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CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V –
Part 2: Terminations

Câbles à isolant minéral et leurs terminaisons de tension assignée ne dépassant pas 750 V –
Partie 2: Terminaisons

IEC 60702-2:2002-02+AMD1:2015-01 CSV(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MINERAL INSULATED CABLES AND THEIR TERMINATIONS WITH A RATED VOLTAGE NOT EXCEEDING 750 V –

Part 2: Terminations

FOREWORD

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IEC 60702-2 edition 2.1 contains the second edition (2002-02) [documents 20/491/FDIS and 20/511/RVD] and its amendment 1 (2015-01) [documents 20/1529/FDIS and 20/1557/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60702-2 has been prepared by IEC technical committee 20: Electric cables.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of the base publication and its amendment 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

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MINERAL INSULATED CABLES AND THEIR TERMINATIONS WITH A RATED VOLTAGE NOT EXCEEDING 750 V –

Part 2: Terminations

1 Scope

This standard specifies requirements for terminations for use with mineral insulated cables complying with the requirements of IEC 60702-1.

2 Normative references

The following ~~referenced~~ documents, in whole or in part, are normatively referenced in this document and are indispensable for ~~the~~ its 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 60079-0~~:1998~~, ~~*Electrical apparatus for explosive gas*~~ *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60364-5-54~~:1980~~, *Low-voltage electrical installations ~~of buildings~~ – Part 5-54: Selection and erection of electrical equipment – ~~Chapter 54:~~ Earthing arrangements and protective conductors*

IEC 60423~~:1993~~, ~~*Conduits for electrical purposes*~~ *Conduit systems for cable management – Outside diameters of conduits for electrical installations and threads for conduits and fittings*

IEC 60702-1~~:2002~~, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Part 1: Cables*

3 Definitions

For the purpose of this part of IEC 60702, the following definitions apply.

3.1
termination
complete end fitting for a mineral insulated cable, normally comprising a seal and a gland or a composite seal/gland device, but excluding the locknut and any associated junction box or accessory

3.2
seal
part of a termination designed to seal the end of the cable against entry of moisture. The design must be such as to provide insulation between conductors and between conductors and sheath and provide conductor insulation external to the seal. It may also have a means of providing a protective conductor

3.3
gland
part of a termination designed to secure the cable in a cable entry. It may or may not be used to ensure earth continuity depending upon the type of construction and material used

3.4
type tests (symbol T)
tests made before supplying, on a general commercial basis, a type of termination covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are such that, after they have been made, they need not be repeated unless changes are made in the termination material, design or manufacturing process which might change the performance characteristics

4 Marking

4.1 Marking of packages

Packages in which terminations or parts of terminations are supplied shall be marked with the following particulars:

a) the number of this standard;

b) a means of identifying the manufacturer or supplier;

c) the maximum and minimum operating temperature of the seals;

d) a mark or means of identifying the cables for which it is intended;

e) whether a protective conductor is provided;

f) gland thread form and size.

4.2 Marking of seals and glands

Seals and glands shall be marked with a means of identifying the cable or cables for which they are intended. In addition, glands certified for use in hazardous areas shall be marked in accordance with IEC 60079-0.

5 Construction

5.1 Seals

5.1.1 Material

A seal shall consist of a moisture-resistant sealing material contained, if necessary, within a suitable enclosure, and shall provide electrical insulation for the cable conductors.

5.1.2 Connection

A protective conductor may be connected to a metallic sealing enclosure by any suitable method (e.g. welding, brazing, crimping or soldering), or it may be connected directly on the metal sheath by any suitable attachment (e.g. clip or clamp). The size of the protective conductor shall be in accordance with IEC 60364-5-54, and the attachment shall meet the electrical continuity test requirement specified in 6.4.1.

5.1.3 Explosive atmospheres

A seal for use in potentially explosive atmospheres shall, in addition to complying with the requirements of this standard, also satisfy the appropriate requirements specified in IEC 60079-0.

5.1.4 Corrosion resistance

A seal or enclosure shall be made from material which will ensure freedom from corrosion arising from electrolytic action.

5.1.5 Test requirements

The material used in the seal shall be such that the completed seal is capable of meeting the test requirements specified in this standard.

5.1.6 Operating temperature

The conductor insulation shall be suitable for the range of operating temperatures stated for the seal by the manufacturer.

5.2 Glands

5.2.1 Material

A gland may be of any suitable material providing that it ensures freedom from corrosion arising from electrolytic action and meets the test requirements specified in this standard.

5.2.2 Thread form

The gland entry threads shall have a preferred thread form in accordance with those specified for conduit in IEC 60423. Other threads are permitted provided that the gland complies with all the other requirements of this standard.

5.2.3 Entry thread length

The length of gland entry threads shall be not less than 8 mm.

5.2.4 Explosive atmospheres

Glands for use in potentially explosive atmospheres shall, in addition to complying with the requirements of this standard, also satisfy the appropriate requirements specified in IEC 60079-0.

6 Type tests

6.1 General

The tests in this standard are type tests intended to establish termination design characteristics. Unless otherwise specified, all tests shall be carried out at an ambient temperature of (20 ± 10) °C.

The test voltage shall be either a.c. of approximately sinusoidal waveform at a frequency in the range 49 Hz to 61 Hz, or d.c. equal to the peak value of the alternating voltage, and shall be applied gradually.

