly used for terminals according to 11.1.1 and 11.1.2 provide sufficient resilience to comply with the requirement for adequate locking against unintentional loosening. 10.5.2 If the switch is subjected to excessive vibration or temperature cycling, special provisions, such as the use of an adequately resilient part (for example, a pressure plate), may be necessary if pillar terminals are used.		P
	10.6 Thread-cutting and thread-forming screws may be used to provide earthing continuity, provided that it is not necessary to disturb the connection in normal use and at least two screws are used for each connection. Compliance is checked by inspection and during the tests of 19.2. 10.7 All parts of an earthing terminal shall be such that there is no risk of corrosion resulting from contact between those parts and the copper		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	of the earthing conductor, or any other metal that is in contact with those parts. 10.8 The body of an earthing terminal shall be of brass or other metal no less resistant to corrosion, unless it is a part of the enclosure, when any screws or nuts shall be of brass, plated steel complying with 19.3, or other metal no less resistant to corrosion and rusting. 10.9 If the body of an earthing terminal is part of a frame or enclosure of aluminium or aluminium alloy, precautions shall be taken to avoid risk of corrosion resulting from contact between copper and aluminium or its alloys. Compliance with the requirements of 10.7, 10.8 and 10.9 is checked by inspection, and in cases of doubt by analysis of the materials and their coatings or platings.		
11	Terminals and terminations		P
	11.1 Terminals for copper conductors 11.1.1 Terminals for unprepared copper conductors and not requiring the use of a special purpose tool 11.1.1.1 Common requirements 11.1.1.1.1 Terminals shall be such that connection is made by means of screws, nuts, springs, wedges, eccentrics, cones or equally effective means or methods, but without requiring a special-purpose tool for connection or disconnection. Compliance is checked by inspection.		P
	11.1.1.1.2 Terminals shall be fixed in such a way that they will not work loose when the clamping means are tightened or loosened. This requirement does not preclude floating terminals or terminals mounted on floating elements, such as those used in some stack-type switches, provided their movement does not impair the correct operation of the switch. Compliance is checked by fastening and loosening 10 times a conductor having the maximum cross-sectional area specified in table 4, for		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	screw-type terminals the torque applied being the torque specified in table 20.		
	11.1.1.1.3 Terminals shall be designed or placed so that a conductor cannot slip out while being connected or while the switch is being operated as intended. Compliance is checked by the following tests: a)terminals are fitted with conductors of maximum cross-sectional areas according to table 4 and the clamping means is fully tightened with the torque according to table 20. The test is repeated with the terminal fitted with conductors of minimum cross-sectional area according to table 4; b)for terminals intended for the connection of two or more conductors, the test is repeated with the terminal fitted with the declared numbers of conductors; c)before insertion into the terminal, wires of rigid conductors are straightened and flexible conductors are twisted in one direction so that a uniform twist of one complete turn in a length of approximately 2 cm is obtained; d)the conductor is inserted into the terminal over a length equal to the minimum distance prescribed or, if no distance is prescribed, until an end-stop is reached or until the conductor just projects from the far side of the terminal and in the position most likely to assist a strand to escape; e)for flexible conductors the test is repeated using a new conductor which is twisted as prescribed above, but in the opposite direction. After the test, the conductor shall not have escaped into or through the gap between the clamping means and retaining device.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 4 – Resistive current carried by the terminal and related cross-sectional areas of terminals for unprepared conductors		P

Resistive current carried by the terminal A		*Flexible conductors*			
		Cross-sectional areas mm²			*Terminal size*
Over	*Up to and including*	*Minimum*	*Medium*	*Maximum*	
–	3		0,5	0,75	
3	6	0,5	0,75	1,0	0
6	10	0,75	1,0	1,5	1
10	16	1,0	1,5	2,5	2
16	25	1,5	2,5	4,0	4
25	32	2,5	4,0	6,0	5
32	40	4,0	6,0	10,0	6
40	63	6,0	10,0	16,0	7

Resistive current carried by the terminal A		*Rigid conductors*			
		Cross-sectional areas mm²			*Terminal size*
Over	*Up to and including*	*Minimum*	*Medium*	*Maximum*	
–	3	0,5	0,75	1,0	0
3	6	0,75	1,0	1,5	1
6	10	1,0	1,5	2,5	2
10	16	1,5	2,5	4,0	3
16	25	2,5	4,0	6,0	4
25	32	4,0	6,0	10,0	5
32	40	6,0	10,0	16,0	6
40	63	10,0	16,0	25,0	7

The different types of conductors are classified according to IEC 60228 as follows:

Rigid solid conductors	*Class 1*
Rigid stranded conductors	*Class 2*
Flexible conductors	*Classes 5 and 6*

	Table 5 – Maximum diameters of circular copper conductors			P

Cross-sectional area	*Rigid conductors in cables for fixed installation*		*Flexible conductors Classes 5 and 6* diameter*
	Solid Class 1 diameter*	*Stranded Class 2* diameter*	
mm²	*mm*	*mm*	*mm*
0,5	0,9	1,1	1,1
0,75	1,0	1,2	1,3
1,0	1,2	1,4	1,5
1,5	1,5	1,7	1,8
2,5	1,9	2,2	2,6
4,0	2,4	2,7	3,2
6,0	2,9	3,3	3,9
10,0	3,7	4,2	5,1
16,0	4,6	5,3	6,3
25,0	5,7	6,6	7,8

* *According to IEC 60228.*

The different types of conductors are classified according to IEC 60228 as follows:

Rigid solid conductors	*Class 1*
Rigid stranded conductors	*Class 2*
Flexible conductors	*Classes 5 and 6*

