



LOW VOLTAGE DIRECTIVE ATTESTATION OF CONFORMITY

Technical file of the company mentioned below has been inspected and audit has been completed successfully.

2014/35/EU Low Voltage Directive has been taken as references for these processes.

Company Name : **YUEQING SHENKAI ELECTRIC FACTORY**

Company Address : (Inside Yueqing Sunshine Villa) Beiaotang, Qianzhou Village, Liushi Town, Yueqing City, Wenzhou City, Zhejiang Province, China

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

Related Standards : **EN IEC 60670-1:2021+A11:2021**

Product Name : **Waterproof box**

Report No and Date : **WBTCF053102-LVD**

Product Brand/Model/Type : **SKAIEIE** R:50*50,80*50,80*80*50,85*85*50,100*100*70, 150*110*70,150*150*70,200*100*70,200*155*80, 200*200*80,255*200*80,255*200*120, 300*250*120,400*350*120,SK120907,SK151009,SK2111075,SK2611075, SK151509,SK2111610,SK221711,SK2611610,SK291914,SK302013,SK302016, SK302017,SK302018,SK303017,SK303018,SK382813,SK352515,SK403016, SK403017,SK403018,SK453520,SK504020,SK604020,SK604022,SK605022, SK635325,SK806025,SK223415,SK304016,SK305216,SK274616,SK365418, SK342813,SK342818,SK381913,SK381918

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WBTCF053102-LVD

LVD Technical Construction File

For

YUEQING SHENKAI ELECTRIC FACTORY

Waterproof box

Model:

R:50*50,80*50,80*80*50,85*85*50,100*100*70,150*110*70,150*150*70,200*100*70,200*155*80,200*200*80,255*200*80,255*200*120,300*250*120,400*350*120,SK120907,SK151009,SK2111075,SK2611075,SK151509,SK2111610,SK221711,SK261610,SK291914,SK302013,SK302016,SK302017,SK302018,SK303017,SK303018,SK382813,SK352515,SK403016,SK403017,SK403018,SK453520,SK504020,SK604020,SK604022,SK605022,SK635325,SK806025,SK223415,SK304016,SK305216,SK274616,SK365418,SK342813,SK342818,SK381913,SK381918

Prepared For : YUEQING SHENKAI ELECTRIC FACTORY
(Inside Yueqing Sunshine Villa)Beiaotang,Qianzhou Village,Liushi
Town,Yueqing City,Wenzhou City,Zhejiang Province,China

Prepared By : China Ceprei (Sichuan) Laboratory
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Sichuan

Report Number: WBTCF053102-LVD

Date of Test: Jun.07, 2023

Date of Report: Jun.07, 2023





WBTCF053102-LVD

TEST REPORT DECLARATION

Applicant : YUEQING SHENKAI ELECTRIC FACTORY
Address : (Inside Yueqing Sunshine Villa)Beiaotang,Qianzhou
Village,Liushi Town,Yueqing City,Wenzhou City,Zhejiang
Province,China
Manufacturer : YUEQING SHENKAI ELECTRIC FACTORY
Address : (Inside Yueqing Sunshine Villa)Beiaotang,Qianzhou
Village,Liushi Town,Yueqing City,Wenzhou City,Zhejiang
Province,China
EUT Description : Waterproof box
Model No. : 100*100*70
Remark : N/A

Test Procedure Used:

EN IEC 60670-1:2021+A11:2021

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

Date of Test : Jun.07, 2023

Prepared by



(Jack)

Checked by

(Gina)

Approved by

:
(Johnson)



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
4	General requirements		P
	Each part of the enclosure shall be so designed and constructed that, when mounted and installed as for normal use, the enclosure ensures adequate electrical and mechanical protection to the parts so enclosed and minimizes the risk of danger to the user or surroundings.	The enclosure ensures adequate electrical and mechanical protection to the parts.	P
	Compliance is checked by carrying out the relevant tests specified.		P
5	General notes on tests		P
5.1	Tests according to this standard are type tests.		P
	Unless otherwise specified boxes and enclosures are tested as delivered.		P
	Accessories complying with other standards are not tested.		P
	Tests on boxes and enclosures of insulating material shall be performed after a preconditioning of at least 10 days at ambient temperature and relative air humidity of between 45% and 85 %.		P
	Unless otherwise specified the tests shall be carried out in the order of the clauses at an ambient temperature of (20 ± 5)°C on a set of three new specimens.		P
5.2	If one of the specimens does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding ones which may have influenced the results of the test shall be repeated and also the tests which follow shall be made in the required sequence on another full set of specimens, all of which shall comply with the requirements.		P
	Connecting boxes with provision for subsequent incorporation of terminals or connecting devices are tested with the terminals or connecting devices recommended by the manufacturer.(EN 60670-22)		P
6	Ratings		P
6.1	The preferred values of the rated voltage of the integrated or incorporated connecting devices are 250 V, 300 V, 400 V, 500 V, 600 V, 690 V, 800 V, 1 000 V a.c. and 1 500 V d.c.(EN 60670-22)		P
	The standard rated connecting capacities are 0,2 mm ² , 0,34 mm ² , 0,5 mm ² , 0,75 mm ² , 1 mm ² , 1,5 mm ² , 2,5 mm ² , 4 mm ² , 6 mm ² , 10 mm ² , 16 mm ² , 25 mm ² , 35 mm ² .(EN 60670-22)		P
7	Classification		P



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
7.1	The nature of their material	PC/ABS	P
7.1.1	Insulating		P
7.1.2	Metallic		N
7.1.3	Composite	PC/ABS	P
7.2	The method of installation		P
7.2.1	Flush, semi-flush or embedded in		N
7.2.1.1	Non-combustible walls, non-combustible ceilings or non-combustible floors		N
7.2.1.2	Combustible walls, combustible ceilings or combustible floors		N
7.2.1.3	Hollow walls, hollow ceilings, hollow floors or furniture		N
7.2.2	Surface mounting on		P
7.2.2.1	Non-combustible walls, non-combustible ceilings, noncombustible floors or non-combustible furniture		P
7.2.2.2	Combustible walls, combustible ceilings, combustible floors or combustible furniture		P
7.2.3	Placement		N
7.2.3.1	Suitable for installation into concrete during the casting process		N
7.2.3.2	Suitable for all types of installation except into concrete		N
7.3	The type(s) of inlets (outlets)		P
7.3.1	With inlets for sheathed cables for fixed installations		N
7.3.2	With inlets for flexible cables		N
7.3.3	With inlets for plain or corrugated conduits		N
7.3.4	With inlets for threaded conduits		N
7.3.5	With inlets for other types of conductors/cables or conduits		N
7.3.6	With spouts (hub)		N
7.3.7	Without inlets. Inlet openings will be made during installation		P
7.4	The clamping means		N
7.4.1	With cable retention		N
7.4.2	With cable anchorage		N
7.4.3	With clamping means for flexible conduit		N
7.4.4	Without clamping means		P
7.5	The minimum and maximum temperatures during installation		P
7.5.1	-5 °C to +60 °C		N
7.5.2	-15 °C to +60 °C		N
7.5.3	-25 °C to +60 °C		P
7.6	The maximum temperature during the casting process		P



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
7.6.1	+60 °C		N
7.6.2	+90 °C		P
7.7	Boxes and enclosures for hollow walls and the like according to 7.2.1.3 are classified as		N
7.8	The provision for fixing accessories to boxes		P
7.8.1	Boxes supplied with screws		P
7.8.2	Boxes intended to receive screws		P
7.8.3	Boxes intended to receive claws		N
7.8.4	Boxes intended to receive other means		N
7.101	The method of fixing the terminals or connecting devices in the connecting box(EN 60670-22)		P
7.101.1	With integrated clamping units(EN 60670-22)		N
7.101.2	With incorporated terminals or connecting devices(EN 60670-22)		P
7.101.3	With provisions for subsequent incorporation of terminals or connecting devices(EN 60670-22)		P
7.101.4	Without fixing (for floating terminals or connecting devices) (EN 60670-22)		N
8	Marking		P
8.1	Boxes and enclosures shall be marked with		P
a)	the name, trade mark or identification mark of the manufacturer or the responsible vendor. In addition enclosures shall be marked with	Chengdu Wired Mechanical & Electrical Co., Ltd	P
b)	the IP code against ingress of solid objects if higher than IP2X in which case the second IP numeral shall also be marked;	IP66	P
c)	the IP code against harmful ingress of water if higher than IPX0 in which case the first IP numeral shall also be marked.	IP66	P
d)	the following marking  on cover of flush enclosures intended to be mounted on rough surfaces and where the IP is dependent on the surface (see Figure 5).		P
	When the declared IP code is higher than IP4X or higher than IPX2 it shall be on the outside of the enclosure so as to be easily discernible when the enclosure is mounted and wired as for normal use.	IP66	P
	The following information shall be marked on the boxes and enclosures or provided by the manufacturer on the smallest package unit or in the instructions of the manufacturer:		P
e)	the type reference, which may be a catalogue number;	JXH22/18/09	P



