








Test Report issued under the responsibility of:



TEST REPORT IEC 60669-1 Switches for household and similar fixed-electrical installations Part 1: General requirements	
Report Reference No.	T211-0036/13
Date of issue	2013-01-21
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CB Testing Laboratory	SIQ – Slovenian Institute of Quality and Metrology, Ljubljana Testing Laboratory is accredited by Slovenian Accreditation, Reg. No.: LP-009
Address	Tržaška cesta 2, SI-1000 Ljubljana, Slovenia
Applicant's name	ALING – CONEL d.o.o.
Address	Železnička 10, 21432 Gajdobra, Serbia
Test specification:	
Standard	IEC 60669-1:1998 (Third Edition) + A1:1999 + A2:2006
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC60669_1D
Test Report Form(s) Originator	IMQ S.p.A.
Master TRF	Dated 2009-03
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Test item description	Flush Mounted Installation Switches (modular system)
Trade Mark	ALING - MODE
Manufacturer	ALING – CONEL d.o.o.
Model/Type reference	See "General Product Information"
Ratings	16 A; 250 V~; IP20

Testing procedure and testing location:	
<input checked="" type="checkbox"/> CB Testing Laboratory:	SIQ-Slovenian Institute of Quality and Metrology, Ljubljana Testing location/ address : Tržaška cesta 2, SI-1000 Ljubljana, Slovenia
<input type="checkbox"/> Associated CB Test Laboratory:	Testing location/ address : Tested by (name + signature)..... : TIBOR KOKELJ Approved by (+ signature)..... : TOMAŽ KNEZ
<input type="checkbox"/> Testing procedure: TMP	Testing location/ address : Tested by (name + signature)..... : Approved by (+ signature)..... : Testing location/ address :
<input type="checkbox"/> Testing procedure: WMT	Testing location/ address : Tested by (name + signature)..... : Witnessed by (+ signature) : Approved by (+ signature)..... : Testing location/ address :
<input type="checkbox"/> Testing procedure: SMT	Testing location/ address : Tested by (name + signature)..... : Approved by (+ signature)..... : Supervised by (+ signature)..... : Testing location/ address :
<input type="checkbox"/> Testing procedure: RMT	Testing location/ address : Tested by (name + signature)..... : Approved by (+ signature)..... : Supervised by (+ signature)..... : Testing location/ address :

Summary of testing:	
Tests performed (name of test and test clause): <p>Testing was performed in 2009 and results are given in test report T211-0039/09 issued on 2009-02-25. This test report contains additional administrative updates related to type designations. No changes have been made which would affect safety.</p>	Testing location: <p>SIQ – Slovenian Institute of Quality and Metrology, Ljubljana Tržaška cesta 2, SI-1000 Ljubljana, Slovenia</p>
Summary of compliance with National Differences:	
Copy of marking plate	
<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>	

Test item particulars	
Pattern number	See "General Product Information"
Contact opening (gap)	<u>normal gap</u> / mini-gap / micro-gap / without contact gap (semiconductor switching device)
Degree of protection against access to hazardous parts and against harmful effects due to the ingress of solid foreign objects	<u>IP2X</u> / IP4X / IP5X
Degree of protection against harmful effects due to the ingress of water	<u>IPX0</u> / IPX4 / IPX5
Method of actuating	rotary / tumbler / <u>rocker</u> / push-button / cord-operated / momentary contact
Method of application	surface-type / <u>flush-type</u> / semi flush-type / panel-type / architrave-type
Method of installation	<u>design A</u> / design B
Type of terminals	<u>screw-type</u> / screwless (rigid) / screwless (rigid and flexible)
Flexible cable outlet	<u>without</u> / with
Rated voltage (V)	250 V~
Rated current (A)	16 A
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing	
Date of receipt of test item	2008-11-10
Date (s) of performance of tests	(2009-01-02) – (2009-02-10) Update: (2012-12-01) – (2013-01-21)
General remarks:	
<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 Issuing testing laboratory.</p> <p>"(see Enclosure #)" refers to additional information appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <u>comma</u> (point) is used as the decimal separator.</p>	

General product information:Type references and pattern numbers:

Model No. / Type reference	Description	Pattern number
art.685.x	Single pole switch	1
art.687.x	Two way switch	6
art.688.x	Intermediate switch	7
art.669.x	Single pole switch with pilot light	1
art.670.x	Two way switch with pilot light	6
art.671.x	Intermediate switch with pilot light	7
art.6851	Single pole switch (supplied without actuating button)	1
art.6691	Single pole switch with pilot light (supplied without actuating button)	1
art.6692.x	Single pole switch with pilot light	1

Additional Model / Type reference list of switch sets due to commercial reasons:

art.6871	Two way switch (supplied without actuating button)	6
art.PP685.x;	Single pole switch (art.685.x packed together as 10 psc.)	1
art.PP687.x;	Two way switch (art.687.x packed together as 10 psc.)	6
art.PP688.x;	Intermediate switch (art.688.x packed together as 10 psc.)	7
art.PP669.x;	Single pole switch with pilot light (art.669.x packed together as 10 psc.)	1
art.PP6692.x;	Single pole switch with pilot light (art.6692.x packed together as 10 psc.)	1
art.PP670.x;	Two way switch with pilot light (art.670.x packed together as 10 psc.)	6
art.PP671.x;	Intermediate switch with pilot light (art.671.x packed together as 10 psc.)	7
art.PP6851;	Single pole switch (supplied without actuating button) (art.6851.x packed together as 10 psc.)	1
art.PP6871;	Two way switch (supplied without actuating button) (art.6871.x packed together as 10 psc.)	6
art.PP6691	Single pole switch with pilot light (supplied without actuating button) (art.6691.x packed together as 10 psc.)	1

Type reference description:

Example: art.685.x (x is color code mark: 0 - white button, A - anthracit button, ...)

Models in **bold letters** are basic switches. All other types listed are marked differently due to comercial requirements (for example: art.PP685.x; is packet of 10 pcs. of Single pole switch (art.685.x))

List of corresponding accessories of MODE program:

Model No. / Type reference	Description
Art.6541.x; 65411.x; 65412.x; 65413.x; 65414.x; 65415.x; 65416.x; 6542.x; 65421.x; 65422.x; 65423.x; 65424.x; 65425.x; 65426.x; 65427.x; 65428.x	Actuator cover (for 1 module) with indication or without
art.6581.x; 65811.x; 65812.x; 65813.x; 65814.x; 65815.x; 65816.x; 65821.x; 65822.x; 65823.x; 65824.x; 65825.x; 65826.x; 65827.x; 65828.x; 6582.x	Actuator cover (for 2 modules) with indication or without
art.6500.x	Empty spot cover (for 1 module)
art.6501.x	Mounting frame cover (for 1 module)
art.6502.x	Mounting frame cover (for 2 modules)
art.6503.x	Mounting frame cover (for 3 modules)
art.6504.x	Mounting frame cover (for 4 modules)
art.6505.x	Mounting frame cover (for 5 modules)
art.6507.x	Mounting frame cover (for 7 modules)
art.65021.x	Mounting frame cover (2 x 2 modules – horizontal)
art.65022.x	Mounting frame cover (2 x 2 modules – vertical)
art.65031.x	Mounting frame cover (3 x 2 modules – horizontal)
art.65032.x	Mounting frame cover (3 x 2 modules – vertical)
art.6511	Mounting frame (for 1 module)
art.6512	Mounting frame (for 2 modules)
art.6513	Mounting frame (for 3 modules)
art.6514	Mounting frame (for 4 modules)
art.6515	Mounting frame (for 5 modules)
art.6517	Mounting frame (for 7 modules)
art.65111	Mounting frame (for 1 module) – hollow walls
art.65121	Mounting frame (for 2 modules) – hollow walls

Type reference description

Example: art.6503.x (x is color code mark: 0 - white button, A - anthracit button, ...)