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	11.1.1.1.4 Terminals suitable for the connection of flexible conductors shall be located or shielded so that, if a wire of a flexible conductor escapes from a terminal when the conductors are fitted, there is no risk of contact between live parts and accessible metal parts, and, for switches for Class II appliances, between live parts and metal parts separated from accessible metal parts by supplementary insulation only. Furthermore, there shall be no risk of short-circuiting those terminals which are electrically connected together by switch action. Compliance is checked by inspection and by the following test: a)at the end of a flexible conductor having the minimum cross-sectional area specified in table 4, the insulation is removed for a length of 8 mm. One wire of the flexible conductor is left free and the remainder are fully inserted into the terminal and clamped; b)the free wire is bent, without tearing the insulation back, in every possible direction, but without making sharp bends around barriers. The free wire of the flexible conductor shall not touch the relevant parts mentioned above. Furthermore, the free wire of a flexible conductor connected to an earthing terminal shall not touch any live part.		P
	11.1.1.1.5 Terminals shall be designed so that they clamp the conductor without undue damage to the conductor. Compliance is checked by inspection.		P
	11.1.1.1.6 Terminals shall be designed so that the insertion of the conductor is prevented by a stop if further insertion may reduce creepage distances and/or clearances or influence the mechanism of the switch. Compliance is checked by inspection and during the tests of 11.1.1.1.3 and 11.1.1.1.4.		P
	11.1.1.2 Screw-type terminals for unprepared copper conductors		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	11.1.1.3 Screwless terminals for unprepared copper conductors		P
	11.1.1.4 Insulation piercing terminals for insulated unprepared copper conductors		P
	11.1.2 Terminals for prepared copper conductors and/or requiring the use of a special purpose tool 11.1.2.1 Common requirements		P
	11.1.2.2 Screw-type terminals for prepared copper conductors No further specific requirements. 11.1.2.3 Screwless terminals for prepared copper conductors		P
	11.1.2.4 Tabs of flat quick-connect terminations 11.1.2.5 Insulation piercing terminals for prepared insulated copper conductors 11.1.2.6 Solder terminals		P
	11.1.3 Additional requirements for terminals for supply connection and connection of external cords 11.1.3.1 Each terminal shall be located near to its corresponding terminal of different polarity, and to the earthing terminal, if any, unless there is a sound technical reason for the contrary.		P
12	Construction		P
	12.1 Constructional requirements relating to protection against electric shock 12.1.1 When double insulation is employed the design shall be such that the basic insulation and the supplementary insulation can be tested separately, unless compliance with regard to the properties of both insulations is provided in another way. Compliance is checked by inspection. a)If the basic and the supplementary insulation cannot be tested separately, or if compliance with regard to the properties of both insulations cannot be obtained in another way, the insulation is considered to be reinforced insulation. b)Specially prepared specimens, or specimens of the insulating parts, are considered to be		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	ways of providing means of determining compliance.		
	12.1.2 Switches shall be designed so that creepage distances and clearances cannot be reduced, as a result of wear, below the values specified in clause 20. They shall be constructed so that if any conductive part of the switch becomes loose and moves out of position, it cannot get so disposed in normal use that creepage distances or clearances across supplementary insulation or reinforced insulation are reduced. Compliance is checked by inspection, by measurement and by manual test. For the purpose of this test: – it is not to be expected that two independent fixings will become loose at the same time; – parts fixed by means of screws or nuts provided with locking washers are regarded as not liable to become loose, provided that these screws or nuts are not required to be removed during user maintenance or servicing; – springs and spring parts are not regarded as being liable to become loose or fall out of position if they do not do so during the tests of clauses 18 and 19.		P
	12.1.3 Integrated conductors shall be rigid, fixed, or insulated so that in normal use creepage distances and clearances cannot be reduced below the values specified in clause 20. Such insulation, if any, shall be such that it cannot be damaged during mounting or in normal use. Compliance is checked by inspection and by the tests of clause 20. If the insulation of a conductor is not at least electrically equivalent to that of cables and cords complying with the appropriate IEC standard and does not comply with the dielectric strength test made between the conductor and metal foil wrapped around the insulation under the		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	conditions specified in clause 15, the conductor is considered to be a bare conductor. 12.1.4 For electronic switches with combinations of semiconductor switching devices and mechanical switching devices, the contacts connected in series with the semiconductor switching device shall be in compliance with the requirements for full disconnection or micro-disconnection. 12.1.5 For mechanical switching devices connected in parallel to the semiconductor switching devices, no requirements concerning the type of disconnection are specified.		
	12.2 Constructional requirements relating to safety during mounting and normal operation of the switch 12.2.1 Covers, cover plates, removable actuators and the like providing safety shall be fixed in such a way that they cannot be displaced or removed except by use of a tool. The fixings for a cover or cover plate shall not serve to fix any other part except an actuating member. It shall not be possible to mount removable parts, for example cover plates bearing indicators or knobs, such that indication of switch positions does not correspond with the actual switch position.		P
	12.2.2 Fixing screws of covers or cover plates shall be captive. The use of tight-fitting washers of cardboard or similar material is deemed to be adequate for this purpose. 12.2.3 A switch shall not be damaged when its actuating member is removed as intended. Compliance with the requirements of 12.2.1, 12.2.2 and 12.2.3 is checked by inspection and, for actuating members which do not require a tool for their removal, by the tests of 18.4. 12.2.4 A pull-cord shall be insulated from live		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	parts and designed such that it shall be possible to fit or to replace it without removing parts causing live parts to become accessible. Compliance is checked by inspection. 12.2.5 If an illuminated indicator is incorporated in a switch, it shall provide the correct indication as declared by the manufacturer. Compliance is checked by connecting the switch to a voltage not deviating by more than ±10 % of the marked voltage for the lamp circuit or rating of the switch, whichever is applicable.		
	12.3 Constructional requirements relating to the mounting of switches and to the attachment of cords 12.3.1 Switches shall be designed so that the methods of mounting in accordance with the manufacturer's declarations do not adversely affect compliance with this standard. 12.3.1.1 These methods of mounting shall be such that the switch cannot rotate, or be otherwise displaced, and cannot be removed from an appliance without the aid of a tool. If the removal of a part, such as a key, is necessary during the normal use of the switch, then the requirements of clauses 9, 15 and 20 shall be satisfied before and after such removal. Compliance is checked by inspection and by manual test. a)Switches fixed by a nut and a single bush concentric with the actuating means are deemed to comply with this requirement, provided that the tightening and/or loosening of the nut requires the use of a tool, and that the parts have adequate mechanical strength. b)An incorporated switch mounted by screwless fixing is deemed to comply with this requirement if the use of a tool is required before the switch can be removed from the appliance.		P
13	Mechanism		P
	For electronic switches, these requirements apply		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	only to those electronic switches provided with mechanical switching devices. 13.1 For d.c. switches, the speed of contact making and breaking shall be independent of the speed of actuation, except for those switches with either a rated voltage not exceeding 28 V or a rated current not exceeding 0,1 A. 13.2 Switches shall be constructed so that the moving contacts can come to rest only in the "ON" and "OFF" positions. An intermediate position is permissible if it corresponds to an intermediate position of the actuating member providing that this does not give a misleading indication of a marked "OFF" position and that the separation of the contacts is then adequate. A switch is deemed to be in the "ON" position as soon as the contact pressure is sufficient to ensure compliance with the requirements of clause 16. A switch is deemed to be in the "OFF" position when the separation of the contacts is sufficient to ensure compliance with the requirements of clause 15. The adequacy of the separation of the contacts in an intermediate position is determined by compliance with the requirements of clause 15 as specified for the adjacent "OFF" position.		
	13.3 When the actuating member is released, it shall take up automatically or stay in the position corresponding to that of the moving contacts, except that, for switches which have only one rest position, the actuating member may take up its normal rest position. Compliance with the requirements of 13.1, 13.2 and 13.3 is checked by manual test, the switch being mounted according to the manufacturer's declarations and the actuating member being actuated as in normal use. If necessary, the adequacy of the separation of the contacts in an intermediate position is determined by a dielectric strength test in		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	accordance with 15.3, the test voltage being applied between the relevant terminals, without removing any cover. 13.4 A cord-operated switch shall be constructed so that, after actuating the switch and releasing the cord, the relevant parts of the mechanism are in a position from which they allow the immediate performance of the next movement in the cycle of actuation. Compliance is checked by inspection and by the following test. Cord-operated switches shall be actuated from any one position, to the next position, by the application and removal of a steady pull not exceeding 45 N vertically downwards, or 70 N at 45° to the vertical, with the switch mounted as declared. 13.5 Multi-pole switches shall make and break all related poles substantially together unless otherwise declared according to 6.2 of table 3. For switches with switched neutral, the neutral may make before and break after the others. Compliance is checked by inspection and, if necessary, by test.		
14	Protection against solid foreign objects, ingress of dust, water, and humid conditions		P
	14.1 Protection against solid foreign objects Switches shall provide the declared degree of protection as in 13.3 of IEC 60529, against solid foreign objects when mounted and used as declared. Compliance is checked by the appropriate test specified in IEC 60529. Detachable parts are removed. A switch which relies on mounting in, or on, an appliance for the declared degree of protection against solid foreign objects shall be suitably mounted in, or on, a closed box to simulate the appliance, and the tests shall be performed using this		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	simulated assembly.		
	14.2 Protection against ingress of dust Switches shall provide the declared degree of protection against ingress of dust when mounted and used as declared. Compliance is checked by the dust test according to IEC 60529, test for first characteristic numeral 5 or 6. a)The test is carried out according to category 2 of IEC 60529. b)The switches are placed in a position of normal use inside the test chamber. Detachable parts are removed. A switch which relies on mounting in, or on, an appliance for the declared degree of protection against ingress of dust shall be suitably mounted in, or on, a closed box to simulate the appliance, and the tests shall be performed using this simulated assembly. c) The test shall be continued for a period of 8 h. During the 8 h period, the switch under test shall be alternatively loaded for 1 h with the maximum rated current and 1 h without current. d) For the test for first characteristic numeral 5, the switch is deemed to comply if – all actions function as declared; – the temperature rise at the terminals does not exceed 55 K when tested in accordance with 16.2, with the exception that the temperature-rise test at the terminals is carried out at rated current and at an ambient temperature of 25 °C ± 10 °C; – the dielectric strength requirement of 15.3 applies with the exception that the specimens are not subjected to the humidity treatment before the application of the test voltage. The test voltage shall be 75 % of the corresponding test voltage specified in 15.3; – there is no evidence that transient fault between live parts and earth metal, accessible metal parts, or actuating members has occurred.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	e) For the test for first characteristic numeral 6, the protection is satisfactory if no deposit of dust is observable inside the switch at the end of the test. f) The switch shall be tested in the most unfavourable position taking into consideration the manufacturer's declarations.		
	14.3 Protection against ingress of water Switches shall provide the declared degree of protection against ingress of water when mounted and used as declared. Compliance is checked by the appropriate tests specified in IEC 60529 with the switch placed in any position of normal use. Switches are allowed to stand at 25 °C ± 10 °C for 24 h before being subjected to the following test. The test is then carried out according to IEC 60529 as follows: – IPX1 switches as described in 14.2.1 with the drain holes open; – IPX2 switches as described in 14.2.2 with the drain holes open; – IPX3 switches as described in 14.2.3 with the drain holes closed; – IPX4 switches as described in 14.2.4 with the drain holes closed; – IPX5 switches as described in 14.2.5 with the drain holes closed; – IPX6 switches as described in 14.2.6 with the drain holes closed; – IPX7 switches as described in 14.2.7 with the drain holes closed. Immediately after the appropriate test, the switch shall withstand the dielectric strength test specified in 15.3, and inspection shall show that there is no trace of water on insulation which could result in a reduction of creepage and clearance below the values specified in clause 20. a)The switch shall not be electrically loaded during these tests. The water temperature shall not differ from that of the switch by more than 5		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	K. b)Detachable parts are removed. c)Switches incorporating separate gaskets, screwed glands, membranes or other sealing means, manufactured from rubber or thermoplastic materials, are aged in a heating cabinet with an atmosphere having the composition and pressure of the ambient air and ventilated by natural circulation. d)Switches without T-rating are kept in the cabinet at a temperature of 70 °C ± 2 °C, and switches with T-rating are kept in the cabinet at a temperature of T + 30 °C for 240 h. Switches with glands or membranes are fitted and connected with conductors as specified in clause 11. Glands are tightened with a torque as specified in table 21. Fixing screws for enclosures are tightened with a torque as specified in table 20. e)Immediately after ageing, the parts are taken out of the cabinet and left at 25 °C ± 10 °C, avoiding direct daylight, for at least 16 h. f)A switch which relies on mounting in, or on, an appliance for the declared degree of protection against harmful ingress of water shall be suitably mounted in, or on, a closed box to simulate the appliance, and the tests shall be performed using this simulated assembly. g)For the tests of second characteristic numerals 3 and 4, preferably the hand-held spray nozzle specified in IEC 60529 shall be used.		
	14.4 Protection against humid conditions All switches shall be proof against humid conditions which may occur in normal use. Compliance is checked by the humidity treatment described in this subclause, followed immediately by the tests of 15.2 and 15.3. Cable inlet openings, if any, and drain-holes are left open. If a drain-hole is provided for a water-tight switch, it is opened. a)Detachable parts are removed and subjected, if		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	necessary, to the humidity treatment with the main part. b)The humidity treatment is carried out in a humidity cabinet containing air with a relative humidity between 91 % and 95 %. The temperature of the air, at all places where specimens can be located, is maintained within ±1 °C of any convenient value (t) between 20 °C and 30 °C. c)Before being placed in the humidity cabinet, the specimens are brought to a temperature between t and t + 4 °C. The specimens are kept in the cabinet for 96 h. d)Immediately after this treatment, the tests of 15.2 and 15.3 are made either in the humidity cabinet, or in the room in which the specimens were brought to the prescribed temperature after the reassembly of any detached parts. The switch shall not show any damage such as to impair compliance with this standard.		
15	Insulation resistance and dielectric strength		P
	15.1 The insulation resistance and the dielectric strength of switches shall be adequate. Compliance is checked by the tests of 15.2 and 15.3, the tests being made immediately after the test of 14.4. The test voltage according to table 12 is applied in the case of – operational insulation: between the different poles of a switch. For the purpose of the test, all the parts of each pole are connected together; – basic insulation: between all live parts connected together and a metal foil covering the outer accessible surface of the basic insulation and accessible metal parts in contact with the basic insulation; – double insulation: between all live parts connected together and a metal foil covering the outer, normally not accessible surface of basic insulation and non-accessible metal parts; and following this: between two metal foils covering separately the inner, normally not		P

<table>
<tr><th colspan="4">EN IEC 61058-1:2018</th></tr>
<tr><th>Clause</th><th>Requirement-Test</th><th>Result-Remark</th><th>Verdict</th></tr>
<tr><td></td><td>accessible surface of supplementary insulation and connected to non-accessible metal
parts, and the outer, accessible surface of supplementary insulation and connected to
accessible metal parts;
– reinforced insulation: between all live parts connected together and a metal foil covering the
outer accessible surface of reinforced insulation and accessible metal parts;
– contacts: between the open contacts of each pole of a switch.</td><td></td><td></td></tr>
<tr><td></td><td>15.2 The insulation resistance is measured with a d.c. voltage of approximately 500 V
applied, the measurement being made 1 min after application of the voltage.
The insulation resistance shall not be less than specified in table 11.</td><td></td><td>P</td></tr>
<tr><td></td><td>Table 11 – Minimum insulation resistance
<table><tr><th>Insulation to be tested</th><th>Insulation resistance
MΩ</th></tr><tr><td>Operational</td><td>2</td></tr><tr><td>Basic</td><td>2</td></tr><tr><td>Supplementary</td><td>5</td></tr><tr><td>Reinforced</td><td>7</td></tr></table></td><td></td><td>P</td></tr>
<tr><td></td><td>15.3 The insulation is subjected to a voltage of substantially sine-wave form, having a
frequency of 50 Hz or 60 Hz. The test voltage shall be raised uniformly from 0 V to the value
specified in table 12 within not more than 5 s and held at that value for 5 s.
No flashover or breakdown shall occur. Glow discharges without drop in voltage are neglected.</td><td></td><td>P</td></tr>
</table>

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 12 – Dielectric strength **Test voltage (r.m.s.) [1]** **Insulation or disconnection to be tested [2]** / **Rated voltage up to and including 50 V** (V) / **Rated voltage above 50 V up to and including 130 V** (V) / **Rated voltage above 130 V up to and including 250 V** (V) / **Rated voltage above 250 V up to and including 440 V** (V) Functional insulation [3]: 500 / 1 300 / 1 500 / 1 500 Basic insulation [4]: 500 / 1 300 / 1 500 / 1 500 Supplementary insulation [4]: – / 1 300 / 1 500 / 1 500 Reinforced insulation [4] [5]: 500 / 2 600 / 3 000 / 3 000 Across electronic disconnection: 100 / 400 / 500 / 700 Across micro-disconnection: 100 / 400 / 500 / 700 Across full disconnection: 500 / 1 300 / 1 500 / 1 500 NOTE 1 Up to 50 V: Not intended to be connected direct to the mains and not expected to be subjected to temporary overvoltages as defined in IEC 60364-4-442. NOTE 2 Over 50 V: The values are based on IEC 60364-4-442. – For functional, basic and supplementary insulation, and for full disconnection, the values are calculated with the formula: U_N + 1 200 V and rounded. – For micro and electronic disconnection, the values are calculated with the formula: U_N + 250 V and rounded. NOTE 3 In this standard, the maximum voltage considered between line and neutral is U_N = 300 V. [1] The high-voltage transformer used for the test shall be designed so that, when the output terminals are short-circuited after the output voltage has been adjusted to the test voltage, the output current is at least 200 mA. The overcurrent relay shall not trip when the output current is less than 100 mA. Care is taken that the r.m.s. value of the test voltage is measured within ±3 %. [2] Special components which might render the test impractical such as discharge lamps, coils, windings, or capacitors are disconnected at one pole, or bridged, as appropriate to the insulation being tested. Where this is not practical on the specimens to be used for the test of clauses 16 and 17, the test of 15.3 shall be carried out on additional specimens. These may be special specimens with the appropriate components omitted. [3] An example is the insulation between poles (see definition 3.7.5). [4] For the test of basic, supplementary and reinforced insulation, all live parts are connected together and care is taken to ensure that all moving parts are in the most onerous position. [5] For switches incorporating reinforced insulation as well as double insulation, care is taken that the voltage applied to the reinforced insulation does not overstress the basic or the supplementary parts of the double insulation.		P
16	Heating		P
	16.1 General requirements Switches shall be constructed so that they do not attain excessive temperatures in normal use. The materials used shall be such that the performance of the switches is not adversely affected by operation in normal use at the maximum rated current or declared thermal current and rated temperature of the switch.		P
	16.2 Contacts and terminals 16.2.1 The material and design of the contacts and terminals shall be such that the oper- ation and performance of the switch is not adversely affected by their oxidation or other deterioration. 16.2.2 Compliance is checked by inspection and by the following tests.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	The tests are carried out as follows. a)Switches with terminals for unprepared conductors are fitted with conductors of a minimum length of 1 m, unless the manufacturer declares a length below 1 m, and having the medium cross-sectional area specified in table 4. b)Switches with terminals for prepared conductors are fitted with conductors of a length of 1 m or less, if so declared by the manufacturer, and having the appropriate cross-sectional area as declared by the manufacturer. c)Terminal screws and/or nuts are tightened with a torque equal to two-thirds of that specified in the appropriate column of table 20. d)Actuating members of biased switches are fixed in the declared "ON" position. e)On switches fitted with screwless terminals, care should be taken to ensure that the conductors are correctly fitted to the terminals in accordance with clause 11. f)The poles of switches which make simultaneously may be connected in series by means of conductors. The minimum length of the conductors between two poles shall be 1 m unless the manufacturer declares a length below 1 m. g)The switches are placed or mounted as declared in a suitable heating or refrigerating cabinet without forced convection. NOTE 1 A cabinet with forced convection may be used, provided the test specimen(s) is (are) not effected by this forced convection. NOTE 2 Electronic switches need not be placed in a heating or refrigerating cabinet. h)Switches with a T-rating up to and including 55 °C are tested at a temperature of 20 °C ± 2 °C without forced convection. Switches with T-rating above 55 °C are placed in a heating cabinet without forced convection and the		