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
f)	the maximum temperature during the building process if 90 °C;		P
g)	the necessary information concerning the openings which can be made during installation in the case of boxes and enclosures classified according to 7.3.7;		P
h)	the minimum temperature during installation for boxes classified according to 7.5.2 and 7.5.3;	-40°C	P
i)	void		N
j)	the letter H or information for boxes and enclosures classified according to 7.2.1.3.*		N
	Unless self-evident, further information for the correct use of the enclosure shall be given in the manufacturer's catalogue or in an instruction sheet.		N
	In special cases, in order to achieve a higher degree of protection by the use of special parts an instruction sheet should be provided and should indicate the higher degree of protection. In such a case, the marking covers the initial degree of protection.		N
k)	rated insulation voltage for boxes with integrated or incorporated terminals or connecting devices (see note 1), (EN 60670-22)	5kV	P
l)	rated connecting capacity (EN 60670-22)		P
m)	maximum number of conductors to be placed in the box(EN 60670-22)		P
8.2	The marking on the boxes and enclosures shall be durable and easily legible.	durable and easily legible.	P
	Compliance with 8.1 and 8.2 is checked by inspection and by the following test.		P
	The test is made by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.		P
	After the test the marking shall still be legible.	still be legible.	P
9	Dimensions		P
	Boxes and enclosures shall comply with the appropriate standard sheets, if any.	Length/Width/Height mm: 220/180/95	P
	Compliance is checked by inspection and measurement.		P
10	Protection against electric shock		P
	Boxes and enclosures shall be so designed that, when they are assembled, equipped and installed as for normal use in accordance with the manufacturer's instructions, live parts are not accessible.		P
	Where enclosures are supplied without a cover,		P



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	cover-plate or an accessory they are tested with the appropriate parts fitted according to the information given in the manufacturer's instructions.		
	Compliance is checked by inspection and in case of doubt by the following test.		P
	Enclosures shall be tested with test probe 11 according to IEC 61032 applied for 1 min with a force of 20 N, and the test probe shall not penetrate in the internal volume of the enclosure, as shown in Figure 26.		P
	Tests shall be carried out on parts which are accessible after installation.		P
	In addition, all enclosures according to 7.1.1 and 7.1.3 with parts made of thermoplastic or elastomeric material shall be subjected for 1 min to a force applied through the tip of test probe 11 of IEC 61032 but at an ambient temperature of $(35 \pm 2) ^\circ\text{C}$, the enclosure being at this temperature.		P
	The probe is applied to all places, where yielding of insulating material could impair the safety, with a force of 75 N except membranes, grommets, knock-outs and the like.		P
11	Provision for earthing		N
11.1	Boxes and enclosures with exposed conductive parts	No exposed conductive parts	N
	Boxes and enclosures with exposed conductive parts shall be provided with an earthing means of low resistance or have provision for the fitting of such an earthing means. For the purpose of this requirement, small screws and the like, for fixing bases, covers or coverplates, etc. isolated from live parts, are not considered as exposed conductive parts.		N
	The earthing means or the provision for the fitting of such an earthing means shall be located so that:		N
	– the means is readily accessible through the open face of the box, and		N
	– the removal of an accessory mounted in the box does not disturb the continuity of the earthing circuit, and		N
	– the means is not part of a removable cover, back, or side of the box or enclosure.		N
	Compliance is checked by inspection.		N
	Exposed conductive parts of covers or cover-plates shall be connected through a low resistance connection to the earthing means when fitted as for normal use.		N

EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	Compliance is checked by the following test.		N
	A current derived from an a.c. source having a no-load voltage not exceeding 12 V and equal to (25 ± 1) A is passed between the earthing terminal and each exposed conductive part in turn. The voltage drop between the earthing terminal and each of the exposed conductive parts is measured, and the resistance calculated from the current and this voltage drop.		N
	In no case shall the resistance exceed 0,05 Ω .		N
11.3	Boxes or enclosures with removable sides according to 7.1.2	PC/ABS	N
	A box or enclosure classified according to 7.1.2 that has removable sides shall be constructed so that the electrical bond between separable parts includes at least one threaded screw connection.		N
	Compliance is checked by inspection.		N
11.4	Earthing terminal threads		N
	The threads of the earthing terminal delivered with or integrated in boxes and enclosures shall not be stripped when the torque shown in the relevant column of Table 4 is applied.		N
	Compliance is checked by inspection and by the following test.		N
	The screws are tightened and loosened 5 times.		N
	The test is made by using a suitable screwdriver or an appropriate tool applying a torque as indicated in Table 4.		N
	If a screw has a hexagonal head with a slot, only the test with the screwdriver is made, with the relevant torque given in column II of Table 4.		N
	Greater values of torque may be used if so stated by the manufacturer, when the relevant information is provided.		N
	Column I applies to screws which cannot be tightened by means of a screwdriver with a blade wider than the nominal diameter of the thread of the screw.		N
	Column II applies to other screws which are tightened by means of a screwdriver.		N
	Column III applies to screws and nuts which are tightened by means other than a screwdriver.		N
	Column IV applies to screws which are tightened by means of a square blade screwdriver.		N
	During the test, there shall be no damage, such as breakage of screw or damage to the head slot (rendering		N



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	the use of the appropriate screwdriver impossible) or to the threads or to the enclosure impairing the further use of the fixing means. The screws shall not be tightened in jerks.		
12	Construction		P
	Boxes and enclosures shall be constructed without sharp edges. Burrs shall be removed from mould lines of interior surfaces so that there are no sharp edges or undue obstructions to the passage of wiring or coupling of parts in the intended use of the product.	No sharp edges	P
	The inner and outer surfaces of a box or cover shall not be subject to peeling, scaling or flaking and shall be smooth and free from blisters, cracks, and other defects.	smooth and free from blisters, cracks, and other defects.	P
	Compliance is checked by inspection.		P
12.1	Lids, covers or cover-plates or parts of them		P
	Lids, covers, or cover-plates or parts of them, such as protective membranes, which are intended to ensure protection against electric shock, shall be held in place effectively.	held in place	P
	In connecting boxes where the fixing means of covers or cover-plates serve also to fix the connecting device, it shall maintain the connecting device in the correct position after removal of the cover or cover-plate.(EN 60670-22)		P
12.1.1	Screw-type fixing		P
	A box or enclosure intended to accept a lid, cover, or cover plate by means of screw fixing shall be provided with means to accommodate the intended screws.	by means of screw fixing	P
	For lids, covers or cover plates whose fixing is of the screw type, compliance is checked by inspection.		P
12.1.2	Non-screw-type fixing operable without the use of a tool or a key		N
	For lids, covers or cover-plates whose fixing is not dependent on screws and whose removal is obtained by applying a force according to Table 2 in a direction approximately perpendicular to the mounting/supporting surface,		N
	– when their removal may give access, with P test probe BQ of IEC 61032, to live parts;		N
	– when their removal may give access, with P test probe BQ of IEC 61032, to non-earthed conductive parts separated from live parts by basic insulation;		N
	– when their removal may give access, with P test probe BQ of IEC 61032, only to		N

EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	insulating parts, or,		N
	earthed conductive parts, or		N
	conductive parts separated from live parts by double or reinforced insulation, or		N
	live parts of SELV circuits according to IEC 61140 having a voltage not greater than 25 V a.c. or 60 V d.c.		N
	Compliance is checked by the tests of 12.1.2.1 and 12.1.2.2.		N
	When testing the force necessary for lids, covers or cover-plates to come off or not come off, the boxes and enclosures are mounted as for normal use. Flush-type boxes and enclosures are fixed and installed as for normal use. If they are provided with locking means which can be operated without the aid of a tool, these means are unlocked.		N
12.1.2.1	Verification of the non-removal of the lids, covers or cover-plates		N
	Forces are gradually applied without jerks in a direction perpendicular to the mounting surfaces, in such a way that the resulting force acting on the centre of the lids, covers or cover-plates, or parts of them, is as specified in the relevant column of table 2.		N
	The force is applied for 1 min.		N
	The lids, covers or cover-plates, shall not come off.		N
	For flush-mounting boxes or enclosures, the test is then repeated on new specimens, the lid, cover or cover-plate is mounted on the box, after a sheet of hard material ($1 \pm 0,1$) mm thick, has been fitted on the wall around the supporting frame, as shown in Figure 12.		N
12.1.2.2	Verification of the removal of the lids, covers or cover-plates		P
	A force not exceeding that specified in the relevant column of Table 2 is gradually applied without jerks, in a direction perpendicular to the mounting/supporting surfaces, to lids, covers or cover-plates, or parts of them by means of a hook placed in turn in each of the grooves, holes, spaces or the like, provided for removing them.		P
	The lids, covers or cover-plates shall come off.		P
	The test is made 10 times on each separable part the fixing of which is not dependent on screws (equally distributing as far as practicable the application points); the removal force is applied each time to the different grooves, holes or the like provided for removing the separable part.		P

EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	For flush-mounting boxes or enclosures, the test is then repeated on new specimens, the lid, cover or cover-plate is mounted on the box being fitted, after a sheet of hard material ($1 \pm 0,1$) mm thick, has been fitted on the wall around the supporting frame, as shown in Figure 12.		N
	After the test, the specimens shall show no damage within the meaning of this standard.		P
12.1.2.3	Verification of the outline of lids, covers and cover-plates		P
	The gauge shown in Figure 13 is pushed towards each side of each lid, cover or cover-plate which is fixed without screws on a mounting or supporting surface, as shown in Figure 14. The face B resting on the mounting/supporting surface, with the face A perpendicular to it, the gauge is applied at right angles to each side under test.		P
	In the case of a lid, cover or cover-plate fixed without screws to another lid, cover or cover-plate or to a mounting box, having the same outline dimensions, the face B of the gauge shall be placed at the same level as the junction; the outline of the lid, cover or cover-plate shall not exceed the outline of the supporting surface.		N
	The distances between the face C of the gauge and the outline of the side under test, measured parallel to face B, shall not decrease (with the exception of grooves, holes, reverse tapers or the like, placed at a distance less than 7mm from a plane including face B and complying with the test of 12.1.2.4) when measurements are repeated starting from point X in the direction of the arrow Y (see Figure 15).		N
12.1.2.4	Verification of grooves, holes and reverse tapers		N
	A gauge according to Figure 16, applied with a force of ($1 \pm 0,2$) N, shall not enter more than 1,0 mm from the upper part of any groove, hole or reverse taper or the like when the gauge is applied parallel to the mounting/supporting surface and at right angles to the part under test, as shown in Figure 17.		N
12.1.3	Non screw-type fixing operable with the use of a tool or a key		N
	For lids, covers or cover-plates whose fixing is not dependent on screws and whose removal is obtained by using a tool and/or a key, in accordance with the manufacturer's instructions, compliance is checked by the same tests of 12.1.2 except that the lids, covers or coverplates, or parts of them need not come off when applying a force not exceeding 120 N in directions perpendicular to the mounting/supporting surface.		N
12.2	Drain holes		N



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	Surface and semi-flush mounting enclosures with a degree of protection IPX1 to IPX6 shall be designed to allow the opening of a drain-hole of at least 5 mm in diameter or 20 mm ² in area with a minimum width or length of 3 mm.		N
	Drain holes shall be so located and available in such a number that one of the holes can always become effective in any intended mounting position of the enclosure.		N
	Compliance is checked by inspection and measurement.		N
12.3	Mounting of enclosures		P
	Enclosures shall have provisions for their suitable attachment according to the method of installation(see 7.2).		P
	Enclosures of insulating material shall be constructed in such a way that any conductive parts of fixing means inside the box or enclosure intended to be used for mounting the enclosure are surrounded by insulation which projects above the top of the fixing means by an amount of not less than 10 % of the maximum width of the cavity for the fixing means.		P
	In case there is a cavity, the head of the screw can be protected by an additional cap of insulating material. In this case the manufacturers instruction shall give information concerning the cap to be used.		P
	In case there is no cavity the head of the screw shall be protected with a cap of insulating material in this case, the cap shall be delivered with the box.		N
	The cap shall stay in position during normal use.		P
	Compliance is checked by the following test.		P
	The caps are fixed to the boxes according to the manufacturer's instructions and subjected to the ageing test of 13.1.		P
	After 1 h, the boxes are then turned to a position with the opening in the direction of the floor.		P
	The cap shall not come detached.		P
	Compliance is checked by inspection and by measurement.		P
12.4	Boxes and enclosures with inlets for flexible cables		N
	Inlets (outlets) provided in boxes and enclosures classified according to 7.3.2 shall be so designed and constructed that the flexible cables can be easily introduced, and will not damage the flexible cable where it enters the box or enclosure impairing its further use.		N
	Compliance is checked by manual test.		N
12.5	Boxes and enclosures with inlets for applications other than flexible cables		N
	Inlet openings classified according to 7.3 other than 7.3.2, if any, shall allow the introduction of		N
	–a conduit or suitable fitting connecting it to the box or enclosure, and/or		N
	–the protective covering of the cable		N
	so as to provide mechanical protection of the conductors where they enter the box or enclosure.		N
	An inlet opening for conduit entries, or at least two of them		N



EN IEC 60670-1:2021+A11:2021			
Clause	Requirement	Remark	Result
	if there are more than one, shall be capable of accepting either conduits of sizes, or a combination of sizes, in accordance with the requirements of IEC 60423.		
	Compliance is checked by inspection with the appropriate cables or conduits installed.		N
12.6	Boxes and enclosures with a cable anchorage(s)		N
	Clamping means of boxes and enclosures classified according to 7.4.2 shall be such that the connection of the conductors of the flexible cable are relieved from strain when this flexible cable is accessible and likely to be stressed after installation.		N
	It shall be clear how the relief from strain and the prevention of twisting are intended to be effected.		N
	Cable anchorages shall be		N
	–suitable for the different types of flexible cable for which the box is intended to be used;		N
	–constructed in such a way that at least one part of it is integral with, or permanently fixed to, one of the component parts of the box;		N
	–of insulating material or be provided with an insulating lining fixed to the metal parts.		N
	Compliance is checked by inspection and the following test.		N
	The effectiveness of the cable anchorage is checked by means of an apparatus as shown in Figure 11.		N
	The cable anchorage is applied as in normal use, clamping screws, if any, being tightened with a torque equal to the 2/3 of the relevant torque specified in Table 4 or, for glands, equal to the relevant torque specified in Table 5.		N
	After reassembly of the specimen, it shall not be possible to push the flexible cable into the specimen by more than 1 mm with the relevant force as specified in Table 3.		N
	The cable is then subjected 50 times for 1 s to a pull force as specified in Table 3 and immediately afterwards the flexible cable is subjected to a torque not less than the relevant value specified in Table 3 for (15 ± 1) s applied as near as practicable to the cable entry.		N
	After the tests, the flexible cable shall not have been displaced by more than 2 mm and the cable anchorage (strain relief) shall not show any damage which leads to non-compliance with this standard.		N
12.7	Boxes and enclosures with cable retention means		N
	Cable retention means of boxes and enclosures classified according to 7.4.1 shall retain the cable in place.		N
	Compliance is checked by the following test which is carried out on three specimens of retention means.		N
	For boxes and enclosures classified according to 7.5.2 or 7.5.3, the test shall be carried out at (-15 ± 2) °C and (-5 ± 2) °C respectively.		N
	First a cable of the maximum nominal cross-sectional area and, subsequently, a cable with the minimum nominal cross-sectional area as declared by the manufacturer shall be used.		N
	The cable is fitted in the cable retention means according to the manufacturer's instructions.		N



