

# TEST REPORT

on behalf of

YUEQING DAIER ELECTRON CO., LTD.

Micro Switch

M/N: KW4, KW4-1, KW4-2, KW4-3, KW4-4, KW4-5,  
KW4-D, KW4-F, KW4-H, KW4-L, KW4-Q, KW4-OZ.

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Date of Test: March 24<sup>th</sup>, 2017 to April 1<sup>st</sup>, 2017  
Date of Report: April 1<sup>st</sup>, 2017

<b>TEST REPORT</b> <b>EN 60947-5-1:2004+A1:2009</b> <b>Switches for appliances Part 1: General requirements</b>	
<b>Report reference No.</b> :	TLZJ17032810466
<b>Tested by (name+ signature)</b> .....	Karl Yip
<b>Approved by (name+ signature)</b> .....	Steven Zhang
<b>Date of issue</b> .....	April 1st, 2017
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<b>Testing laboratory</b> .....	Shanghai Global Testing Services Co., Ltd.
<b>Address</b> .....	No. 968 Meilong West Road, Minhang District, Shanghai,201104 China
<b>Testing procedure</b> .....	GTS
<b>Applicant</b> .....	YUEQING DAIER ELECTRON CO., LTD.
<b>Address</b> .....	No.1636 Liuhuang Road, Xirendang Industrial Zone, Liushi Town, Yueqing City, Wenzhou City, Zhejiang Province, China.
<b>Manufacturer</b> .....	YUEQING DAIER ELECTRON CO., LTD.
<b>Address</b> .....	No.1636 Liuhuang Road, Xirendang Industrial Zone, Liushi Town, Yueqing City, Wenzhou City, Zhejiang Province, China.
<b>Test specification</b> .....	CE
<b>Standard</b> .....	EN 60947-5-1:2004+A1:2009
<b>Test Report Form No.</b> .....	EN60947_1B
<b>TRFOriinator</b> .....	GTS
<b>Master TRF</b> .....	GTS
<b>Type of test object</b> .....	Micro Switch
<b>Model/type reference</b> .....	KW4、KW4-1、KW4-2、KW4-3、KW4-4、KW4-5、KW4-D、KW4- F、KW4-H、KW4-L、KW4-Q、KW4-OZ



Copy of marking plate



Test item particulars:	
- kind of control circuit device .....	
	<input checked="" type="checkbox"/> manual control switches, e.g. push-buttons, rotary switches, foot switches, ect.
	<input type="checkbox"/> electromagnetically operated control switches, either time delayed or instantaneous, e.g. contactor relays
	<input type="checkbox"/> pilot switches, e.g. pressure switches, temperature sensitive switches (thermostats)
	<input type="checkbox"/> position switches
	<input type="checkbox"/> associated control equipment, e.g. Push Buttons, ect
- kind of switching elements .....	
	<input checked="" type="checkbox"/> auxiliary contacts of a switching device (e.g. contactor, circuit-breaker, ect) which are not dedicated exclusively for use with the coil of that device
	<input type="checkbox"/> interlocking contacts of enclosure doors
	<input type="checkbox"/> control circuit contacts of rotary switches
	<input type="checkbox"/> control circuit contacts of overload relays
- number of poles.....	1
- kind of current.....	
	<input checked="" type="checkbox"/> A.C.
- interrupting medium.....	
	<input checked="" type="checkbox"/> air, <input type="checkbox"/> oil, <input type="checkbox"/> gas, <input type="checkbox"/> vacuum, <input type="checkbox"/> _____
- operating conditions .....	
- method of operations .....	<input checked="" type="checkbox"/> manual
	<input type="checkbox"/> electromagnetic
	<input type="checkbox"/> pneumatic
	<input type="checkbox"/> electro-pneumatic
- method of control .....	<input type="checkbox"/> automatic
	<input checked="" type="checkbox"/> non-automatic
	<input type="checkbox"/> semi-automatic
- rated and limiting values for switching elements:	
- voltages:	
- rated operational voltage Ue (V) .....	AC-15:Ue:125V/250V

- rated insulation voltage $U_i$ (V) .....	
- rated impulse withstand voltage $U_{imp}$ (kV) .....	
- currents:	
- conventional free air thermal current $I_{th}$ (A) .....	
- conventional enclosed thermal current $I_{the}$ (A) :	
- rated operational current $I_e$ (A) .....	
- rated frequency ( Hz).....	50
- utilization category.....	
	AC.....
- short-circuit characteristic:	
- rated conditional short-circuit current (kA) .....	.....kA
- co-ordination of short-circuit protective devices :	type
- kind of protective device .....	
- switching overvoltages .....	
	see EN 60947-5-1
- electrically separated contact elements .....	
	(state by manufacturer)
- actuating quantities for pilot switches.....	
- pilot switches having two or more contact elements.....	
- indication of contact elements of same polarity	
-IP code , incase of an enclosed control device	IP40
- pollution degree	
Suitability for isolation, with the symbol 07-13-06 of EN60617-7	



Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)
<b>Testing</b>	
Date of receipt of test item .....	March 24th, 2017
Date (s) of performance of tests .....	March 24th, 2017 to April 1st, 2017
<p>General remarks:</p> <p>"(see remark #)" refers to a remark appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma / point is used as the decimal separator.</p> <p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> <p>This test report includes the following:</p> <p>Annex I: Photo Documentation, <b>5</b> page(s)</p>	


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Clause	Requirement – Test	Result - Remark	Verdict

<b>8</b>	<b>Marking and documentation</b>		
8.1	The switch manufacturer provide adequate information to ensure that:		
	<ul style="list-style-type: none"> <li>• appliance manufacturer can install a switch</li> <li>• end user can use a switch as intended</li> <li>• tests performed in accordance with this standard</li> </ul>	OK	P
8.1.1	Information is provided in one or more of the following ways, as in table 3.		
	By Marking (Ma) on the switch itself.	OK	P
8.1.2	By Documentation (Do)		
	Documentation available in any suitable format.	OK	P

Table 3 No.	Switch information Characteristic	Way of information <input type="checkbox"/> C.T. <input type="checkbox"/> U.T.			
<b>1</b>	<b>SWITCH IDENTIFICATION</b>	<b>MA</b>	<b>MA</b>		
1.1	Manufacturer's name or trade mark			See page 1	P
1.2	Type reference			See page 1	P
<b>2</b>	<b>SWITCH ENVIRONMENT/MOUNTING</b>	<b>Do</b>	<b>Do</b>		
2.1	Degree of protection for the switch when mounted			IP 00 code of IEC 60529	P
2.2	Degree of protection against electric shock, from outside of an appliance			<input type="checkbox"/> Class 0 <input type="checkbox"/> Class I <input checked="" type="checkbox"/> Class II <input type="checkbox"/> Class III	P
2.3	Method of	<b>Do</b>	<b>Do</b>		
	<ul style="list-style-type: none"> <li>• mounting and actuating the switch</li> </ul>			Special holder in appliance	P
	<ul style="list-style-type: none"> <li>• earthing</li> </ul>			-	N/A
	Method(s) of mounting and orientation(s) declared.			OK	P
2.4	Pollution degree	<b>Do</b>	<b>Do</b>	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	P
<b>3</b>	<b>TEMPERATURE</b>	<b>Ma</b>	<b>Do</b>		
3.1	Ambient temperature limits if $\neq 0 - 55^{\circ}\text{C}$			T55 °C	N/A
<b>4</b>	<b>ELECTRICAL LOAD / CONNECTION</b>	<b>Ma</b>	<b>Do</b>		
4.1	Rated voltage or voltage range (V)			125/250 V	P
4.2	Nature of supply.			~	P
4.3	Frequency or frequency range. (Hz)			-	N/A
4.4	Circuits of substantially resistive loads	<b>Ma</b>	<b>Do</b>		
	<ul style="list-style-type: none"> <li>• rated current</li> </ul>			5 A	P
4.5	Circuits for resistive and motor load with a power factor $\geq 0.6$	<b>Ma/Do</b>	<b>Do</b>		
	<ul style="list-style-type: none"> <li>• rated current</li> </ul>			- A	N/A
4.6	Circuits for resistive and capacitive load	<b>Ma</b>	<b>Do</b>		
	<ul style="list-style-type: none"> <li>• rated current and peak surge current</li> </ul>			- A	N/A
4.7	Circuits for tungsten filament lamp load	<b>Ma/Do</b>	<b>Do</b>		

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Clause	Requirement – Test			Result - Remark		Verdict
	• rated current			-	A	N/A
4.8	Circuits for declared specific loads	<b>Do</b>				
	• details of the appliance to be controlled			-		N/A
4.9	Switches for more than one circuit	<b>Ma / Do</b>	<b>Do</b>			
	• current to each circuit and to each terminal			-	A	N/A
	Made clear to which circuit or which terminal the information applies			-		N/A
4.10	Rated impulse withstand voltage	<b>Do</b>	<b>Do</b>	2500	V	P
4.14	Type and/or connection of switch	<b>Do</b>	<b>Do</b>	Single pole, single load		P
4.15	Circuits for specific lamp load	<b>Do</b>	<b>Do</b>			
	• rated current and inrush current			-	A	N/A
4.16	Circuits for an inductive load with a power factor $\geq 0.6$	<b>Do</b>	<b>Do</b>			
	• rated current			-	A	N/A
4.17	Circuits for specific load of motor with a locked rotor and with a power factor $\geq 0.6$					
	• rated current			<b>Do</b>	<b>Do</b>	N/A
<b>5</b>	<b>TERMINALS / CONDUCTORS</b>					
5.1	All terminals suitably identified	<b>Ma</b>	<b>Ma</b>	1, 2, 3, 4		P
5.2	Terminals for earthing marked with the protective earth symbol	<b>Ma</b>	<b>Ma</b>	-		N/A
5.3	Information for terminal if this needs prepared conductors or use of special purpose tool	<b>Do</b>	<b>Do</b>	-		N/A
5.4	Method of connection and disconnection for screw less terminals	<b>Do</b>	<b>Do</b>	-		N/A
5.5	Type of conductor to be connected to the terminal	<b>Do</b>	<b>Do</b>	Hand with soldering iron		P
5.6	Suitability for interconnection of two or more conductors to terminals	<b>Do</b>	<b>Do</b>	-		N/A
5.7	Type of solder terminal for	<b>Do</b>	<b>Do</b>	<input checked="" type="checkbox"/> hand with soldering iron <input type="checkbox"/> solder bath <input checked="" type="checkbox"/> securing the conductor by mechanical means and by soldering		P
				<input checked="" type="checkbox"/> type 1 <input type="checkbox"/> type 2		P
5.8	Suitability for connection of supply conductors to terminals	<b>Do</b>	<b>Do</b>	<input type="checkbox"/> unprepared <input type="checkbox"/> prepared		P
5.9						
5.10	Tabs with dimension other than those according to IEC 61210	<b>Do</b>	<b>Do</b>			
	• appropriate female connector ( <i>size, material etc</i> )					N/A
<b>6</b>	<b>OPERATING CYCLES / SEQUENCE</b>					
6.1	Number of operating cycles	<b>Ma</b>	<b>Do</b>	1E4		P
6.2	Operating sequence for switches with more than one circuit	<b>Do</b>	<b>Do</b>	-		N/A