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	temperature is raised to the T-rating of the switch. The temperature of the cabinet is maintained at T ± 5 °C or T ± 0,05 T, whichever is greater. i)The temperature of the air in which the specimens are placed shall be measured as near as possible to the centre of the space occupied by the specimens and at a distance approximately 50 mm from the specimen.		
	16.3 Other parts 16.3.1 Other parts of switches shall not attain excessive temperatures such that the performance or operation of the switch is impaired or a hazard is presented to the user and/or the immediate surroundings of the switch in normal use. 16.3.2 For mechanical switches, compliance is checked by the following tests. a)The switches shall be mounted as declared and fitted with conductors and loaded with a test current as prescribed in 16.2.2 with the additional requirement that the test on all switches is carried out at the maximum rated temperature. b)For switches only partially suitable for a rated ambient temperature higher than 55 °C, those parts which are accessible when the switch is mounted as declared shall be exposed to a temperature not higher than 55 °C. c)The temperature of metal mounting surfaces of the test equipment shall be between T and 20 °C. d)If other heating sources are incorporated or integrated in the switch, these circuits shall be of the maximum power declared and are connected to a supply having a voltage between 0,94 and 1,06 times the rated voltage, whichever will produce the most heat. NOTE Examples of such heating sources are tungsten filament lamps or discharge lamp assemblies		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	incorporating resistors. e)The temperature of the parts and/or surfaces of the switch indicated in table 13 shall be determined by means of fine wire thermocouples or other equivalent means, so chosen and positioned that they have the minimum effect on the temperature of the part under test. f)Thermocouples used for determining the temperature of surfaces are attached to the back of blackened discs of copper or brass 5 mm in diameter and 0,8 mm thick. As far as possible, the discs are positioned on that part of the surface likely to attain the highest temperature in normal use. g)In determining the temperature of actuating members, consideration has to be given to all parts which are gripped in normal use and to non-metallic parts where they are in contact with hot metal. h)During this test, the temperatures shall not exceed the values specified in table 13.		
	Table 13 – Permissible maximum temperatures **Parts** / **Maximum temperature**: **Normal conditions Subclauses 16.3.2 and 16.3.3** °C; **Abnormal conditions Clause 23** °C Rubber or polyvinyl chloride insulation of non-detachable cables and cords – without T-marking: 75 [1] / 135 – with T-marking: T [2] / 135 Cord sheaths used as supplementary insulation: 60 / 120 Rubber other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety: – when used as supplementary insulation or as reinforced insulation: 65 / 125 – in other cases: 75 / 135 Material used as insulation other than that specified for wires: – printed circuit boards: [3] Moulding of – thermosetting materials: [4] [9] / [4] [9] – thermoplastic materials: [4] / [4] All accessible surfaces except those of actuating members or handles: 85 / 100 Accessible surfaces of actuating members or handles which are held for short periods only – of metal: 60 / 100 – of porcelain or vitreous material: 70 / 100 – of moulded material or rubber: 85 / 100		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 13 *(suite)*		P

Parts	Maximum temperature	
	Normal conditions Subclauses 16.3.2 and 16.3.3 °C	Abnormal conditions Clause 23 °C
Inside of enclosures of insulating material	5)	5)
Windings – Thermal classification 6):		
– class A	100	135
– class E	115	150
– class B	120	155
– class F	145	180
– class H	165	200
– class 200	185	220
– class 220	205	240
– class 250	235	270
Terminals and terminations for unprepared conductors	80 7)	125 8)
Other terminals and terminations	7)	125 8)

1) This limit applies to cables, cords and wires complying with the relevant IEC standards; for others, it may be different.

2) This limit will become applicable as soon as there are IEC standards for high-temperature cables, cords and wires.

3) The material must be according to IEC 60893-1. The maximum permissible temperature shall not exceed values which can be proved to be safe in service for the materials in question.

4) There is no specific limit. The material shall withstand the test of clause 21, for which purpose the temperature shall be measured.

5) The permissible temperature rises at the inside of enclosures of insulating material are those indicated for the relevant materials.

6) The thermal classification is the thermal class according to IEC 60085 with the following deductions which take into consideration the conventional difference between the average temperature and the maximum temperature:

- Classes A and E ..... 5 °C
- Classes B and F ..... 10 °C
- Classes H to 250 ..... 15 °C

7) The temperature measured shall not exceed 80 °C, unless a higher value has been declared by the manufacturer.

8) The temperature measured shall not exceed 125 °C, unless a higher value has been declared by the manufacturer.

9) For mechanical switches, the maximum permissible temperature shall not exceed that which can be shown to be safe in service for these materials. The material shall withstand the test of clause 21, for which purpose the temperature shall be measured.

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 14 – Temperatures for thermosetting materials used for electronic switches **Parts** / **Maximum temperature**: **Normal conditions Subclauses 16.3.2 and 16.3.3** °C; **Abnormal conditions Clause 23** °C Material used as insulation other than that specified for wires: – melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins: 135 (225) [1] / 145 (225) [1] – urea-formaldehyde resin: 115 (200) [1] / 125 (200) [1] Moulding of: – phenol-formaldehyde with cellulose fillers: 110 (200) [1] / 165 (200) [1] – phenol-formaldehyde with mineral fillers: 125 (225) [1] / 185 (225) [1] – melamine-formaldehyde: 100 (175) [1] / 175 – urea-formaldehyde: 90 (175) [1] / 175 – polyester with glass-fibre reinforcement: 135 / 185 – silicone rubber: 170 / 225 – polytetrafluorethylene: 290 / 290 [1] The values in parentheses apply if the material is in contact with hot metal parts, not submitted to electrical stress, however.		P
17	Endurance		P
	17.1 General requirements 17.1.1 Switches shall withstand without excessive wear or other harmful effect the electrical, thermal and mechanical stresses that occur in normal use. For all switches except electronic switches, compliance is checked as specified in 17.1.2. For electronic switches, compliance is checked as specified in 17.1.3. The different types of tests are specified in 17.2.4. 17.1.2 The sequence of tests for all switches except electronic switches is as follows: – a test at high speed specified in 17.2.4.3; this test only applies to switches with more than one pole, and where the type of connection is of polarity reversal; – a test at slow speed specified in 17.2.4.2; – an increased-voltage test at accelerated speed as specified in 17.2.4.1; this test does not apply to switches classified according to 7.1.2.9; – a locked-rotor test as specified in 17.2.4.9 at accelerated speed; this test only applies to switches classified according to 7.1.2.9; – a test at accelerated speed as specified in		P

<table>
<tr><th colspan="4">EN IEC 61058-1:2018</th></tr>
<tr><th>Clause</th><th>Requirement-Test</th><th>Result-Remark</th><th>Verdict</th></tr>
<tr><td></td><td>17.2.4.4;</td><td></td><td></td></tr>
<tr><td></td><td>17.2 Electrical endurance tests
17.2.1 Electrical conditions
17.2.1.1 The switch shall be loaded as specified in table 17 and/or table 18 and connected in accordance with the circuit(s) as given in table 2 if applicable, following the declaration according to 7.1.13.
Switches of a declared specific type and/or connection are connected and loaded as specified by the manufacturer.
Circuits and contacts which are not intended for external loads are operated with the designated load.
Where, in table 2, an auxiliary switch (A) is symbolized in the test circuit, the tests for the two ON-positions of the specimen (S) are performed on two separate sets of test samples. The connection to the test load to be performed for the two tests is symbolized in table 2 by an auxiliary switch A.
Multiway switches classified according to 7.1.13.4.2 to 7.1.13.4.5 are loaded according to table 16.</td><td></td><td>P</td></tr>
<tr><td></td><td>Table 16 – Test loads for multiway switches
<table>
<tr><th>Operating cycles</th><th>Switch position of</th><th>Type of switch Subclause</th><th>Load</th></tr>
<tr><td rowspan="3">First half</td><td>Highest load</td><td>7.1.13.4.2 to 7.1.13.4.5</td><td>I_R</td></tr>
<tr><td>Next lower load</td><td>7.1.13.4.2 to 7.1.13.4.5</td><td>$0,8 \times I_R$</td></tr>
<tr><td>Further next lower load</td><td>7.1.13.4.5</td><td>$0,533 \times I_R$</td></tr>
<tr><td rowspan="3">Second half</td><td>Highest load</td><td>7.1.13.4.2 to 7.1.13.4.5</td><td>I_R</td></tr>
<tr><td>Next lower load</td><td>7.1.13.4.2 to 7.1.13.4.5</td><td>$0,5 \times I_R$</td></tr>
<tr><td>Further next lower load</td><td>7.1.13.4.5</td><td>$0,333 \times I_R$</td></tr>
</table></td><td></td><td>P</td></tr>
<tr><td></td><td>The load for the other switch positions is that resulting from the loads necessary to achieve the conditions specified above.
For circuits according to 7.1.2.7 for specific lamp load, the connection and test load is as specified by the manufacturer using the maximum</td><td></td><td>P</td></tr>
</table>

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	occurring inrush current at room temperature. No electrical endurance tests are necessary for switches for 20 mA load as classified in 7.1.2.6. NOTE For a specific lamp load, it is recommended that the specimen be operated with loads that are used in the field rather than with synthetic loads. Forced cooling of the specific lamp load may be applied in order to ensure cold resistance for each operating cycle and shorten the test time. For electronic switches, the test circuit shall be as shown in figure 19. The declared load shall be set at rated voltage before the electronic switch is inserted into the circuit. 17.2.1.2 When increased-voltage conditions are specified, the loads used are those specified for tests at rated voltage, the voltage then being increased to 1,15 the rated voltage. For test circuits for capacitive load tests and simulated lamp load tests for a.c. circuits, the test voltage is the rated voltage and the test currents are increased to 1,15 rated currents.		

