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NORME INTERNATIONALE

Cable glands for electrical installations

Presse-étoupes pour installations électriques

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CABLE GLANDS FOR ELECTRICAL INSTALLATIONS

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International Standard IEC 62444 has been prepared by subcommittee 23A: Cable management systems, of IEC technical committee 23: Electrical accessories.

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

FDIS	Report on voting
23A/606/FDIS	23A/618/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

NOTE The following print types are used:

– requirements: in roman type;
– *test specifications: in italic type;*
– notes: in small roman type.

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- withdrawn,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.

CABLE GLANDS FOR ELECTRICAL INSTALLATIONS

1 Scope

This Standard provides requirements and tests for the construction and performance of cable glands. This standard covers complete cable glands as supplied by the manufacturer or the supplier responsible for placing the product on the market. This standard does not cover cable glands for mineral insulated cables.

This standard covers cable glands with IEC 60423 metric entry threads.

This standard can be used as a guide for cable glands with other type of entry threads.

NOTE Certain cable glands may also be used “in Hazardous Areas.” Regard should then be taken of other or additional requirements necessary for the enclosure to be installed in such conditions, for example as specified in the IEC 60079 series.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60423:2007, *Conduit systems for cable management – Outside diameters of conduits for electrical installations and threads for conduits and fittings*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1 (1999)[1]

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

ISO 868:2003, *Plastics and ebonite – Determination of indentation hardness by means of durometer (Shore hardness)*

ISO 4287:1997, *Geometrical product specifications (GPS) – Surface texture: Profile method – Terms, definitions and surface texture parameters*

ISO 9227:2006, *Corrosion tests in artificial atmospheres – Salt spray tests*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1
cable gland
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

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[1] There is a consolidated edition 2.1 (2001) that includes IEC 60529 (1989) and its amendment 1 (1999).

3.2
entry thread
the threaded portion of a cable gland which is intended to be attached to an enclosure or equipment

3.3
cable gland size
the nominal diameter of the entry thread

3.4
cable retention
the minimum ability of a cable gland to limit the displacement of a fitted cable under static load

3.5
cable anchorage
the ability of a cable gland to limit the displacement of a fitted cable under dynamic and torque loads

3.6
series
cable glands of the same classification and design but with different dimensions

3.7
clearance hole
unthreaded opening in an enclosure or equipment intended to permit entry of a cable gland

3.8
metallic cable gland
cable gland which consists of metallic material only

NOTE Sealing systems are excluded from this definition.

3.9
non-metallic cable gland
cable gland which consists of non-metallic material only

NOTE Sealing systems are excluded from this definition.

3.10
composite cable gland
cable gland comprising both metallic and non-metallic materials

NOTE Sealing systems are excluded from this definition.

3.11
single-orifice seal
seal with one orifice suitable for the passage of a single cable

3.12
multi-orifice seal
seal with more than one orifice, each orifice being suitable for the passage of a separate cable

4 General requirements

Cable glands shall be designed to provide in normal use all the functions declared by the manufacturer or supplier.

5 General conditions for tests

5.1 Tests according to this standard are type tests.

5.2 Unless otherwise specified, the tests shall be carried out on new cable glands assembled and mounted in accordance with the manufacturer's or supplier's instructions, as declared in 7.3.

There shall be no adjustment between or during the tests.

NOTE Remounting of the sample between tests is not considered to be adjustment.

5.3 Unless otherwise specified, the tests shall be carried out at an ambient temperature of (20 ± 5) °C.

5.4 Non-metallic and composite cable glands as well as the sealing systems of metallic cable glands shall be pre-conditioned in an oven at (70 ± 2) °C and maintained for (168 ± 4) h. If the maximum temperature declared by the manufacturer is greater than 65 °C, then the test temperature shall be the declared temperature +5 °C.

5.5 Prior to the tests, non-metallic and composite cable glands as well as the sealing systems of metallic cable glands shall be conditioned at a temperature of (20 ± 5) ºC and a relative humidity between 40 % and 60 % for a minimum of 24 h or longer as specified by the manufacturer.

5.6 Unless otherwise specified, three samples shall be subjected to the relevant tests.

In the case of a series of cable glands, three samples of the largest and smallest and one sample of all other sizes of the same series shall be subjected to the relevant tests.

In the case of a cable gland utilising alternative sealing arrangements, each sealing arrangement as specified by the manufacturer or supplier shall be considered as a sample.