Note: Each accessory sold separately is marked with Model No. / Type reference on packaging

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Clause	Requirement + Test	Result - Remark	Verdict
8	MARKING		P
8.1	Switches marked with:		-
	- rated current (A) or rated fluorescent load (AX) or a combination of both if the two ratings are different ...:	16 A	P
	- rated voltage (V)	250 V	P
	- symbol for nature of supply	~	P
	- manufacturer's or responsible vendor's name, trade mark or identification mark	ALING - CONEL d.o.o.	P
	- type reference	art.685.x, art.687.x, art.688.x, art.669.x, art.670.x, art.671.x, art.6851, art.6691, art.6692.x, art.6871	P
	- symbol for mini-gap construction (m)		N/A
	- symbol for micro-gap construction (μ)		N/A
	- symbol for semiconductor switching device (ϵ)		N/A
	- first IP characteristic numeral, if declared higher than 2, in which case the second characteristic numeral is also marked	IP20	N/A
	- second IP characteristic numeral, if declared higher than 0, in which case the first characteristic numeral is also marked	IP20	N/A
	Switches with screwless terminals: marked with an indication of the suitability to accept rigid conductors only (if any)	Screw terminals	N/A
8.2	Symbols used: as required in the standard		P
	Marking for the nature of supply placed next to the marking for rated current and rated voltage	16 A; 250 V~	P
8.3	Marking of switches placed on the main part:		-
	- rated current, rated voltage and nature of supply	See photos	P
	- either the name, trade mark, or identification mark of the manufacturer or of the responsible vendor	See photos	P
	- length of insulation to be removed, if any	(10 mm) See photos	P
	- symbol for mini-gap construction, micro-gap construction or semiconductor switching device, if any		N/A
	- type reference	See photos	P
	Cover plates necessary for safety purposes and intended to be sold separately: marked with the manufacturer's or responsible vendor's name, trade mark or identification mark and type reference	Cover plate(s) isn't necessary for safety purpose although sold separately. Marked with manufacturers name, type reference:	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	IP code, when applicable, marked so as to be easily discernible when the switch is mounted and wired as in normal use		N/A
	Marking clearly visible and easily legible		P
	Markings are placed on parts which cannot be removed without the use of a tool		P
8.4	Terminals for phase conductors (supply conductors): identified unless method of connection is of no importance, self evident or indicated on a wiring diagram	Wiring diagram supplied on each product (printed on body)	P
	Indications not placed on screws or other easily removable part		P
	Terminals associated with any one pole for switches of pattern number 2, 3, 03 and 6/2: similar identification differing from that of terminals associated with other poles		N/A
8.5	Neutral terminals: N	art.6692, art 6691	P
	Earthing terminals: [earth symbol]		N/A
	Markings not placed on screws or other easily removable parts		P
	Terminals for conductors not forming part of the main function of the switch:		-
	- clearly identified unless their purpose is self evident, or		P
	- indicated in a wiring diagram fixed to the accessory		P
	Identification of equipment terminals may be achieved by:		-
	- their marking with graphical symbols according to IEC 60417 or colours and/or alphanumeric system, or	All switches supplied with printed-on circuit diagram and identification of terminals	P
	- their physical dimension or relative location		P
8.6	Switches marked to indicate the switch position: they are so marked that the direction of movement of the actuating member to its different positions or the actual position is clearly indicated		N/A
	Switches having more than one actuating member: marking indicates the effect achieved by the operation		N/A
	Marking clearly visible on the front of the switch		P
	Not possible to fix cover, cover plate, or removable actuating members in an incorrect position		P
	Symbols for "on" and "off" not used for indication of switch positions unless clearly indicate the direction of movement of the actuating members	Symbols not used	P
8.7	Red colour only for push-button to open the circuit		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.8	Special precautions necessary to take when installing the switch: details of these and clear information given in an instruction sheet which accompanies the switch		N/A
8.9	Marking durable and easily legible. Test: 15 s with water and 15 s with petroleum spirit		P
9	CHECKING OF DIMENSIONS		P
	Switches and boxes comply with the appropriate standard sheets, if any	Modular system with accompanying installation frames	P
10	PROTECTION AGAINST ELECTRIC SHOCK		P
10.1	Switches: live parts not accessible		P
	Switches designed to be fitted with pilot lights supplied at voltage other than ELV have means to prevent direct contact with the lamp		P
	Test with standard test finger shown in figure 1 of IEC 60529		P
	Switches with thermoplastic or electrometric material: additional test carried out at $35\text{ °C} \pm 2\text{ °C}$ with a straight unjointed test finger (75 N for 1 min)		P
	Straight unjointed test finger applied to thin-walled knock-outs with a force of 10 N		N/A
	During the test: switches not deform and no live parts accessible		P
10.2	Knobs, operating levers, push buttons, rockers and the like: of insulating material, unless:		P
	- accessible metal parts separated from metal parts of mechanism by double or reinforced insulation, or		N/A
	- reliably connected to earth		N/A
10.3	Accessible parts of switches which a rated current $\leq 16\text{ A}$ are made of insulating material		P
10.3.1	Metal covers or cover plates protected by supplementary insulation made by insulating linings or insulating barriers		N/A
	Insulating linings or insulating barriers:		-
	- cannot be removed without being permanently damaged, or designed that		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	- cannot be replaced in an incorrect position; if they are omitted, accessories are rendered inoperable or manifestly incomplete; there is no risk of accidental contact between live parts and metal covers or cover plates; precautions are taken to prevent creepage distances or clearances becoming less than the values specified in clause 23		N/A
10.3.2	Earthing of metal covers or cover plates: connection of low resistance		N/A
10.4	Metal parts of mechanism not insulated from live parts: not protrude from enclosure		N/A
	Switches operated by means of a removable key or similar device: metal parts of mechanism insulated from live parts		N/A
10.5	Metal parts of mechanism not accessible and insulated from accessible metal parts, unless		P
	- separated from live parts (creepage distances and clearances have at least twice the value specified in clause 23), or		N/A
	- reliably connected to earth		N/A
10.6	Switches operated by means of a removable key or an intermediate part: key or an intermediate part can only touch parts insulated from live parts		N/A
	key or intermediate part: insulated from metal parts of mechanism, unless		N/A
	creepage distances and clearances between live parts and metal parts of mechanism have at least twice the values specified in clause 23		N/A
10.7	Cord-operated switches: impossible to touch live parts when fitting or replacing the pull cord		N/A

11	PROVISION FOR EARTHING		N/A
11.1	Accessible metal parts: provided with, or permanently and reliably connected to, an earthing terminal		N/A
11.2	Earthing terminals: with screw clamping or screwless terminals and comply with clause 12		N/A
	Capacity of earthing terminals not less than that of the corresponding terminals for the supply conductors		N/A
	Any additional external earthing terminal has a size suitable for conductors of at least 6 mm ² (mm ²)		N/A
11.3	Surface-type switches with an enclosure of insulating material, with IP > X0 and more than one cable inlet, are provided for the continuity of the earthing circuit with:		-

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Clause	Requirement + Test	Result - Remark	Verdict

	- an internal fixed earthing terminal, or		N/A
	- adequate space for a floating terminal allowing the connection of an incoming and outgoing conductor		N/A
11.4	Connection between earthing terminal and accessible metal parts: of low resistance		N/A
	Test current equal to 1,5 In or 25 A (A)		—
	Resistance $\leq 0,05 \Omega$ (Ω)		N/A

12	TERMINALS		P
12.1	General		P
	Switches provided with screw-type terminals or with screwless terminals	Screw terminals	P
	Clamping means of terminals: not serve to fix any other components		P
	All the test on terminals, with the exception of the test of 12.3 11, made after the test of 15.1		P
12.2	Terminals with screw clamping for external copper conductors		-
12.2.1	Switches provided with terminals which allows the proper connection of copper conductors as shows in table 2		P
	Rated current (A)	16 A	—
	Type of conductor (rigid / flexible)	Rigid	—
	Smallest / largest cross-sectional area (mm ²)	1,5 mm ² / 4 mm ² (2 x 2,5 mm ²)	—
	Diameter of largest conductor (mm)	2,72 mm	—
	Figure of terminal	1 / 2 / 3 / 4 / 5	—
	Minimum diameter D (minimum dimensions) of conductor space: required (mm); measured (mm) ...:	2,0 – 2,7 mm / 3,5 mm	P
12.2.2	Terminals allow the conductor to be connected without special preparation		P
12.2.3	Terminals have adequate mechanical strength		P
	Screws and nut for clamping the conductors have metric ISO thread or a comparable thread		P
	Screws not of soft metal such as zinc or aluminium		P
12.2.4	Terminals resistant to corrosion		P
12.2.5	Screw-type terminals clamp the conductor(s) without undue damage	See appended table 12.2.5	P
	During the test: conductor not slip out, no break near clamping unit and no damage		P