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

Table 17 – Test loads for electrical endurance tests for a.c. circuits

Type of circuit as classified in 7.1.2	Operation of contacts	Test voltage	Test current r.m.s.	Power factor [3]
Substantially resistive (classified in 7.1.2.1)	Making and breaking	Rated voltage	*I-R*	≥0,9
Resistive and/or motor (classified in 7.1.2.2)	Making [2]	Rated voltage	6 × *I-M* or *I-R* [1]	0,60 (+0,05) ≥0,9
	Breaking	Rated voltage	*I-R* or *I-M* [1]	≥0,9 ≥0,9 [5]
Circuit for specific load of motor with a locked rotor and with a power factor not less than 0,6 (classified in 7.1.2.9)	Making	Rated voltage	6 × *I-M*	0,60 (+0,05)
	Breaking	Rated voltage	6 × *I-M*	0,60 (+0,05)
Circuit for an inductive load (classified in 7.1.2.8)	Making [2]	Rated voltage	6 × *I-I*	0,60 (+0,05)
	Breaking	Rated voltage	*I-I*	0,60 (+0,05)
Resistive and capacitive (classified in 7.1.2.3)	Making and breaking	Tested in a circuit as shown in figure 9a		
Tungsten filament lamp load (classified in 7.1.2.4)	Making and breaking	Tested in a circuit as shown in figure 9a [4] Rated voltage ≥ 110 V a.c., *X* = 16 Rated voltage < 110 V a.c., *X* = 10		
Circuit for specific lamp load (classified in 7.1.2.7)	Making and breaking	Rated voltage	As determined by load	
Specific declared (classified in 7.1.2.5)	Making and breaking	Rated voltage	As determined by load	

NOTE *I-I*: inductive-load current
I-M: motor-load current
I-R: resistive-load current

[1] Whichever is arithmetically greater or the most unfavourable value in case of equal values.

[2] The specified making conditions are maintained for a period between 50 ms and 100 ms, and are then reduced by an auxiliary switch to the specified breaking conditions.

For all switches except electronic switches the test current may be reduced to *I-R* by introducing a resistor in the circuit. Short interruptions of the test current during the reduction to *I-R* not exceeding a period of 50 ms to 100 ms are permitted.

For electronic switches, the reduction to the break current should be achieved without any open circuiting of the simulated inductive loads circuit, to ensure that no abnormal voltage transients are generated.

A typical method of achieving this is shown in figure 19.

[3] Resistors and inductors are not connected in parallel except that if any air-core inductor is used, a resistor taking approximately 1 % of the current through the inductor is connected in parallel with it. Iron-core inductors may be used provided that the current has a substantial sine-wave form. For three-phase tests, three-core inductors are used.

[4] In the case where the tests are performed with tungsten filament lamp bulbs, the following test conditions apply:

- the ratio *X* = 16 or *X* = 10 shall be achieved;
- the cold resistance of the lamps shall be ensured for each operating cycle;
- the resistance of connections within the load circuit (for example lamp sockets) shall be constant;
- the proper function of the lamps performing the load set shall be ensured for each operating cycle.

[5] The test circuit condition for testing electronic switches, according to figure 18, shall be substantially resistive.

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Table 18 – Test loads for electrical endurance tests for d.c. circuits **Type of circuit as classified in 7.1.2** / **Operation of contacts** / **Test voltage** / **Test current** / **Time constant** Substantially resistive load / Making and breaking / Rated voltage / *I*–*R* / *L*/*R* < 1,15 ms Tungsten filament lamp load (classified in 7.1.2.4) / Making and breaking / Tested in a circuit as shown in figure 9b; Rated voltage ≥ 110 V d.c., *X* = 16; Rated voltage < 110 V d.c., *X* = 10 [1)] Resistive and capacitive load (classified in 7.1.2.3) / Making and breaking / Tested in a circuit as shown in figure 9b Circuit for specific lamp load (classified in 7.1.2.7) / Making and breaking / Rated voltage / As determined by load Declared specific load (classified in 7.1.2.5) / Making and breaking / Rated voltage / As determined by load NOTE *I*–*R*: resistive load current 1) In case where the tests are performed with tungsten filament lamp bulbs, the following test conditions apply: – the ratio *X*=16 or *X*=10 shall be achieved; – the cold resistance of the lamps shall be ensured for each operating cycle; – the resistance of connections within the load circuit (for example, lamp sockets) shall be constant; – the proper function of the lamps performing the load set shall be ensured for each operating cycle.		P
	17.2.3 Manual and mechanical conditions 17.2.3.1 The switches are operated by means of its actuating member either manually or by an appropriate apparatus which is arranged to simulate normal actuation. The operating speed for the operating cycles shall be as follows: For the tests of switches except electronic switches: a)for slow speed: – approximately 9°/s for rotary actuations at an angle of operation £45°; – approximately 18°/s for rotary actuations at an angle of operation >45°; – approximately 20 mm/s for linear actuations. b)for high speed, the actuating member shall be actuated by hand as fast as possible. If a switch is normally provided without an actuating member, then a suitable actuating member should be supplied by the manufacturer for the purpose of this test. c)for accelerated speed: – approximately 45°/s for rotary actuations at an angle of operation £45°; – approximately 90°/s for rotary actuations at an angle of operation >45°; – approximately 80 mm/s for linear actuations. For the tests of electronic switches:		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	d)for slow speed: – approximately 9°/s for rotary actions; – approximately 5 mm/s for linear actions; e)for high speed, the actuation member shall be actuated by hand as fast as possible. If a switch is delivered without an actuating member, then a suitable actuating member should be supplied by the manufacturer for the purpose of this test; f)for accelerated speed: – approximately 45°/s for rotary actions, – approximately 25 mm/s for linear actions.		
	17.2.3.2 For biased switches, the actuating member shall be moved to the limit of travel of the opposite position. 17.2.3.3 During the slow-speed test, care is taken that the test apparatus drives the actuating member positively, without significant backlash between the apparatus and the actuating member. 17.2.3.4 During the accelerated speed test a)care shall be taken to ensure that the test apparatus allows the actuating member to operate freely, so that there is no interference with the normal action of the mechanism; b)for switches designed for a rotary actuation where the movement is not limited in either direction, three-quarters of the total number of operating cycles in each test shall be made in a clockwise direction, and one-quarter in an anti-clockwise direction; c)for switches which are designed for rotary actuation in one direction only, the test shall be performed in the designed direction, provided that it is not possible to rotate the actuating member in the reverse direction using the torques necessary for actuation in the designed direction;		P
	17.2.4 Type of test condition (TC) 17.2.4.1 Increased-voltage test at accelerated speed (TC1)		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	The electrical conditions are those specified for increased-voltage in 17.2.1. The method of operation is that specified for accelerated speed in 17.2.3. The number of operating cycles is 100. 17.2.4.2 Test at slow speed (TC2) The electrical conditions are those specified in 17.2.1. The method of operation is that specified for slow speed in 17.2.3. The number of operating cycles is 100. 17.2.4.3 Test at high speed (TC3) This test applies only to switches which have more than one pole and when polarity reversal occurs. The electrical conditions are those specified in 17.2.1. The method of operation is that specified for high speed in 17.2.3. The number of operating cycles is 100.		
	17.2.4.4 Test at accelerated speed (TC4) For all switches except electronic switches, the electrical conditions are those specified in 17.2.1. For electronic switches, the electrical conditions are those specified in table 15. The thermal conditions are those specified in 17.2.2. The number of operating cycles is the number declared according to 7.1.4 less the number actually made during the tests of 17.2.4.1, 17.2.4.2 and 17.2.4.3. For switches classified according to 7.1.13.4.2 to 7.1.13.4.5, the total number of operations shall be not more than 200 000. The method of operation is that specified for accelerated speed in 17.2.3.		P
	17.2.4.5 Manual functional test (TC5) Semiconductor switching devices including their electronic control units incorporated in electronic switches are subjected to the following functional tests.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	The electronic switch is loaded with thermal current or maximum rated resistive current, if no thermal current is declared, at rated voltage until steady-state temperatures are reached. When tested with maximum rated resistive current, the voltage is then increased to 1,1 times rated voltage, and again allowed to stabilize. The switch is operated 20 times at the fastest manual rate possible, over the whole range from minimum to maximum and back to minimum, by means of its actuating member. During and after the test, the specimens shall operate correctly.		
	17.2.4.6 Functional test at minimum load (TC6) For electronic switches for which a minimum load or minimum current is specified by the manufacturer, the characteristic is additionally tested with the specified minimum load or current at 0,9 times rated voltage. The switch is operated 10 times over the whole range from minimum to maximum and back to minimum by means of its actuating member. In addition, where appropriate, the switch is operated 10 times over the whole range from minimum to maximum and back to minimum by means of a remote control. During and after the test, the specimens shall operate correctly.		P
	17.2.4.7 Test with limited number of operations (TC7) The electrical conditions are those specified in table 15. The thermal conditions are those specified in 17.2.2. The number of operating cycles is 1 000 or the declared number of cycles whichever is the lowest. The method of operation is that specified in 17.2.3 for accelerated speed.		P
	17.2.4.8 Endurance test (TC8) Full number of operating cycles with TL1 (table 15) at accelerated speed.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	17.2.4.9 Locked-rotor test (TC9) For switches according to 7.1.2.9, the test load condition for making operation for resistive and/or motor load with a rated current of 6 × I-M and with a power factor of 0,6 is used for the making and breaking operation.		
	17.2.5 Evaluation of compliance 17.2.5.1 Functional compliance (TE1) After all the appropriate tests of 17.2.4, the switch is deemed to comply if – all actions function as declared; – no loosening of electrical or mechanical connections occur; – sealing compound shall not flow to such an extend that live parts are exposed. 17.2.5.2 Thermal compliance (TE2) After all the appropriate tests of 17.2.4, the switch is deemed to comply if the temperature rise at the terminals does not exceed 55 K, when tested in accordance with 16.2, with the exception that the temperature-rise test at the terminals is carried out at rated current and in an ambient temperature of 25 °C ± 10 °C. 17.2.5.3 Insulating compliance (TE3) After all the appropriate tests of 17.2.4, the switch is deemed to comply if – the dielectric strength requirement of 15.3 applies with the exception that the specimens are not subjected to the humidity treatment before the application of the test voltage. The test voltage shall be 75 % of the corresponding test voltage specified in that subclause; – there is no evidence that any transient fault between live parts and earth metal, accessible metal parts, or actuating members has occurred.		P
18	Mechanical strength		P
	18.1 Switches shall have adequate mechanical strength and be constructed so as to withstand such rough handling as may be expected in normal use. 18.1.1 Accessible parts of actuating members of switches for Class I and Class II appliances		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	shall either have adequate mechanical strength or be such that adequate protection against electric shock is maintained if the actuating member is broken. Compliance is checked by the tests of 18.2, 18.3 and 18.4, as appropriate, carried out sequentially.		
	18.2 Switches are checked by applying blows to the specimen by means of the spring-operated impact test apparatus of IEC 60068-2-75. 18.2.1 The actuating member and all surfaces which are accessible when the switch is mounted as in normal use are tested with the impact test apparatus. Incorporated switches are mounted in a test device as shown in figure 11. Switches where only the actuating member is accessible when mounted as declared are fixed to the metal plate shown in figure 11, so that they are between it and the sheet of plywood. Blows are applied to all accessible surfaces, including actuating members, in a direction perpendicular to the surface of the point to be tested, the test apparatus being calibrated to deliver an energy of 0,5 Nm ± 0,04 Nm. Foot-actuated switches shall be subject to the same test, but using a test apparatus calibrated to deliver an energy of 1,0 Nm ± 0,05 Nm. For all such surfaces, three blows are applied to every point that is likely to be weak. Care shall be taken that the results from one series of three blows do not influence subsequent series. If there is doubt whether a defect has been caused by the application of preceding blows, this defect is neglected and the group of three blows which led to the defect is applied to the same place on a new specimen, which shall then withstand the test. Foot-operated switches are, in addition, subjected to a force applied by means of a circular		P

<table>
<tr><th colspan="4">EN IEC 61058-1:2018</th></tr>
<tr><th>Clause</th><th>Requirement-Test</th><th>Result-Remark</th><th>Verdict</th></tr>
<tr><td></td><td>steel pressure plate with a diameter of 50 mm. The force is increased continuously from an initial value of about 250 N up to 750 N within 1 min, after which it is maintained at this value for 1 min. The switches are mounted as in normal use in a horizontal panel, with the operating means protruding, and the force is applied once.
After these tests, the switch shall still comply with the requirements of clauses 9, 13, 15 and 20. Insulating linings, barriers and the like shall not have worked loose. It shall still be possible to remove and to replace detachable and other external parts such as cover plates without these parts or their insulating linings being broken.
It shall still be possible to actuate the actuating member to provide the appropriate disconnection.</td><td></td><td></td></tr>
<tr><td></td><td>18.3 Cord-operated switches are submitted to an additional pull test as follows. The switch is mounted as declared by the manufacturer, and the pull-cord is subjected to a force, applied without jerks, first for 1 min in the normal direction, and then for 1 min in a direction 45° maximum from the normal direction. The minimum values of the pull force shall be as specified in table 19 or three times the values of the normal operating force if that is greater</td><td></td><td>P</td></tr>
<tr><td></td><td>Table 19 – Minimum values of pull force
<table><tr><th rowspan="2">Rated current
A</th><th colspan="2">Force
N</th></tr><tr><th>Normal direction</th><th>45° from normal direction</th></tr><tr><td>Up to and including 4</td><td>50</td><td>25</td></tr><tr><td>Over 4</td><td>100</td><td>50</td></tr></table></td><td></td><td>P</td></tr>
<tr><td></td><td>8.4 Switches supplied or intended to be fitted, with actuating members shall be tested as follows.
First, a pull shall be applied for 1 min to try to pull off the actuating member.
The pull to be applied is normally 15 N, but if the actuating member is intended to be pulled in</td><td></td><td>P</td></tr>
</table>