If a sample does not satisfy a test due to an assembly or manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated on 3 new samples of the size that failed. The tests which follow shall be made in the required sequence. All new samples shall fulfil the requirements.

5.7 Unless otherwise specified test mandrels shall consist of bars having a hardness of 65 Shore D ± 15 points in accordance with ISO 868 and a surface roughness less than or equal to 7 μm R_a in accordance with ISO 4287. The test mandrel shall have a tolerance of ± 0,2 mm for test mandrels up to and including 16 mm in diameter and ± 0,3 mm for test mandrels larger than 16 mm in diameter. The shape shall be circular or a profile simulating the outer dimension of the cables as declared by the manufacturer or supplier.

5.8 Clearance holes for test purposes shall have the values as given in Table 1, unless otherwise specified by the manufacturer or supplier.

NOTE Annex B shows test sequences which shall be used for guidance only.

Table 1 – Clearance holes for cable glands for test purposes

Cable gland size	Thread size	Clearance hole diameter mm
6	M 6	6 (0/ +0,2)
8	M 8	8 (0/ +0,2)
10	M 10	10 (0/ +0,2)
12	M 12	12 (0/ +0,2)
16	M 16	16 (0/ +0,2)
20	M 20	20 (0/ +0,2)
25	M 25	25 (0/ +0,2)
32	M 32	32 (0/ +0,3)
40	M 40	40 (0/ +0,3)
50	M 50	50 (0/ +0,4)
63	M 63	63 (0/ +0,4)
75	M 75	75 (0/ +0,5)
90	M 90	90 (0/ +0,5)
110	M 110	110 (0/ +0,5)

6 Classification

Cable glands shall be classified for test purposes in accordance with 6.1, 6.2 and 6.5 and where appropriate, with 6.3 and 6.4.

6.1 According to material

6.1.1 Metallic cable glands

6.1.2 Non-metallic cable glands

6.1.3 Composite cable glands

6.2 According to mechanical properties

6.2.1 Non-armoured cable retention or anchorage

6.2.1.1 Anchorage Type A

6.2.1.2 Anchorage Type B

6.2.1.3 Retention only

6.2.2 Armoured cable anchorage

6.2.2.1 Anchorage Type C

6.2.2.2 Anchorage Type D

6.2.3 Impact category

6.2.3.1 Category 1

6.2.3.2 Category 2

6.2.3.3 Category 3

6.2.3.4 Category 4

6.2.3.5 Category 5

6.2.3.6 Category 6

6.2.3.7 Category 7

6.2.3.8 Category 8

6.3 According to electrical properties

6.3.1 With electrical continuity characteristics

6.3.1.1 Equipotential bonding to enclosure

6.3.1.2 Equipotential bonding to metallic layer(s) of cable

NOTE A metallic layer may be provided for purposes such as earthing, screening, armouring or mechanical protection.

6.3.1.3 Cable glands with connection to protective earth

6.3.1.3.1 Category A

6.3.1.3.2 Category B

6.3.1.3.3 Category C

6.4 According to resistance to external influences

6.4.1 Degree of protection in accordance with IEC 60529 (IP Code) with a minimum of IP54

6.4.2 Temperature range if different from that defined in Subclause 8.5

6.4.3 Resistance to ultraviolet light for non-metallic cable glands

6.4.3.1 Resistance to ultraviolet light not declared

6.4.3.2 Resistant to ultraviolet light

6.5 According to sealing system

6.5.1 With a single-orifice seal

6.5.2 With a multi-orifice seal

NOTE For cable glands used for armoured cable this standard only addresses single-orifice type sealing systems.

7 Marking and documentation

7.1 Marking

The cable gland shall be legibly and durably marked in a visible place with the following:

– name, logo or registered mark of the manufacturer or supplier;
– identification of the product.

Where it is not possible to apply the marking directly onto the product, then the marking shall be placed on the smallest supplied package.

Compliance is checked by inspection.

Marking on the product not made by pressing, moulding or engraving is tested in accordance with 7.2.

7.2 Durability and legibility

The test is made by rubbing the marking by hand for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked in petroleum spirit.

NOTE Petroleum spirit is defined as the aliphatic solvent hexane with a content of aromatics of maximum 0,1 % volume, a kauri-butanol value of 29, initial boiling point of 65 °C, a dry point of 69 °C and a specific gravity of approximately 0,68 kg/l.

After this test, the marking shall be legible to normal or corrected vision without additional magnification.

The marking shall remain legible after all the non-destructive tests of this standard. It shall not be possible to remove labels easily and they shall not show curling.

Compliance is checked by inspection.

7.3 Documentation

The manufacturer or supplier shall provide in his literature all information necessary for the proper use and safe installation, such as

– sealing range (maximum and minimum cable dimensions);
– installation torque, if any;
– entry thread length, if any;
– entry thread size and type;
– maximum clearance hole diameter;
– type of cable anchorage and anchorage range, if any;
– impact category;
– correct assembly of the cable gland for use as part of the protective earth conductor or electrical connection;
– degree of protection in accordance with IEC 60529 (IP Code) if higher than IP 54;
– temperature range if different from Subclause 8.5;
– multi-orifice seals if any.

Compliance is checked by inspection.

8 Construction

8.1 Those parts of a cable gland that are used for tightening or holding during installation shall be suitable for gripping without damage to the cable gland or cable with commonly available tools or following the manufacturer's instructions. For sizes up to and including M110, the entry thread, if any, shall be constructed in accordance with IEC 60423, Table 1.

Compliance is checked by measurement or manual test.

8.2 All external projecting edges and corners of cable gland components shall be smooth to prevent danger of injury in handling the cable gland.

Compliance is checked by inspection and manual test.

8.3 Cable glands shall be constructed to avoid cable damage when installed in accordance with the manufacturer's or supplier's instructions.

Compliance is checked by inspection.

8.4 Cable glands shall provide a minimum degree of IP54 in accordance with IEC 60529.

Compliance is checked in accordance with 12.1.

8.5 Cable glands shall be suitable for use within a temperature range from at least –20 °C to at least 65 °C.

A temperature exceeding this range can be declared by the manufacturer or supplier.

Compliance is checked in accordance with pre-conditioning in 5.4 and the test in 9.5.

8.6 Metallic parts shall be resistant to or protected against corrosion.

Compliance is checked in accordance with 12.2.

8.7 Cable glands declared in accordance with 6.4.3.2 shall have adequate resistance to ultra-violet light.

Compliance is checked in accordance with 12.3.

9 Mechanical properties

9.1 General

Cable glands declared in accordance with 6.2.1.3 shall provide minimum cable retention in accordance with Table 2 column "Cable retention".

Compliance is checked in accordance with the test in 9.2.

Cable glands declared in accordance with 6.2.1.1 shall provide cable anchorage in accordance with Table 2 "Type A".

Cable glands declared in accordance with 6.2.1.2 shall provide cable anchorage in accordance with Table 2 "Type B".

Compliance is checked in accordance with the test in 9.3.

Cable glands declared in accordance with 6.2.2.1 shall provide cable anchorage in accordance with Table 2 "Type C". Cable glands declared in accordance with 6.2.2.2 shall provide cable anchorage in accordance with Table 2 "Type D".

Compliance is checked in accordance with the test 9.4.

9.2 Cable retention test

For cable glands classified according to 6.2.1.3 and with a sealing system in accordance with 6.5.1, a test mandrel equivalent to the minimum value of the sealing range of the cable gland as declared by the manufacturer or supplier is fixed to the cable gland.

For cable glands classified according to 6.2.1.3 and with a sealing system in accordance with 6.5.2, a test mandrel equivalent to the minimum value of the sealing range of the smallest orifice of the cable gland is fixed into the smallest orifice of the cable gland and each remaining orifice is plugged with a plug equivalent to the minimum value of its sealing range.

A circular test mandrel is loaded until the pull force is in accordance with the values given in Table 2 column "Cable retention".

For test mandrels which are not circular in shape, i.e. where non-circular cables are being simulated, their cross-sectional area shall be determined, and the diameter of a circular cable of the same cross-sectional area shall be calculated. The test values shall be appropriate to the nearest circular test mandrel size.

For cable glands with sealing systems comprising two or more seals with different sizes, the mandrel shall be stepped appropriately. The test values shall be appropriate to the largest test mandrel diameter.

The test mandrel is marked when unloaded so that any displacement relative to the cable gland can be easily detected.

The load is maintained for 5 min and at the end of this period the displacement shall not exceed 3 mm when unloaded.

The test is repeated using new samples and a test mandrel equivalent to the maximum value of the sealing range of the cable gland as declared by the manufacturer or supplier, with the test value of the relevant maximum cable diameter specified in Table 2.

A typical arrangement for the cable retention test is shown in Figure 1.