

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

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

**Boîtes et enveloppes pour appareillage électrique pour installations électriques fixes pour usages domestiques et analogues –
Partie 1: Règles générales**



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FOREWORD

This amendment has been prepared by subcommittee 23B: Plugs, socket-outlets and switches, of IEC technical committee 23: Electrical accessories.

The text of this amendment is based on the following documents:

FDIS	Report on voting
23B/981/FDIS	23B/991/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

CONTENTS

Add, in the list of contents, the following new titles:

11.3 Boxes or enclosures with removable sides according to 7.1.2

11.4 Earthing terminal threads

Replace the title of Subclause 12.1.3 by the following new title:

12.1.3 Non screw-type fixing operable with the use of a tool or a key

Replace the titles of Subclause 12.8 by the following:

12.8 Knock-outs intended to be removed by mechanical impact

12.8.1 General

12.8.2 Knock-out retention

12.8.3 Knock-out removal

12.8.4 Flat surfaces surrounding knock-outs

Replace the title of Subclause 12.10 by the following:

12.10 Fixing of boxes and enclosures classified according to 7.2.1.1 and 7.2.1.2

Replace the title of Subclause 12.12 by the following:

12.12 Fixing of boxes and enclosures classified according to 7.7.2

Add the following new titles:

12.15 Internal volume of boxes and enclosures

16.3.1 Mechanical strength

16.3.2 Parts of insulating material necessary to retain parts of the earthing circuit

Replace the title of Figure 4 by the following:

Figure 4 – Volume measurement (see 12.15)

Replace the title of Figure 5 by the following:

Figure 5 – Test wall (see 13.3.2)

Replace the title of Figure 7 by the following:

Figure 7 – Mounting block for flush type boxes and enclosures in order to apply blows on the rear surface (See 15.3)

Replace the title of Figure 9 by the following:

Figure 9 – Height of fall for blows for part A (See 15.3)

Replace the title of Figure 19 by the following:

Figure 19 – Test according to 12.12.3

Add the following new titles:

Figure 22 – Example of mounting block for boxes to be embedded in masonry (flush type and semi-flush type) according to 12.10

Figure 23 – Example of the fixing of the auxiliary device mounted on a specimen according to 12.10

Figure 24 – Example of test apparatus for the test according to 12.10

Figure 25 – Example of the protected volume (See 13.3.4)

Figure 26 – Demonstration of the non-penetration of the internal volume

2 Normative references

Add the following new reference:

IEC 62444:2010, *Cable glands for electrical installations*

3 Definitions

3.10 cable gland

Replace the definition of 3.10 by the following:

a device designed to permit the entry of a cable, flexible cable or insulated conductor into an enclosure, and which provides sealing and retention. It may also provide other functions such as earthing, bonding, insulation, cable guarding, strain relief or a combination of these

Add the following new definition after Definition 3.19:

3.20 blanking-plug

a blanking-plug is a component used to close an open inlet or an open knock out

Table 1 – Classification of boxes and enclosures

Add the following new row after the row concerning 7.7:

7.8 The provision for fixing accessories to boxes	7.8.1 Boxes supplied with screws
	7.8.2 Boxes intended to receive screws
	7.8.3 Boxes intended to receive claws
	7.8.4 Boxes intended to receive other means

8 Marking

8.1

Move item e) after the third paragraph, before the paragraph commencing with “The following information...”.

Add the following NOTE after 8.1 e):

NOTE In the following country the marking of the type reference is not used: UK.

Replace the reference to 12.12.5 in 8.1i) by 12.15.

8.2

Replace NOTE 1 by the following:

NOTE 1 Marking made by moulding, pressing or engraving is considered durable and is therefore not subjected to this test.

10 Protection against electric shock

Replace the existing text by the following:

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.

Where enclosures are supplied without a cover, 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.

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.

Tests shall be carried out on parts which are accessible after installation.

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 ± 2) °C, the enclosure being at this temperature.

The probe is applied to all places except membranes or the like, where yielding of insulating material could impair the safety, with a force of 75 N.