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Clause	Requirement	Remark	Result
	The cable is loaded with an axial force of (20 ± 1) N.		N
	The load is maintained for 1 min and at the end of this period the displacement of the cable shall not exceed 3 mm following the removal of the load.		N
12.8	Knock-outs		N
12.8.1	General		N
	It shall be possible to remove knock-outs without damaging the box.		N
	Knock-outs intended for use with cables shall be free from chips or burrs.		N
	Knock-outs intended for use with conduits and/or a grommet or a membrane, chips and burrs are disregarded.		N
	In order to close an open knock-out in a box or an enclosure classified according to 7.1.2 a blanking-plug can be used.		N
	This blanking-plug used without a locknut:		N
	– shall not become dislodged or damaged, and		N
	– its effectiveness shall not be impaired, and		N
	– it shall fulfil all requirements for knock-outs.		N
	This requirement does not apply to a blanking-plug which is assembled by threading into a threaded inlet.		N
	Compliance is checked by inspection and by the tests as specified in 12.8.2 and 12.8.3.		N
12.8.2	Knock-out retention		N
	For boxes and enclosures having knock-outs that		N
	– do not provide access to live parts and are accessible after installation, a force of (30 ± 1) N shall be applied to a knock-out for (15 ± 1) s,		N
	– provide direct access to live parts after installation, a force of (40 ± 1) N shall be applied to a knock-out for (60 ± 1) s,		N
	by means of a 6 mm diameter mandrel with a flat end.		N
	The force is to be applied without a blow in a direction perpendicular to the plane of the knock-out and at a point most likely to cause movement.		N
	When the box is provided with a multi-stage knock-out, the force shall be applied to the smallest knock-out.		N
	The knock-out shall remain in place and the degree of protection of the box or enclosure shall be unchanged when measured 1 h after the force has been removed.		N
12.8.3	Knock-out removal		N
	The knock-outs shall be removed by means of a tool, as stated by the manufacturer. The side edge of a screwdriver may be run along the edge of the knock-out opening once to remove any fragile tabs remaining along the edge.		N
	For boxes or enclosures according to 7.1.1 or 7.1.3 the test is repeated with one previously untested box or enclosure which has been conditioned for $5 \text{ h} \pm 10 \text{ min}$ in air maintained at the minimum temperature during installation as specified according to 7.5. Immediately following this conditioning, the knock-out is to be removed as above.		N



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Clause	Requirement	Remark	Result
	For a box or enclosure employing multi-stage knock-outs, there shall be no displacement of a larger stage when a smaller stage is removed.		N
	After the test, there shall be no sharp edges, except for knock-outs for conduits and/or for use with a grommet or a membrane, and the box and enclosure shall not be damaged.		N
12.8.4	Flat surfaces surrounding knock-outs		N
	Knock-outs intended for the use of grommets, glands or fittings shall be located in flat surfaces to permit grommets, glands or fittings to be placed fully against these surfaces when installed as intended.		N
	Projections or indentations in the flat surface area shall be prohibited, however holes shall be allowed. The flat surface areas of adjacent knock-outs that partially or wholly overlap meet the intent of this requirement.		N
	Compliance is checked by inspection and by measurement according to the appropriate national standard sheet, if any.		N
12.9	Screw fixings		P
	Fixing means for covers, accessories, terminals, connecting devices, strain reliefs, etc. shall be so designed and constructed that these means withstand the mechanical stresses occurring during installation and normal use.	withstand the mechanical stresses	P
	Screws or other fixing means made from insulating material similar to screws without standardised thread which have to be tightened by any tool for fixing covers shall be tested according to the manufacturer's instructions (e.g. torque value which could be different from Table 4, nature of the tool,....).	Screws	P
	Thread-forming and thread-cutting screws intended only for mechanical assembly may be used provided they are supplied together with one of the pieces with which they are intended to be assembled.	Thread-forming screws	P
	For thread-forming and thread-cutting screws, the screw assembly operation shall be done before carrying out the tests.		P
	Compliance is checked by inspection and by the following test.		P
	The screws of the fixing means are tightened and loosened:		P
	– 10 times for metal screws in engagement with a thread of insulating material;		P
	– 5 times in all other cases.		N
	Screws and nuts in engagement with a thread of insulating material and screws of insulating material are completely removed and reinserted each time. The test is made by using a suitable screwdriver or an appropriate tool applying a torque as indicated in Table 4.		N
	If a screw has a hexagonal head with a slot, only the test with the screwdriver is made, with the relevant torque given in column II of Table 4.		P
	Greater values of torque may be used if so stated by the manufacturer, when the relevant information is provided		P
	Column I applies to screws which cannot be tightened by		N



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Clause	Requirement	Remark	Result
	means of a screwdriver with a blade wider than the nominal diameter of the thread of the screw and for non-metallic screws and metallic screws in a thread of insulating material. In this latter case the width of the profile of the recess to tighten the screw is chosen instead of the diameter of the thread when this profile width is smaller than the nominal diameter of the thread with a minimum of 3 mm.		
	Column II applies to other screws which are tightened by means of a screwdriver.		P
	Column III applies to screws and nuts which are tightened by means other than a screwdriver.		N
	Column IV applies to screws which are tightened by means of a square blade screwdriver.		N
	During the test, there shall be no damage, such as breakage of screw or damage to the head slot (rendering the use of the appropriate screwdriver impossible) or to the threads or to the enclosure impairing the further use of the fixing means. The screws shall not be tightened in jerks.	no damage	P
12.10	Fixing of boxes and accessories		P
	Flush type boxes and enclosures other than for hollow walls, and as otherwise indicated below, shall be provided with fixing means for their suitable attachment to the wall. Screws intended to fix the box or enclosure to the building structure need not be supplied with the box or enclosure but can be provided by the installer according to the manufacturer's instructions.		N
	Separately supplied fixing means for a box or enclosure shall comply with the requirements for the fixing means of the box or enclosure with which they are intended to be used and shall include a means for fixing to the box or enclosure.		P
	Screws, additional mechanical supports or design features, which prevent the displacement of the box or the enclosure, are considered to be adequate fixing means.		P
	Compliance is checked by inspection.		P
	Boxes and enclosures not fulfilling at least one of the above requirements and having an internal volume less than 400 cm ³ , shall be tested as follows.	>400	N
	The internal volume of the box or enclosure shall be checked by inspection or by the test in 12.15.		N
	For boxes and parts of enclosures to be embedded in masonry the specimen is mounted into the mounting block shown in Figure 22 and fixed according to the manufacturer's instructions.		N
	The gap between the main external profile of the specimen and the internal profile of the receptacle shall be at least 20 mm and for parts that project from the main profile never less than 10 mm. The block is filled by the material specified in the manufacture's instructions, or by plaster where the manufacturer's instructions do not specify the material.		N
	The assembly is kept at ambient temperature for (10 + 1/0) days.		N
	The auxiliary device described in Figure 23 is mounted on the specimen and the screws are tightened with a torque equal to two thirds of the applicable torque given in		N



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Clause	Requirement	Remark	Result
	Table 4.		
	The assembly is then fixed to the mounting plate (A) of an apparatus shown in Figure 24, so that the axes of the screws are normal to the mounting plane.		N
	The total weight of the device including the principal weight (PW) shall be $(72 \pm 0,1)$ N, and the supplementary weight (SW) shall be $(8 \pm 0,1)$ N.		N
	The supplementary weight (SW) and the principal weight (PW) are introduced on the axis of the device and fixed by the carrier (C) (see Figure 24).		N
	The supplementary weight shall fall from a height of 50 mm onto the principal weight 10 times.		N
	After the test the specimen shall not have been displaced by more than 0,5 mm from the mounting block.		N
12.11	Boxes and enclosures classified according to 7.2.1.3		N
	Boxes and enclosures for hollow walls classified according to 7.2.1.3 shall provide suitable means for fixing the box or the enclosure to hollow walls.		N
	The fixing means shall not rely on the cable management system.		N
	Compliance is checked by the following test.		N
	A specimen of the box or enclosure is mounted in a test wall in accordance with the manufacturer's instructions. Where the manufacturer's instructions are not specific regarding the type of wall, a sheet of plywood (10 ± 1) mm thick, 500 mm wide and 500 mm high shall be used.		N
a)	Checking pull and torque		N
	A lever shall be fixed with the fixing means for accessories or covers to the specimen, as shown in Figure 18.		N
	This lever is loaded for one minute with a force F1 as shown in Figure 18a in such a way that a torque of 3 Nm is applied to the box and simultaneously with a force F2 as shown in Figure 18b of 100 N applied on the main axis of the box perpendicular to the mounting surface.		N
	After this test, the specimens shall show no damage impairing their further use and the displacement of the lever shall be no more than 2°.		N
b)	Checking displacement		N
	The end of the lever is subjected for 1 min to a force F3 in such a way that a torque of 3 Nm is applied to the box as shown in Figure 18c.		N
	After the test, the edge of the box shall not have been displaced by more than 1 mm in comparison to the mounting surface.		N
12.12	Subclause deleted•		N
12.13	Cable gland entry		N
	Cable glands shall not damage the box or enclosure when used as intended.		N
	Compliance is checked by the following test.		N
	Cable glands are fitted with a cylindrical metal rod having a diameter, in millimetres, equal to the internal diameter of the gasket rounded to the nearest whole number as specified in the first column of Table 5. The cable glands are then tightened and loosened 10		N