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	normal use, the force is increased to 30 N. Secondly, a push of 30 N for 1 min is then applied to all actuating members. During these tests, a movement of the actuating member on the actuating means is acceptable provided this does not result in an incorrect indication of the switch position. After both of these tests, the specimen shall show no damage to impair compliance with this standard. If a switch is intended to have an actuating member but is submitted for approval without, then a pull and a push of 30 N are applied to the actuating means. Adhesives, except of the self-hardening type, are not deemed to be adequate to prevent loosening of the actuating member.		
19	Screws, current-carrying parts and connections		P
	19.1 General requirements for electrical connections Electrical connections shall be designed so that contact pressure is not transmitted through insulating material other than ceramic, pure mica or other material with characteristics no less suitable, unless there is visual evidence of sufficient resiliency in the metallic parts to compensate for any possible shrinkage or distortion of the insulating material. a)The suitability of the material is considered in respect to the stability of the dimensions within the temperature range applicable to the switch. b)This requirement is not applicable to connections internal to a switch where the connection is used for lamps for indicating purposes and where the current in this circuit is equal or below 20 mA. Compliance is checked by inspection.		P
	19.2 Screwed connections 19.2.1 Screwed connections, electrical or other,		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	shall withstand the mechanical stresses occurring in normal use. 19.2.2 Screws transmitting contact pressure shall be in engagement with a metal thread. Such screws shall not be of metal which is soft or liable to creep, such as zinc or aluminium. 19.2.3 Mechanical connections to be used during installation of switches may be made using thread-forming tapping screws or thread-cutting tapping screws, only if the screws are supplied together with the piece in which they are intended to be inserted. In addition, thread-cutting tapping screws intended to be used during installation shall be captive with the relevant part of the switch. 19.2.4 Thread-forming (metal sheet) screws shall not be used for the connection of current-carrying parts, unless they clamp these parts directly in contact with each other and are provided with a suitable means of locking. Thread-cutting (self-tapping) screws shall not be used for the electrical connection of current-carrying parts, unless they generate a full metric ISO thread or a thread of equivalent effectiveness. Such screws shall not, however, be used if they are likely to be operated by the user or installer, unless the thread is formed by a swaging action. Provisionally, SI, BA and Unified threads are deemed to be of equivalent effectiveness to a metric ISO thread. Compliance is checked by inspection and, for screws and nuts which are likely to be operated while the switches are being mounted and connected, by the following test. The screws or nuts are tightened and loosened – 10 times for screws in engagement with a thread of insulating material; – 5 times in all other cases. Nuts concentric with the button or dolly are		

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	tightened and loosened five times. If either thread is of insulating material, the torque is 0,8 Nm. If the threads are of metal, the torque is 1,8 Nm.		
	19.3 Current-carrying parts Current-carrying parts and parts in an earthing path shall be of a metal having, under conditions occurring in the switch, adequate mechanical strength and resistance to corrosion. Springs, resilient parts, clamping screws and the like of terminals are not considered as parts mainly intended for carrying current. Examples of metals resistant to corrosion when used within the permissible temperature range and under normal conditions of chemical pollution, are – copper; – an alloy containing at least 58 % copper for parts that are worked cold or at least 50 % copper for other parts; – stainless steel containing at least 13 % chromium and not more than 0,09 % carbon; – steel provided with an electroplated coating of zinc according to ISO 2081, the coating having a thickness of at least • 5 mm ISO service condition No. 1, for non-protected switches; •12 mm ISO service condition No. 2, for switches with degree of protection IPX1 through IPX4; •25 mm ISO service condition No. 3, for switches with degree of protection IPX5 through IPX7; – steel provided with an electroplated coating of nickel and chromium according to ISO 1456, the coating having a thickness of at least • 20 mm ISO service condition No. 2, for non-protected switches; •30 mm ISO service condition No. 3, for switches with degree of protection IPX1 through IPX4; •40 mm ISO service condition No. 4, for switches with degree of protection IPX5 through		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	IPX7; – steel provided with an electroplated coating of tin according to ISO 2093, the coating having a thickness of at least • 12 mm ISO service condition No. 2, for non-protected switches; •20 mm ISO service condition No. 3, for switches with degree of protection IPX1 through IPX4; •30 mm ISO service condition No. 4, for switches with degree of protection IPX5 through IPX7.		
20	Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies		P
	Switches shall be constructed so that the clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies are adequate to withstand the electrical, mechanical and thermal stresses taking into account the environmental influences that may occur during the anticipated life of the switch. Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies shall comply with the relevant subclauses 20.1 to 20.4.		P
	20.1 Clearances The clearances shall be dimensioned to withstand the rated impulse voltage declared by the manufacturer according to 7.1.10, considering the rated voltage and the overvoltage category as given in annex K and the pollution degree declared by the manufacturer according to 7.1.6. For the measurements: – Detachable parts are removed and movable parts which can be assembled in different orientations placed in the most unfavourable position. NOTE 1 Movable parts are for example hexagonal nuts, the position of which cannot be controlled throughout		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	an assembly. – Distances through slots or openings in surfaces of insulating material are measured to a metal foil in contact with the surface. The foil is pushed into comers and the like by means of the standard test finger of IEC 60529, but is not pressed into openings. – A force is applied to bare conductors and accessible surfaces in order to attempt to reduce clearances when making the measurement. The force is: • 2 N for bare conductors; • 30 N for accessible surfaces. The force is applied by means of a straight unjointed test finger of the same dimensions as the jointed test finger shown in figure 1 of IEC 60529. When applied to openings as specified in 9.1, the distance through insulation between live parts and the metal foil shall not be reduced below the values specified.		
	20.2 Creepage distances The creepage distances shall be dimensioned for the voltage which is expected to occur in normal use taking into account the pollution degree as declared by the manufacturer according to 7.1.6 and the material group. For the measurements: – Detachable parts are removed and movable parts and parts which can be assembled in different orientations placed in the most unfavourable position. NOTE 1 Movable parts are, for example, hexagonal nuts, the position of which cannot be controlled throughout an assembly. – Distances through slots or openings in surfaces of insulating material are measured to a metal foil in contact with the surface. The foil is pushed into corners and the like by means		P

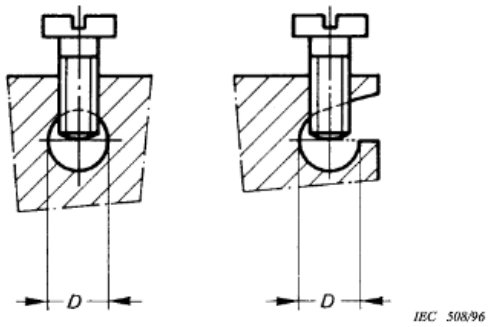
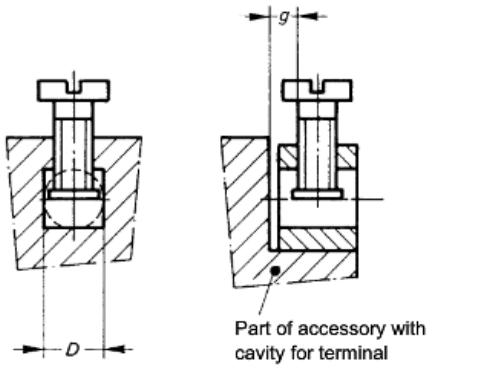
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	of the standard test finger of IEC 60529, but is not pressed into openings. – A force is applied to bare conductors and accessible surfaces in order to attempt to reduce creepage distances when making the measurement. The force is • 2 N for bare conductors; • 30 N for accessible surfaces. The force is applied by means of a straight unjointed test finger of the same dimensions as the jointed test finger shown in figure 1 of IEC 60529.		
	20.2.3 Creepage distances for supplementary insulation The creepage distances for supplementary insulation shall not be less than the values specified for basic insulation in 20.2.1. Compliance is checked by measurement.		P
	20.2.4 Creepage distances for reinforced insulation The creepage distances for reinforced insulation shall not be less than double the values specified for basic insulation in 20.2.1. Compliance is checked by measurement.		P
	20.2.5 Creepage distances for disconnection The creepage distances for disconnection shall not be less than the values specified for functional insulation in 20.2.2. Compliance is checked by measurement		P
	20.3 Solid insulation Solid insulation shall be capable of durably withstanding electrical and mechanical stresses as well as thermal and environmental influences which may occur during the anticipated life of the switch. Compliance is checked during the tests of clauses 14, 15, 16 and 17. The distance through accessible supplementary solid insulation shall have a minimum value		P

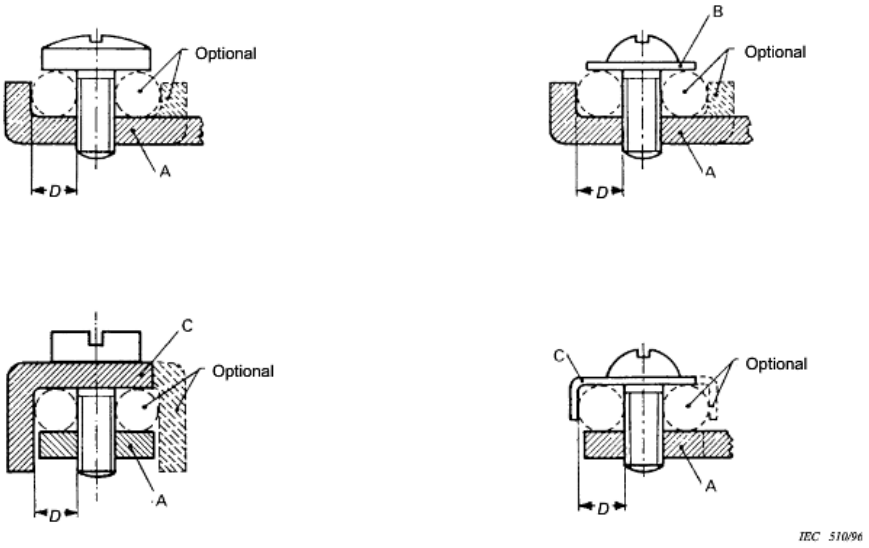
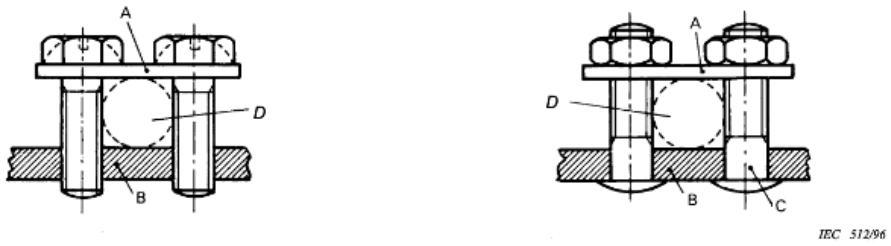
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	of 0,8 mm. The distances through accessible reinforced solid insulation shall have the following minimum values: – for rated impulse withstand voltage equal to or less1 500 V:0,8 mm; – for rated impulse withstand voltage equal to or larger2 500 V:1,5 mm. NOTE 1 The values take into consideration the possibility of cracks as a single fault occurring in the solid insulation. The values corresponding to basic insulation are taken from table 22, considering pollution degree 3. NOTE 2 No minimum thickness is specified for functional, basic, inaccessible supplementary and inaccessible reinforced insulation. Compliance is checked by inspection and by measurement.		
	20.4 Coatings of rigid printed board assemblies Coatings of rigid printed board assemblies shall provide protection against pollution and/or insulation depending on the type A or type B coating used.		P
21	Resistance to heat and fire		P
	21.1 Resistance to heat and fire NOTE Annex J may be used as a guideline to select the sequences and tests of this clause. Parts of non-metallic material (except parts unlikely to be ignited or to propagate flames originating from the switch, for which no test is required) shall be resistant to heat and fire. Compliance is checked by the tests of 21.1.1, 21.1.2, 21.1.3 and 21.1.4.		P
22	Resistance to rusting		P
	Ferrous parts, the rusting of which might impair safety, shall be adequately protected against rusting. Compliance is checked by the following test. All grease is removed from the parts to be tested, by immersion in an appropriate cleaning		P