11 Provision for earthing

Replace Subclauses 11.1 and 11.2 by the following:

11.1 Boxes and enclosures with exposed conductive parts

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.

The earthing means or the provision for the fitting of such an earthing means shall be located so that:

- the means is readily accessible through the open face of the box, and
- the removal of an accessory mounted in the box does not disturb the continuity of the earthing circuit, and
- the means is not part of a removable cover, back, or side of the box or enclosure.

Compliance is checked by inspection.

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.

Compliance is checked by the following test.

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.

In no case shall the resistance exceed 0,05 Ω .

NOTE 1 Care should be taken that the contact resistance between the tip of the measuring probe and the exposed conductive part under test does not influence the test results.

NOTE 2 In insulating boxes and enclosures having an IP degree higher than IPX0, provisions can be made for the addition of means for the effective continuity of the earthing conductor, when more than one inlet is provided.

11.2 Boxes and enclosures of insulating material classified according to 7.7.2

Boxes and enclosures of insulating material shall be provided with a minimum of one earthing strap having one screw terminal for earthing purposes with a connecting capacity of at least 4 mm². The design of the earthing strap shall ensure that the metal mounting yokes of accessories mounted inside the box and metallic covers mounted on the box are connected to the earthing conductors (see Figure 2).

Compliance is checked by inspection.

The earthing strap shall be securely fastened to the box or enclosure.

Compliance is checked by the test in 16.3.2.

Add the following new Subclauses 11.3 and 11.4 after Subclause 11.2:

11.3 Boxes or enclosures with removable sides according to 7.1.2

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.

Compliance is checked by inspection.

11.4 Earthing terminal threads

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.

Compliance is checked by inspection and by the following test.

The screws are tightened and loosened 5 times.

The test is made by using a suitable screwdriver or an appropriate tool applying a torque as indicated in Table 4.

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.

Greater values of torque may be used if so stated by the manufacturer, when the relevant information is provided.

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.

Column II applies to other screws which are tightened by means of a screwdriver.

Column III applies to screws and nuts which are tightened by means other than a screwdriver.

Column IV applies to screws which are tightened by means of a square blade screwdriver.

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.

12 Construction

Add the following new text at the beginning of Clause 12:

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.

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.

Compliance is checked by inspection.

12.1 Lids, covers or cover-plates or parts of them

Replace the first paragraph by the following:

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.

12.1.1 Screw-type fixing

Replace Subclause 12.1.1 by the following:

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.

For lids, covers or cover plates whose fixing is of the screw type, compliance is checked by inspection.

Table 2

Replace Table 2 by the following:

Table 2 – Forces to be applied to covers, cover-plates or actuating members whose fixing is not dependent on screws

Accessibility with the test finger after removal of lids, covers or cover-plates or parts of them	Force to be applied N			
	Enclosures complying with 12.1.2.3 and 12.1.2.4		Enclosures not complying with 12.1.2.3 and 12.1.2.4	
	shall not come off	shall come off*	shall not come off	shall come off*
To live parts	40	120	80	120
To non-earthed conductive parts separated from live parts by basic insulation	10	120	20	120
To insulating parts, or earthed conductive parts, or conductive parts separated from live parts by double or reinforced insulation or live parts of SELV ≤ 25 V a.c. or 60 V d.c.	10	120	10	120

* These columns do not apply for 12.1.3.

12.1.3 Other fixings

Replace Subclause 12.1.3 by the following:

12.1.3 Non screw-type fixing operable with the use of a tool or a key

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.

12.3 Mounting of enclosures

Replace the second paragraph of Subclause 12.3 by the following:

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.

12.4 Boxes and enclosures with inlets for flexible cables

Replace Subclause 12.4 by the following:

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.

Compliance is checked by manual test.