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Clause	Requirement – Test	Result - Remark			Verdict
6.3	Forces applied to end stops or full travel of actuating member	Do	Do	-	N/A
<b>7</b>	<b>SIGNAL INDICATORS</b>				
7.1	Maximum power of tungsten filament signal lamps.	Ma	Ma		N/A
	Marking visible when replacing lamp	Ma	Ma	-	N/A
7.2	Intended function or operation of the signal indicator	Do	Do	-	N/A
<b>8</b>	<b>CIRCUIT DISCONNECTION</b>				
8.2		Ma	Do	<input checked="" type="checkbox"/> Micro	P
8.3		Do	Do	<input type="checkbox"/> Full	
<b>9</b>	<b>INSULATING MATERIALS</b>				
9.1	Proof tracking index PTI			175 V	P
9.2 – 9.4	Level of glow-wire test	-	Do	<input type="checkbox"/> 650°C <input type="checkbox"/> 750°C <input checked="" type="checkbox"/> 850°C	P
12.2	Test conditions for switches having a contact making and breaking speed independent from the speed of actuation	Do	Do	-	N/A
8.3	When symbols are used, they be as follows ( <i>see note 1</i> ):				
	<input checked="" type="checkbox"/> Volts (V) <input checked="" type="checkbox"/> Amperes (A) <input type="checkbox"/> Watts (W) <input type="checkbox"/> Volt-amperes (VA)				P
	Alternating current ( <i>single-phase</i> )				
	<input checked="" type="checkbox"/> $\sim$ <input type="checkbox"/> or a.c. <input type="checkbox"/> or $\sim$				P
	Alternating current ( <i>3-phase</i> )				
	<input type="checkbox"/> $3\sim$ <input type="checkbox"/> or 3 a.c. <input type="checkbox"/> or $3\sim$ a.c.				N/A
	Alternating current ( <i>3-phase with neutral</i> )				
	<input type="checkbox"/> $3N\sim$ <input type="checkbox"/> or 3 N a.c. <input type="checkbox"/> or $3N\sim$ a.c.				N/A
	Direct current				
	<input type="checkbox"/> = = = <input type="checkbox"/> or d.c. <input type="checkbox"/> or = = = d.c.				N/A
	<input type="checkbox"/> Earth symbol  <input type="checkbox"/> Protective earth symbol 				N/A
	Non-protected against solid objects	IP0X	OK		P
	Protected against solid objects	IP1X – IP6X	-		N/A
	Non-protected against water	IPX0	OK		P
	Protected against water	IPX1 – IPX7	-		N/A
	Ambient temperature limit(s)	T	-		N/A
	Frequency of supply	Hz	-		N/A
	Number of operating cycles	See 8.7	OK		P
	Symbol for micro-disconnection	$\mu$	OK		P
	Symbol for the				

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Clause	Requirement – Test	Result - Remark	Verdict
	<input type="checkbox"/> "OFF"-position or the direction of actuation to the "OFF" position <input type="checkbox"/> "ON"-position or the direction of actuation to the "ON" position		-
8.4	Information about rated current and rated voltage provided by using figures alone.		
8.4.1	<input type="checkbox"/> Resistive load and/or motor load	-	N/A
8.4.2	<input type="checkbox"/> Resistive load and capacitive load	-	N/A
8.4.3	<input type="checkbox"/> Resistive load and tungsten filament lamp load	-	N/A
8.4.4	<input type="checkbox"/> Declared specific loads	-	N/A
8.4.5	<input type="checkbox"/> Inductive load according	-	N/A
8.4.6	<input type="checkbox"/> Specific load of motor ( <i>locked rotor</i> )	-	N/A
8.4.7	The thermal current $I_{th}$ , if applicable.	-	A
	Test conditions for verifying $I_{th}$ specified.	-	N/A
	Information concerning thermal current $I_{th}$ given together with the maximum rated current $I_R$	-	N/A
	Minimum power specified is indicated together with the maximum power.	-	N/A
8.5	Information about rated ambient temperature "T"		
	<input type="checkbox"/> 25 T 85 (-25 °C up to +85 °C) ( <i>example</i> ) <input type="checkbox"/> T 85 (0 °C up to +85 °C) ( <i>example</i> )	-	N/A
	If no information is given		
	<ul style="list-style-type: none"> <li>rated ambient temperature range is 0 – 55 °C</li> </ul>	OK	P
8.5.1	Switches only partially suitable for a rated ambient temperature > 55 °C		
	<ul style="list-style-type: none"> <li>T 85 / 55 (<i>example</i>)</li> </ul>	-	N/A
8.5.2	Switches only partially suitable for a rated ambient temperature > 55 °C or 35 °C		
	<ul style="list-style-type: none"> <li>T 85 / 35 (<i>example</i>)</li> </ul>	-	N/A
8.6	Symbol for Class II equipment or appliances not used for switches.		N/A
8.7	Information about rated operating cycles by using symbol "E", indicating exponent		P
8.8	Required marking is preferably on the body of the switch.		P
	Not on screws, removable washers or other removable.		P
8.9	The required marking legible and durable. Requirements of 8.1 to 8.8 checked by inspection and rubbing the marking by hand 15 back-and-forth movements in about 15 s with a piece of cloth.		
	<ul style="list-style-type: none"> <li>soaked with distilled water, followed by soaked with petroleum spirit</li> </ul>	OK	P
	During tests the cloth pressed on the marking with a pressure of about 2 N/cm <sup>2</sup> .	OK	P
	After these tests the marking is still legible.	OK	P
8.10	Switches with own enclosure and not intended to be incorporated in an appliance,		
	<ul style="list-style-type: none"> <li>"OFF"-position, clearly indicated</li> </ul>	-	N/A
	Switches with micro-disconnection		

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Clause	Requirement – Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> <li>not marked with symbol "O" for the "OFF" position</li> </ul>	-	N/A
	Switches where marking of switch position is impossible or leads to misunderstanding		
	<ul style="list-style-type: none"> <li>direction of actuation(s) is marked</li> </ul>	-	N/A
	Switches having more than one actuating member		
	<ul style="list-style-type: none"> <li>marking is indicate for each of the actuating members, the effect achieved by its operation</li> </ul>	-	N/A
<b>9</b>	<b>Protection against electric shock</b>		
9.1	Switches are constructed so that there is adequate protection against contact with live parts. Checked by inspection and by the following test:		
	a) Applied to accessible parts on the switch when mounted according to declared with detachable parts, except lamps with caps removed	-	N/A
	b) Jointed test finger of IEC 60529 applied without force in every possible position.	-	N/A
	Openings preventing the entry of the finger tested by means of a straight unjointed test finger of the same dimensions in IEC 60529		
	<ul style="list-style-type: none"> <li>applied with a force of 20 N.</li> </ul>	-	N/A
	If the unjointed test finger enters the opening		
	<ul style="list-style-type: none"> <li>test repeated with the jointed finger in the angled position</li> </ul>	-	N/A
	Electrical contact indicator used to show contact.	-	N/A
	c) Openings in insulating material and in unearthed metal parts tested by applying the test pin figure 13 without force in every possible position.	-	N/A
	Not possible with either the standard test finger or the test pin to touch bare live parts.	-	N/A
	For switches which have any parts of double insulation construction		
	<ul style="list-style-type: none"> <li>not possible to touch with the standard test finger unearthed metal parts separated from live parts by basic insulation, or by the basic insulation itself</li> </ul>	-	N/A
	Insulating properties of lacquer, enamel, paper, cotton, oxide film on metal parts, beads and sealing compounds which soften in heat		
	<ul style="list-style-type: none"> <li>not used give protection against live parts</li> </ul>	-	N/A
9.1.2	Cover or cover-plate or a fuse which can be removed without the use of a tool or instruction for use specifies that covers and cover plates fastened by means of a tool have to be removed. Checked with test finger B according to IEC 61032.		
	<ul style="list-style-type: none"> <li>Protection against contact with live parts assured even after removal of the cover or cover-plate</li> </ul>	-	N/A
9.1.3	Switch provided with a hole accessible to the user - when mounted as declared - for adjusting the setting of the switch. Checked by applying a test pin according to IEC 61032, figure 3, test probe C, through the hole.		
	The pin does not touch live parts.	-	N/A
9.2	Actuating member is adequately fixed if removal of the actuating member gives access to live parts.		