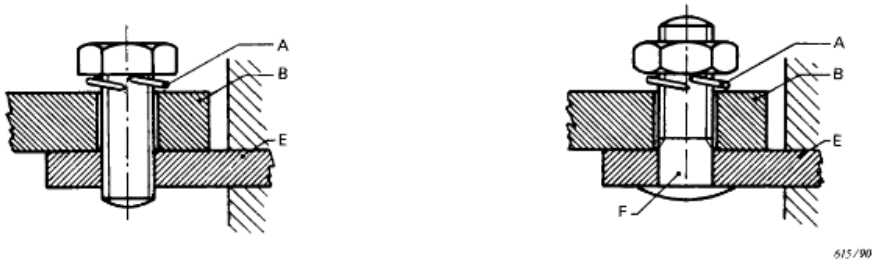
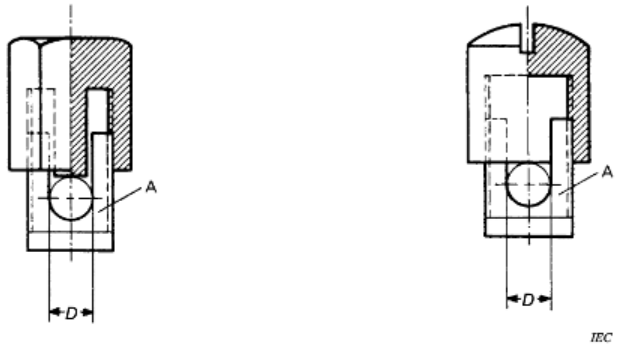
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of 25 °C ± 10 °C. Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of 25 °C ± 10 °C. After the parts have been dried for 10 min in a heating cabinet at a temperature of 100 °C ± 5 °C, their surfaces shall show no signs of rust. Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored. For small helical springs and the like, and for inaccessible parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are only subjected to the test if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease		
23	Abnormal operation and fault conditions for electronic switches		P
	Switches shall be constructed so that the risk of fire, mechanical damage impairing safety or protection against electric shock as a result of abnormal condition is prevented. Compliance is checked by the following tests: – temperature under abnormal conditions according to 23.1; – protection against electric shock in case of abnormal conditions according to 23.2; – protection against short circuit according to 23.3; – protection against failing of cooling according to 23.4. It is acceptable to carry out all tests on the same specimen provided that, with the replacement of an incorporated fuse, the switch is still capable of operation according to the specified rating(s). Otherwise new specimens shall be used.		P
	23.1 When switches are operated under		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	abnormal conditions, no part shall reach such a temperature that there is danger of fire to the surroundings of the switches. Compliance is checked by subjecting the switches to a heating test under fault conditions, as described in 23.1.1. During the test, the temperature shall not exceed the values given in tables 13 and 14, second column.		
	23.2 Protection against electric shock is required, even though a switch is being used or has been used during fault conditions. Compliance is checked by carrying out the tests described in 23.1. Having been subjected to the test, the switch shall comply with the requirements of clause 9.		P
	23.3 Electronic cord switches and electronic independently mounted switches shall, without endangering their surroundings, withstand the short circuits they may be subjected to. Compliance is checked by the following test. The switch is tested in a substantially non-inductive circuit in series with a load impedance and a device for limiting the let-through I2t. The prospective short circuit of the supply shall be 1 500 A r.m.s. at a voltage equal to the rated voltage of the switch under test.		P
	23.4 Protection against fire in case of failure of cooling For switches with declared thermal current intended to be used with forced cooling, the switch is mounted and connected as specified in 16.3.2, but without forced cooling during the test. The switch is loaded with the rated current which is continued until steady state is achieved or the switch disconnects the load circuit. During the test, emission of flames or burning particles shall not occur. If it is declared by the manufacturer that the		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	switch will open during this test condition, this function is verified.		
24	Components		P
	Components which, if they fail, may cause risk of electric shock or fire (for example, SELV transformers, protective impedances, fuses, capacitors which may cause a shock hazard, and capacitors for electromagnetic interference suppression) shall comply either with the requirements of this standard or with the relevant IEC component standard as far as they reasonably apply. If components are marked with their operating characteristics, the conditions under which they are used in the electronic switch shall be in accordance with these markings, unless a specific exception is made in this standard. The testing of components which have to comply with other standards is, in general, carried out separately, according to the relevant standard as follows. If the component is marked and used in accordance with its marking, the number of samples is that required by the relevant standard. Where no IEC standard exists or when the component has not been tested in accordance with a relevant IEC standard, or is used not in accordance with its specified ratings, the component is tested under the conditions occurring in the electronic switch.		P
25	EMC requirements		P
	Switches for appliances shall fulfil the requirements for immunity and emission when used in accordance with the manufacturer's specification. Electronic switches intended to be built in or incorporated in an appliance shall comply with the requirements for immunity and emission of the end product.		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	Compliance is checked with the electronic switch incorporated or integrated in the appliance. NOTE Electronic switches intended to be built in or incorporated in an appliance are only tested if requested by the manufacturer. Electronic cord switches and independently mounted switches shall fulfil the requirements for immunity and emission when used in accordance with the manufacturer's declaration. Compliance is checked by 25.1 and 25.2 with the electronic cord switch or independently mounted switch tested as a separate device or together with the relevant appliance.		
	 **1a – Terminals without pressure plates**  **1b – Examples of pillar terminals** *D* conductor space (not specified) *g* distance between clamping screw and end-stop (not specified) **Figure 1 – Examples of pillar terminals**		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	 **2a – Screw terminals**  **2b – Stud terminals** A fixed part B washer or clamping plate C anti-spread device *D* conductor space (not specified) E stud **Figure 2 – Examples of screw terminals and stud terminals**		P
	 A saddle B cable lug or bar C stud *D* conductor space (not specified) **Figure 3 – Examples of saddle terminals**		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	 A locking means B cable lug or bar E fixed part F stud **Figure 4 – Examples of lug terminals**		P
	 A fixed part *D* conductor space (not specified) The bottom of the conductor space shall be slightly rounded in order to obtain a reliable connection. **Figure 5 – Examples of mantle terminals**		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

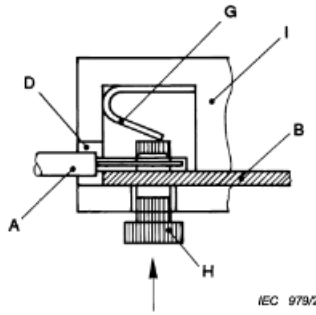


Figure 6a – Screwless terminal with indirect pressure clamping means and loosening with an actuating element

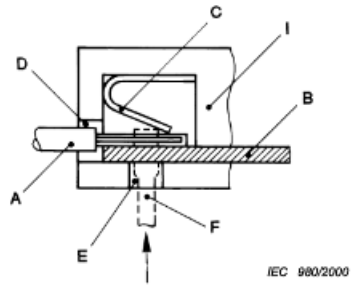


Figure 6b – Screwless terminal with direct pressure clamping means and loosening with a tool

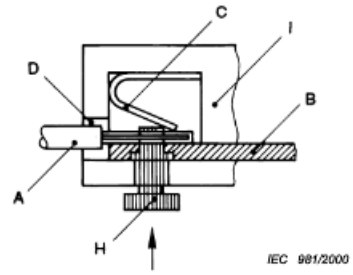
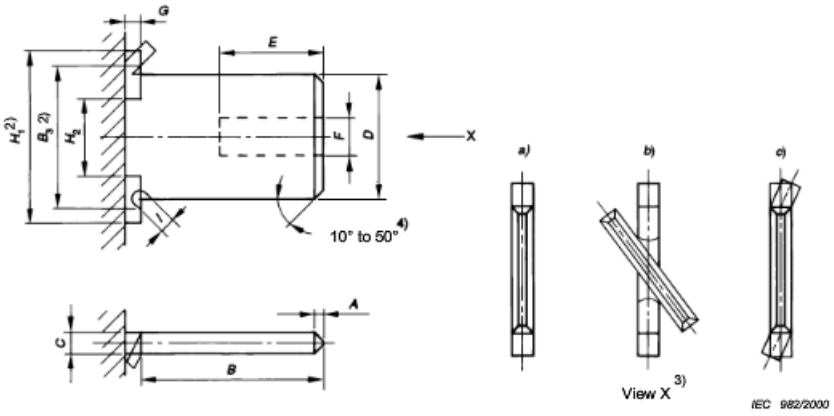


Figure 6c – Screwless terminal with direct pressure clamping means and loosening with an actuating element

A	conductor	F	tool (screwdriver)
B	current-carrying part	G	pressure-spring
C	clamping spring	H	actuating element
D	conductor opening	I	part of the switch
E	tool opening		

Figure 6 – Examples of screwless terminals

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P



Dimensions of tabs 5)

Dimensions in millimetres

Nominal size	*A* (Man-datory) Max.	*B* (Man-datory) Min.	*C* (Man-datory) +0,04 −0,03	*D* (Man-datory) +0,1 −0,1	*E* (Optional) Max.	*F* (Optional) Max.	*G* (Man-datory) Min.	H_2 (Man-datory) Min.	*I* (Optional) Diameter Max.
2,8 × 0,5	0,7	7,0	0,5	2,8	2,5	1,5	1,2	1,8	0,6
2,8 × 0,8	0,7	7,0	0,8	2,8	2,5	1,5	1,2	1,8	0,6
4,8 × 0,5 1)	1,2	6,2	0,5	4,7	4,2	1,6	1,2	3,0	1,0
4,8 × 0,8	1,2	6,2	0,8	4,7	4,2	1,6	1,2	3,0	1,0
6,3 × 0,8	1,3	7,8	0,8	6,3	5,7	2,0	1,2	4,0	1,3
9,5 × 1,2	1,3	12,0	1,2	9,5	6,5	2,0	1,2	6,2	1,8

1) Nominal size 4,8 × 0,5 is not recommended for new design.

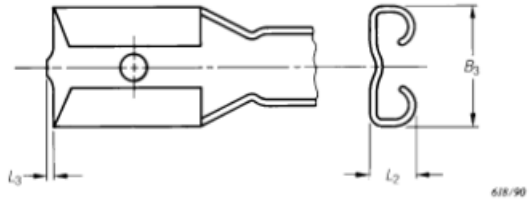
2) Dimensions "B_3" and "H_1" not specified.

3) View "X" shows examples a) to c) of different possible methods of fixation.

4) The end of the tab is shaped to facilitate the application of the female connector.

5) Tabs manufactured according to the dimensions of figure 7 will be compatible with female connectors manufactured according to IEC 60760. For push-on and pull-off forces, refer to annex H.

Figure 7 – Tabs of flat quick-connect terminations

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P

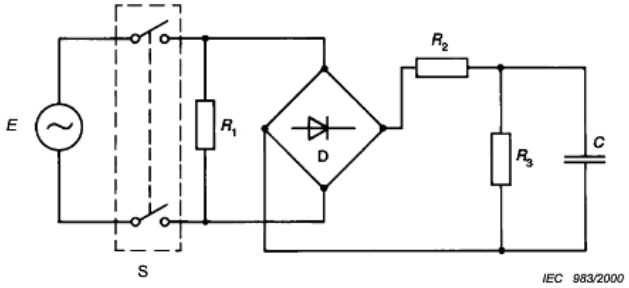
Dimensions of female connectors

Dimensions in millimetres

Connector for tab size	B_3 Max.	L_2 Max.	L_3 Max.
2,8 × 0,5	3,8	2,3	0,5
2,8 × 0,8	3,8	2,3	0,5
4,8 × 0,5 [1)]	6,0	2,9	0,5
4,8 × 0,8	6,0	2,9	0,5
6,3 × 0,8	7,8	3,5	0,5
9,5 × 1,2	11,1	4,0	0,5

1) Nominal size 4,8 × 0,5 is not recommended for new design.

Figure 8 – Female (test) connector of flat quick-connect termination

			P

$R_1 = E / I$ where E is the rated voltage and I is the rated resistive current or the rated current of the lamp;

$R_2 = R_1 \times 1{,}414 / (X - 1)$ where X is the ratio between the peak surge current and the rated resistive current, or the ratio of the peak inrush current of the cold lamp and the rated current of the lamp;

$R_3 = (800/X) \times R_1$

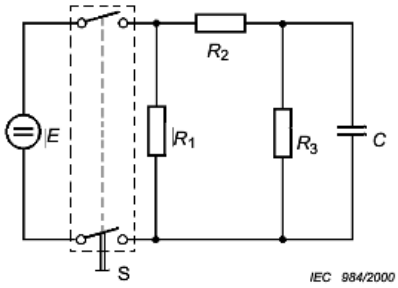
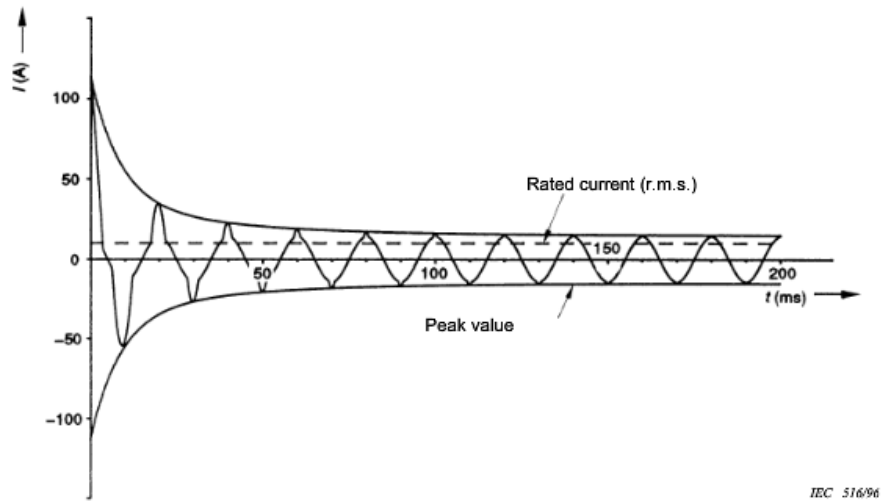
$C \times R_2 = 2\,500$ µs

D silicon rectifier-bridge

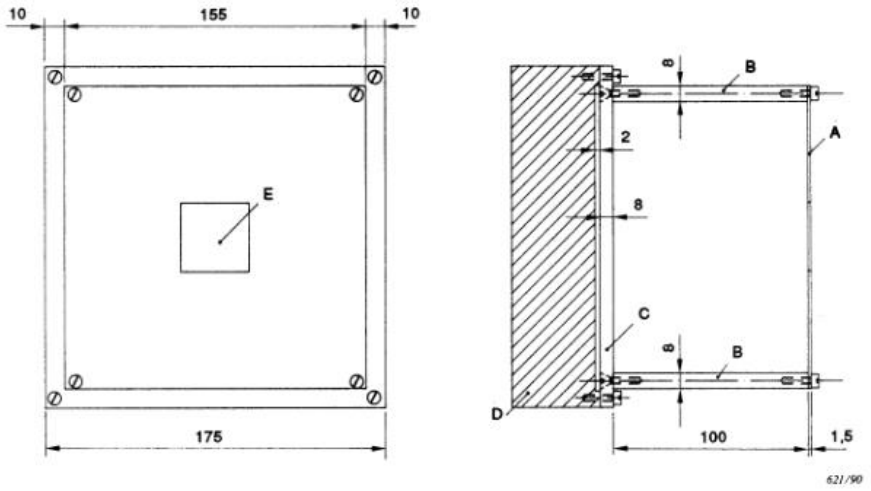
S specimen

The circuit elements and the source impedance are chosen so as to ensure a 10 % accuracy of the surge current, the peak inrush current of the cold lamp, the rated resistive current, or the rated current of the lamp.

Figure 9a – Circuit for capacitive load test and simulated tungsten filament lamp load test for a.c. circuits

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	 $R_1 = E / I$ where E is the rated voltage and I is the rated resistive current or the rated current of the lamp; $R_2 = R_1 / (X - 1)$ where X is the ratio between the peak surge current and the rated resistive current, or the ratio of the peak inrush current of the cold lamp and the rated current of the lamp; $R_3 = (800/X) \times R_1$ $C \times R_2 = 2\ 500\ \mu s$ S specimen The circuit elements and the source impedance are chosen so as to ensure a 10 % accuracy of the surge current, the peak inrush current of the cold lamp, the rated resistive current, or the rated current of the lamp. **Figure 9b – Circuit for capacitive load test and simulated lamp load test for d.c. circuits**		P
	 List of values $R_1 = 25\ \Omega$ $R_2 = 3{,}93\ \Omega$ $R_3 = 2\ 000\ \Omega$ $C = 636\ \mu F$ **Figure 10 – Values of the capacitive load test circuit for test of switches rated 10/100 A 250 V~**		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P



A interchangeable steel plate with a thickness of 1,5 mm
B aluminium plate with a thickness of 8 mm
C sheet of plywood with a thickness of 8 mm
D mounting-support of steel with a mass of 10 kg ± 1 kg
E cut-out in the steel plate for the specimen

Dimensions in millimetres

Figure 11 – Mounting device for the impact test

			P

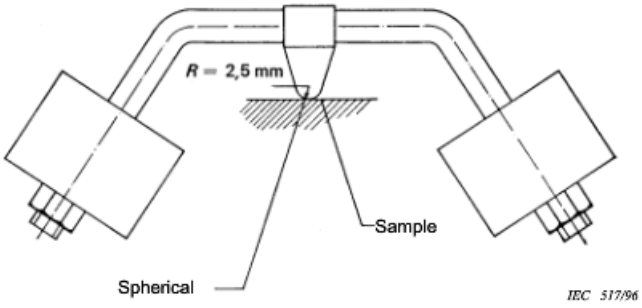
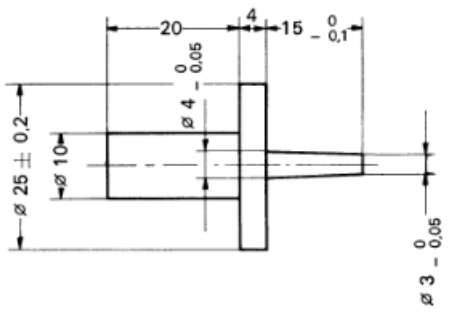


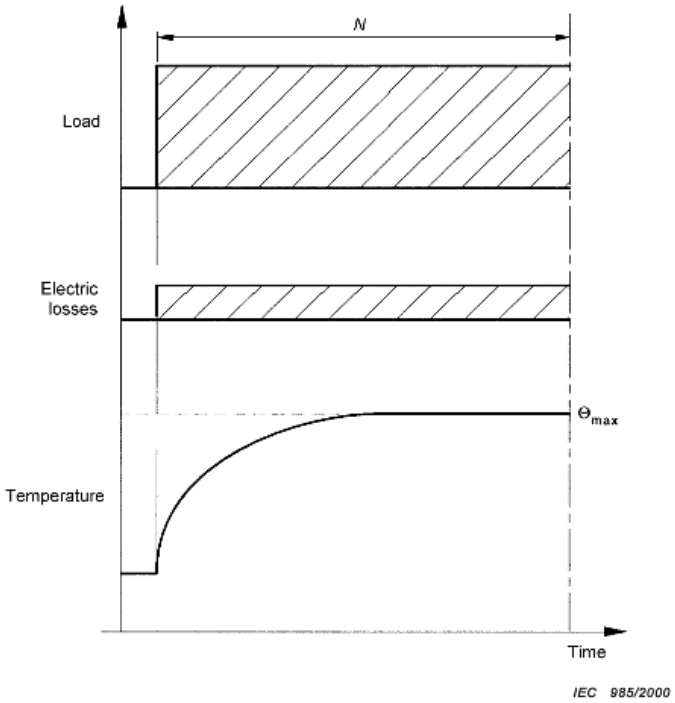
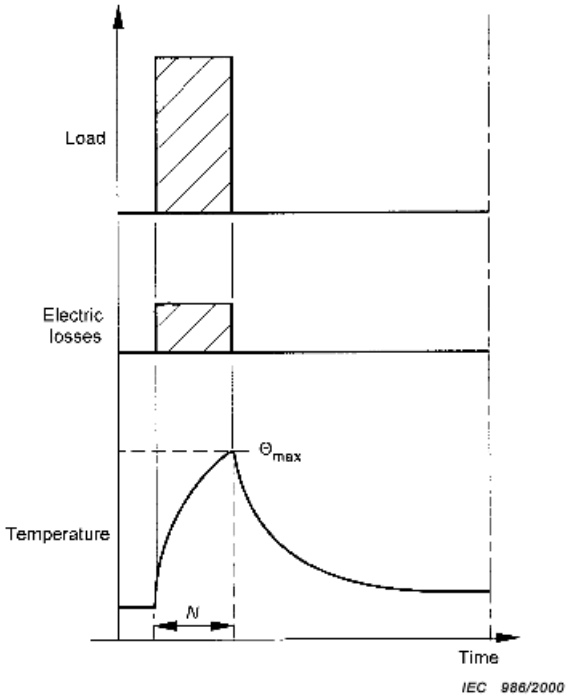
Figure 12 – Ball pressure apparatus

			P

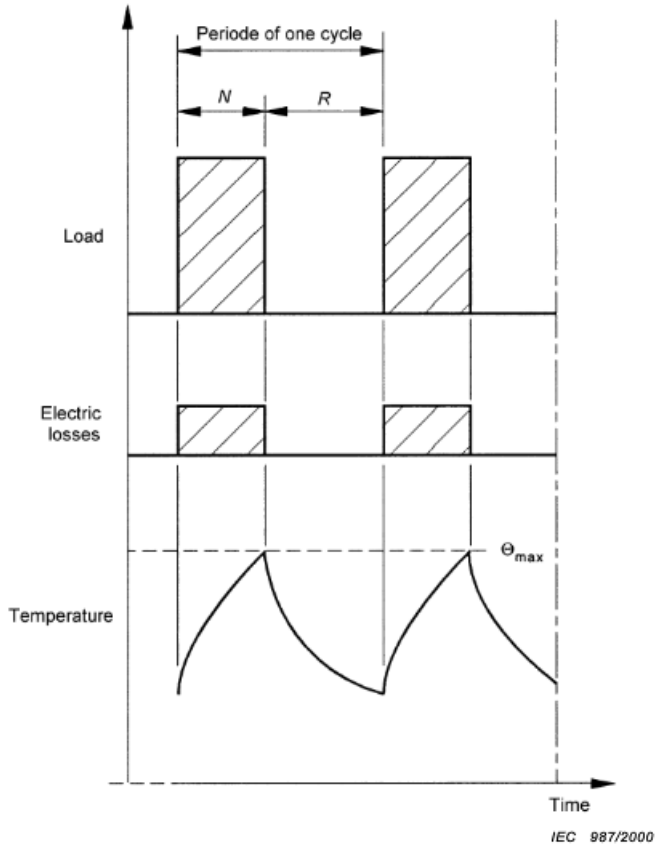


Dimensions in millimetres

Figure 13 – Test pin

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	 *N* Operation at constant load Θ_{max} Maximum temperature attained **Figure 14 – Continuous duty – Duty type S1** (see 7.1.16.1)		P
	 *N* Operation at constant load Θ_{max} Maximum temperature attained **Figure 15 – Short-time duty – Duty type S2** (see 7.1.16.2)		P

EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
			P



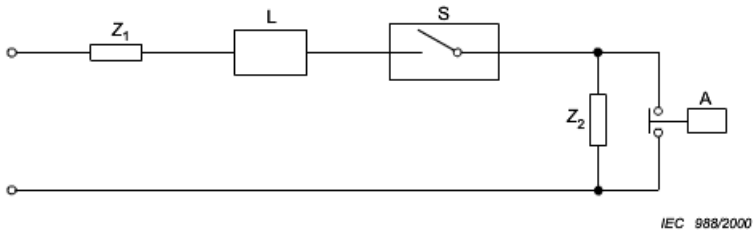
N Operation at constant load

R At rest and de-energized

Θ_{max} Maximum temperature attained

Figure 16 – Intermittent periodic duty – Duty-type S3 (see 7.1.16.3)

			P



A Auxiliary switch for causing the short circuit

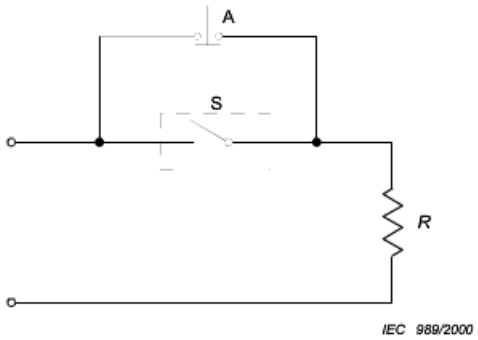
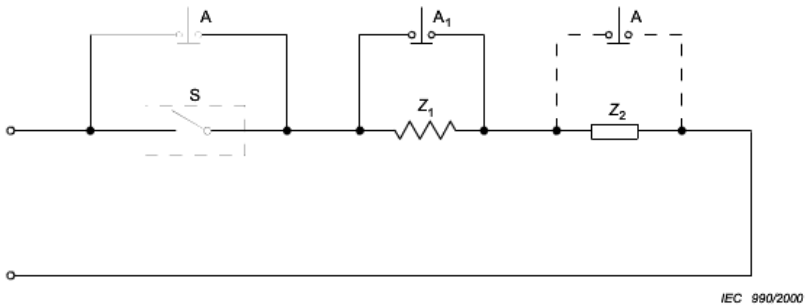
L Limiting device for the let-through I^2t

S Specimen

Z_1 Impedance for adjusting the prospective short-circuit current (non-inductive)

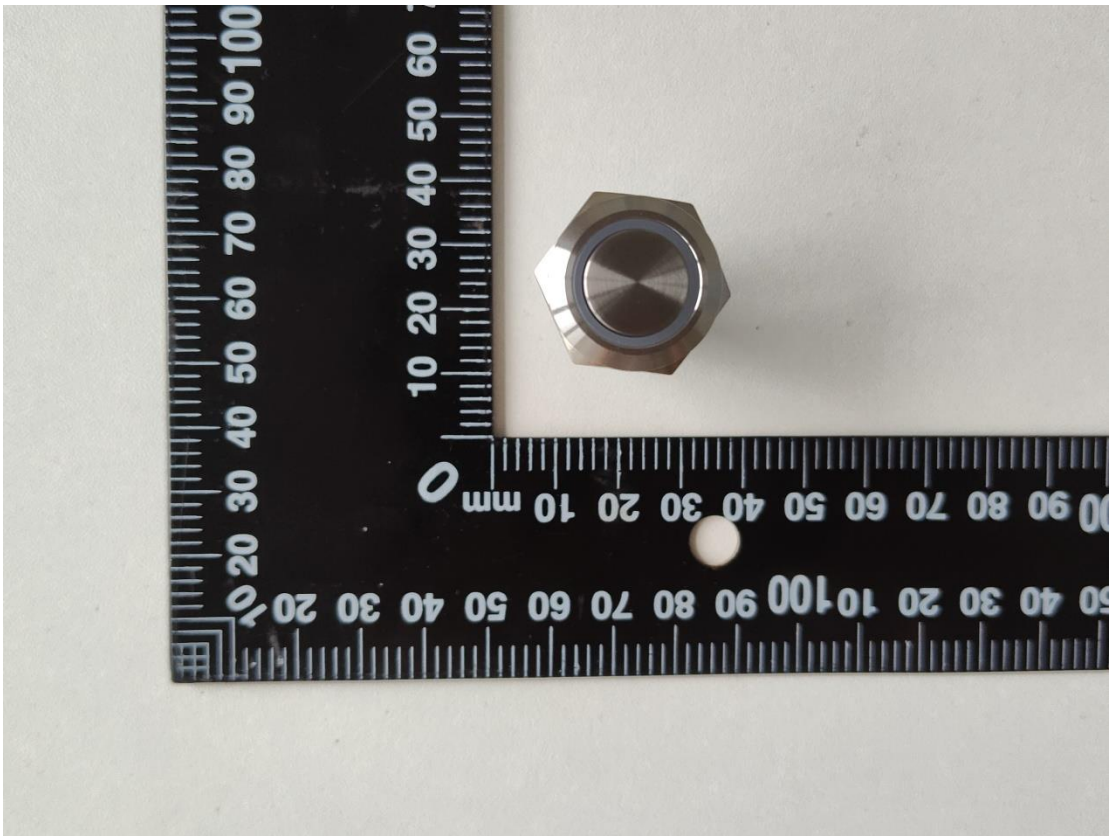
Z_2 Impedance for adjusting the load (non-inductive)

Figure 17 – Diagram for short-circuit test

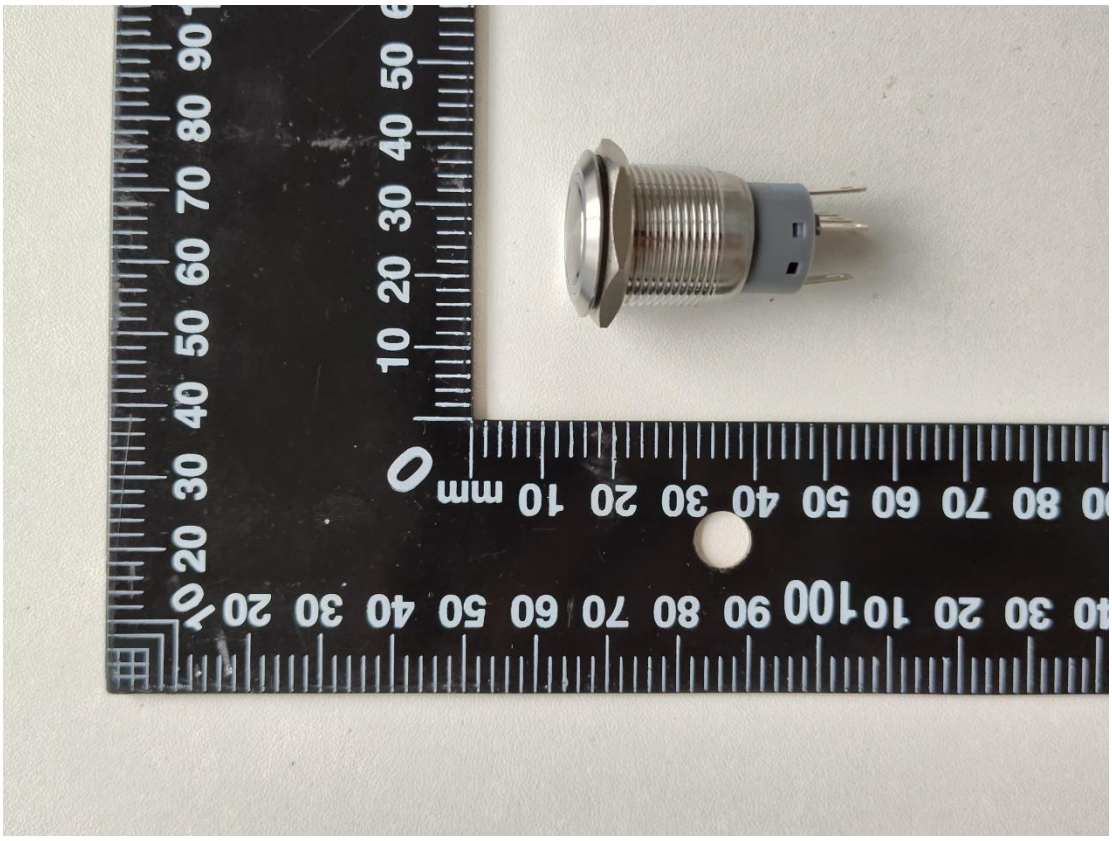
EN IEC 61058-1:2018			
Clause	**Requirement-Test**	**Result-Remark**	**Verdict**
	 A Auxiliary switch to set switch load *R* Resistive load to attain current S Test specimen **Figure 18 – Diagram for heating test**		P
	 A Auxiliary switch to set switch load A_1 Auxiliary switch to attain "break" current S Test specimen Z_1 Resistive load to attain "break" current Z_2 Load for "make" current The "make" test load is set by closing the auxiliary switches A and A_1 and adjusting Z_2. The "break" test load is set by closing the auxiliary switch A and adjusting Z_1 with the auxiliary switch A_1 open-circuited. Throughout the electrical endurance test, the auxiliary switch A is open-circuited. A_1 is initially closed and is open-circuited time-delayed after the test specimen closes, to reduce the "make" test load to the break load. After the test, the specimen S switches off, and the auxiliary switch A_1 is closed before the next operation of the test specimen. For the test of electrical contacts, the delay time shall be 50 ms to 100 ms. For the test of electronic switches, where the phase angle of the switched load voltage varies with the movement of the actuating member, the delay time is chosen in such a way that, depending on the operating speed of the actuating mechanism of the test equipment, A_1 is open-circuited at maximum phase angle. NOTE Some simulated loads, for example 12(2) A, will require auxiliary additional switches in order to set the correct break load. **Figure 19 – Diagram for endurance test**		P

Annex：Technical Information

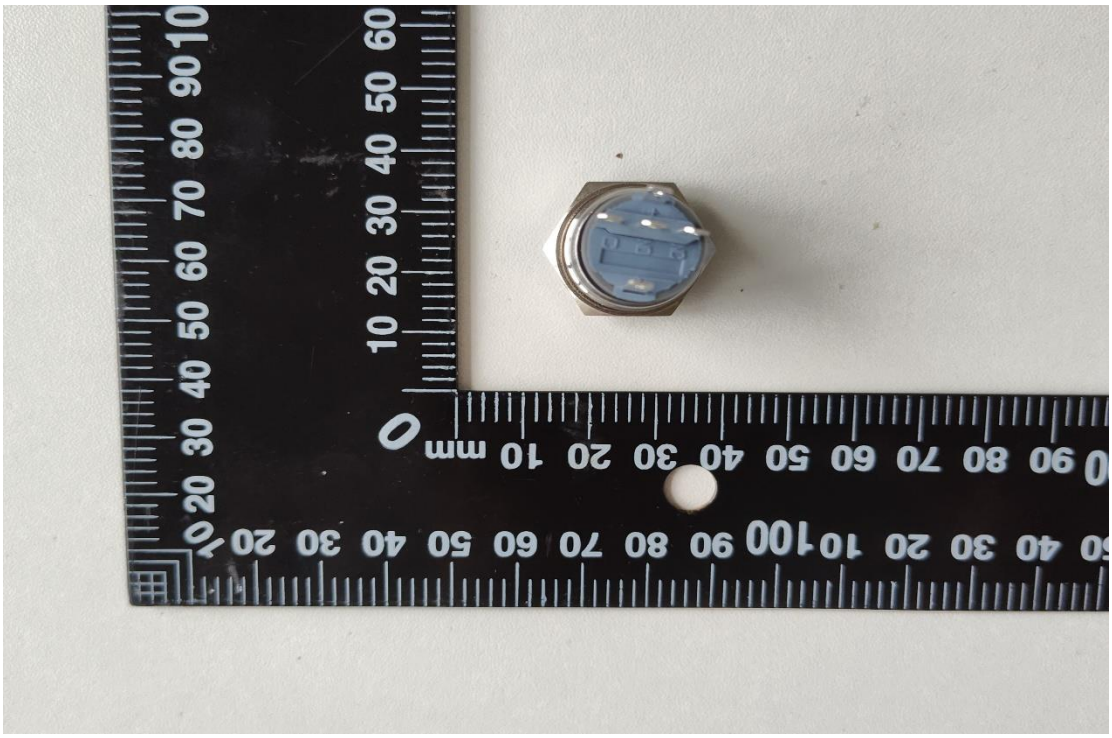
(1) Product Photos



A.1



A.2



A.3