The seals and glands to be tested shall be fitted in accordance with the manufacturer's recommendations to both ends of (300 ± 50) mm lengths of cable complying with IEC 60702-1, of a size and rated voltage appropriate to the seals/glands under test. Each seal shall be fitted as soon as possible after the end of the cable has been prepared, to minimize the ingress of moisture.

New seals/glands shall be taken for each electrical and mechanical test.

6.2 Seals

6.2.1 Voltage test

The sample shall withstand the following test voltage applied between each conductor and every other conductor, and between all conductors bunched together and the sheath, for 5 min:

– 2 000 V r.m.s. for seals for 500 V cable;

– 2 500 V r.m.s. for seals for 750 V cable.

6.2.2 Insulation resistance test

The insulation resistance measured with a d.c. voltage between 80 V and 500 V applied between each conductor and every other conductor, and between each conductor and the sheath shall be not less than 100 MΩ.

6.2.3 Insulation integrity test

This test shall be carried out, in addition to the insulation resistance test after the ~~environmental~~ tests specified in 6.2.4 and 6.2.5, as an indirect check that the insulation has not deteriorated.

The insulation integrity test is a voltage test applied between each conductor and every other conductor and between each conductor and the sheath. A voltage equal to the rated voltage of the cable shall be applied for 5 min. No insulation breakdown shall occur.

6.2.4 Maximum operating temperature test

The sample shall be heated to a temperature at least 5 K - and not more than 10 K - higher than the maximum operating temperature specified by the manufacturer. At this temperature, the sample shall pass the insulation integrity test as specified in 6.2.3, and the insulation resistance measured with a d.c. voltage between 80 V and 500 V applied between each conductor and every other conductor and between each conductor and the sheath shall be not less than 1 MΩ.

6.2.5 Temperature cycle test

The sample shall be heated to a temperature at least 5 K - and not more than 10 K - higher than the maximum operating temperature specified by the manufacturer and maintained at this temperature for (16 ± 1) h. Then it shall be transferred to a refrigerated compartment and maintained at the minimum operating temperature specified by the manufacturer (±5 K) for (8 ± 1) h. This cycle shall be repeated 20 times.

On completion of the 20 cycles the sample shall be allowed to return to room temperature, and then it shall be placed in a humidity cabinet at (25 ± 5) °C and (95 ± 5) % relative humidity for (16 ± 1) h.

After removal from the humidity cabinet, the surface moisture shall be dried and the sample shall pass the insulation resistance test as specified in 6.2.2 and the insulation integrity test as specified in 6.2.3.

6.2.6 Tensile test

This test is applicable only to those seals which are intended to be used as a means of attachment of cables to supporting structures or enclosures. For the purpose of this test, only one seal need be fitted to the cable sample.

The assembly shall be tested in a suitable tensile testing machine in such a way that the load is applied without imparting any crushing force. The load shall be increased gradually to the proof value specified in table 1, and maintained at that value for 5 s.

After testing, the seal shall show no splits or cracks or movement relative to the cable when examined with normal or corrected vision without magnification.

Table 1 – Proof loads for sealing pots or glands

Nominal diameter of cable mm		Proof load N
Above	Up to and including	
–	6	35
6	9	70
9	–	100

6.3 Glands

6.3.1 Tensile test

The gland shall be fitted to one end of a cable sample in accordance with the manufacturer's recommendations.

The entry thread on the body of the gland shall be screwed into an appropriate female thread cut in a block of metal attached to one of the members of a suitable tensile testing machine. The load shall be increased gradually to the proof value in table 1 and maintained at that value for 5 s.

After testing, the gland shall show no splits or cracks or movement relative to the cable when examined with normal or corrected vision without magnification.

6.4 Electrical earth continuity test

6.4.1 General

The samples, prepared as described in 6.4.2 or 6.4.3, shall be heated in an oven to a temperature at least 5 K - and not more than 10 K - higher than the maximum temperature specified by the manufacturer, and then allowed to return to room temperature. The electrical potential difference shall be measured as specified in 6.4.2 or 6.4.3 and recorded. The initial potential difference shall not exceed 10 mV.

The temperature cycle and potential measurement shall be repeated until the variation in three successive voltage measurements is less than 2 % or for 10 cycles, whichever is the greater.

The final reading shall not be greater than the original reading by more than 10 %.

6.4.2 Glands or seals with integral protective conductors or other protective conductor attachments

The test shall be carried out on an assembly incorporating a gland/seal with a protective conductor at each end of a cable sample, assembled in accordance with the manufacturer’s recommendations. Only those components concerned with electrical continuity need be incorporated. All parts shall be in a clean new condition and shall not be adjusted during the test.

A current of 25 A d.c. or a.c. r.m.s. shall be passed between the free ends of the protective conductors. The potential difference shall be measured at each end of the assembly between a point on the protective conductor not more than 1,5 mm from the attachment and a point on the cable sheath no more than 1,5 mm from the attachment.

6.4.3 Glands intended to provide earth continuity without integral protective conductors

The test shall be carried out on an assembly incorporating two glands screwed into appropriate threads cut in two blocks of metal.

A current of 25 A d.c. or a.c. r.m.s. shall be passed between the two blocks. The potential difference shall be measured at each end of the assembly between a point on the gland body and a point on the cable sheath no more than 1,5 mm from the gland.