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Clause	Requirement	Remark	Result
	times by means of a suitable tool with the torque specified in Table 5 with a tolerance of $(\pm 5\%)$, the relevant torque being applied for 1 min $\pm$ 5 s.		
	After the test, the boxes and enclosures shall show no damage within the meaning of this standard.		N
12.14	Boxes and enclosures with inlets (outlets) for conduits or spouts (hubs)		N
	Boxes and enclosures classified according to 7.3.4 and conical spouts as in 7.3.6 shall withstand the tests of 12.14.1, 12.14.2 and 12.14.3.		N
	Boxes and enclosures classified according to 7.4.3 shall withstand the tests of 12.14.1 and 12.14.2.		N
	The tests are carried out with conduits of minimum nominal size according to IEC 60423 after installation as in normal use or assembly according to the manufacturer's instructions.		N
12.14.1	Enclosures with the inlet spout for conduits, if any, shall be tested so that a minimum size piece of conduit is pressed for 1 min $\pm$ 5 s with a force of (100 ± 2) N. The inlet spout shall prevent further entry of the conduit into the box.		N
12.14.2	A pull-out test shall be carried out after the test according to 12.14.1, as follows. The conduit with the minimum size corresponding to the insert opening shall be loaded axially for 1 min with a tensile force of (20 ± 2) N. The conduit shall not come loose from the inlet spout of the enclosure.		N
12.14.3	The resistance to bending strain of an inlet spout shall be tested as follows. A piece of a conduit shall be inserted into the inlet spout with a compressible force of (100 ± 2) N and loaded with a bending moment of 3 Nm. The strain shall slowly rise from zero to full value and the test shall be done in six different directions through the centre line of the inlet spout with an interval of $(60 \pm 2)^\circ$. At each angle position the inlet spout shall be loaded for 1 min. The inlet spout shall not come loose or be damaged and the conduit shall stay within the inlet spout.		N
12.15	Internal volume of boxes and enclosures		P
	When referred to in the standard, the declared internal volume of the box or enclosure, each partitioned section of a box or enclosure, raised covers and box extensions shall be measured in the following manner:		P
a)	all internal screws, clamps, etc, shall be removed except earthing terminals and assembly screws;		P
b)	any projections such as a cover or flush-mounting ears that extend beyond the normal edge of the box or enclosure shall be ground flush with the edge;		P
c)	all knock-outs shall be left as punched and shall be sealed externally;		N
d)	all openings shall be plugged with model ling clay, putty, wax, or other material(s) and shall be filled flush with the internal surface;		N
e)	the box, enclosure, or raised covers shall be covered with a flat plate of any convenient transparent material not more than 3,2 mm thick. In the centre of the plate a hole with a nominal diameter of 13 mm shall be provided (see Figure 4). If necessary, the gap between the box,		P



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Clause	Requirement	Remark	Result
	enclosure or raised cover and the plate shall be sealed with the material used to seal the other openings;		
f)	using any convenient graduated cylinder or measuring flask filled with water at room temperature, the box, enclosure, or raised cover shall be filled without overflowing. The difference in the volume of water in the measuring cylinder measured before and after the filling of the box, enclosure or raised cover indicates the volume of the box.		P
	The volume of a side pocket provided to increase the volume of a box or enclosure shall be calculated using a depth-of-pocket not more than the smallest dimension of the opening into that side pocket.		P
12.101	Connecting boxes shall have adequate space to allow the correct connection of conductors which are specified in the relevant sections of the particular requirements of Parts 2 of IEC 60998, concerning the number and cross-sectional area of the conductors.(EN 60670-22)		P
12.102	Retention means for terminals or connecting devices shall withstand the mechanical stresses occurring during installation and normal use.(EN 60670-22)		P
	After the test there shall be no harmful deformation, cracks or similar damage which would lead to non-compliance with this part.(EN 60670-22)		P
12.103	Connecting boxes classified according to 7.101.1, 7.101.2 and 7.101.3 shall comply with the temperature rise requirements of Clause 16.102.(EN 60670-22)		P
13	Resistance to ageing, protection against ingress of solid objects and against harmful ingress of water		P
13.1	Resistance to ageing		P
13.1.1	Insulating and composite boxes and enclosures, glands, grommets and replaceable membranes shall be resistant to ageing.		P
	Compliance is checked as follows.		P
	Boxes and enclosures of insulating or composite material with provision for glands or grommets are mounted and assembled as in normal use or according to the manufacturer's instructions.		P
	Boxes and enclosures of insulating or composite material without provision for glands, grommets, or membranes are assembled according to the manufacturer's instructions."		P
	Parts intended for decorative purposes which can be removed without the aid of a tool, shall be removed before the tests.		N
	For boxes and enclosures provided with glands or grommets, approximately half of the number of glands or grommets of each of the boxes and enclosures are fitted with seals together with cylindrical metal rods having a diameter equal to the lower limit specified for the mean overall diameter of the smallest cable as declared by the manufacturer. The remainder of the glands or grommets of the same boxes and enclosures are fitted with seals together with cylindrical metal rods having a diameter equal to the upper limit specified for the mean overall diameter of the largest cable as declared by the manufacturer.		N



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Clause	Requirement	Remark	Result
	Where the number of glands or grommets in a box is greater than six, the test is made with three glands or grommets equipped for the smallest cable size and three glands or grommets equipped for the largest cable size on each box.		N
	In the case of grommets, the rod shall be kept in place in such a way that the rod cannot move. The means to keep the rod in place shall have no influence on the results of the tests.		N
	The glands are tightened with a torque equal to two-thirds of that applied during the test of 12.13 (Table 5) any other openings being closed. Greater values of torque may be used if so stated by the manufacturer.		N
	The specimens are then subjected to a test in a heating cabinet with an atmosphere having the composition and pressure of the ambient air.		P
	The temperature in the heating cabinet is $(70 \pm 2) ^\circ\text{C}$.		P
	The specimens are kept in the cabinet for $(168^{+4}_0) \text{ h}$.		P
	After the treatment, the specimens are removed from the cabinet and kept at room temperature for $(96^{+4}_0) \text{ h}$.		P
	After the test, the specimen shall show no harmful deformation or similar damage, which may impair their further use within the meaning of this standard.	no harmful deformation and similar damage	P
13.1.2	Grommets, blanking plug and entry membranes in inlet openings and protecting membranes shall be reliably fixed and shall not be displaced by the mechanical and thermal stresses occurring in normal use.		N
	Compliance is checked by the following test, which shall be applied to all grommets, blanking plug replaceable and non-replaceable membranes		N
	Grommets, blanking plug and membranes are tested while fixed to the enclosures.		N
	First, the enclosures that have been subjected to the treatment specified in 13.1.1 are placed for 2 h r 15 min in a heating cabinet as described in 13.1.1, the temperature being maintained at $(40 \pm 2) ^\circ\text{C}$.		N
	Immediately after this period, a force of $(30^{+2}_0) \text{ N}$ is applied for $(5 \pm 1) \text{ s}$ to various parts of the grommets, blanking plug and/or membranes by means of the tip of test probe 11 according to IEC 61032.		N
	During these tests, the grommets, blanking plug and/or membranes shall not be deformed to such an extent that live parts of any included accessory become accessible.		N
	For grommets, blanking plug and/or membranes likely to be subjected to an axial pull in normal use, an axial pull of $(30^{+2}_0) \text{ N}$ shall be applied for $(5 \pm 1) \text{ s}$.		N
	The test is then repeated on the same enclosures fitted with grommets, blanking plug and/or membranes which have not been subjected to any treatment.		N
	After the test, grommets, blanking plug and/or membranes shall show no harmful deformation, cracks or similar damage which would lead to non-compliance with this standard.		N