12.5 Boxes and enclosures with inlets for applications other than flexible cables

Replace the first dashed text of the first paragraph of Subclause 12.5 by the following:

- a conduit or suitable fitting connecting it to the box or enclosure, and/or

12.7 Boxes and enclosures with cable retention means

Add the following NOTE after the first paragraph of Subclause 12.7:

NOTE In the following countries a cable retention is required for boxes and enclosures for hollow walls due to installation practices: DE.

Add the following text after the second paragraph of Subclause 12.7:

For boxes and enclosures classified according to 7.5.2 or 7.5.3, the test shall be carried out at $(-15 \pm 2) ^\circ\text{C}$ and $(-25 \pm 2) ^\circ\text{C}$ respectively.

12.8 Knock-outs inlets (outlets) intended to be removed by mechanical impact

Replace Subclause 12.8 by the following:

12.8 Knock-outs intended to be removed by mechanical impact

12.8.1 General

It shall be possible to remove knock-outs intended to be removed by mechanical impact without damaging the box.

For knock-outs for cables, chips or burrs are not accepted.

For knock-outs for conduits and/or for use with a grommet or a membrane, chips and burrs are disregarded.

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.

This blanking-plug used without a locknut:

- shall not become dislodged or damaged, and
- its effectiveness shall not be impaired, and
- it shall fulfil all requirements for knock-outs.

This requirement does not apply to a blanking-plug which assembles by threading into a threaded inlet.

Compliance is checked by inspection and by the tests as specified in 12.8.2 and 12.8.3.

12.8.2 Knock-out retention

For boxes and enclosures having knock-outs that

- *do not provide access to live parts and are accessible after installation, a force of $(30 \pm 1) \text{ N}$ shall be applied to a knock-out for $(15 \pm 1) \text{ s}$,*
- *provide direct access to live parts after installation, a force of $(40 \pm 1) \text{ N}$ shall be applied to a knock-out for $(60 \pm 1) \text{ s}$,*

by means of a 6 mm diameter mandrel with a flat end.

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.

When the box is provided with a multi-stage knock-out, the force shall be applied to the smallest knock-out.

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.

12.8.3 Knock-out removal

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.

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.

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.

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.

12.8.4 Flat surfaces surrounding knock-outs

Knock-outs in boxes and enclosures shall be located in flat surfaces to permit grommets, glands or fittings to be seated fully against these surfaces when installed as intended.

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.

Compliance is checked by inspection and by measurement according to the appropriate national standard sheet, if any.

12.9 Screw fixings

Replace the two first paragraphs of Subclause 12.9 by the following:

Fixing means for lids, covers, cover plates, accessories, terminals, connecting devices, strain reliefs, etc. effected by screws shall be so designed and constructed that these means withstand the mechanical stresses occurring during installation and normal use.

Screws or other fixing means made from insulating material similar to screws without standardized thread which have to be tightened by any tool for fixing covers shall be tested according to the manufacturer's instructions.

NOTE In the following country flush-type boxes shall have metal inserts and be provided with metal screws having ISO metric thread: NL.

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.

12.10 Fixing of boxes and accessories

Replace Subclause 12.10 by the following:

12.10 Fixing of boxes and enclosures classified according to 7.2.1.1 and 7.2.1.2

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.

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.

Screws, additional mechanical supports or design features, which prevent the displacement of the box or the enclosure, are considered to be adequate fixing means.

Compliance is checked by inspection.

Boxes and enclosures not fulfilling at least one of the above requirements and having an internal volume less than 400 cm³, shall be tested as follows.

The internal volume of the box or enclosure shall be checked by inspection or by the test in 12.15.

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.

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 manufacturer's instructions, or by plaster where the manufacturer's instructions do not specify the material.

The assembly is kept at ambient temperature for $(10 + 1/0)$ days.

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 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.

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.

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).

The supplementary weight shall fall from a height of 50 mm onto the principal weight 10 times.

After the test the specimen shall not have been displaced by more than 0,5 mm from the mounting block.

12.11 Boxes and enclosures classified according to 7.7.1

Replace Subclause 12.11 by the following:

Boxes and enclosures for hollow walls or the like classified according to 7.7.1 shall have suitable means for fixing the box or the enclosure to hollow walls or the like.