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Clause	Requirement – Test	Result - Remark	Verdict
	Checked by inspection and by applying the jointed test finger B according to IEC 60529 without force.	-	N/A
9.3	For switches for appliances other than of Class III, actuating members is of one of the following types:		
	<input type="checkbox"/> a) Insulating material. <input type="checkbox"/> b) Metal separated from basic insulated parts by supplementary insulation. <input type="checkbox"/> c) Metal separated from live parts by double or reinforced insulation.	-	N/A
9.4	Capacitors not connected to unearthed metal parts which are accessible when the switch is mounted	-	N/A
	Metal casing of capacitors are separated by supplementary insulation from accessible unearthed metal parts, when the switch is mounted.	-	N/A
<b>10</b>	<b>Provision for earthing</b>		
10.1	Switches for Class II have no provision for earthing.	-	N/A
	Interconnections for maintaining the earthing circuit are permitted.	-	N/A
10.2	Earthing terminals, earthing terminations and other earthing means		
	• not connected electrically to any neutral terminal	-	N/A
10.3	Accessible metal parts of switches for Class I appliances		
	• have provision for earthing	-	N/A
10.4	The connection between an earthing terminal, earthing termination or other earthing means, and parts required to be connected thereto, is of low resistance.		
	a) A current of $1.5I_R$ but $\geq 25$ A a.c. with $\leq 12$ V, passed between the type of used earthing and each of the parts in turn	-	A N/A
	The resistance not exceeding 50 mΩ.	-	mΩ N/A
10.5	Earthing terminals of all types for unprepared conductors		
	• is of a size $\geq$ required for the corresponding current carrying terminal	-	N/A
	Not possible to loosen the clamping means without the aid of a tool, and they are adequately locked against unintentional loosening.	-	N/A
10.5.1	Terminals according to 11.1 and 11.2 provide sufficient resilience for adequate locking against unintentional loosening.	-	N/A
10.5.2	Switch subjected to excessive vibration or temperature cycling,		
	• special provisions are used	-	N/A
10.6	Thread-cutting and thread-forming screws may be used to provide earthing continuity; provided it is not necessary to disturb the connection in normal use and at least 2 screws are used for each connection.		
	• checked by inspection and the tests of 19.2	-	N/A
10.7	All parts of an earthing terminal, no risk of corrosion.	-	N/A
10.8	The body of an earthing terminal made		

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Clause	Requirement – Test	Result - Remark	Verdict
	<input type="checkbox"/> of brass <input type="checkbox"/> or other metal resistant to corrosion and rusting	-	N/A
10.9	Body of an earthing terminal is part of a frame or enclosure of aluminium or aluminium alloy,		
	<ul style="list-style-type: none"> <li>precautions taken to avoid risk of corrosion resulting from contact between copper and aluminium or its alloys</li> </ul>	-	N/A
<b>11</b>	<b>Terminals and terminations</b>		
11.1	Terminals for unprepared copper conductors		
11.1.1	Common requirements		
11.1.1.1	Terminals connection is made of screws, nuts, springs, wedges, eccentrics, cones or equally effective means or methods, without requiring a special tool for connection or disconnection.	-	N/A
11.1.1.2	Terminals is fixed that they will not work loose when clamping means are tightened or loosened. Checked by fastening and loosening 10 times		
	<ul style="list-style-type: none"> <li>with a conductor having the <b>maximum or declared</b> cross-sectional area in table 4</li> </ul>	-	mm <sup>2</sup> N/A
	<ul style="list-style-type: none"> <li>screw-type terminals, torque as in table 20</li> </ul>	-	Nm N/A
11.1.1.3	Terminals designed or placed that a conductor cannot slip out while being connected or the switch is operated as intended. Checked by the following tests:		
	a) Terminals fitted with conductors of <b>maximum or declared</b> cross-sectional areas to table 4	-	mm <sup>2</sup>
	Clamping means is fully tightened with the torque according to table 20.	-	Nm
	Test repeated with conductors of <b>minimum</b> cross-sectional area to table 4.	-	mm <sup>2</sup>
	After the test, the conductor have not escaped into or through the gap between the clamping means and retaining device.	-	N/A
11.1.1.4	Terminals for connection of flexible conductors located and shielded if a wire of a flexible conductor escapes from a terminal when the conductors are fitted. A free 8-mm wire of a flexible conductor does not make contact between live parts		
	<input type="checkbox"/> and accessible metal parts <input type="checkbox"/> and metal parts separated from accessible metal parts only by supplementary insulation for switches for class II appliances	-	N/A
	The free wire of a flexible conductor connected to an earthing terminal does not touch any live part.	-	N/A
11.1.1.5	Terminals so designed that they clamp the conductor without undue damage to the conductor	-	N/A
11.1.1.6	Terminals so designed that insertion of the conductor is prevented by a stop.		
	<ul style="list-style-type: none"> <li>inspection and tests of 11.1.1.3 and 11.1.1.4</li> </ul>	-	N/A
11.1.2	Screw-type terminals for unprepared copper conductors		
11.1.2.1	Screw-type terminals allow connection of conductors having cross-sectional areas as in table 4. Checked by inspection, measurement and insertion of		
	<ul style="list-style-type: none"> <li>flexible rigid conductors</li> </ul>	-	mm <sup>2</sup> N/A
	<ul style="list-style-type: none"> <li>rigid conductors</li> </ul>	-	mm <sup>2</sup> N/A

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Clause	Requirement – Test	Result - Remark	Verdict

	The conductors enter into the terminal without undue force to the designed depth of the terminal.	-		N/A
11.1.2.2	Screw-type terminals clamp the conductor reliably and between metal surfaces. a) The terminals are fitted with conductors of			
	• <b>declared</b> cross-sectional areas in table 4	-	mm <sup>2</sup>	N/A
	• <b>largest</b> cross-sectional areas in table 4	-	mm <sup>2</sup>	N/A
	• <b>smallest</b> cross-sectional areas in table 4	-	mm <sup>2</sup>	N/A
	• Terminal screws tightened with a torque of appropriate column of table 20.	-	Nm	N/A
	a) If the screw has a hexagonal head with a slot, the torque applied is equal to column III of table 20.	-	Nm	N/A
	c) Each conductor subjected to a pull force given in table 6, applied without jerks, for 1 min, in the direction of the axis of the conductor space.			

Table 6	Pulling forces for screw-type terminals			
	• Terminal size	-		
	• Pulling force	-	N	
	During test, conductor does not move noticeably in the terminal.	-		N/A
11.1.2.3	Screws and nuts for clamping the conductors does not serve to fix any other part.			N/A
11.1.3	Screw less terminals for unprepared copper conductors			
11.1.3.1	Screw less terminals allow, proper connection of conductors having cross-sectional areas as specified in table 4			
	• $\leq 2.5$ mm <sup>2</sup> for flexible conductors	-		N/A
	• and $\leq 4$ mm <sup>2</sup> for rigid conductors	-		N/A
	It is obvious how the insertion and disconnection of the conductors are intended to be effected.	-		N/A
	Intended disconnection of a conductor can be effected manually with or without the help of a tool in normal use.	-		N/A
	Openings for the use of a tool intended to assist the insertion or disconnection is clearly distinguishable from the opening for the conductor.	-		N/A
	The conductors enter without undue force into the terminal aperture to the designed depth.	-		N/A
11.1.3.2	Screw less terminals withstand the mechanical stress occurring in normal use.			
	Conductor clamped reliably and between metal surfaces	-		N/A
	Except for terminals in circuits carrying a current $\leq 0.2$ A, one of the surfaces may be non-metallic.	-		N/A
	Checked with uninsulated copper conductors with cross-sectional area as in table 4:			
	• <b>declared</b> cross-sectional area	-	mm <sup>2</sup>	
	• <b>largest</b> cross-sectional area	-	mm <sup>2</sup>	
	• <b>smallest</b> cross-sectional area	-	mm <sup>2</sup>	
	a) <b>rigid conductors</b>			

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Clause	Requirement – Test	Result - Remark	Verdict

	<ul style="list-style-type: none"> <li>5 insertions and disconnections for <b>solid</b></li> </ul>	-	N/A
	<ul style="list-style-type: none"> <li>1 insertion and disconnection for <b>stranded</b></li> </ul>	-	N/A
	b) <b>or flexible:</b> 5 insertions and disconnections;	-	N/A
	c) <b>or rigid and flexible:</b> tests are carried out with rigid and flexible conductors for 5 times	-	N/A
	For each insertion, the conductors are either pushed as far as possible into the terminal or so inserted that adequate connection is obvious.	-	N/A
	After each insertion, conductor twisted 90° in an axial direction then subjected to a pull force in table 6 without jerks, for 1 min.	-	N
	During the application of the pull, the conductor does not come out of the terminal.	-	N/A
	After these tests, neither the terminals nor the clamping means have worked loose.	-	N/A
11.1.3.3	Screw less terminals for interconnection of more than one conductor so designed that		
	<ul style="list-style-type: none"> <li>operation of one clamping means is independent of the operation of one other clamping means;</li> </ul>	-	N/A
	<ul style="list-style-type: none"> <li>during the disconnection, the conductors can be disconnected simultaneously or separately</li> </ul>	-	N/A
11.1.3.4	Screw less terminals withstand the thermal stress occurring in normal use. Clamping means of screw less terminal does form part of the conductive path through the switch		
	<ul style="list-style-type: none"> <li>checked during the tests of clause 17</li> </ul>	-	N/A
	Switch rated $\leq 1E4$ cycles, or the clamping means of the screw less terminal forms part of the conductive path through the switch, checked by thermal endurance test.		
	Maximum $I_R$ is passed through the switches	-	A
	Subjected to 192 test cycles, each cycle duration of approximately 1h, as follows:		
	a) temperature in the cabinet is raised in $\approx 20$ min to the maximum ambient temperature	-	$^{\circ}C \pm 5^{\circ}C$ of this value $\approx 10$ min.
	b) Switches then cooled down in $\approx 20$ min to a temperature of $\approx 30^{\circ}C$ with no current flowing through the specimens	-	$^{\circ}C$ for $\approx 10$ min
	c) Temperature in the heating cabinet measured $\geq 50$ mm from the specimen assemblies.	-	N/A
	After the 192 test cycles the $\Delta T$ does not exceed 55 K, samples 1 – 3:	-	K
11.2	Terminals for prepared copper conductors and/or requiring the use of a special purpose tool.		
11.2.1.1	Terminals suitable for their purpose when the connection made as declared.		
	<ul style="list-style-type: none"> <li>inspection and tests of clauses 16 and 19</li> </ul>	OK	P
11.2.1.2	Terminals allow connection of conductors having cross-sectional areas as declared.	OK, 0,5-0,75 mm <sup>2</sup> (I <sub>r</sub> =5A)	P
11.2.1.3	Terminals so designed that they make connection reliably between metal surfaces and without undue damage to the conductor.		
	<ul style="list-style-type: none"> <li>inspection and the tests of clauses 16 and 19</li> </ul>	-	N/A
11.2.1.4	Terminals so designed that the insertion of the conductor is limited by a stop		

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Clause	Requirement – Test	Result - Remark	Verdict

	<ul style="list-style-type: none"> <li>inspection and tests of 11.2.1.2 and 11.2.1.3</li> </ul>	-	N/A
11.2.2	Screw-type terminals for prepared copper conductors		
	<ul style="list-style-type: none"> <li>No further specific requirements.</li> </ul>	-	N/A
11.2.3	Screw less terminals for prepared copper conductors		
11.2.3.1	Screw less terminals clamp the conductor between metal surfaces	-	N/A
	Except for terminals in circuits carrying a current $\leq 0.2$ A, one of the surfaces may be non-metallic.	-	N/A
11.2.3.2	Screw less terminals withstand the thermal stress occurring in normal use.		
	<ul style="list-style-type: none"> <li>checked by test according to 11.1.3.4</li> </ul>	-	N/A
11.2.3.3	It is obvious how insertion and disconnection of the conductors are intended to be effected	-	N/A
11.2.4	Non-disconnectable screw less terminations		
11.2.4.1	Non-disconnectable screw less terminations clamp the conductor between metal surfaces	-	N/A
	Except if they carrying a current $\geq 0.2$ A, one of the surfaces may be non-metallic	-	N/A
11.2.4.2	Screw less terminations withstand thermal stress occurring in normal use		
	<ul style="list-style-type: none"> <li>Checked by test according to 11.1.3.4</li> </ul>	-	N/A
11.2.4.3	It is obvious how insertion of the conductors are intended to be effected	-	N/A
11.2.5	Tabs of flat quick-connect terminations		
11.2.5.1	Tabs forming part of a switch complies with the dimensions according to figure U.1 (see Annex U)	-	N/A
	Tabs with dimensions other than those according to IEC 61210 or Annex U allowed if the dimensions and shapes are such that in normal use, they function safely with the female connector shown in Figure 8 or a special female connector is prescribed.	-	N/A
11.2.5.2	Material and plating of tabs is appropriate to $T_{max}$ of the tab as in table 7		

Table 7	Material and plating for tabs	$T_{max}$ °C		
	Bare copper	155	-	N/A
	Bare brass	210	-	N/A
	Tin plated copper and copper alloys	160	-	N/A
	Nickel plated copper and copper alloys	185	-	N/A
	Silver plated copper and copper alloys	205	-	N/A
	Nickel plated steel	400	-	N/A
	Stainless steel	400	-	N/A
11.2.5.3	Tabs allow the application and withdrawal of female connectors without damage. Checked by applying axial forces without jerks equal to those specified in table 8			

Table 8	Tab size	Push (N)	Pull (N)		
				-	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
11.2.5.4	<p>11.2.5.4 Tabs are adequately spaced to allow connection of uninsulated female connectors. Checked by applying female connector to each tab in the most onerous orientation</p> <ul style="list-style-type: none"> <li>during this operation no strain or distortion occur to any of the tabs or to their adjacent parts,</li> <li>nor is the creepage distances or clearances reduced to values &lt; than those in clause 20.</li> </ul>	-	N/A
11.2.7	Solder terminals		
11.2.7.1	Solder terminals have sufficient solderability. Checked by tests to IEC 60068-2-20.		

Table 9	Test conditions for Ta Condition			
4.6/4.7	<input type="checkbox"/> Test method 1: Solder bath at 235°C, or <input checked="" type="checkbox"/> Test method 2: Soldering iron size "B" at 350°C			
4.10	Final measurement $\Delta t$ according to clause 16. Samples 1 – 3:	Max.4	°C	P
	Dipped surface is covered with a smooth and bright solder coating.	OK	P	
	Imperfections not concentrated in one area.	OK	P	
11.2.7.2	Solder terminals have sufficient resistance to soldering heat. Solder terminals type 1 to 7.2.14.1, checked during the tests of 11.1.2.6.1. After tests the solder terminals,			
	<ul style="list-style-type: none"> <li>have not worked loose,</li> <li>or been displaced impairing their further use,</li> <li>still comply with clause 20</li> </ul>	OK	P	
	Solder terminals type 2 according to 7.2.14.2, checked by tests to IEC 60068-2-20.			

Table 10	Test conditions for Tb Condition			
5.4/5.5	<input type="checkbox"/> Test method 1: Solder bath at 235°C, or <input type="checkbox"/> Test method 2: Soldering iron size "B" at 350°C After the tests the solder terminals			
	<ul style="list-style-type: none"> <li>have not worked loose,</li> <li>or been displaced impairing their further use,</li> <li>still comply with clause 20</li> </ul>	-		N/A
11.2.7.3	Solder terminals according to 7.2.12 provided with means for mechanically securing the conductor in position independently of the solder. Such means are provided by			
	<input checked="" type="checkbox"/> a hole suitable for hooking-in the conductor; <input type="checkbox"/> edges to allow conductor to be wrapped around the terminal before soldering; <input type="checkbox"/> clamping means	OK		P
11.2.8	Welded terminations			
	<ul style="list-style-type: none"> <li>No further specific requirements</li> </ul>	-		N/A
11.2.9	Crimped terminations			
	<ul style="list-style-type: none"> <li>No further specific requirements</li> </ul>	-		N/A
11.3	Additional requirements for terminals for connection of supply and of external cords			
11.3.1	Terminal located near to its corresponding terminal of different polarity, and to the earthing terminal.	-		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
<b>12</b>	<b>Construction</b>		
12.1	Constructional requirements relating to protection against electric shock		
12.1.1	When double insulation is employed,		
	<ul style="list-style-type: none"> <li>basic and the supplementary tested separately</li> </ul>	-	N/A
	a) Basic and supplementary insulation cannot be tested separately, the insulation is considered to be reinforced insulation.	-	N/A
12.1.2	Creepage distances and clearances not reduced, as a result of wear, below values in clause 20.	OK	P
	If any conductive part of the switch becomes loose and moves out of position		
	<ul style="list-style-type: none"> <li>not get disposed in normal use that creepage distances or clearances across supplementary or reinforced insulation are reduced</li> </ul>	OK	P
	For the purpose of this test:		
	<input checked="" type="checkbox"/> <input type="checkbox"/> not expected that two independent fixings will become loose at the same time <input type="checkbox"/> <input type="checkbox"/> parts fixed by screws or nuts provided with locking washers not liable to become loose <input checked="" type="checkbox"/> <input type="checkbox"/> springs and spring parts not become loose or fall out of position during tests of clauses 18 and 19	OK	P
12.1.3	Integrated conductors		
	<input type="checkbox"/> <input type="checkbox"/> is rigid and fixed, <input type="checkbox"/> <input type="checkbox"/> or insulated that creepage distances and clearances not reduced below values in clause 20	-	N/A
	Such insulation not damaged during mounting or in normal use.	-	N/A
	If the insulation of a conductor is not at least electrically equivalent to that of cables and cords complying with the appropriate IEC standard or does not comply with the dielectric strength test made between the conductor and the metal foil wrapped around the insulation under the conditions specified in Clause 15,		
	<ul style="list-style-type: none"> <li>the conductor is a bare conductor</li> </ul>	-	N/A
12.2	Constructional requirements relating to safety during mounting and normal operation of the switch		
12.2.1	Covers, cover plates, removable actuators cannot be displaced or removed except by use of a tool	-	N/A
	Fixings for a cover or cover plate does not serve to fix any other part except an actuating member.	-	N/A
	Not possible to mount removable parts, such that indication of switch positions does not correspond with the actual switch position.	-	N/A
12.2.2	Fixing screws of covers or cover plates captive.	-	N/A
12.2.3	Switch not damaged when its actuating member is removed as intended.	-	N/A
	Actuating members which do not require a tool for their removal,		
	<ul style="list-style-type: none"> <li>checked by the tests of 18.4</li> </ul>	-	N/A
12.2.4	Pull-cord is insulated from live parts	-	N/A
	Possible to fit or to replace it without removing parts causing live parts to become accessible.	-	N/A

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Clause	Requirement – Test	Result - Remark		Verdict
12.2.5	Illuminated indicator incorporated in a switch provides correct indication as declared.			
	Checked by connecting the switch to a voltage $\pm 10\%$ of marked $U_L$ or $U_N$ .	125/250	V	P
12.3	Constructional requirements relating to the mounting of switches and to the attachment of cords			
12.3.1	Methods of mounting do not adversely affect compliance with this standard.	OK		P
12.3.1.1	Switch cannot rotate, or be displaced, and be removed from an appliance without the aid of a tool.	OK		P
	If removal of a part is necessary during the normal use, requirements of clauses 9, 15 and 20 is satisfied before and after such removal.	-		N/A
<b>13</b>	<b>Mechanism</b>			
13.1	For d.c. switches ( <i>checked during tests in clause 17</i> )			
	<input type="checkbox"/> speed of contact making and breaking is independent of the speed of actuation <input type="checkbox"/> except for switches with a rated voltage $\leq 28$ V or a rated current $\leq 0.1$ A	-		N/A
13.2	Moving contacts can come to rest only in the "ON" and "OFF" positions. Intermediate position permissible if it corresponds to			
	• an intermediate position of the actuating member providing not give a misleading indication of a marked "OFF" position and separation of the contacts is adequate	-		N/A
	Switch in position			
	• "ON" contact pressure comply with clause 16 • "OFF" separation of contacts comply clause 15	OK		P
	Separation of the contacts in an intermediate position			
	• comply with clause 15 for "OFF" position	-		N/A
13.3	When the actuating member is released			
	<input type="checkbox"/> it take automatically or stay in the position corresponding to the moving contacts <input checked="" type="checkbox"/> except only one rest position	OK		P
13.4	Cord operated switch that after actuating the switch and releasing the cord			
	• parts of the mechanism allow performance of the next movement in the cycle of actuation	-		N/A
	Cord-operated switches actuated from any position, to the next position,			
	<input type="checkbox"/> <input type="checkbox"/> by a pull $\leq 45$ N vertically downwards <input type="checkbox"/> <input type="checkbox"/> or 70 N at $45^\circ$ to the vertical	-		N/A
13.5	Multi-pole switches makes and breaks all poles substantially together.	-		N/A
	Neutral makes before and breaks after the others.	-		N/A
<b>14</b>	<b>Protection against solid foreign objects, ingress of water and humid conditions</b>			
14.1	Protection against ingress of solid foreign objects			

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Clause	Requirement – Test	Result - Remark		Verdict
	Degree of protection as in 13.3 of IEC 60529.	IP00		N/A
	Detachable parts are removed.	-		N/A
	Switch which relies on mounting for the declared degree of protection			
	<ul style="list-style-type: none"> <li>mounted in or on a closed box to simulate the appliance</li> <li>tests performed using this simulated assembly</li> </ul>	-		N/A
	For numerals 5 and 6			
	<ul style="list-style-type: none"> <li>test carried out according to category 2 with the specimen in the most unfavourable position to the manufacturer's declarations for a period of 8 h</li> </ul>	-		N/A
	During the 8 h the switch loaded alternatively for 1 h with the maximum $I_R$ and 1 h without current.	-	A	N/A
	For the test for first characteristic numeral 5, the switch comply if			
	<ul style="list-style-type: none"> <li>all actions function as declared</li> </ul>	-		N/A
	<ul style="list-style-type: none"> <li><math>\Delta t</math> at the terminals <math>\leq 55</math> K tested as in 16.2 at <math>I_R</math> and at <math>25 \pm 10^\circ\text{C}</math></li> </ul>	-	K	N/A
	<ul style="list-style-type: none"> <li>dielectric strength of 15.3 with no humidity treatment before application of test voltage. Test voltage is 75 % of the test voltage in 15.3</li> </ul>	-	V	N/A
	<ul style="list-style-type: none"> <li>no transient fault occurred</li> </ul>	-		N/A
	Test for 1 <sup>st</sup> characteristic numeral 6, no deposit of dust is inside the switch at the end of the test.	-		N/A
14.2	Protection against ingress of water Degree of protection against ingress of water when mounted and used as declared.			
	Checked by tests in IEC 60529 with the switch placed in any position of normal use.	-		N/A
	Switches kept at $25 \pm 10^\circ\text{C}$ for 24 h before being subjected to the test.	-	$^\circ\text{C}$	N/A
	The test is carried out according to IEC 60529 as follows:			
	<input type="checkbox"/> IPX1 – IPX2 switches as in 14.2.1 – 14.2.2 with <b>the drain holes open</b> <input type="checkbox"/> IPX3 – IPX7 switches as in 14.2.3 – 14.2.7 with <b>the drain holes closed</b>	-		N/A
	a) Switch not electrically loaded during tests.	-		N/A
	The water temperature does not differ from that of the switch by more than 5 K.	-		N/A
	b) Detachable parts are removed.	-		N/A
	c) Switches incorporating separate gaskets, screwed glands, membranes or other sealing means, manufactured from rubber or thermoplastic materials are			
	<ul style="list-style-type: none"> <li>aged in a heating cabinet with pressure of the ambient air and ventilated by natural circulation</li> </ul>	-		N/A
	d) Switches <b>without T-rating</b> , kept in the cabinet at a temperature of $70 \pm 2^\circ\text{C}$ for 240 h	-	$^\circ\text{C}$	N/A
	Switches <b>with T-rating</b> , kept in the cabinet at a temperature of $T + 30^\circ\text{C}$ for 240 h	-	$^\circ\text{C}$	N/A

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Clause	Requirement – Test	Result - Remark		Verdict

	Switches with glands or membranes are fitted and connected with conductors as in clause 11.	-		N/A
	Glands tightened with a torque as in table 21	-	Nm	N/A
	Fixing screws for enclosures are tightened with a torque as in table 20	-	Nm	N/A
	e) Immediately after ageing, the parts are taken out of the cabinet and left at $25 \pm 10$ °C, avoiding direct daylight, for at least 16 h	-	°C	N/A
	f) Switch which relies on mounting for the declared degree of protection			
	• mounted in or on a closed box to simulate the appliance	-		N/A
	• tests performed using this simulated assembly	-		N/A
	g) For tests of 2 <sup>nd</sup> characteristic numerals 3 and 4, preferably hand-held spray in IEC 60529 used.	-		N/A
	Immediately after test the switch withstand the dielectric strength test specified in 15.3	-	V	N/A
	Inspection show no trace of water on insulation which could result a reduction of creepage and clearance below the values in clause 20.	-		N/A
14.3	Protection against humid conditions			
	Cable inlet openings and drain-holes left open.	-		
	Drain-hole for a water-tight switch is opened.	-		
	a) Detachable parts removed and subjected to the humidity treatment with the main part.	-		
	b) Humidity treatment in humidity cabinet containing air with humidity between 91 – 95%	93	%	
	The temperature of air maintained within $\pm 1$ °C of value (t) between 20 – 30°C	25	°C	
	c) Before placed in the humidity cabinet, specimens brought to a temperature between t and t + 4°C.	25	°C	
	The specimens kept in the cabinet for 96 h.	96	h	
	The switch does not show any damage	OK		P

<b>15</b>	<b>Insulation resistance and dielectric strength</b>			
15.1	The insulation resistance and the dielectric strength of switches shall be adequate. Checked by the tests of 15.2 and 15.3, immediately after test of 14.3.			
	The foils not pressed into openings but pushed into corners and the like by means of standard test finger	OK		P
	Basic insulation and supplementary insulation cannot be tested separately,			
	• subjected to test voltages for reinforced insulation	-		N/A
15.2	Insulation resistance measured with d.c. of $\approx 500$ V one minute after application of the voltage.	OK		P
	Insulation resistance not less than in table 11.	OK		P

Table 11	Minimum insulation resistance		
	Insulation to be tested	Insulation resistance	

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Clause	Requirement – Test	Result - Remark	Verdict	
	Functional	$\geq 2 \text{ M}\Omega$	-	N/A
	Basic	$\geq 2 \text{ M}\Omega$	199 M $\Omega$	P
	Supplementary	$\geq 5 \text{ M}\Omega$	-	N/A
	Reinforced	$\geq 7 \text{ M}\Omega$	-	N/A
15.3	The insulation is subjected to a voltage of substantially sine wave form, 50 or 60 Hz. The test voltage raised uniformly from 0 V to in table 12 within 5 s and kept for 5 s.			

Table 12	Dielectric strength	Rated voltage (V)	250	
	Insulation or disconnection to be tested	Test voltage (V)		
	Functional	1500	-	N/A
	Basic	1500	OK	P
	Supplementary	1500	-	N/A
	Reinforced	3000	-	N/A
	Micro-disconnection	500	OK	P
	Full disconnection	1500	-	N/A
	No flash over or breakdown occurs.		OK	P

16	Heating			
16.2	Contacts and terminals			
16.2.2	a) Terminals for <b>unprepared</b> conductors fitted with conductors of $\geq 1 \text{ m}$ or declared and with medium or declared cross-sectional area in table 4	-	mm <sup>2</sup>	
	b) Terminals for <b>prepared</b> conductors fitted with conductors of <b>1 m or less if declared</b> and have a cross-sectional area as declared	0,5 / 0,75	mm <sup>2</sup>	
	c) Terminal screws and/or nuts are tightened with a torque equal to 2/3 in table 20	-	Nm	
	f) Poles of switches, which make simultaneously, may be connected in series by means of conductors.			
	Minimum length of the conductors between two poles is 1 m unless declared a length below 1 m.	1,0	m	
	h) Switches with T-rating $\leq 55 \text{ }^\circ\text{C}$ , tested at $20 \pm 10 \text{ }^\circ\text{C}$	-	$^\circ\text{C}$	
	Switches with T-rating $> 55 \text{ }^\circ\text{C}$ , placed in a heating cabinet without forced convection	-	$^\circ\text{C}$	
	The temperature of the cabinet is maintained at $T \pm 5 \text{ }^\circ\text{C}$ or $T \pm 0.05 T$ whichever is greater	-	$^\circ\text{C}$	
	Switches only partially suitable for a rated ambient temperature higher than $55 \text{ }^\circ\text{C}$			
	• parts which are accessible when the switch is mounted as declared is exposed to a temperature not higher than $55 \text{ }^\circ\text{C}$ .	-	$^\circ\text{C}$	
	j) Actuating member left in the most unfavourable "ON" position and the switches loaded with a current of $1.06I_R$ for resistive load	5.3	A	

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Clause	Requirement – Test	Result - Remark		Verdict
	Switches for a.c. voltage and switches for d.c. voltage where no polarity is given,			
	<ul style="list-style-type: none"> <li>the test is performed with d.c. voltage in both polarities and an average value calculated</li> </ul>	-	V	
	n) $\Delta t$ at the terminals does not exceed 45K	Max. 4	K	P
16.3	Other parts			
16.3.2	For mechanical switches compliance is checked by the following tests:			
	a) Mounted as declared, fitted with conductors and loaded with a test current in 16.2.2 and carried out at maximum T-rating	25	°C	P
	b) Switches only partially suitable for a rated ambient temperature higher than 55°C,			
	<ul style="list-style-type: none"> <li>parts accessible when the switch is mounted are exposed to a temperature not higher than 55 °C.</li> </ul>	-	°C	N/A
	c) The temperature of metal mounting surfaces of the test equipment is between T and 20 °C.	-	°C	N/A
	d) If other heating sources incorporated or integrated in the switch			
	<ul style="list-style-type: none"> <li>these circuits are connected to a supply voltage between 0.94 – 1.06 x <math>U_N</math></li> </ul>	-	V	N/A
	h) During this test the temperatures not exceeds the values in table 13.	OK		P

Table 13	Permissible maximum temperatures	°C	Normal conditions	
	Rubber or polyvinyl chloride insulation of non-detachable cables and cords:			
	<ul style="list-style-type: none"> <li>without T-marking</li> </ul>	75	-	N/A
	<ul style="list-style-type: none"> <li>with T- marking</li> </ul>		-	N/A
	Cord sheaths as supplementary insulation	60	-	N/A
	Rubber other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety used as:			
	<ul style="list-style-type: none"> <li>supplementary or reinforced insulation</li> </ul>	65	-	N/A
	<ul style="list-style-type: none"> <li>in other cases</li> </ul>	75	-	N/A
	Material used as insulation other than that specified for wires:			
	<ul style="list-style-type: none"> <li>printed circuit boards</li> </ul>		-	N/A
	Moulding of:			
	<ul style="list-style-type: none"> <li>thermosetting materials</li> </ul>			
	<ul style="list-style-type: none"> <li>thermoplastic materials</li> </ul>		29	P
	All accessible surfaces except those of actuating members or handles	85	-	N/A
	Accessible surfaces of actuating members or handles which are held for short periods only of:			
	<ul style="list-style-type: none"> <li>metal</li> </ul>	60	-	N/A
	<ul style="list-style-type: none"> <li>porcelain or vitreous material</li> </ul>	70	-	N/A
	<ul style="list-style-type: none"> <li>moulded material or rubber</li> </ul>	85	-	N/A
	Inside of enclosures of insulating material		-	N/A
	Windings: Thermal classification:			
	<ul style="list-style-type: none"> <li>class: <input type="text"/> ⇒</li> </ul>		-	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	Terminals and terminations for unprepared conductors acc. to Table 4	80 -	N/A
	Other terminals and terminations	29	P

17	Endurance			
17.2	Electrical endurance tests	<input checked="" type="checkbox"/> Circuit or <input type="checkbox"/> type:	2.3	
17.2.1	Electrical conditions (V):	Rated voltage	250 0.98 T55 AC	
	Rated current (A):			
	Ambient temperature (°C):			
	Nature of supply AC/DC:			
17.2.1.1	The switch loaded as in table 17 and/or table 18 and connected as given in table 2 following 7.1.10.		OK	P
	Switches of declared specific type and/or connection			
	• connected and loaded as declared		-	N/A
	Circuits and contacts which are not intended for external loads			
	• operated with the designated load		-	N/A
	Where in table 2 an auxiliary switch (A) is symbolised in the test circuit,			
	• tests for two ON-positions of the specimen (S) performed on 2 separate sets of test samples		-	N/A
	The connection to the test load to be performed for the two tests			
	• symbolised in table 2 by an auxiliary switch A		-	N/A
	Multiway switches classified according to 7.1.13.4.2 to 7.1.13.4.5			
	• loaded according to table 16		-	N/A