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Clause	Requirement	Remark	Result
13.1.3	Grommets, blanking plug and entry membranes in inlet openings of boxes and enclosures classified according to 7.5.2 and 7.5.3 shall be so designed and made of such material that the introduction of the cables and conduits is permitted when ambient temperature is low.		N
	Compliance is checked by the following test.		N
	The enclosure is fitted with grommets!, blanking plug" and/or entry membranes which have not been subjected to any ageing treatment.		N
	After being left to cool down to the ambient temperature, the boxes and enclosures are then kept for 2 h in a refrigerator		N
	– at a temperature of $(-15 \pm 2) ^\circ\text{C}$ for boxes and enclosures classified according to 7.5.2, or		N
	– at a temperature of $(-25 \pm 2) ^\circ\text{C}$ for boxes classified according to 7.5.3.		N
	Immediately after conditioning, while the boxes and enclosures are still cold and in the refrigerator, it shall be possible to pierce any blind grommets, blanking plug and entry membranes and to introduce cables and conduits of the maximum diameter intended, the cables and conduits having been submit-ted to the same conditioning as the boxes and enclosures.		N
	After the test, the grommets, blanking plug or entry membranes shall show no harmful deformation, cracks or similar damage which would lead to non-compliance with this standard.		N
13.2	Protection against the ingress of solid objects		P
	Enclosures shall provide a degree of protection against the ingress of solid objects in accordance with their declared IP Code.	IP66	P
	Compliance is checked by the appropriate test of IEC 60529 under the following test conditions.		P
	Enclosures are mounted as for normal use according to the manufacturer's instructions. Unless otherwise stated herein, where the enclosure has drain holes, at least one open drain-hole shall be in the lowest position.		N
	Enclosures with screwed glands or grommets are fitted with cables having the smallest and the largest cross-sectional area and/or conduit having the smallest and the largest diameter/ dimensions, if any, as declared by the manufacturer.		N
	Fixing screws of the cover or cover-plate of the box are tightened with a torque equal to two-thirds of the values from Table 4 used for the test of 12.9.		P
	Greater values of torque may be used if so stated by the manufacturer, when the relevant information is provided.		N
	Other fixing means shall be fastened as in normal use or, if provided, according to the manufacturer's instructions.		N
	Cable and/or conduit entry means are made according to the manufacturer's instructions.		N
	Parts which can be removed without the aid of a tool are removed.		N



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Clause	Requirement	Remark	Result
	Glands are not filled with sealing compound or the like.		N
	For degree of protection IP5X, the test is carried out according to IEC 60529 category 2 and the drain holes, if any, shall not be open.	IP66	N
	For degrees of protection up to and including IP4X, the protection is satisfactory if the full diameter of the probe does not pass through any opening other than through drain holes, in which case the probe shall not touch live parts within the enclosure.		N
	For degree of protection IP5X, the protection is satisfactory if the dust does not cover the whole inner surface.		N
	For degree of protection IP6X, the protection is satisfactory if there is no dust inside the box or enclosure.		P
13.3	Protection against harmful ingress of water		P
13.3.1	Enclosures with a degree of protection higher than IPX0 shall provide a degree of protection against harmful ingress of water in accordance with the declared IP Code.	IP66	P
	Compliance is checked by the appropriate tests of IEC 60529 under the following test conditions.		P
	The reference surface S to be chosen for verification is calculated as follows:		P
	– for square and rectangular boxes and enclosures, the surface to take into account is the smallest interior width (l) multiplied by the depth (h) (see Figure 6a);		P
	–for round boxes and enclosures, the surface to take into account is the interior depth (h) of the box or enclosure multiplied by the smallest diameter (d) divided by 4 (see Figure 6b).		N
	Enclosures with screwed glands or grommets are fitted with cables having the smallest and the largest cross-sectional area and/or conduit having the smallest and the largest diameter/dimensions, if any, as declared by the manufacturer.		N
	Fixing screws of the cover or cover-plate of the box are tightened with a torque equal to two-thirds of the values from Table 4 used for the test of 12.9.		P
13.3.2	Surface-mounting enclosures are mounted as for normal use according to the manufacturer's instructions with any open drain holes in the lowest position unless otherwise specified.		P
	Flush type and semi-flush type enclosures are fixed in a test wall in accordance with the manufacturer's instructions.		N
	In this case, the manufacturer's instructions shall specify a type of wall, as well as the mounting. These shall be described in sufficient detail to ensure reproducible tests.		P
	Where the manufacturer's instructions do not specify a type of wall, the test wall according to Figure 5 is used.		P
	The test wall of Figure 5 is made with bricks having smooth surfaces. When the box is mounted in the test wall, it shall fit tight against the wall so that water cannot enter between the box and the wall.		P
	The test wall is placed in a vertical position.		P
	Enclosures are mounted as in normal use and fitted with cables having conductors of the largest and smallest		N



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Clause	Requirement	Remark	Result
	cross-sectional area as declared by the manufacturer.		
	During the tests of enclosures of degree of protection higher than IPX4, drain holes, if any, shall not be opened.		P
	Care shall be taken not to disturb, for example, to knock or shake, the enclosure, in such a manner that the test result will be affected.		N
13.3.3	Immediately after the test, there shall be no more than 0,2 ml× S (cm ²)water in the enclosure.		P
	The specimens, except connecting boxes classified according to 7.101.4, shall withstand an electric strength test specified in 14.2 which shall be started within 5 min of the completion of the test according to this subclause.(EN 60670-22)		P
13.3.4	Ingress of water is verified by the use of dry absorbent paper positioned to occupy the base area of the protected volume.		P
	Unless it is decided otherwise by the manufacturer the protected volume shall correspond to the total internal space of the box reduced by 5 % on each face of the box, i.e. 10 % on each dimension of the enclosure (See Figure 25).		P
	For doors or covers a strip of paper, bent to form a 90° angle profile, is attached to the cover or lid in the lowest position in order to protrude inside the box until it reaches the internal protected volume of the box (See Figure 25).		N
	If the enclosure could have more than one position of installation the test shall be carried out in all case of installation.		N
	Immediately after the test, the indicator paper shall still be dry.		P
14	Insulation resistance and electric strength		P
14.1	The insulation resistance and the electric strength of enclosures classified according to 7.1.1 and 7.1.3 shall be adequate.		P
	Compliance is checked by the tests of 14.2 and 14.3, these tests being made immediately after the following humidity treatment.		P
	The specimens are placed in a humidity cabinet containing air with a relative humidity maintained between 91 % and 95 %.		P
	The temperature of the air where the specimens are placed is maintained within ± 1 °C of any convenient value t between 20 °C and 30 °C.		P
	Before being placed in the humidity cabinet, the specimens are brought to a temperature between t and (t + 4) °C.		P
	The specimens are kept in the cabinet for		--
	– 2 days $(48 \begin{smallmatrix} +2 \\ 0 \end{smallmatrix})$ h for enclosures classified IPX0;		N
	–7 days $(168 \begin{smallmatrix} +4 \\ 0 \end{smallmatrix})$ h for other enclosures.		P
	After this treatment, the specimen shall show no damage impairing its further use and shall pass the following tests.		P
14.2	When a solid material is intended to provide electrical insulation between live parts and the body, the insulation	500V, 1min	P



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Clause	Requirement	Remark	Result
	resistance between the body and a metal foil in contact with the internal surface of the box and enclosure, is measured with a d.c. voltage of approximately 500 V, the measurement being made 1 min after application of the voltage.		
	The term "body" includes all accessible metal parts, metal foil in contact with the outer surface of accessible external parts of insulating material, fixing screws of bases or covers and external assembly screws.		P
	If metal foil is used for testing the insulation resistance and the electric strength, one metal foil is placed in contact with the inner surfaces and another metal foil, having a size not exceeding 200mm ×100 mm, is placed in contact with the external surfaces and, if necessary, is moved so as to test all parts.		P
	Care shall be taken that during the test the distance between the inner and the outer metal foil shall be arranged in such a way that there is no flashover in the surroundings of holes, premoulded knock-outs, membranes, etc.		P
	The insulation resistance shall be not less than 5 <i>MΩ</i> .		P
14.2.101	For boxes with integrated or incorporated terminals or connecting devices, the measurements are made consecutively as indicated below.(EN 60670-22)		N
14.3	The electric strength is tested by applying a voltage of a substantially sinusoidal waveform, having a nominal frequency of 50 Hz or 60 Hz and a value as specified in Table 6, for 1 min between the parts listed in 14.2.		N
	The test voltage is taken from Table 6 according to the rated insulation voltage as declared by the manufacturer.		N
	For enclosures having class II protection, the test voltage according to Table 6 is multiplied by 1.5.		N
	Initially, not more than half the prescribed voltage is applied, then it is raised rapidly to the full value.		N
	No flashover or breakdown shall occur during the test.		N
	The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is of at least 200 mA. The over current relay shall not trip when the output current is less than 100 mA.		N
	During the test a metal foil, as described in 14.2, is placed in contact with the inner surfaces and another metal foil is placed in contact with the external surfaces and, if necessary, moved so as to test all the parts.		N
15	Mechanical strength		P
	Boxes and enclosures shall have adequate strength to withstand the mechanical stresses occurring during installation and normal use.		P
	Compliance is checked by the appropriate tests of 15.1 to 15.3 as follows:		P
	– for non-metallic boxes and enclosures intended for use in cast concrete classified according to 7.2.3.1, by the test of 15.1;		N



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Clause	Requirement	Remark	Result
	–for non-metallic boxes and enclosures intended for use in cast concrete and able to with-stand 90 °C during building process classified according to 7.2.3.1 and 7.6.2, by the test of 15.2;		N
	– for boxes and enclosures classified according to 7.2.2, 7.2.3.2 and parts of flush and semi-flush boxes and enclosures which are intended to be accessible after the completion of the building process, by the test of 15.3.		P
15.1	Impact test at low temperature		N
	The specimen shall be subjected to an impact test with a vertical hammer test apparatus (see Figure 8).		N
	The whole arrangement together with the specimens shall be placed in a refrigerator, the temperature within being maintained for 2 h r 15 min at		N
	– (–5 ± 2) °C for types as classified according to 7.5.1;		N
	– (–15 ± 2) °C for types as classified according to 7.5.2;		N
	– (–25 ± 2) °C for types as classified according to 7.5.3.		N
	At the end of this period, each specimen is subjected to an impact by means of a mass of 1 kg falling vertically from a height of 100 mm.		N
	One blow is applied on the back and four equally spaced on the side walls		N
	After the test, the specimens shall show no damage leading to non-compliance with the standard.	No damage	N
	Cracks passing through the material not visible with normal or corrected vision without magnification, surface cracks in fibre-reinforced mouldings and small indentations are disregarded.		N
15.2	Compression test		N
	The boxes and enclosures are placed in a heating cabinet for (60 ± 15) min at a temperature of (90 ± 5) °C		N
	The boxes and enclosures are then allowed to cool down to ambient temperature.		N
	After the test, the boxes and enclosures shall show neither deformation nor damage leading to non-compliance with the standard.		N
	The boxes and enclosures are then placed between two flat hardwood plates each having a surface area sufficient to cover the face and back of the box. The plates are then loaded without impact with a force of (500 ± 5) N for 1 min ± 5 s which is applied away from the front face of the box towards the back.		N
	After the test, the box and the enclosure shall show no deformation or damage leading to non-compliance with the standard or affecting its further intended use.		N
	During these two tests, the boxes and enclosures shall be fitted according to the manufacturer's Instructions with the special part (if any) intended to improve the mechanical behaviour of the boxes and enclosures during the casting of the concrete.		N
	For the test, any special part shall be delivered together with the box and the enclosure.		N
15.3	Impact test for boxes and enclosures		P
	The specimens are checked by applying blows by means of the pendulum hammer test apparatus as described in		P



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Clause	Requirement	Remark	Result
	IEC 60068-2-75 (test EHA), with an equivalent mass of 250 g.		
	For boxes classified according to 7.5.2 and 7.5.3, this test shall be performed at the following temperature:		P
	– (–15 ± 2) °C for types as classified according to 7.5.2;		N
	– (–5 ± 2) °C for types as classified according to 7.5.3.		P
	The specimen shall be maintained at the specified temperature for 2 h ± 15 min		P
	Specimens classified according to 7.2.3.2 intended to be flush-mounted in normal use are reverse-mounted for the purpose of the test, so that the rear surface of the specimen is accessible as shown in Figure 7 and the blows are applied as shown in Figure 9.		N
	Test specimens are mounted on a mounting block made from a 8 mm thick, 175 mm X175 mm plywood sheet which is secured at its top and bottom edges by a rigid bracket. Inlet/outlet openings without knock-outs are left open. Where inlet/outlet openings are provided with knock-outs, one is opened.		N
	Specimens intended to be surface-mounted in normal use are mounted in accordance with the manufacture's instructions as shown in Figure 7.		P
	The mounting support as shown in Figure 7 shall be designed to allow the specimen to be moved horizontally and turned about an axis perpendicular to the surface of the plywood sheet.		P
	The design of the mounting support shall be such that		--
	–the mounting support has a mass of (10 ± 1) kg and is mounted on a rigid frame;		P
	– the specimen can be mounted so that the point of impact lies in the vertical plane through the axis of the pivot;		P
	– the plywood sheet can be turned about a vertical axis.		P
	Parts are submitted to an impact energy and a specified number of blows dependent on the distance of the accessible surface of the specimen from the surface of the plywood sheet when mounted as above. Distances A, B, C, D, E, F and G are defined as indicated in Table 7.		P
	The striking element is allowed to fall from a height which is specified in Table 8.		P
	The height of fall is the vertical distance between the position of the checking point, when the pendulum is released, and the position of that point at the moment of impact. The checking point is marked on the surface of the striking element where the line through the point of intersection of the axis of the steel tube of the pendulum and the striking element, perpendicular to the place through both axes, meets the surface.		P
	The specimens are subjected to blows, which are evenly distributed over the specimen.		P
	The following blows are applied:		--
	– for parts A, five blows as applicable		P
	one blow in the centre, then after the specimen has been moved horizontally;		P



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Clause	Requirement	Remark	Result
	One on each of the two least favourable points between the centre and the edges,		P
	and then, after the specimen has been turned $90^\circ \pm 2^\circ$ about its axis perpendicular to the plywood		P
	one on each of two similar points;		--
	– for parts B (as far as applicable), C ,D, E, F and G, four blows (see Figure 10)		P
	one blow is applied on the side of the specimen on which the blow can be applied after the plywood sheet has been turned $60^\circ \pm 2^\circ$ about a vertical axis;		P
	one blow is applied on the opposite side on which the blow can be applied after the plywood sheet has been turned $60^\circ \pm 2^\circ$ about a vertical axis in the opposite direction;		P
	after the specimen is turned $90^\circ \pm 2^\circ$ about its axis perpendicular to the plywood;		P
	one blow is applied on one of the sides of the specimen on which the blow can be applied after the plywood sheet has been turned $60^\circ \pm 2^\circ$ about a vertical axis;		P
	one blow is applied on the opposite side of the specimen on which the blow can be applied after the plywood sheet has been turned $60^\circ \pm 2^\circ$ about a vertical axis in the opposite direction.		P
	The blows shall not be applied to		--
	knock-outs or to an area within 10 mm of them,		N
	other parts not necessary to achieve the declared IP of the enclosure,		P
	Accessories and equipment complying with the other relevant standards.		N
	fixing means recessed below the surface, that are not subject to impacts in normal use.		P
	If inlet openings are provided, the specimen is so mounted that the two lines of blows are as nearly as possible equidistant from these openings.		N
	After the test, the specimens shall show no damage leading to non-compliance with the standard.		N
	There shall be no cracks passing through the material which are visible to normal or corrected vision without magnification. Surface cracks in fibre-reinforced mouldings and small indentations are ignored.		P
16	Resistance to heat		P
16.1	Parts of insulating material necessary to retain current-carrying parts		P
	Parts of insulating material necessary to retain current-carrying parts and/or parts of the earthing circuit in position are subjected to a ball-pressure test by means of the apparatus according to IEC 60695-10-2 except that insulating parts necessary to retain earthing terminals in position shall be tested as specified in 16.2.		N
	When it is not possible to carry out the test on the specimen under test, the test shall be carried out on a specimen of the material at least 2 mm thick.		P
	The part under test shall be placed on a steel plate at least 3 mm thick and in direct contact with it.		P
	The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter is		P

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Clause	Requirement	Remark	Result
	pressed against the surface with a force of $(20 \pm 0,5)$ N.		
	The test is made in a heating cabinet at a temperature of (125 ± 2) °C. After (60 ± 5) min, the ball is removed from the specimen which is then cooled down within 10 s to approximately room temperature by immersion in cold water.		P
	The diameter of the impression caused by the ball is measured and shall not exceed 2 mm.		P
16.2	Parts of insulating material not necessary to retain current-carrying parts		P
	Parts of insulating material not necessary to retain current-carrying parts and/or parts of the earthing circuit in position, even though they are in contact with them, are subjected to a ball-pressure test in accordance with 16.1, but the test is made at a temperature of (70 ± 2) °C.		P
	Parts of insulating material of flush-mounted enclosures classified according to 7.6.2 are subjected to the test described in 16.1 but at a temperature of (90 ± 2) °C.		P
	If the test cannot be made on a complete enclosure, a suitable part may be cut from it for the purpose of the test.		P
16.101	Connecting devices having parts of insulating material shall be sufficiently resistant to heat.(EN 60670-22)		P
16.101.1	The specimens or portions of the specimens are kept for 1 h in a heating cabinet at a temperature of (85 ± 2) °C.(EN 60670-22)		P
	During the test they shall not undergo any change impairing their further use and sealing compound if any, shall not flow to such an extent that live parts are exposed.(EN 60670-22)		P
	After the test and after the specimens have been allowed to cool to approximately ambient temperature, there shall be no access to live parts which are normally not accessible when the specimens are mounted as in normal use, even if the test probe B of IEC 61032 is applied with a force not exceeding 5 N.(EN 60670-22)		P
	After the test, markings shall still be legible.(EN 60670-22)		P
16.101.2	Parts of the insulating material not necessary to retain current carrying parts and parts of the earthing circuit in position, even though they are in contact with them, are subjected to a ball-pressure test as described in clause 16.1 of Part 1 but at a temperature of (70 ± 2) °C or (40 ± 2) °C, plus the highest temperature rise determined for the relevant part during the test of 16.102.4, whichever is the higher.(EN 60670-22)		P
16.101.3	Parts of the insulating material necessary to retain current carrying parts and parts of the earthing circuit in position are subjected to a ball pressure test in a heating cabinet at a temperature of (125 ± 2) °C.(EN 60670-22)		N
16.102	Connecting devices integrated or incorporated in connecting boxes shall be so constructed that the temperature rise in normal use does not exceed the value specified in 16.102.4.(EN 60670-22)		N
16.102.1	Connecting devices with a single terminal (see Figure 101) having one or more clamping units shall be connected to conductors in the intended manner and the most unfavourable conditions.(EN 60670-22)		N



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Clause	Requirement	Remark	Result
16.102.2	For multiway terminal devices a maximum of 3 adjacent terminals are connected in series. If single pole connecting devices are designed to be mounted side by side, 3 devices are placed in the intended manner and connected together.(EN 60670-22)		N
16.102.3	The connections are made with new rigid or flexible conductors of the largest cross-sectional area appropriate to the clamping units, the clamping units being connected according to the specifications of the relevant part of IEC 60998.(EN 60670-22)		N
	Conductor length shall be 1 m for a cross-sectional area up to and including 10 mm ² and 2 m for a cross-sectional area above 10 mm ² . Conductor length may be reduced in agreement with the manufacturer.(EN 60670-22)		N
16.102.4	Temperature rise measurements are made when the device under test has reached thermal equilibrium. It is generally accepted that the temperature is stable when the temperature of the part under test does not increase by more than 1 K/h. During the test the devices are loaded with an alternating current having the value shown in Table 101 for the corresponding rated connecting capacity.(EN 60670-22)		N
	The temperature is determined by means of colour changing indicators or thermocouples, so chosen and positioned that they have a negligible effect on the temperature being determined (EN 60670-22)		N
	The temperature rise of current-carrying parts of the clamping unit shall not exceed 45 K, it being understood that in the case of an insulated device the temperature rise of the conductor shall be measured as close as possible to the clamping unit.(EN 60670-22)		N
17	Creepage distances, clearances and distances through sealing compound (EN 60670-22)		P
	See the relevant Part 2 of this standard.		N
	Creepage distances, clearances and distances through sealing compound shall not be less than the value shown in Table 102.(EN 60670-22)		N
	This test does not apply to boxes for floating terminals or connecting devices classified according to 7.101.4.(EN 60670-22)		P
18	Resistance of insulating material to abnormal heat and fire		P
	Parts of insulating material which might be exposed to thermal stresses due to electric effects, the deterioration of which might impair safety, shall not be unduly affected by abnormal heat and by fire.		P
	Compliance is checked by means of the glow-wire test performed according to Clauses 4 to 10 of IEC 60695-2-11, under the following conditions:		P
	A current-carrying part or a part of the earthing circuit retained by a mechanical means is considered to be retained in position. The use of grease or the like is not considered to be mechanical means.		N
	External conductors cannot be considered as retaining the current-carrying parts.		N
	In case of doubt, to determine whether an insulating material is necessary to retain current-carrying parts and parts of the earthing circuit in position, the device is		N



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Clause	Requirement	Remark	Result
	examined without conductors while held in positions with the insulating material in question removed.		
	If the tests specified have to be made at more than one place on the same specimen, care shall be taken to ensure that any deterioration caused by previous tests does not affect the result of the test to be made.		N
	Small parts, where each surface lies completely within a circle 15 mm in diameter, or where any part of the surface lies outside a 15mm diameter circle and where it is not possible to fit a circle 8 mm in diameter on any of the surfaces, are not subjected to the test of this subclause (see Figure 21 for a diagrammatic representation).		N
	The tests are not made on parts of ceramic material.		N
	The glow-wire test is applied to ensure that an electrically heated test wire under defined test conditions does not cause ignition of insulating parts or to ensure that a part of insulating material, which can be ignited by the heated test wire under defined conditions, has a limited time to burn without spreading fire by flame or burning parts or droplets falling down from the tested parts onto the pinewood board covered with a tissue paper.		N
	If possible, the specimen should be a complete box or enclosure.		P
	If the test cannot be made on a complete box or enclosure, a suitable part may be cut out for the purpose of the test.		N
	The test is made on one specimen.		P
	In case of doubt, the test shall be repeated on two further specimens.		P
	The test is made by applying the glow wire once for (30 ± 1) s.		P
	The specimen shall be positioned during the test in the most unfavourable position of its intended use (with the surface tested in a vertical position).		P
	The tip of the glow wire shall be applied to the specified surface of the specimen taking into account the conditions of the intended use under which a heated or glowing element may come into contact with the specimen.		P
	The specimen is regarded as having passed the glow-wire test if		P
	– there is no visible flame and no sustained glowing, or if		P
	– flames and glowing at the specimen extinguish within 30 s after the removal of the glow wire.		P
	There shall be no ignition of the tissue paper or scorching of the board.		P
19	Resistance to tracking		P
	For boxes and enclosures with protection degree higher than IPX0, all parts of the insulating material retaining live parts in position shall be made of a material resistant to tracking.		P
	For materials other than ceramic and where the creepage distances are less than twice the values specified in Clause 17, compliance is checked by the test of IEC 60112 on three specimens.		N
	A flat surface of the part to be tested, if possible at least 15		P

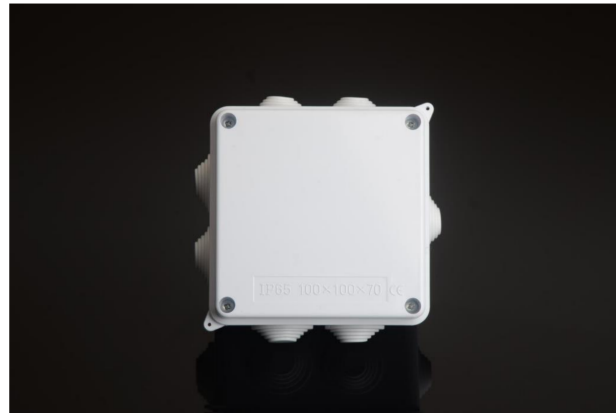


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Clause	Requirement	Remark	Result
	mm X 15 mm and at least 3 mm thick, is placed in the horizontal position.		
	The material under test shall pass a proof-tracking index of 175 using test solution A with a Time interval between drops of (30 ± 5) s.		P
	No flashover or breakdown between electrodes shall occur before a total of 50 drops has fallen.		P
	Alternatively, the CTI value for the material may be used. The CTI value shall not be less than 175.		P
20	Resistance to corrosion		P
	Ferrous parts of boxes and enclosures shall be adequately protected against rusting.	PC/ABS	N
	Compliance is checked by the following test.		N
	All grease is removed from the parts to be tested by immersion in a degreasing agent for (10 ± 1) min.		N
	The parts are then immersed for (10 ± 1) min in a 10 % solution of ammonium chloride in water at a temperature of (20 ± 5) °C.		N
	Without drying, but after shaking off any drops, the parts are placed for (10 ± 1) min in a box containing air saturated with moisture to a level of 91 % to 95 % at a temperature of (20 ± 5) °C.		N
	After the parts have been dried for (10 ± 1) min in a heating cabinet at a temperature of (100 ± 5) °C, their surface shall show no sign of rust.		N
21	Electromagnetic compatibility (EMC)		N
	Products covered by this standard are, in normal use, passive in respect to electromagnetic influences (emission and immunity).		N
	Therefore, no tests are necessary.		N



Annex: Technical Information

(1) Product Photos



A.1