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Clause	Requirement + Test	Result - Remark	Verdict
12.2.6	Terminals clamp the conductor reliably between metal surfaces	See appended table 12.2.6	P
	During the test: conductor not move noticeably		P
12.2.7	Terminals designed or placed that the conductor cannot slip out while the clamping screws or nuts are tightened	See appended table 12.2.7	P
	After the test: no wire of the conductor escaped outside the clamping unit thus reducing creepage distances and clearances to values lower than those indicated in clause 23		P
12.2.8	Terminals not work loose from their fixing to the switch		P
	Torque test:		-
	- rated current (A)	16 A	—
	- solid rigid copper conductor of the largest cross-sectional area (mm ²) (table 2)	4 mm ² ; 2x 2,5 mm ²	—
	- torque (Nm) (table 3 or appropriate figures 1, 2, 3, 4)	0,8 Nm	—
	Screws and nuts tightened and loosened 5 times. During the test: terminals not work loose and show no damage		P
12.2.9	Clamping screws or nuts of earthing terminals: adequately locked against accidental loosening, not possible to loosen them without the aid of a tool		N/A
12.2.10	Earthing terminals: no risk of corrosion		N/A
	Body of brass or other metal no less resistant to corrosion		P
	If the body is a part of a frame or enclosure of aluminium alloy, precautions are taken to avoid the risk of corrosion		N/A
12.2.11	Pillar terminals: distance g no less than the value specified in figure 1: required (mm); measured (mm) :		N/A
	Mantle terminals: distance g no less than the value specified in figure 5: required (mm); measured (mm) :		N/A
12.2.12	Lug terminals:		-
	- used only for switches having rated current ≥ 40 A		N/A
	- fitted with spring washers or equally effective locking means		N/A
12.3	Screwless terminals for external copper conductors		N/A
12.3.1	Screwless terminals of the type suitable for:		N/A
	- for rigid copper conductors only, or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- for both rigid and flexible copper conductors (tests carried out with rigid and then repeated with flexible conductors)		N/A
12.3.2	Screwless terminals provided with clamping units which allow the proper connection of rigid or of rigid and flexible conductors having nominal cross-sectional areas as shown in table 7		N/A
	Rated current (A)		—
	Type of conductor (rigid / flexible)		—
	Smallest / largest cross-sectional area (mm ²)		—
	Diameter of largest rigid conductor (mm)		—
	Diameter of largest flexible conductor (mm)		—
12.3.3	Screwless terminals allow the conductor to be connected without special preparation		N/A
12.3.4	Parts of screwless terminals intended for carrying current of materials as specified in 22.5		N/A
12.3.5	Screwless terminals clamp specified conductors with sufficient contact pressure without undue damage to the conductor		N/A
	Conductor clamped between metal surfaces		N/A
12.3.6	It is clear how the connection and disconnection of the conductors is to be made		N/A
	Disconnection of a conductor require an operation, other than a pull, so that can be made manually with or without a general-purpose tool		N/A
	It is not possible to confuse the opening for the use of a tool with the opening intended for the conductor		N/A
12.3.7	Screwless terminals intended for the interconnection of two or more conductors:		N/A
	- during insertion, operation of clamping means of one of the conductors is independent of operation of that for the other conductor(s);		N/A
	- during disconnection, conductors can be disconnected either at the same time or separately;		N/A
	- each conductor introduced in a separate clamping unit.		N/A
	It is possible clamp securely any number of conductors up to the maximum as designed. Number of conductors; Nominal cross-sectional area (mm ²)		N/A
12.3.8	Screwless terminals: adequate insertion obvious and over-insertion prevented		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Screwless terminals of switches: undue insertion of the conductor prevented by a stop if further insertion is liable to reduce creepage distances and/or clearances required in table 20 or to influence the mechanism		N/A
12.3.9	Screwless terminals properly fixed to the switch		N/A
	Not work loose when conductors are connected or disconnected		N/A
	Self-hardening resins used to fix terminals not subject to mechanical stress		N/A
12.3.10	Screwless terminals withstand mechanical stresses occurring in normal use	See appended table 12.3.10	N/A
	During application of the pull conductor not come out of the terminal		N/A
	Test with apparatus shown in figure 10	See appended table 12.3.10	N/A
	During the test conductors not move noticeably in the clamping unit		N/A
	After these tests: neither terminals nor clamping means have worked loose and conductors show no deterioration		N/A
12.3.11	Screwless terminals withstand electrical and thermal stresses occurring in normal use	See appended table 12.3.11	N/A
	After the test: inspection show no changes		N/A
	Repetition of test according to 12.3.10: screwless terminals withstand mechanical stresses occurring in normal use	See appended table 12.3.11	N/A
	During application of the pull conductor not come out of the terminal		N/A
	Test with apparatus shown in figure 10	See appended table 12.3.11	N/A
	During the test conductors not move noticeably in the clamping unit		N/A
	After these tests: neither terminals nor clamping means have worked loose and conductors show no deterioration		N/A
12.3.12	Screwless terminals: connected rigid solid conductor remains clamped, even when deflected during normal installation	See appended table 12.3.12	N/A
13	CONSTRUCTIONAL REQUIREMENTS		P
13.1	Insulating lining, barriers and like: adequate mechanical strength and secured in a reliable manner		P
13.2	Switches constructed so as to permit:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	- easy introduction and connection of the conductors in the terminals;		P
	- correct positioning of the conductors		P
	- easy fixing of the switch to a wall or in a box		P
	- adequate space between underside of the base and the surface on which the base is mounted or between the sides of the base and the enclosure (cover or box)		P
	Surface-type switches: fixing means do not damage insulation of the cable		N/A
	Switches classified as design A: permit easy positioning and removal of the cover or cover plate, without displacing the conductors		P
13.3	Covers, cover-plates and actuating members or parts of them intended to ensure protection against electric shock:		-
	- held in place at two or more points by effective fixings		N/A
	- fixed by means of a single fixing, e.g. by a screw, provided that they are located by another means (e.g. by a shoulder)		N/A
	Fixings of covers, cover-plates or actuating members of switches of design A serves to fix the base: there is means to maintain the base in position, even after removal of the covers, cover-plates or actuating members		N/A
13.3.1	Covers, cover plates or actuating members whose fixing is of the screw-type:		-
	Compliance checked by inspection only		N/A
13.3.2	Covers, cover plates or actuating members whose fixing is not dependent on screws and whose removal is obtained by applying a force in a direction approximately perpendicular to the mounting/supporting surface:		-
	Compliance checked, when their removal may give access, with the standard test finger:		-
	to live parts: by the test of 20.4 (verification of the non-removal and the removal)		N/A
	to non-earthed metal parts separated from live parts by creepage distances and clearances according to table 20: by the test of 20.5 (verification of the non-removal and the removal)		N/A
	only to insulating parts, or earthed metal parts, or metal parts separated from live parts by creepage distances and clearances twice those according to table 20, or live parts of SELV circuits not greater than 25 V a.c.: by the test of 20.6 (verification of the non-removal and the removal)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
13.3.3	Covers, cover-plates or actuating members whose fixing is not dependent on screws and whose removal is obtained by using a tool, in accordance with the manufacturer's information given in an instruction sheet or in a catalogue:		-
	Compliance checked, when their removal may give access, with the standard test finger:		-
	to live parts: by the test of 20.4 (verification of the non-removal only)		N/A
	to non-earthed metal parts separated from live parts by creepage distances and clearances according to table 20: by the test of 20.5 (verification of the non-removal only)		N/A
	only to insulating parts, or earthed metal parts, or metal parts separated from live parts by creepage distances and clearances twice those according to table 20, or live parts of SELV circuits not greater than 25 V a.c.: by the test of 20.6 (verification of the non-removal only)		N/A
13.4	Switches: no free openings in their enclosures according to their IP classification		P
13.5	Knobs of rotary switches securely attached to the shaft or part operating the mechanism		N/A
	- axial pull test: 100 N for 1 min		N/A
	- knob of switches having only one direction of operation: turned 100 times in the reverse direction		N/A
	During the test: knob not become detached		N/A
13.6	Screws or other means for mounting the switch on a surface or in a box or enclosure: easily accessible from the front.	Modular system – screwless mounting into installation box	N/A
	Fixing means not serve any other fixing purpose		N/A
13.7	Combinations of switches, or of switches and socket-outlets, comprising separate bases: correct position of each base ensured		N/A
	Fixing of each base independent of the fixing of the combination to the mounting surface		P
13.8	Accessories combined with switches: comply with their standard		N/A
13.9	Surface-type switches with IP > 20 are in according to their classification when fitted with conduits or with sheathed cables		N/A
	Surface-type switches with IPX4 or IPX5 have provisions for opening a drain hole		N/A
	Switches provided with a drain hole: it is not less than 5 mm in diameter, or 20 mm ² in area with a width and a length not less than 3 mm	Ø mm / mm ²	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Drain hole: effective		N/A
	Lid springs (if any): of corrosion resistant material (bronze or stainless steel)		N/A
13.10	Switches to be installed in a box: conductor ends can be prepared after the box is mounted in position, but before the switch is fitted in the box		P
	Base have adequate stability when mounted in the box		P
13.11	Surface-type switches with IP > X0, pattern numbers 1, 5 and 6, with more than one inlet opening, provided with:		-
	- fixed additional terminal complying with the requirements of clause 12, or		N/A
	- adequate space for a floating terminal		N/A
13.12	Inlet openings: allow the introduction of the conduit or the sheath of the cable		N/A
	Surface-type switches: intended conduit or protective covering can enter at least 1 mm into the enclosure		N/A
	Inlet openings for conduit entries of surface-type switches: capable of accepting conduit sizes of 16, 20, 25 or 32 or a combination of at least two of these sizes not excluding two of the same size		N/A
	Inlet openings for cable entries of surface-type switches: capable of accepting cables having the dimensions specified in table 12 or be as specified by the manufacturer: rated current (A); limits of external diameter of cables min/max (mm)		N/A
13.13	Surface-type switches: provision for back entry (if are intended)		N/A
13.14	Membranes or the like (if provided): replaceable		N/A
13.15	Requirements for membranes in inlet openings		N/A
13.15.1	Membranes reliably fixed and not displaced by the mechanical and thermal stresses occurring in normal use		N/A
	Test on membranes subjected to the ageing treatment specified in 15.1 and fitted with the switches		-
	Switches placed at 40 °C for 2 h. Force of 30 N applied for 5 s by test finger. During the test: no deformation, live parts not accessible		N/A
	Membranes likely to be subjected to an axial pull: axial pull of 30 N applied for 5 s. During the test: membranes not come out		N/A
	After the test: no harmful deformation, cracks or similar damage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test repeated with membranes not subjected to any treatment		N/A
13.15.2	Membranes in inlet openings: introduction of the cables into the accessory permitted when the ambient temperature is low		N/A
	Test on membranes not subjected to the ageing treatment specified in 15.1 and fitted with the switches		-
	Switches kept at -5 °C for 2 h: possibility to introduce cables of the heaviest type through the membranes		N/A
	After the test: no harmful deformation, cracks or similar damage		N/A
13.16	Flexible cable outlet switches: flexible cable (60245 IEC 66 or 60227 IEC 53, or as specified by the manufacturer) may enter the switch through a suitable hole, groove or gland		N/A
	Maximum dimension of flexible cable having conductors specified in table 12a accepted by the entry:		-
	- rated current (A)		—
	- cross-sectional area (mm ²) (min 1,5 mm ²)		—
	Entry shaped to prevent damage to the flexible cable		N/A
	Flexible cable outlet switches: provided with cable anchorage		N/A
	Cable anchorage: contains the sheath, of insulating material or provided with an insulating lining fixed to the metal parts		N/A
	Cable anchorage: anchor the flexible cable securely to the switch		N/A
	Cable anchorage cannot be released from the outside		N/A
	Use of a special purpose tool not required		N/A
	Screws: not serve to fix any other component, unless		N/A
	- switch is rendered manifestly incomplete if component omitted or replaced in an incorrect position, or		N/A
	- component cannot be removed without further use of a tool		N/A
	Pull test (30 N, 25 times): cable 60227 IEC 53, cross-sectional area 1,5 mm ² ; torque (Nm) (2/3 table 3)		N/A
	Torque test: torque 0,15 Nm for 1 min, cable not displaced > 2 mm		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Pull test (60 N, 25 times): cable 60245 IEC 66, diameter (mm) of cable; torque (Nm) (2/3 table 3) ...:		N/A
	Torque test: torque 0,35 Nm for 1 min, cable not displaced > 2 mm		N/A
	Test voltage of 2000 V a.c. applied for 1 min between the conductors and the cord anchorage:		-
	During the test: insulation of flexible cable not damaged (no breakdown or flashover)		N/A
14	MECHANISM		P
14.1	Actuating member of a switch, when released, automatically take up the position corresponding to that of moving contacts		P
14.2	Moving contact of switches can come to rest only in "on" and "off" positions		P
	Intermediate position permissible if:		-
	- it corresponds to the intermediate position of the actuating member, and		N/A
	- the insulation between fixed and moving contacts is adequate. Electric strength test as specified in 16.2: test voltage a.c. for 1 min (V)	500 V / 750 V / 1250 V / 2000 V	N/A
14.3	No undue arcing in slowly operation		P
	Test carried out at the end of the test of clause 19.1: breaking of the circuit 10 times, actuating member moved over a period of 2 s. During the test: no sustained arcing	no sustained arcing	P
14.4	Switches of pattern numbers 2, 3, 03 and 6/2 make and break all poles substantially simultaneously		N/A
	Neutral pole of switches of pattern numbers 03 not make after or break before the other poles		N/A
14.5	Action of the mechanism: independent of the presence of cover or cover plate. Test: no flicker	Switch can be switched on/off without presence of cover although cover constitutes part of the actuating member	P
14.6	Cord-operated switches: effecting a change by application and removal a pull not exceeding:		-
	- 45 N applied vertically, and		N/A
	- 65 N applied at $45^\circ \pm 5^\circ$		N/A
15	RESISTANCE TO AGEING, PROTECTION PROVIDED BY ENCLOSURES OF SWITCHES, AND RESISTANCE TO HUMIDITY		P
15.1	Resistance to ageing		P
	Switches and boxes placed for 7 days (168 h) in a heating cabinet at $70^\circ\text{C} \pm 2^\circ\text{C}$		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- no crack visible after test with normal or corrected vision without additional magnification		P
	- no sticky or greasy material as a result of heat		P
	- no trace of cloth (forefinger pressed with 5 N)		P
	- no other damage as a result of heat		P
15.2	Protection provided by enclosures of switches		P
15.2.1	Protection against access to hazardous parts and against harmful effects due to ingress of solid foreign objects		P
	Enclosure of the switch provides a degree of protection against access to hazardous parts and against harmful effects due to ingress of solid foreign objects in accordance with the IP classification of the switch		P
	Glands: torque (Nm) (2/3 of torque applied in 20.3) :	/	—
	Screws of the enclosure: torque (Nm) (2/3 table 3)	/	—
15.2.1.1	Protection against access to hazardous parts		-
	Appropriate test according to IEC 60529: IP2X		P
15.2.1.2	Protection against harmful effects due to ingress of solid foreign objects		-
	Appropriate test according to IEC 60529: IPX0		N/A
	Dust not penetrate in quantity to interfere with satisfactory operation or to impair safety		N/A
15.2.2	Protection against harmful effects due to ingress of water		N/A
	Enclosure of switches provide a degree of protection against harmful effects due to ingress of water in accordance with their IP classification		N/A
	Appropriate test according to IEC 60529: IP		N/A
	Flush-type and semi-flush-type switches fixed:		-
	- in a test wall using an appropriate box in accordance with the manufacturer's instructions		N/A
	- in a test wall according to figure 27		N/A
	Screws of the enclosure: torque (Nm) (2/3 table 3)	/	—
	Glands: torque (Nm) (2/3 of torque applied in table 19): /		—
	Specimens withstand an electric strength test specified in 16.2 which is started within 5 min of completion of the test		N/A
15.3	Resistance to humidity		P
	Switches proof against humidity which may occur in normal use		P

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Clause	Requirement + Test	Result - Remark	Verdict

	Compliance checked by a humidity treatment carried out in a humidity cabinet containing air with relative humidity maintained between 91 % and 95 %. Specimens kept in the cabinet for:		-
	- 2 days (48 h) for switches with IPX0		P
	- 7 days (168 h) for switches with IP>X0		N/A
	After this treatment: specimens show no damage		P

16	INSULATION RESISTANCE AND ELECTRIC STRENGTH		P
16.1	The insulation resistance measured 1 min after application of 500 V d.c.	See appended table 16.1	P
16.2	Electric strength: a.c. test voltage applied for 1 min	See appended table 16.2	P

17	TEMPERATURE RISE		P
17.1	Switches so constructed that the temperature rise in normal use is not excessive	See appended table 17	P
	No oxidation or any other deterioration of contacts		P
17.2	Switches incorporating or intended to incorporate pilot lights are designed that in normal use temperature of the accessible surface is not excessive	See appended table 17	P

18	MAKING AND BREAKING CAPACITY		P
	Switches have adequate making and breaking capacity		P
	- model/type reference	art.685.x, art.688.x, art.687.x	—
	- pattern number	art.685.x (1) art.688.x (7) art.687.x (6)	—
	- rated voltage (V)	250 V	—
	- rated current (A)	16 A	—
	- nominal cross-sectional area as for the test of clause 17 (mm ²)	2,5 mm ²	—
18.1	Test with cos ϕ 0,3 alternating current		P
	- test voltage (1,1 V _n) (V)	275 V	—
	- test current (1,25 I _n) (cos ϕ 0,3) (A)	20 A	—
	- 200 operations; rate (operations per minute)	15	—
	- samples number	3	—
	During the test: no sustained arcing		P

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Clause	Requirement + Test	Result - Remark	Verdict

	After the test: specimens show no damage		P
18.2	Test with tungsten filament lamps load (switches with $I_n \leq 16$ A / $V_n \leq 250$ V and switches of pattern numbers 3 and 03 with $V_n > 250$ V)		P
	- test voltage (V_n) (V)	250 V	—
	- test current ($\geq 1,2 I_n$) (A)	19,2 A	—
	- number of 200 W tungsten filament lamps	25	—
	- 200 operations; rate (operations per minute)	15	—
	- samples number	3	—
	During the test: no sustained arcing nor welding of the contacts		P
	After the test: specimens show no damage		P

19	NORMAL OPERATION		P
19.1	Switches withstand without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use		P
	- model/type reference	art.685.x, art.688.x, art.687.x	—
	- pattern number	art.685.x (1) art.688.x (7) art.687.x (6)	—
	- nominal cross-sectional area per clause 18 (mm ²)	2,5 mm ²	—
	- test voltage (V_n) (V)	250 V	—
	- test current (I_n) ($\cos \phi$ 0,6) (A)	16 A	—
	- number of operations per table 17	40 000	—
	- rate (operations per minute)	15	—
	- samples number	3	—
	Reduced electric strength per clause 16	See appended table 19.1	P
	Temperature rise test per clause 17 after normal operation	See appended table 19.1	P
	After the tests the specimens not show:		-
	- wear impairing their further use;		P
	- discrepancy between the position of the actuating member (if indicated) and that of the moving contacts		P
	- deterioration of enclosures, insulating lining or barriers;		P
	- seepage of sealing compound		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- loosening of electrical or mechanical connections;		P
	- displacement of moving contacts of switches pattern number 2, 3, 03 or 6/2		N/A
	No sustained arcing in slowly operation (sub-clause 14.3)		P
19.2	Switches intended for fluorescent lamp load withstand, without excessive wear or other harmful effect, the electrical and thermal stresses occurring when controlling fluorescent lamp circuits		P
	- model/type reference	art.685.x, art.688.x, art.687.x	—
	- pattern number	Art.685.x (1) Art.688.x (7) Art.687.x (6)	—
	- nominal cross-sectional area per clause 18 (mm ²)	2,5 mm ²	—
	- rate (operations per minute)	15	—
	- test voltage (Vn); test current (In) (cos φ 0,9); number of operations with load A	250 V / 16 A / 10 000	—
	- test voltage (Vn); 100 operations with load B	250 V / 100	—
	- samples number	3	—
	During the test: copper wire F not melt, specimens function correctly, no sustained arcing or welding of contacts		P
	Temperature rise test per clause 17 after normal operation	See appended table 19.2	P
	After the tests it is possible to make and break the switch by hand, and specimen not show:		P
	- wear impairing their further use;		P
	- discrepancy between the position of the actuating member (if indicated) and that of the moving contacts		P
	- deterioration of enclosures, insulating lining or barriers;		P
	- loosening of electrical or mechanical connections;		P
	- seepage of sealing compound		N/A
	- displacement of moving contacts of switches pattern number 2, 3 or 6/2		N/A
20	MECHANICAL STRENGTH		P
	Switches, boxes and screwed glands have adequate mechanical strength		P

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Clause	Requirement + Test	Result - Remark	Verdict
20.1	For all types of switches and for boxes: impact test (9 blows)	See appended table 20.1	P
	After the test: no damage, live parts no become accessible		P
20.2	Bases of surface-type switches first fixed to a cylinder of rigid steel sheet of radius equal to 4,5 times the distance between fixing holes (mm)		N/A
	Bases then fixed to a flat steel sheet		N/A
	Torque applied to fixing screws (Nm)	0,5 Nm / 1,2 Nm	—
	During and after the test: bases show no damage		N/A
20.3	Screwed glands of switches with that have IP code higher than IP20: torque test		-
	- diameter of cylindrical metal test rod (mm)		—
	- type of material	metal / moulded material	—
	- torque for 1 min (table 19) (Nm)		—
	After the test: no damage of glands and enclosure of the specimens		N/A
20.4	Force necessary for covers, cover-plates or actuating members to come off or not to come off (accessibility with the test finger to live parts)		N/A
20.4.1	Verification of the non-removal of covers, cover-plates or actuating member		N/A
	Force applied for 1 min in direction perpendicular to the mounting surface	40 N / 80 N	—
	Covers, cover-plates or actuating members not come off		N/A
	Test repeated on new specimens with a sheet of hard material, 1 mm \pm 0,1 mm thick, fitted around the supporting frame (fig. 19)		N/A
	Covers, cover-plates or actuating members not come off		N/A
	After the test: no damage		N/A
20.4.2	Verification of the removal of covers, cover-plates or actuating members		N/A
	Force not exceeding 120 N applied 10 times in direction perpendicular to the mounting / supporting surface: covers, cover-plates or actuating members come off		N/A
	Test repeated on new specimens with a sheet of hard material, 1 mm \pm 0,1 mm thick, fitted around the supporting frame (fig. 19)		N/A
	Covers, cover-plates or actuating members come off		N/A
	After the test: no damage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.5	Force necessary for covers, cover-plates or actuating members to come off or not to come off (accessibility with the test finger to non-earthed metal parts separated from live parts by creepage distances and clearances according to table 20)		P
20.4.1	Verification of the non-removal of covers, cover-plates or actuating members		P
	Force applied for 1 min in direction perpendicular to the mounting surface: <u>10 N / 20 N</u>		—
	Covers or cover-plates not come off		P
	Test repeated on new specimens with a sheet of hard material, 1 mm ± 0,1 mm thick, fitted around the supporting frame (fig. 19)		P
	Covers, cover-plates or actuating members not come off		P
	After the test: no damage		P
20.4.2	Verification of the removal of covers, cover-plates or actuating members		-
	Force not exceeding 120 N applied 10 times in direction perpendicular to the mounting / supporting surface: covers, cover-plates or actuating members come off		P
	Test repeated on new specimens with a sheet of hard material, 1 mm ± 0,1 mm thick, fitted around the supporting frame (fig. 19)		P
	Covers, cover-plates or actuating members come off		P
	After the test: no damage		P
20.6	Force necessary for covers, cover-plates or actuating members to come off or not to come off (accessibility to insulating parts, earthed metal parts, live parts of SELV ≤ 25 V a.c. or metal parts separated from live parts by creepage distances twice those according to table 20)		N/A
20.4.1	Verification of the non-removal of covers, cover-plates or actuating members		-
	Force 10 N applied for 1 min in direction perpendicular to the mounting surface: covers, cover-plates or actuating members not come off		N/A
	Test repeated on new specimens with a sheet of hard material, 1 mm ± 0,1 mm thick, fitted around the supporting frame (fig. 19)		N/A
	Covers, cover-plates or actuating members not come off		N/A
	After the test: no damage		N/A
20.4.2	Verification of the removal of covers, cover-plates or actuating members		-
	Force not exceeding 120 N applied 10 times in direction perpendicular to the mounting / supporting surface: covers, cover-plates or actuating members come off		P

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Clause	Requirement + Test	Result - Remark	Verdict

	Test repeated on new specimens with a sheet of hard material, 1 mm \pm 0,1 mm thick, fitted around the supporting frame (fig. 19)		P
	Covers, cover-plates or actuating members come off		P
	After the test: no damage		P
20.7	Test with gauge of figure 20 applied according to figure 21 for verification of the outline of covers, cover-plates or actuating members: distances between face C of gauge and outline of side under test, not decrease: <u>complying</u> / not complying		—
20.8	Test with gauge according to figure 23 applied as shown in figure 24 (1 N): gauge not enter more than 1mm: <u>complying</u> / not complying		—
20.9	Operating members of cord-operated switch have adequate strength		N/A
	Pull test: pull 100 N for 1 min (normal use); pull of 50 N for 1 min (unfavourable direction). After the test:		-
	- switch show no damage		N/A
	- operating member not broken and cord-operated switch still operate		N/A

21	RESISTANCE TO HEAT		P
21.1	Switches kept for 1 h in a heating cabinet at a temperature of 100 °C \pm 2 °C		P
	During the test: no change impairing their further use and sealing compound, if any, not flow		P
	After the test: no access to live parts, markings still legible		P
21.2	Parts of insulating material necessary to retain current-carrying parts and parts of the earthing circuit in position: ball-pressure test (1 h, 125 °C)	See appended table 21.2	P
21.3	Parts of insulating material not necessary to retain current-carrying parts and parts of the earthing circuit in position, even though in contact with them: ball-pressure test (1 h)	See appended table 21.3	P

22	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		P
22.1	Connections withstand mechanical stresses		P
	Thread-forming or thread-cutting screws used only if supplied together with the piece in which they are intended to be inserted		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	thread-cutting screws intended to be used during installation are captive with the relevant part of the accessory		N/A
	Screws and nuts which transmit contact pressure: in engagement with a metal thread		P
	Threaded part torque test	See appended table 22.1	P
22.2	Screws in engagement with a thread of insulating material: correct introduction into the screw hole or nut ensured		N/A
22.3	Contact pressure: not transmitted through insulating material other than ceramic, pure mica or other material no less suitable unless there is sufficient resiliency in metallic parts		P
22.4	Screws and rivets locked against loosening or turning		P
22.5	Current-carrying parts of metal having mechanical strength, electrical conductivity and resistance to corrosion adequate:		P
	- copper;		N/A
	- alloy with at least 58 % copper for parts made from cold-rolled sheet or with at least 50 % copper for other parts;		P
	- stainless steel with at least 13 % chromium and not more than 0,12 % carbon		N/A
	- steel with electroplated coating of zinc (ISO 2081): service condition ISO no. (1/2/3); IP (X0/X4/X5); thickness (µm)		N/A
	- steel with electroplated coating of nickel and chromium (ISO 1456): service condition ISO no. (2/3/4); IP (X0/X4/X5); thickness (µm)		N/A
	- steel with electroplated coating of tin (ISO 2093): service condition ISO no. (2/3/4); IP (X0/X4/X5); thickness (µm)		N/A
	Current-carrying parts subjected to mechanical wear: not of steel with electroplated coating		N/A
	Metals having a great difference of electrochemical potential: not used in contact with each other		P
22.6	Contacts subjected to sliding action: of metal resistant to corrosion		N/A
22.7	Thread-forming screws and thread-cutting screws not used for the connection of current-carrying parts		P
	Thread-forming screws and thread-cutting screws used to provide earthing continuity: not necessary to disturb the connection and at least two screws are used for each connection		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

23	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH SEALING COMPOUND		P
23.1	Creepage distances, clearances and distances through sealing compound no less than the values shown in table 20	See appended table 23.1	P
23.2	Insulating compound: not protrude above the edge of the cavity in which it is contained		P

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Clause	Requirement + Test	Result - Remark	Verdict
24	RESISTANCE OF INSULATING MATERIAL TO ABNORMAL HEAT, TO FIRE AND TO TRACKING		P
24.1	Parts of insulating material which might be exposed to thermal stresses due to electric effects and the deterioration of which might impair the safety are not unduly affected by abnormal heat and fire		P
24.1.1	Glow-wire test according to IEC 60695-2-1	See appended table 24.1.1	P
24.2	Parts of insulating material retaining live parts in position of switches with IP>X0: of material resistant to tracking		N/A
	Tracking test with solution A of IEC 60112	See appended table 24.2	N/A
25	RESISTANCE TO RUSTING		P
	Ferrous parts protected against rusting		P
	Test: 10 min in carbontetrachloride, trichloroethane or equivalent degreasing agent, 10 min 10 % solution of ammonium chloride, 10 min in a box with air saturated with moisture and 10 min at 100 °C ± 5 °C:		-
	No signs of rust		P
26	EMC REQUIREMENTS		N/A
26.1	Immunity		
	No immunity tests necessary		N/A
26.2	Emission		
	No emission tests necessary		N/A

12.2.5	TABLE: test with apparatus shown in figure 10 (screw terminals)				P
	rated current (A)	16 A			—
	type of conductors	rigid solid / rigid stranded			—
	smallest/largest cross-sectional area per table 2 (mm ²)	1,5 mm ² / 4 mm ²			—
	number of conductors	2			—
	nominal diameter of thread (mm); torque per table 3 (Nm)	3,4 mm / 0,8 Nm			—
	Cross-sectional area (mm ²)	Diameter of bushing hole per table 4 (mm)	Height H per table 4 (mm)	Mass (kg)	Remarks
	1,5 mm ²	6,5 mm	260 mm	0,4	P
	2 x 2,5 mm ²	9,5 mm	280 mm	0,7	P
	4 mm ²	9,5 mm	280 mm	0,9	P
supplementary information: Switches of all type references have the same terminal construction					

12.2.6	TABLE: pull test (screw terminals)				P
	rated current (A)	16 A			—
	smallest/largest cross-sectional area per table 2 (mm ²)	1 mm ² / 2 x 2,5 mm ² / 4 mm ²			—
	nominal diameter of thread (mm); torque 2/3 per table 3 (Nm)	3,4 mm / 0,54 Nm			—
	Cross-sectional area (mm ²)	Number of conductors	Type of conductors (rigid solid / rigid stranded)	Pull per table 5 applied for 1 min (N)	Remarks
	1 mm ²	1	rigid solid	50	P
	2,5 mm ²	2	rigid solid	50	P
	4 mm ²	1	rigid solid	50	P
supplementary information: Switches of all type references have the same terminal construction					

12.2.7	TABLE: tightening test (screw terminals)			P
	rated current (A)	:	16 A	—
	nominal diameter of thread (mm); torque 2/3 per table 3 (Nm)	:	3,4 mm / 0,54 Nm	—
Largest cross-sectional area per table 2 (mm ²)	Permissible number of conductors	Type of conductors (rigid solid / rigid stranded)	Number of wires and nominal diameter of wires per table 6	Remarks
2,5 mm ²	2	rigid solid	1 x 1,78 mm	P
2,5 mm ²	2	rigid stranded	7 x 0,67 mm	P
4 mm ²	2	rigid solid	1 x 2,25 mm	P
supplementary information: Switches of all type references have the same terminal construction				

12.3.10	TABLE: mechanical stresses occurring in normal use (screwless terminals)			N/A
	rated current (A)	:		—
	largest/smallest cross-sectional area per table 7 (mm ²)	:		—
Number of connection (after that conductor subjected to a pull of 30 N for 1 min) / disconnection	Type of conductor (solid / rigid stranded / flexible)	Cross-sectional area (mm ²)	Remarks	
	TABLE: test with apparatus shown in figure 10			N/A
	rated current (A)	:		—
	type of conductors	:	rigid solid / rigid stranded	—
	smallest/largest cross-sectional area per table 7 (mm ²)	:		—
	number of conductors	:		—
Cross-sectional area (mm ²)	Diameter of bushing hole per table 4 (mm)	Height H per table 4 (mm)	Mass (kg)	Remarks
supplementary information:				

12.3.11	TABLE: electrical and thermal stresses occurring in normal use						N/A
Test a)	Test carried out for 1 h connecting rigid solid conductors:						N/A
	test current per table 8 (A)						—
	nominal cross-sectional area (mm ²)						—
Screwless terminal number		Voltage drop (mV)			Required voltage drop		
1					≤ 15 mV		
2					≤ 15 mV		
3					≤ 15 mV		
4					≤ 15 mV		
5					≤ 15 mV		
Test b)	Temperature cycles test) carried out on terminals subjected to Test a):						N/A
	test current per table 8 (A)						—
	nominal cross-sectional area (mm ²)						—
	allowed voltage drop (mV)	≤ 22,5 mV or 2 times 24 th cycle value (mV)					—
Screwless terminal number		1	2	3	4	5	Remarks
voltage drop after 24 th cycle							
voltage drop after 48 th cycle							
voltage drop after 72 th cycle							
voltage drop after 96 th cycle							
voltage drop after 120 th cycle							
voltage drop after 144 th cycle							
voltage drop after 168 th cycle							
voltage drop after 192 th cycle							

12.3.10	TABLE: mechanical stresses occurring in normal use						N/A
	rated current (A)						—
	largest/smallest cross-sectional area per table 7 (mm ²)						—
Number of connection (after that conductor subjected to a pull of 30 N for 1 min) / disconnection		Type of conductor (solid / rigid stranded / flexible)		Cross-sectional area (mm ²)		Remarks	

	TABLE: test with apparatus shown in figure 10						N/A
	rated current (A)						—
	type of conductors	rigid solid / rigid stranded					—

	smallest/largest cross-sectional area per table 7 (mm ²)				—
	number of conductors				—
Cross-sectional area (mm ²)	Diameter of bushing hole per table 4 (mm)	Height H per table 4 (mm)	Mass (kg)	Remarks	
supplementary information:					

12.3.12	TABLE: deflection test (principle of test apparatus shown in figure 11a)						N/A
	Test carried out for 1 h connecting rigid solid conductors:						
	test current (A) (equal rated current)						—
	required voltage drop (mV)			≤ 25 mV			—
Type of conductor		Smallest			Largest		Remarks
cross-sectional area per table 9 (mm ²)							
force per table 10 (N)							
screwless terminal number		1	2	3	1	2	3
starting point (X = deflection original point)		X	X+10°	X+20°	X	X+10°	X+20°
voltage drop 1 st deflection (mV)							
voltage drop 2 nd deflection (mV)							
voltage drop 3 rd deflection (mV)							
voltage drop 4 th deflection (mV)							
voltage drop 5 th deflection (mV)							
voltage drop 6 th deflection (mV)							
voltage drop 7 th deflection (mV)							
voltage drop 8 th deflection (mV)							
voltage drop 9 th deflection (mV)							
voltage drop 10 th deflection (mV)							
voltage drop 11 th deflection (mV)							
voltage drop 12 th deflection (mV)							
supplementary information:							

16.1	TABLE: insulation resistance			P
Item per table 20	test voltage applied between:	measured (MΩ)	required (MΩ)	
1	Between all poles connected together and the body	> 100 MΩ	5	
2	Between each pole in turn and all other poles connected to the body with the switch in the ON position	> 100 MΩ	2	
3	Between the terminals which are electrically connected together when switch in ON position, the switch being in OFF position (<u>normal gap</u>)	> 100 MΩ	2	
4	Between metal parts of the mechanism (<u>spring in momentary contact switches</u>) and live parts	> 100 MΩ	5	
supplementary information:				

16.2	TABLE: electric strength			P
	rated voltage (V)	250 V~		—
item per table 20	test voltage applied between:	test voltage (V)	flashover / breakdown (Yes/No)	
1	Between all poles connected together and the body	2000 V~	No	
2	Between each pole in turn and all other poles connected to the body with the switch in the ON position	2000 V~	No	
3	Between the terminals which are electrically connected together when switch in ON position, the switch being in OFF position (<u>normal gap</u>)	2000 V~	No	
4	Between metal parts of the mechanism (<u>spring in momentary contact switches</u>) and live parts	2000 V~	No	
supplementary information:				

17	TABLE: temperature rise measurements			P
	rated current (A)	16 A		—
	nominal cross-sectional area (mm ²)	2,5 mm ²		—
	terminal screws: torque (Nm) (2/3 table 3)	0,54 Nm		—
	test current per table 15 passed for 1 h (A)	20 A		—
	rated voltage of pilot light (V)	Pilot light connected in series with resistor 177,6 kΩ. Measured voltage drop on pilot light: 66 V. See "General Product Information" for list of switches with incorporated pilot light.		—
	samples number	3		—

17	TABLE: temperature rise measurements		P
thermocouple locations	max. measured temperature rise (K)	allowed temperature rise (K)	
(art.688) Terminal - 1	14,2	45	
(art.688) Terminal - 2	11,1	45	
(art.671) Terminal - 1	17,3	45	
(art.671) Terminal - 2	18,4	45	
(art.670) Terminal - 1	17,0	45	
(art.670) Terminal - 2	12,5	45	
(art.687) Terminal - 1	14,0	45	
(art.687) Terminal - 2	21,6	45	
(art.669) Terminal - 1	13,7	45	
(art.669) Terminal - 2	17,2	45	
(art.6692) Terminal - 1	6,7	45	
(art.6692) Terminal - 2	10,5	45	
(art.685)Terminal - 1	15,4	45	
(art.685)Terminal – 2	18,4	45	
(art.6851)Terminal - 1	13,9	45	
(art.6851)Terminal - 2	16,3	45	
supplementary information:			

19.1	TABLE: reduced electric strength after normal operation (clause 19.1)		P
item per table 20	test voltage applied between:	test voltage (V)	flashover / breakdown (Yes/No)
1	Between all poles connected together and the body	1500 V~	No
2	Between each pole in turn and all other poles connected to the body with the switch in the ON position	1500 V~	No
3	Between the terminals which are electrically connected together when switch in ON position, the switch being in OFF position (<u>normal gap</u>)	1500 V~	No
4	Between metal parts of the mechanism (<u>spring in momentary contact switches</u>) and live parts	1500 V~	No
	TABLE: temperature rise measurements at terminals after normal operation (clause 19.1)		P
	test current (In) passed for 1 h (A)	16 A	—

thermocouple locations	max. measured temperature rise (K)	allowed temperature rise (K)
(art.688) Terminal - 1	33,3	45
(art.688) Terminal - 2	23,7	45
(art.688) Terminal - 3	29,7	45
(art.685) Terminal - 1	14,9	45
(art.685) Terminal - 2	10,8	45
(art.687) Terminal - 1	36,6	45
(art.687) Terminal - 2	38,1	45

19.2	TABLE: temperature rise measurements at terminals after test with fluorescent lamp load (clause 19.2)		P
	test current (In) passed for 1 h (A)	16 A	—
thermocouple locations	max. measured temperature rise (K)	allowed temperature rise (K)	
(art.688) Terminal - 1	25,1	45	
(art.688) Terminal - 2	24,1	45	
(art.688) Terminal - 3	27,8	45	
(art.685) Terminal - 1	22,4	45	
(art.685) Terminal - 2	20,9	45	
(art.687) Terminal - 1	25,1	45	
(art.687) Terminal - 2	28,2	45	
supplementary information:			

20.1	TABLE: impact test			P
part of enclosure tested per table 18 (A, B, C, D)	blows per part	height of fall (mm)	comments	
A (front surface parts)	5	100	No damage	
supplementary information:				

21.2	TABLE: ball pressure test of thermoplastic materials			P
	allowed impression diameter (mm)	≤ 2 mm		—
part under test	material designation / manufacturer	test temperature (°C)	impression diameter (mm)	
Switch body	LEXAN 164R	125	< 2 mm	
Actuator/rocker (black color)	PA 6GF – Zytel 73G45	125	< 2 mm	
supplementary information:				

21.3	TABLE: ball pressure test of thermoplastic materials			P
	allowed impression diameter (mm)	≤ 2 mm		—
part under test	material designation / manufacturer	test temperature (°C) ⁽¹⁾	impression diameter (mm)	
Mounting frame (grey)	ABS Novodur P2H-AT	70	< 2 mm	
Frame cover	ABS Novodur P2H-AT	20	< 2 mm	
Actuator cover	ABS Novodur P2H-AT	70	< 2 mm	
Actuator cover support	ABS Novodur P2H-AT	70	< 2 mm	
supplementary information:				
⁽¹⁾ 70 °C / 40 °C + highest temperature rise determined during the test of clause 17				

22.1	TABLE: threaded part torque test					P
threaded part identification	diameter of thread (mm)	column number (I, II, or III)	applied torque (Nm)	times (5/10)	no damage	
Terminal Screw	3,4 mm	II	0,8	5	P	
supplementary information:						

23.1	TABLE: creepage distances, clearances and distances through sealing compound							P
	rated voltage (V)			250 V~				—
item per table 20	creepage distance dcr, clearance cl and distance through sealing compound dtsc at/of:	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	required dtsc (mm)	dtsc (mm)	
1, 6	Between live parts which are separated when the contacts are open	≥ 3	5,5	≥ 3	> 10	≥ /	/	
3, 8	Between live parts and accessible surfaces of parts of insulating material	≥ 3	> 10	≥ 3	> 10	≥	/	
3, 8	Between live parts and metal parts of the mechanism (insulated from live parts) – spring in momentary contact switches	≥ 3	> 10	≥ 3	> 10	≥	/	
2, 7	Between live parts of different polarity (pilot light connection)	≥ 1	1,9	≥ 1	1,9	≥	/	
Supplementary information:								
<ul style="list-style-type: none"> - Pilot light connection (cr and cl distances) -> NOTE 6 of Table 20 taken into consideration. Voltage drop measured on pilot light (184 V~ on resistor; 66 V on pilot light) at 250 V. - No sealing compound used in switches - Measurements made on art.687 and art.6692 (all other types are of the same construction) 								

24.1.1	TABLE: glow-wire test			P
part under test		material designation / manufacturer	test temperature (°C)	remarks
Switch body		LEXAN 164R	850	Pass
Actuator/rocker (black color)		PA 6GF – Zytel 73G45	850	Pass
Mounting frame (grey)		ABS Novodur P2H-AT	650	Pass
Frame cover		ABS Novodur P2H-AT	650	Pass
Actuator cover		ABS Novodur P2H-AT	650	Pass
Actuator cover support		ABS Novodur P2H-AT	650	Pass
supplementary information:				

24.2	TABLE: resistance to tracking			N/A
	number of drops	50	—	
part under test	material designation / manufacturer		test voltage (V)	flashover / breakdown (Yes/No)
			175	
supplementary information:				

National Differences for (country name)			N/A
:		
:		
:		
:		
:		
:		
:		
:		

List of test equipment used

(Note: This is an example of the required attachment. Other forms with a different layout but containing similar information are also acceptable.) **Administrative update – no testing**

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
9	Checking of dimensions	Caliper: Mitutoyo Absolte CD-15CPX; Gauges: SIQ	/	27.7.2013
10	Protection against electrical shock	Jointed test finger, unjointed test finger,	/	/
11.4	Measuring of contact resistance	V-meter, A-meter: Kiethley 2700 SIQ Id. 104425		16.12.2012
12.2	Tests on screw terminals	Torque meter: Stahlwille SIQ Id. 104374 Figure 11: Arrangement for checking damage to conductors	15 - 75 Ncm	20.12.2013
15.1	Ageing test	Heating cabinet: Kambič S-205 Omega HH314A SIQ Id. 414	/	22.3.2014
15.3	Humidity treatment	Humidity chamber: SIQ Omega HH314A SIQ Id. 414	/	22.3.2014
16.1	Insulation resistance	Insulation test equipment: CE tester (SIQ 103929)	DC 500 V	18.07.2013
16.2	Electric strength	High voltage test equipment: CE tester (SIQ 103929)	AC 2000 V	18.07.2013
17	Temperature rise	V-meter, A-meter, T meter: Kiethley 2700 SIQ Id. 106707	/	22.3.2014
20.1	Impact test	Impact-test apparatus: SIQ Id.102511	/	/
21	Resistance to heat	Heating cabinet: Kambič S205 Ball pressure test apparatus: SIQ Id.104309 Omega HH314A SIQ Id. 414		18.05.2017 22.3.2014
23	Creepage distances, clearances	Caliper: Mitutoyo Absolte CD-15CPX SIQ Id. 105203	/	19.1.2013
24.1.1	Glow-wire test	GW apparatus: PTL T03.14 SIQ Id. 102252	850°C / 650°C	28.10.2012

Photo documentation (examples):