Table 16	Test loads for multiway switches							
	Cycles of operations	Switch position of	Type of switch Sub-clause	Circuit ⇒ Load (A) ↓				
	1st half	Highest load	7.1.13.4.2 to 7.1.13.4.5	$I_R$	-			N/A
		Next lower load	7.1.13.4.2 to 7.1.13.4.5	$0.8 I_R$	-			N/A
		Further next lower load	7.1.13.4.5	$0.533 I_R$	-			N/A
	2nd half	Highest load	7.1.13.4.2 to 7.1.13.4.5	$I_R$	-			N/A
		Next lower load	7.1.13.4.2 to 7.1.13.4.5	$0.5 I_R$	-			N/A
		Further next lower load	7.1.13.4.5	$0.333 I_R$	-			N/A
	For circuits according to 7.1.2.7 for specific lamp load,							
	• connection and test load as declared using the maximum occurring inrush current at $T_{room}$				-			N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	No electrical endurance tests necessary for switches for 20 mA load as classified in 7.1.2.6.	-	N/A
17.2.1.2	When increased-voltage conditions, the loads used are those for tests at $U_N$		
	• the voltage then increased to $1.15U_N$	OK, 288V~	P
	Test circuits for capacitive load tests and simulated lamp load tests for a.c. circuits		
	• the test voltage is $U_N$ and the test currents are increased to 1.15 times rated currents $I_R$	-	N/A
17.2.2	Thermal conditions		
17.2.2.1	For switches according to 7.1.3.2 and 7.1.3.4.2		
	<input type="checkbox"/> 1 <sup>st</sup> half of test at maximum T-rating (+5 / 0)°C	- °C	N/A
	<input type="checkbox"/> 2 <sup>nd</sup> half of test at 25°C ± 10°C	- °C	N/A
	<input type="checkbox"/> or at the minimum T-rating (0 / -5)°C if $T < 0^\circ\text{C}$		
17.2.2.2	Switches according to 7.1.3.3, parts declared for use at 0°C to 55°C		
	• is exposed to a temperature °C	- °C	N/A
	The ambient air temperature of the remainder of the switch,		
	<input type="checkbox"/> 1 <sup>st</sup> half of test at maximum T-rating (T-0/+5)°C	- °C	N/A
	<input type="checkbox"/> 2 <sup>nd</sup> half of test are carried out at 25 ± 10 °C	- °C	N/A
	<input type="checkbox"/> or at minimum T-rating (0 / -5) °C if $T < 0^\circ\text{C}$		
17.2.3	Manual and mechanical conditions		
17.2.3.1	Operating speed for the operating cycles is as follows: a) For slow speed approximately:		
	<input type="checkbox"/> 9°/s for rotary actuations at an angle ≤ 45°; <input type="checkbox"/> 18°/s for rotary actuations at an angle >45°; <input checked="" type="checkbox"/> 20 mm/s for linear actuations	OK	P
	b) For high speed:		
	• actuating member actuated by hand as fast as possible	-	N/A
	c) For accelerated speed approximately:		
	<input type="checkbox"/> 45°/s for rotary actuations at an angle ≤ 45°; <input type="checkbox"/> 90°/s for rotary actuations at an angle > 45°; <input checked="" type="checkbox"/> 80 mm / s for linear actuations	OK	P
17.2.3.2	For biased switches, the actuating member is moved to the limit of travel of the opposite position.	-	N/A
17.2.3.3	During the slow speed test, test apparatus drives the actuating member positively, without backlash between apparatus and actuating member.	-	N/A
17.2.3.4	During the accelerated speed test:		
	a) Care taken that test apparatus allows actuating member to operate freely.	-	N/A
	b) Switches for a rotary actuation where movement is not limited in either direction		
	• 3/4 of operating cycles made in a clockwise and 1/4 in an anti-clockwise direction	-	N/A
	c) Switches for rotary actuation in one direction only, test is performed in the designed direction.	-	N/A
	d) Additional lubrication not applied during tests.	OK	P
	e) Forces applied to the end stops of the actuating members do not exceed declared values.	-	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
17.2.3.4.1	As the design allows the switches are operated at a rate of:		
	<input checked="" type="checkbox"/> 30 operations / minute, if $I_R \leq 10A$ ; <input type="checkbox"/> 15 operations / minute, if $I_R > 10A$ but $< 25A$ ; <input type="checkbox"/> 7.5 operations / minute, if $I_R$ is $\geq 25 A$ <input checked="" type="checkbox"/> ON period = 25 (0 / +5) % of an operating cycle. <input checked="" type="checkbox"/> OFF period = 75 (-5 / +0) % of an operating cycle.	OK	P
17.2.3.4.2	For capacitive and simulated lamp load tests according to figure 9A and figure 9B,		
	• switches operated 2s ON and 15s OFF	-	N/A
17.2.3.4.3	For locked rotor tests,		
	• switches operated 1s ON and 30s OFF	-	N/A
17.2.4	Type of test condition (TC)		
	Electrical conditions as in 17.2.1 Thermal conditions are those in 17.2.2. Method of operation as in 17.2.3.	OK	P
	<input checked="" type="checkbox"/> Circuit or <input type="checkbox"/> type:	1.2	
17.2.4.1	Increased-voltage test at accelerated speed (TC1)		
	Test voltage $1.15 \times U_N$ (V):	288	
	Making Test current (A):	0.98	
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms):	0.99	
	Breaking Test current (A):	0.98	
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms):	0,98	
	Number of operating cycles is 100. Samples 1, 2, 3:	OK	P
17.2.4.2	Test at slow speed (TC2)		
	Test voltage $U_N$ (V):	250	
	Making Test current (A):	0.99	
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms):	0,98	
	Breaking Test current (A):	0.99	
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms):	0,98	
	Number of operating cycles is 100. Samples 1, 2, 3:	OK	P
17.2.4.3	Test at high speed (TC3) ( <i>only switches with more than one pole and with reversal polarity</i> ).		
	Test voltage $U_N$ (V)	-	
	Making Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Breaking Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Number of operating cycles is 100. Samples 1, 2, 3:	-	N/A
17.2.4.4	Test at accelerated speed (TC4)		
	Test voltage $U_N$ (V)	250	
	Making Test current (A)	0.99	

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Clause	Requirement – Test	Result - Remark	Verdict
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	0,98	
	Breaking Test current (A)	0.99	
	<input checked="" type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	0,98	
	Number of operating cycles declared 7.1.4	IE4	
	• less <b>number</b> of 17.2.4.1	100	
	• less <b>number</b> of 17.2.4.2	100	
	• less <b>number</b> of 17.2.4.3	-	
	= <b>number</b> to test	19 800	
	Samples 1, 2, 3:	OK	P
17.2.4.9	Locked-rotor test (TC9) with method for accelerated speed in 17.2.3.		
	Test voltage (V)	-	
	Making Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Breaking Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Number of operating cycles is 50. Samples 1, 2, 3:	-	N/A
17.2.4.10	Test at very slow speed (TC10). Operating speed for the operating cycles as is approximately follows:		
	<input type="checkbox"/> 1°/s for rotary actuation <input type="checkbox"/> 0.5 mm/s for linear actuation	-	N/A
	Test voltage (V)	-	
	Making Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Breaking Test current (A)	-	
	<input type="checkbox"/> Power factor ( $\varphi$ ) <input type="checkbox"/> Time constant (ms)	-	
	Number of operating cycles is 50. Samples 1, 2, 3:	-	N/A
17.2.5	Evaluation of compliance		
17.2.5.1	Functional compliance (TE1) switch complies if		
	<input checked="" type="checkbox"/> all actions function as declared <input checked="" type="checkbox"/> no loosening of electrical / mechanical connections occur; <input type="checkbox"/> sealing compound does not flow to such an extend that live parts are exposed	OK	P
17.2.5.2	Thermal compliance (TE2) • $\Delta t$ at the terminals < 55K tested in accordance with 16.2 at $I_R$ and $25^\circ\text{C} \pm 10^\circ\text{C}$		
	Test current	10 A	
	Samples 1, 2, 3:	1) 6 K 2) 5 K 3) 6 K	P
17.2.5.3	Insulating compliance (TE3) • dielectric strength of 15.3 with specimens not subjected to humidity treatment before application of the test voltage 75 % of the test voltage in sub-clause 15.3:		

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Clause	Requirement – Test	Result - Remark	Verdict

	<p>Samples 1, 2, 3: no transient fault occurred</p> <p><input checked="" type="checkbox"/> Over contact gap(s)</p> <p><input type="checkbox"/> Between live parts of different polarity</p> <p><input type="checkbox"/> Between live parts and earth metal</p> <p><input type="checkbox"/> Between live parts and accessible metal parts or actuating members etc.</p>	OK	P
--	--	----	---

<b>18</b>	<b>Mechanical strength</b>		
18.2	Applying blows to the specimen by means of the spring-operated impact test apparatus of IEC 60068-2-75. Actuating member and all surfaces accessible parts when the switch is mounted as in normal use and declared are tested with test apparatus		
	• calibrated to deliver an energy of $0.5 \pm 0.04$ Nm.	-	N/A
	Foot-actuated switches subject to the same test but using a test apparatus		
	• calibrated to deliver an energy of $1.0 \pm 0.05$ Nm	-	N/A
	For all such surfaces		
	• 3 blows applied to every point likely to be weak.	-	N/A
	Foot-operated switches mounted as in normal use,		
	• are subjected to a force applied by means of a circular steel pressure plate with a $\varnothing$ of 50 mm	-	N/A
	The force is increased continuously from an initial value of about 250 N up to 750 N within 1 min	-	N/A
	Maintained at this value, 750 N for 1 min.	-	N/A
	After these tests the switch still comply with the requirements of		
	<ul style="list-style-type: none"> <li>• clauses 9</li> <li>• clauses 13</li> <li>• clauses 15</li> <li>• clauses 20</li> </ul>	-	N/A
	Insulating linings, barriers and the like have not worked loose.	-	N/A
	Still possible to		
	<input type="checkbox"/> remove and to replace detachable and other external parts such as cover plates without these parts or their insulating linings being broken <input type="checkbox"/> actuate the actuating member to provide the appropriate disconnection	-	N/A
18.3	Cord-operated switches are submitted to an additional pull test as follows.		
	Switch mounted as declared by the manufacturer.	-	N/A