The fixing means shall not rely on the cable management system.

Compliance is checked by the following test.

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.

a) Checking pull and torque

A lever shall be fixed with the fixing means for accessories or covers to the specimen, as shown in Figure 18.

This lever is loaded for one minute with a force F_1 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 F_2 as shown in Figure 18b of 100 N applied on the main axis of the box perpendicular to the mounting surface.

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° .

b) Checking displacement

The end of the lever is subjected for 1 min to a force F_3 in such a way that a torque of 3 Nm is applied to the box as shown in Figure 18c.

After the test, the edge of the box shall not have been displaced by more than 1 mm in comparison to the mounting surface.

12.12 Boxes and enclosure classified according to 7.7.2

Replace the title of Subclause 12.12 by the following:

12.12 Fixing of boxes and enclosures classified according to 7.7.2

Replace the first paragraph of Subclause 12.12 by the following:

Boxes and enclosures for hollow walls or the like classified according to 7.7.2 shall have suitable means for fixing the box or the enclosure to hollow walls or the like.

The fixing means shall not rely on the cable management system.

Compliance is checked by the tests in Subclauses 12.12.1, 12.12.2, 12.12.3 or 12.12.5 as applicable.

12.12.1 Boxes intended for mounting to a wood structural member of a wall

Replace the first paragraph of Subclause 12.12.1 by the following:

The box shall be mounted as in normal use to a (38 mm × 90 mm) wood structural member of any convenient length so that the plane of the front of the box is in vertical position.

12.12.2 Boxes intended for mounting to a wood structural member of a ceiling

Replace the first paragraph of Subclause 12.12.2 by the following:

The box shall be mounted as in normal use to a (38 mm × 190 mm) wood structural member of any convenient length so that the plane of the front of the box is in vertical position.

12.12.3 Boxes intended for mounting to a steel-stud structural member of a wall

Replace the fourth paragraph of Subclause 12.12.3 by the following:

Application of the force and measurement of the displacement are shown in Figure 19.

12.12.4 Internal volume of boxes and enclosures classified according to 7.7.2

Replace Subclause 12.12.4 by the following:

For boxes, enclosures, raised covers and box extensions classified according to 7.7.2, the declared internal volume of a box, enclosure, raised cover or box extension shall be verified.

A box or enclosure provided with a partition shall have the volume of each partitioned section verified.

Compliance is checked by the test of 12.15.

Add, after Subclause 12.12.4, the following:

12.12.5 Boxes intended for mounting in a finished structure

The supporting means of a box intended for installation in a finished structure shall not crack or break nor shall the face of the box be permanently displaced more than 3,2 mm from the plane of the face of the test surface when measured 1 minute after the test load is removed.

NOTE In a finished structure, structural framing members are not typically accessible for mounting and supporting boxes or enclosures flush or semi-flush in hollow walls.

Compliance is checked by the following test:

Six boxes intended for use in walls or eight boxes intended for use in ceilings shall be installed in a 9,5 mm thick plywood sheet reinforced with a support 152 mm from one edge of the opening for the boxes, or in a finished surface in accordance with the manufacturer's instructions.

Screws for the box supporting means shall be tightened in accordance with the manufacturer's instructions. In the absence of instructions, screws shall be tightened in accordance with column 4 of Table 4. A screw that strips before being tightened to the torque specified shall not override more than once.

Following installation, a force of 222 N shall be applied for 5 min consecutively to each of two boxes in a direction normal to the plane of the face of the test surface along the centerline of the box, and tending to push the box into the opening. The same force is to be applied to each of two previously untested boxes in a direction tending to pull the box out of the opening. Following this test, the screw shall be capable of being removed by a screwdriver.

Two additional samples of a box secured so that the plane of the front of the box is vertical, shall be subjected to a force of 222 N applied for 5 min suspended from the lower rear corner of the outer back edge of the box.

Table 5 – Torque test values for cable glands

Replace Table 5 by the following: