



TESTING AND MEASURING EQUIPMENT/ALLOWED SUBCONTRACTING

IEC 60670-1:2002-12, Edition 1

Boxes and enclosures for electrical accessories for household and similar fixed electrical installations Part 1: General requirements

R=Required by Lab

S=May be subcontracted

3PPS=Three Phase Power Supply required

Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8	Indelibility of marking	- Piece of cloth, Water, Petroleum spirit (Definition see Note 2 in clause 8)	R
9	Checking of dimensions	- Calliper, micrometer, gauges (if standard sheets exist)	R
10	Protection against electric shock	- IPXXB; Jointed test finger according to Table 6 and Figure 1 of IEC 60529, Dynamometer (Push), range 0 to 10 N \pm 10% - Test probe 11 according to IEC 61032, Dynamometer (Push), range 0 to 10 N/20 N/75 N - Electric contact indicator with a voltage not less than 40V and not more than 50V	R
11.1	Voltage drop, calculation of resistance in earthing circuit between the earthing terminal and exposed conductive parts of covers or cover-plates	- Apparatus deriving a current from an a.c. source having a no-load voltage not exceeding 12V and equal to (25 \pm 1) A, Measuring probe	R



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11.2	Test on earthing strap (boxes and enclosures of insulating material classified according to 7.7.2)	<ul style="list-style-type: none"> - Heating cabinet adjustable to min. 90 °C - Figure 3: Test strap - Screwdriver or spanner with torque meter (range according to Table 4) - Load of 45 N (if a tensile machine is used: jaw separation speed of 10 mm/min) - Stop watch 	R
12.1.2.1 – 12.1.2.2 – 12.1.3	Verification of non-removal/removal of lids, covers or cover-plates fixed without screws	<ul style="list-style-type: none"> - Test probe A according to IEC 61032 - Load of 10 N, 20 N, 40 N, 80 N and 120 N (Table 2) - Sheet of hard material ($1 \pm 0,1$) mm thick - Stop watch 	R
12.1.2.3	Verification of the outline of lids, covers and cover-plates fixed without screws	<ul style="list-style-type: none"> - Figure 13: gauge for the verification of the outline of lids, covers or cover-plates 	R
12.1.2.4	Verification of grooves, holes and reverse tapers	<ul style="list-style-type: none"> - Figure 16: gauge for the verification of grooves, holes and reverse tapers - Dynamometer (Push), ($1 \pm 0,2$) N 	R
12.2	Size of drain-holes	<ul style="list-style-type: none"> - Slide calliper, or appropriate probe 	R
12.3	Insulation surroundings of any metal parts of internal fixing means	<ul style="list-style-type: none"> - Slide calliper - Appropriate micrometer 	R
12.5	Inlet openings for conduit entries. Conduit samples of sizes in accordance with IEC 60423 or IEC 60981	<ul style="list-style-type: none"> - Slide calliper - Appropriate micrometer 	R



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12.6	Test of the cable anchorage (boxes and enclosures classified according to 7.4.2)	<ul style="list-style-type: none"> - Figure 11: Apparatus for testing the cable anchorage - Screwdriver or spanner with torque meter (range according to Table 4) - Spanner or suitable tool with torque meter (range according to Table 5) - Loads (range according to Table 3) - Apparatus for the torque test (range according to Table 3) - Stop watch - Slide calliper 	R
12.7	Test of the cable retention (boxes and enclosures classified according to 7.4.1)	<ul style="list-style-type: none"> - Load (20 ± 1) N - Stop watch - Slide calliper 	R
12.8.1	Knock-out retention	<ul style="list-style-type: none"> - 6 mm diameter mandrel with a flat end - Load (30 ± 1) N - Stop watch 	R
12.8.2	Knock-out removal	<ul style="list-style-type: none"> - Refrigerator adjustable to -5 °C/-15 °C/-25 °C - Stop watch 	R
12.9	Torque test of screw fixing means for covers, accessories, etc.	<ul style="list-style-type: none"> - Slide calliper - Screwdriver or spanner with torque meter (range according to Table 4) 	R
12.11	Verification of fixing means for boxes and enclosures classified according to 7.7.1	<ul style="list-style-type: none"> - Sheet of plywood (10 ± 1) mm thick, 500 mm wide, 500 mm high (mandatory if the manufacturer's instructions are not specific regarding the type of wall) - Lever according to according Figure 18 - Dynamometer (range 0 to 100 N) - Stop watch - Slide calliper 	R



Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
12.12.1	Verification of fixing means for boxes and enclosures classified according to 7.7.2 intended for mounting to a wood structural member of a wall	<ul style="list-style-type: none"> - (45 x 90) mm wood structural member - Dynamometer (range 0 to 225 N) - Stop watch - Movement measurement apparatus 	R
12.12.2	Verification of fixing means for boxes and enclosures classified according to 7.7.2 intended for mounting to a wood structural member of a ceiling	<ul style="list-style-type: none"> - (35 x 180) mm wood structural member - Dynamometer (range 0 to 225 N) - Stop watch - Deflection measurement apparatus 	R
12.12.3	Verification of fixing means for boxes and enclosures classified according to 7.7.2 intended for mounting to a steel-stud structural member of a wall	<ul style="list-style-type: none"> - Steel-stud structural member according to Figure 19 - Dynamometer (range 0 to 180 N) - Stop watch - Deflection measurement apparatus 	R
12.12.4	Measurement of internal volume of boxes and enclosures classified according to 7.7.2	<ul style="list-style-type: none"> - Flat transparent plate not more than 3,2 mm thick (cover of Figure 4) - Graduated cylinder or measuring flask 	R
12.13	Test on cable glands	<ul style="list-style-type: none"> - Metal rods - Spanner or suitable tool with torque meter (range according to Table 5) - Stop watch 	R
12.14	Test for boxes and enclosures classified according to 7.3.4 and conical spouts as in 7.3.6	<ul style="list-style-type: none"> - Conduits of minimum nominal size according to IEC 60423 or IEC 60981 - Dynamometer (range 0 to 20 ± 2 N, 100 ± 2 N) - Stop watch 	R
13.1.1	Ageing test for insulating and composite boxes and enclosures, seals, grommets and replaceable membranes	<ul style="list-style-type: none"> - Cylindrical metal rods - Spanner or suitable tool with torque meter (range according to Table 5) - Heating cabinet 	R



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13.1.2	Test applicable to all grommets, replaceable and non-replaceable membranes	<ul style="list-style-type: none">- Heating cabinet- Test probe 11 according to IEC 61032- Dynamometer (Push), range 0 to 30 0/-2 N- Stop watch	R
13.1.3	Test applicable to grommets and entry membranes in inlet opening of boxes and enclosures classified according to 7.5.2 and 7.5.3	<ul style="list-style-type: none">- Refrigerator adjustable to -15 °C/-25 °C- Stop watch	R



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13.2	Protection against the ingress of solid objects IP2X to IP6X	<ul style="list-style-type: none"> - Slide caliper - Screwdriver or spanner with torque meter (range according to Table 4) - Electric contact indicator with a voltage not less than 40 V and not more than 50 V IP2X: - Rigid sphere without handle or guard 12,5 mm diameter according to Table 7 of IEC 60529, Dynamometer (Push), range 0 to 30 N \pm 10% <ul style="list-style-type: none"> - Jointed test finger according to Table 6 and Figure 1 of IEC 60529, Dynamometer (Push) range 0 to 10 N \pm 10% IP3X: - Rigid steel rod 2,5 mm diameter according to Table 7 of IEC 60529, Dynamometer (Push), range 0 to 3 N \pm 10% <ul style="list-style-type: none"> - Test rod 2,5 mm diameter 100 mm long according to Table 6 of IEC 60529, Dynamometer (Push), range 0 to 3 N \pm 10% IP4X: - Rigid steel wire 1,0 mm diameter according to Table 7 of IEC 60529, Dynamometer (Push) range 0 to 1 N \pm 10% <ul style="list-style-type: none"> - Test wire 1,0 mm diameter 100 mm long according to Table 6 of IEC 60529, Dynamometer (Push) range 0 to 1 N \pm 10% IP5X: - Dust chamber according to Table 7 and Figure 2 of IEC 60529, Category 2 <ul style="list-style-type: none"> - Test wire 1,0 mm diameter, 100 mm long according to Table 6 of IEC 60529, Dynamometer (Push) range 0 to 1 N \pm 10% IP6X: - Dust chamber according to Table 7 and Figure 2 of IEC 60529, Category 1 <ul style="list-style-type: none"> - Test wire 1,0 mm diameter 100 mm long according to Table 6 of IEC 60529, Dynamometer (Push) range 0 to 1 N \pm 10% 	R



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13.3	Protection against harmful ingress of water IPX1 to IPX8	<ul style="list-style-type: none"> - Slide caliper - Screwdriver or spanner with torque meter (range according to Table 4) - Test wall according to Fig. 5 (mandatory if the manufacturer's instructions are not specific regarding the type of wall) - Absorbent paper (coloured blotting or filter paper) <p>IPX1: Drip box according to Table 8 and Fig. 3a) of IEC 60529 IPX2: Drip box according to Table 8 and Fig. 3b) of IEC 60529 IPX3: Oscillating tube or spray nozzle according to Table 8 and respectively Figure 4 or Figure 5 of IEC 60529, spray 60° from each side of vertical, or spray nozzle with counterbalanced shield in place IPX4: Same as IPX3 equipment, except spray 180° from each side of vertical, or spray nozzle with counterbalance shield removed IPX5: Water jet hose nozzle according to Table 8 and Figure 6 of IEC 60529, nozzle 6,3 mm diameter IPX6: Same as IPX5, except nozzle 12,5 mm diameter IPX7: Immersion tank suitable for the purpose IPX8: Same as IPX7 equipment, but water level by agreement Voltage test equipment as mentioned under clause 14.3</p>	R
14.1	Humidity treatment	<ul style="list-style-type: none"> - Humidity chamber with relative humidity (91 to 95)% RH, temperature (20 to 30 ±1) °C 	R
14.2	Insulation resistance	<ul style="list-style-type: none"> - DC source of 500V and instruments, Metal foil - Stop watch 	R
14.3	Electric strength test	<ul style="list-style-type: none"> - Adjustable high voltage test equipment (AC – 50 Hz or 60 Hz) up to 5250 V, output current is at least 200 mA, not trip when the output current is less than 100 mA, Metal foil - Stop watch 	R