Table 19	Minimum values of the pull force as in table 19 or 3 times the values of the normal operating force if greater.			
	Minimum values of pull force			
	Rated current	Force (N)		
	A	Normal direction	45° from normal direction	
	≤ 4	50	25	-
	> 4	100	50	-

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Clause	Requirement – Test	Result - Remark	Verdict

	After test, the switch shows no damage.	-	N/A
18.4	Switches supplied with, or intended to be fitted with actuating members tested as follows.		
	A pull force is applied for 1 min to try to pull off the actuating member normally 15 N.	-	N/A
	Actuating member intended to be pulled in normal use		
	• the force is increased to 30 N	-	N/A
	A push of 30 N for 1 min is applied to all actuating members	-	N/A
	Switch intended to have an actuating member but is submitted for approval without		
	• pull and push of 30 N are applied to the actuating means	OK	P

<b>19</b>	<b>Screws, current-carrying parts and connections</b>		
19.1	General requirements for electrical connections Contact pressure is not transmitted through insulating material other than		
	<input type="checkbox"/> ceramic <input type="checkbox"/> pure mica <input type="checkbox"/> other material no less suitable <input type="checkbox"/> there is visual evidence of sufficient resiliency in the metallic parts to compensate for any possible shrinkage or distortion of the insulating material	-	N/A
	Requirement not applicable to connections internal to a switch where the connection		
	• used for lamps for indicating purposes and where the current in this circuit is $\leq 20$ mA	-	N/A
19.2	Screwed connections		
19.2.1	Screwed connections, electrical or other,		
	• withstand the mechanical stresses occurring in normal use	-	N/A
19.2.2	Screws transmitting contact pressure		
	• is in engagement with a metal thread	-	N/A
	Screws not of metal which is		
	• soft or liable to creep, as zinc or aluminium	-	N/A
19.2.3	Mechanical connections used during installation of switches may be made of using thread-forming or thread-cutting tapping screws,		
	• only if the screws are supplied together with the piece in which they are intended to be inserted	-	N/A
	Thread-cutting tapping screws intended to be used during installation		
	• captive with the relevant part of the switch	-	N/A
19.2.4	Thread-forming ( <i>metal sheet</i> ) screws not used		
	<input type="checkbox"/> for the connection of current-carrying parts <input type="checkbox"/> unless they clamp directly in contact with each other and are provided with means of locking	-	N/A
	Thread-cutting ( <i>self-tapping</i> ) screws not used		
	<input type="checkbox"/> for electrical connection of current-carrying parts <input type="checkbox"/> unless they generate a full metric ISO thread or a thread of equivalent effectiveness	-	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	Such screws not used		
	<input type="checkbox"/> if likely to be operated by the user or installer <input type="checkbox"/> unless the thread is formed by a swaging action	-	N/A
	SI, BA and Unified threads is of equivalent effectiveness to a metric ISO thread.	-	N/A
	The screws or nuts are tightened and loosened		
	<input type="checkbox"/> 10 times for screws with thread of insulating material; <input type="checkbox"/> 5 times in all other cases	-	N/A
	Nuts concentric with the button or lever are tightened and loosened 5 times. Thread		
	<input type="checkbox"/> is of insulating material $\Rightarrow$ the torque is 0.8 Nm <input type="checkbox"/> are of metal $\Rightarrow$ the torque is 1.8 Nm	-	N/A
	When testing terminal screws and nuts, conductors having the cross-sectional areas specified in clause 11 are placed in the terminal.		
	The conductor is solid for terminals not intended for connection of supply cables or cords or if nominal cross-sectional area $\leq 6 \text{ mm}^2$	-	mm <sup>2</sup> N/A
	In other cases the conductor is stranded.	-	mm <sup>2</sup> N/A
	For terminals for the connection of supply cables or cords,		
	• conductor have the largest cross-sectional area	-	mm <sup>2</sup> N/A
	Applied torque is equal to appropriate column of table 20 if not otherwise specified.		

Table 20	Torque values			
	Type of screw	Nominal thread $\varnothing$ (mm)	Torque (Nm)	
	Terminal:	-	-	-
	Assembly:	-	-	-
	Cord anchorages:	-	-	-
	Other:	-	-	-
	During the test, terminals do not work loose.	-	-	N/A
	No damage that could impair the further use of the screwed connection.	-	-	N/A

19.2.5	Switches having screwed glands are submitted to the following test:			
Table 21	Torque values for screwed glands			
	$\varnothing$ of the test rod (mm)	Torque (Nm) for glands of		
		Metal	Insulating material	
				-
	After test, neither the glands or the enclosure of the specimen show any damage	-	-	N/A
19.2.6	Correct introduction of the screws operated during mounting or connection of the switch into the screw holes or nuts ensured.	-	-	N/A
19.2.7	Screws which make a mechanical connection between different parts of the switch			

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Clause	Requirement – Test	Result - Remark	Verdict

	<ul style="list-style-type: none"> <li>locked against loosening if the connection carries current</li> </ul>	-	N/A
	Rivets used for current-carrying connections		
	<ul style="list-style-type: none"> <li>secured against loosening if these connections are subject to torsion in normal use</li> </ul>	-	N/A
	Sealing compound which softens in heat		
	<ul style="list-style-type: none"> <li>provides satisfactory locking only for screw connections not subject to torsion in normal use</li> </ul>	-	N/A
19.2.8	Screws and nuts for clamping the conductors have a metric ISO thread or a thread comparable in pitch and mechanical strength.	-	N/A
19.3	Current-carrying parts are containing of:		
	<input type="checkbox"/> copper;	-	N/A
	<input checked="" type="checkbox"/> alloy $\geq 58$ % copper for parts worked cold <input type="checkbox"/> or $\geq 50$ % copper for other parts;	OK	P
	<input type="checkbox"/> stainless steel containing $\geq 13$ % chromium and $\leq 0.09$ % carbon;	-	N/A
	<ul style="list-style-type: none"> <li>steel provided with an electroplated coating having a thickness of at least</li> </ul>		
	<input type="checkbox"/> zinc, ISO 2081 ( $\mu\text{m}$ ) <input type="checkbox"/> nickel and chromium, ISO 1456 ( $\mu\text{m}$ ) <input type="checkbox"/> tin, ISO 2093 ( $\mu\text{m}$ )	-	N/A
	Parts subjected to arcs and mechanical wear, not made of steel provided with an electroplated coating.	-	N/A

<b>20</b>	<b>Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies</b> Generally for the measurements		
	<input type="checkbox"/> Detachable and movable parts placed in the most unfavourable position. <input checked="" type="checkbox"/> Distances through slots or openings in surfaces of insulating material are measured to a metal foil in contact with the surface. <input checked="" type="checkbox"/> 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.	OK	P
	<ul style="list-style-type: none"> <li>A force is applied to bare conductors and accessible surfaces in order to attempt to reduce clearances when making the measurement. The force is:</li> </ul>		
	<input type="checkbox"/> 2N for bare conductors <input type="checkbox"/> 30N for accessible surfaces.	-	N/A
	When applied to openings as specified in 9.1,		
	<ul style="list-style-type: none"> <li>the distance through insulation between live parts and the metal foil not reduced below the specified values</li> </ul>	-	N/A
<b>20.1</b>	<b>Clearances</b> Withstand the rated $U_{imp}$ declared according to 7.1.10 considering the		
	<ul style="list-style-type: none"> <li>rated voltage and overvoltage category in annex K</li> </ul>	250V/Category II	P
	<ul style="list-style-type: none"> <li>pollution degree declared by the manufacturer</li> </ul>	Pollution degree 2	P
20.1.1	Clearances for basic insulation		

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Clause	Requirement – Test	Result - Remark	Verdict
	• $\geq$ the values given in table 22	OK	P
	Smaller clearances except those in table 22 with note 5 may be used if the switch meets the $U_{imp}$ test of annex M	-	N/A
20.1.2	Clearances for functional insulation		
	• $\geq$ the values for basic insulation in 20.1.1	-	N/A
20.1.3	Clearances for supplementary insulation		
	• $\geq$ the values given in table 22	-	N/A
20.1.4	Clearances for reinforced insulation		
	• $\geq$ the values for basic insulation in 20.1.1 but using the next higher step for the rated $U_{imp}$ in table 22	-	N/A
20.1.5	Clearances for disconnection		
20.1.5.2	Micro disconnection		
	Clearances between terminals and terminations fulfil functional insulation according to 20.1.2.	OK	P
	Clearances between other current carrying parts separated by action of the switch		
	<input type="checkbox"/> $\geq$ the actual value of distance between relevant contacts <input type="checkbox"/> $> 0.5$ mm for switches with a rated $U_{imp}$ of $\geq 1.5$ kV	-	N/A
20.1.5.3	<b>Full disconnection</b>		
	Clearances for full disconnection $\geq$ the values in table 22.	-	N/A
	Switches provided by two or more breaks in series,		
	• the separation is the sum of the distances of the breaks	-	N/A
	Each break $\geq 1/3$ of the prescribed distance.	-	N/A
20.2	Creepage distances are dimensioned for the voltage to occur in normal use and pollution degree as declared by the manufacturer. Relationship between material group and proof tracking index (PTI) values:		
	Material group .....: IIIa	$\Rightarrow$ PTI: 175	P
	PTI values obtained in accordance with annex D.	OK	P
20.2.1	Creepage distances for basic insulation		
	• $\geq$ the values given in table 23	OK	P
20.2.2	Creepage distances for functional insulation		
	• $\geq$ the values given in table 24	-	N/A
20.2.3	Creepage distances for supplementary insulation		
	• $\geq$ the values for basic insulation in 20.2.1	-	N/A
20.2.4	Creepage distances for reinforced insulation		
	• $\geq$ double the values for basic insulation in 20.2.1	-	N/A
20.2.5	Creepage distances for disconnection		
	• $\geq$ the values for functional insulation in 20.2.2	OK	P

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Clause	Requirement – Test	Result - Remark	Verdict

20.3	Solid insulation withstanding electrical and mechanical stresses, thermal and environmental influences which may occur during the anticipated life of the switch		
	<ul style="list-style-type: none"> <li>checked during tests of clauses 14, 15, 16 and 17</li> </ul>	OK	P
	Distance through accessible supplementary solid insulation		
	<ul style="list-style-type: none"> <li>have a minimum value of 0.8 mm</li> </ul>	-	N/A
	Distances through accessible reinforced solid insulation have minimum values:		
	<input type="checkbox"/> for rated $U_{imp} \leq 1500$ V: $\geq 0.8$ mm; <input type="checkbox"/> for rated $U_{imp} \geq 2500$ V: $\geq 1.5$ mm.	-	N/A
	Working voltage (V):	250V	
	Degree of pollution:	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	

Table 22 – 24	Creepage distance Cd and clearance Cl across:	required Cd (mm)	Cd (mm)	required Cl (mm)	Cl (mm)
	Functional, sealed or incapsulated	-	-	-	-
	Functional,	-	-	-	-
	Basic (from live parts to mounting hole)	2,5	3,0	1,5	3,0
	Supplementary	-	-	-	-
	Reinforced	-	-	-	-
	Full disconnection	-	-	-	-
	Micro disconnection (terminal)	2,5	5,0	1,5	5,0
	Micro disconnection (contact)	2,5	3,0	0,5	0,7

<b>21</b>	<b>Fire hazard</b>			
21.1	Resistance to heat			
	a) for parts accessible when the switch is mounted as declared			
	<input type="checkbox"/> the maximum measured during heating test of 16.3 plus 20 °C ± 2 °C <input type="checkbox"/> or as declared <input type="checkbox"/> or at 75 °C ± 2 °C whichever is the highest.	-	°C	N/A
	The $\varnothing$ of the impression by the ball not > 2 mm.	-	mm	N/A
	b) for parts in contact with, maintain or retain electrical connections in position including those parts which maintain an electrical connection under spring force,			
	<input checked="" type="checkbox"/> minimum 125 °C <input type="checkbox"/> or maximum temperature recorded during the heating test of 16.3+20 °C if it would give a higher temperature	125	°C	P
	The $\varnothing$ of the impression by the ball not > 2 mm.	1,3	mm	P
21.2	Resistance to abnormal heat			
	<ul style="list-style-type: none"> <li>for parts in contact with, maintain or retain in position electrical connections including those parts which maintain an electrical connection under spring force</li> </ul>			
	<input type="checkbox"/> Level 1 – glow-wire test at 650 °C <input type="checkbox"/> Level 2 – glow-wire test at 750 °C <input checked="" type="checkbox"/> Level 3 – glow-wire test at 850 °C	OK		P
	All other parts			

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Clause	Requirement – Test	Result - Remark	Verdict
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	• glow-wire test at 650 °C	-	N/A
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<b>22</b>	<b>Resistance to rusting</b>		
	Ferrous parts, the rusting of which might impair safety, adequately protected against rusting.	OK	P

<b>Annex D</b>	<b>Proof tracking test (PTI) (normative)</b>		
	Proof tracking test made according to IEC 60112.	175	P

<b>Annex K</b>	<b>Relation between rated impulse withstand voltage <math>U_{imp}</math>, rated voltage <math>U_N</math> and overvoltage category (normative)</b>		
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Table K1	Rated impulse withstand voltage for switches energized directly from the low voltage mains						
	Nominal voltage of the supply system based on IEC 60038 <sup>1)</sup> (V) Three phase Single phase	Voltage line to neutral derived from nominal voltages a.c. or d.c. up to including (V)	$U_{imp}^{2) 3)}$ (kV) Overvoltage category				
			I	II	III		
	-	250	300	-	2,5	-	P

<b>Annex M</b>	<b>Impulse voltage test (normative)</b> To verify that clearances will withstand specified transient overvoltage.			
	Impulse withstand voltage test $U_{imp}$ is carried out with a voltage having a 1.2/50 $\mu$ s wave-form as in IEC 60060-1 and is intended to simulate overvoltage of atmospheric origin.	2500	V	P
	Covers overvoltages due to switching of low-voltage equipment	OK		P
	The test is conducted for a minimum of 3 impulses of each polarity with an interval > 1 s between pulses.	OK		P
	When surge suppression is provided inside the specimen, the impulse have the following characteristics: Waveform			
	<input type="checkbox"/> 1.2/50 $\mu$ s for the no-load voltage with amplitudes equal to the values in table M1; <input type="checkbox"/> 8/20 $\mu$ s for an appropriate surge current.	-		N/A

Table M1	Test voltages for verifying clearances at sea level			
	Rated impulse withstand voltage $\hat{U}$ (kV)	Impulse test voltage at sea level $\hat{U}$ (kV)		
	2.5	2.95	OK	P

<b>Annex N</b>	<b>Altitude correction factors (normative)</b> Dimensions given in table 22 are valid for altitudes $\leq$ 2000 m above sea level, clearances for altitudes > 2000 m sea level is multiplied by the altitude correction factor specified as follows:		
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Table N.1	Altitude correction factors			
	Altitude m	Normal barometric pressure (Pa)	Multiplication factor for clearances	

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Clause	Requirement – Test		Result - Remark	Verdict
	2000.0	80.0	1.00	OK
				P

<b>Annex U</b>		<b>Dimensions of tabs forming part of a switch</b> ( <i>normative</i> )							
U.1	Tabs forming part of a switch complies with the dimensions according to Figure U.1.								
	Nominal size ⇒	2.8 × 0.5	2.8 × 0.8	4.8 × 0.5	4.8 × 0.8	6.3 × 0.8	9.5 × 1.2	-	
	A Max.	1.3	1.3	1.3	1.3	1.3	1.3	-	
	B Min.	7.0	7.0	6.2	6.2	7.8	12.0	N/A	
	C +0.04 -0.03	0.5	0.8	0.5	0.8	0.8	1.2		
	D ± 0.1	2.8	2.8	4.7	4.7	6.3	9.5		
	E Max.	3.2	3.2	4.3	4.3	5.7	6.5		
	F Max.	1.7	1.7	1.7	1.7	2.5	2.5		
	G Min.	0.6	0.6	0.6	0.6	0.6	0.6		
	H <sub>2</sub> Min.	1.3	1.3	2.8	2.8	2.8	2.8		
	I ∅, max.	1.0	1.0	1.0	1.0	1.3	1.8		
U.2	Tabs may have an optional detent for latching.								
	Round dimple detents, rectangular dimple detents or hole detents located in the area "EF" along the centre line of the tab as indicated in Figure U.1.						-	N/A	
U.3	Provisions for non-reversible connections may be located in the area "EF" along the centre line of the tab, as indicated in Figure U.1.							-	N/A

<b>Annex V</b>		<b>Requirements and tests for resistance to abnormal heat for unattended appliances</b> ( <i>informative</i> )		
V.1	Appliances that are operated while unattended tested as specified in 30.2.3.1 and 30.2.3.2 of IEC 60335-1:2001.		-	N/A
	Parts of non-metallic material supporting connections carrying a current ≤ 0,2 A and parts of non-metallic material within a distance of 3 mm of such connections,			
	• glow-wire tested against IEC 60695-2-11 with a test severity of 850 °C.		-	N/A
	Glow-wire test is not carried out when the glow-wire flammability index is at least 850 °C according to IEC 60695-2-12		-	N/A
	The glow-wire flammability index is not available			
	• the test sample have a thickness equal to the nearest preferred value specified in IEC 60695-2-12 that is no thicker than the relevant part		-	mm
	Provided that the test sample used for the classification was no thicker than the relevant part of the appliance, the glow-wire test is also not carried out on			
	<input type="checkbox"/> small parts that comply with the needle-flame test of Annex E of IEC 60335-1:2001 <input type="checkbox"/> or on small parts of material classified as V-0 or V-1 according to IEC 60695-11-10		-	N/A
	Where a non-metallic material is within 3 mm of a current-carrying connection, but is shielded from the connection by a different material			
	• glow-wire test of IEC 60695-2-11 is carried out at the relevant temperature with the tip of the glow-wire applied to the interposed shielding material		-	N/A

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Clause	Requirement – Test	Result - Remark	Verdict

	Parts of non-metallic material supporting current-carrying connections, and parts of non metallic material within a distance of 3 mm of such connections		
	<ul style="list-style-type: none"> <li>are subjected to glow wire test of IEC 60695-2-11</li> </ul>	-	°C
	The glow-wire test is not carried out on parts of material classified as having a glow-wire ignition temperature according to IEC 60695-2-13 of at least		
	<input type="checkbox"/> 775 °C, for connections that carry a current exceeding 0,2 A during normal operation <input type="checkbox"/> 675 °C, for other connections	-	N/A

	The glow-wire ignition temperature is not available for a sample with a thickness within $\pm 0,1$ mm of the relevant part		
	<ul style="list-style-type: none"> <li>the test sample have a thickness equal to the nearest preferred value specified in IEC 60695-2-13 that is no thicker than the relevant part</li> </ul>	-	mm
	Non-metallic material is within 3 mm of a current carrying connection, but is shielded from the connection by a different material, the glow-wire test of IEC 60695-2-11 is carried out at the relevant temperature with the tip of the glow-wire applied to the interposed shielding material		
	<input type="checkbox"/> 750 °C, for connections that carry a current exceeding 0,2 A during normal operation, <input type="checkbox"/> 650 °C, for other connections	-	N/A
	Parts withstand the glow-wire test of IEC 60695-2-11, but during the test produce a flame that persists longer than 2 s, these parts and adjacent parts are further tested as follows		
	Parts above the connection within the envelope of a vertical cylinder having a diameter of 20 mm and a height of 50 mm are subjected to the needle-flame test of Annex E of IEC 60335-1:2001.	-	N/A
	Parts shielded by a flame barrier that meets the needle-flame test of Annex E of IEC 60335-1:2001		
	<ul style="list-style-type: none"> <li>are not tested</li> </ul>	-	N/A
	The needle-flame test is not carried out on parts of material classified as V-0 or V-1 according to IEC 60695-11-10 provided that		
	<ul style="list-style-type: none"> <li>the test sample used for the classification was no thicker than the relevant part of the appliance</li> </ul>	-	N/A

APPENDED TABLE 101 Critical components (clause 24)					
Component	Manufacturer	Type/Model	Technical data	Standard	Mark(s)
All insulation material	-	PA66 / PBT	Black	EN 60947-5-1:2004 +A1:2009	Test with appliance

Type of equipment, model: Micro Switch, the model: KW4, KW4-1, KW4-2, KW4-3, KW4-4, KW4-5, KW4-D, KW4-F, KW4-H, KW4-L, KW4-Q, KW4-OZ. ....

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general

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