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15.1	Impact test for non-metallic boxes and enclosures intended for use in cast concrete classified according to 7.2.3.1	<ul style="list-style-type: none"> - Vertical hammer test apparatus according to Figure 8, or, on larger enclosures, spring hammer according to IEC 60068-2-75 - Refrigerator adjustable to $(-5 \pm 2) ^\circ\text{C}/(-15 \pm 2) ^\circ\text{C}/(-25 \pm 2) ^\circ\text{C}$ 	R
15.2	Compression test for non-metallic boxes and enclosures intended for use in cast concrete and able to withstand $90 ^\circ\text{C}$ during building process classified according to 7.2.3.1 and 7.6.2	<ul style="list-style-type: none"> - Heating cabinet adjustable to $(90 \pm 5)^\circ\text{C}$ - Flat hardwood plates - Load of $(500 \pm 5) \text{ N}$ - Stop watch 	R
15.3	Impact test on boxes and enclosures classified according to 7.2.3.2 (7.2.2, 7.2.3.1, 7.5.2, 7.5.3) and parts of boxes and enclosures which are intended to be accessible after the completion of the building process	<ul style="list-style-type: none"> - Impact test apparatus according to Annex D of IEC 60068-2-75 (pendulum hammer), or on larger enclosures, spring hammer according to IEC 60068-2-75 - Mounting block made from a 8 mm thick, 175 mm x 175 mm plywood sheet and mounting support with a mass of $(10 \pm 1) \text{ kg}$ - Tape measure or suitable measurement rod 	R
16.1	Ball-pressure test on parts of insulating material necessary to retain current-carrying parts and/or parts of the earthing circuit in position	<ul style="list-style-type: none"> - Ball-pressure test apparatus according to IEC 60695-10-2 (steel ball of 5 mm diameter pressed with a force of $(20 \pm 0,5 \text{ N})$) - Heating cabinet adjustable to $(125 \pm 2) ^\circ\text{C}$ - Stop watch - Suitable device for measurement of impression 	R
16.2	Ball-pressure test on insulating parts necessary to retain earthing terminals in position and parts of insulating material not necessary to retain current-carrying parts and/or parts of the earthing circuit in position	<ul style="list-style-type: none"> - Same as under 16.1, but heating cabinet adjustable to $(70 \pm 2)^\circ\text{C}$ 	R
16.2	Ball-pressure test on parts of insulating material of flush-mounted enclosures classified according to 7.6.2	<ul style="list-style-type: none"> - Same as under 16.2, but heating cabinet adjustable to $(90 \pm 2)^\circ\text{C}$ 	R



Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
16.3	Mechanical strength test at high temperature for boxes and enclosures of insulating materials classified according to 7.7.2	<ul style="list-style-type: none">- Figure 20: rigid crossbar- Screwdriver or spanner with torque meter (range according to Table 4)- Total load of 180 N (including the rigid crossbar and any associated suspension means)- Heating cabinet adjustable to $(80 \pm 2) ^\circ\text{C}/(105 \pm 2) ^\circ\text{C}$- Stop watch- Slide caliper	R
18	Glow-wire test	<ul style="list-style-type: none">- Glow-wire test apparatus according to IEC 60695-2-10 (test performed according to Clauses 4 to 10 of IEC 60695-2-11), Pinewood board and tissue paper- Stop watch	R
19	Resistance to tracking	<ul style="list-style-type: none">- Tracking test apparatus according to IEC 60112	R
20	Resistance to corrosion	<ul style="list-style-type: none">- Suitable degreasing agent, Ammonium chloride- Humidity chamber saturated with moisture of 91 % to 95 %- Heating cabinet adjustable to $(100 \pm 5) ^\circ\text{C}$- Stop watch	R

Note: The presence of equipment alone does not indicate a satisfactory situation. Assessors must evaluate the equipment design, calibration, uncertainty and documentation to ensure compliance with the directions of the standard. The requirements of ISO Guide 25 regarding validation are applicable, as the tests of this standard are not standardized tests.