

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Conduit systems for cable management –
Part 1: General requirements

ITAH STANDARD PREVIEW
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Systemes de conduits pour la gestion du câblage –
Partie 1: Exigences générales

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IEC 61386-1:2008



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONDUIT SYSTEMS FOR CABLE MANAGEMENT –**Part 1: General requirements**

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International Standard IEC 61386-1 has been prepared by subcommittee 23A: Cable management systems, of IEC technical committee 23: Electrical accessories.

This second edition cancels and replaces the first edition published in 1996, and its Amendment 1 (2000), and it constitutes a technical revision. The changes to the first edition are as follows:

- change to the length of the test specimen between fittings for the tensile test,
- editorial and normative reference updates.

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

FDIS	Report on voting
23A/553/FDIS	23A/558/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.

A list of all the parts in the IEC 61386 series, under the general title *Conduit systems for cable management*, can be found on the IEC website.

This Part 1 is to be used in conjunction with the appropriate Part 2, which contains clauses to supplement or modify the corresponding clauses in Part 1, to provide the relevant particular requirements for each type of product. A conduit system which conforms to this standard is deemed safe for use.

In this publication, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

The following differences exist in some countries:

6.5.2: In Australia and Austria, conduits and conduit fittings may be classified with low acid gas emission. <https://standards.iteh.ai/catalog/standards/sist/e22c95af-aa04-4497-9b96-45307b10e72b/iec-61386-1-2008>

13.1.4: In Australia conduits and conduit fittings classified as low acid gas emission shall be tested in accordance with IEC 60754-1, evolve not more than the equivalent of 5 mg of hydrochloride-acid per gram of sample.

In Austria conduits and conduit fittings classified as low acid gas emission shall be tested in accordance with IEC 60754-2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

CONDUIT SYSTEMS FOR CABLE MANAGEMENT –

Part 1: General requirements

1 Scope

This part of IEC 61386 specifies requirements and tests for conduit systems, including conduits and conduit fittings, for the protection and management of insulated conductors and/or cables in electrical installations or in communication systems up to 1 000 V a.c. and/or 1 500 V d.c. This standard applies to metallic, non-metallic and composite conduit systems, including threaded and non-threaded entries which terminate the system. This standard does not apply to enclosures and connecting boxes which come within the scope of IEC 60670.

NOTE 1 Certain conduit systems may also be suitable for use in hazardous atmospheres. Regard should then be taken of the extra requirements necessary for equipment to be installed in such conditions.

NOTE 2 Earthing conductors may or may not be insulated.

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 60417, *Graphical symbols for use on equipment*

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)

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*

IEC 60695-11-2:2003, *Fire hazard testing – Part 11-2: Test flames - 1 kW nominal pre-mixed flame - Apparatus, confirmatory test arrangement and guidance*

3 Terms and definitions

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

3.1

conduit system

cable management system consisting of conduits and conduit fittings for the protection and management of insulated conductors and/or cables in electrical or communication installations, allowing them to be drawn in and/or replaced, but not to be inserted laterally

3.2**conduit**

part of conduit system of circular cross-section for insulated conductors and/or cables in electrical or communication installations, allowing them to be drawn in and/or replaced

3.3**conduit fitting**

device designed to join components of a conduit system, or for them to change direction

3.4**terminating conduit fitting**

conduit fitting that terminates a conduit system

3.5**metallic conduit and/or conduit fitting**

conduit or conduit fitting which consists of metal only

3.6**non-metallic conduit and/or conduit fitting**

conduit or conduit fitting which consists uniquely of non-metallic material and which has no metallic components whatsoever

3.7**composite conduit and/or conduit fitting**

conduit or conduit fitting comprising both metallic and non-metallic materials

3.8**non-flame propagating conduit and/or conduit fitting**

conduit or conduit fitting which is liable to catch fire as a result of an applied flame, but in which the flame does not propagate, and which extinguishes itself within a limited time after the flame is removed

3.9**plain conduit**

conduit in which the profile is even in the longitudinal section (see note to 3.10)

3.10**corrugated conduit**

conduit in which the profile is corrugated in the longitudinal section

NOTE Both annular and helical corrugated conduits are permissible, and a combination of both corrugated and plain conduit is possible.

3.11**rigid conduit**

conduit which cannot be bent, or which can only be bent with the help of a mechanical aid, with or without special treatment

3.12**pliable conduit**

conduit which can be bent by hand with reasonable force, and which is not intended for frequent flexing

3.13**flexible conduit**

conduit which can be bent by hand with reasonable small force, and which is intended to flex frequently throughout its life

3.14

self-recovering conduit

pliable conduit which deforms when a transverse force is applied for a short time and which, after removal of this force, returns close to its original shape within a further short time

3.15

threadable conduit and conduit fitting

conduit and conduit fittings which carry a thread for connection, or in or on which a thread can be formed

3.16

non-threadable conduit and conduit fitting

conduit and conduit fittings which are suitable for connection only by means other than threads

3.17

external influence

factors which may affect the conduit system

NOTE Examples of such factors are a presence of water, oil or building materials, low and high temperatures, and corrosive or polluting substances.

4 General requirements

4.1 Conduit and conduit fittings shall be so designed and constructed that in normal use their performance is reliable and they provide protection to the user or surroundings.

When assembled in accordance with manufacturer's instructions as part of a conduit system, conduits and conduit fittings shall provide mechanical and, where required, electrical protection of the insulated conductors and cables contained therein.

4.2 The protective properties of the joint between the conduit and conduit fitting shall not be less than that declared for the conduit system.

4.3 Conduit and conduit fittings shall withstand the stresses likely to occur during transport, storage, recommended installation practice and application.

4.4 Compliance is checked by carrying out all specified tests.

5 General conditions for tests

5.1 Tests in accordance with this standard are type tests. Conduit systems, having the same classification, which can vary in colour only, shall be the same product type.

5.2 Unless otherwise specified, the tests shall be carried out at an ambient temperature of $(20 \pm 5) ^\circ\text{C}$.

5.3 Unless otherwise specified, each test shall be made on three new samples, which may be taken from one length.

NOTE Certain tests, for instance the checking of dimensions, do not affect a change in the property of the samples; therefore these samples are considered as new samples and can be used for further tests.

5.4 Samples of non-metallic and composite conduits and conduit fittings shall be conditioned for at least 240 h, at a temperature of (23 ± 2) °C and a relative humidity between 40 % and 60 %. All tests shall be carried out immediately after general conditioning.

5.5 Unless otherwise specified, the samples for each test shall be in a clean and new condition, with all parts in place and mounted as in normal use. After checking dimensions in accordance with Clause 8, and unless otherwise specified in the relevant test, the conduit fittings shall be assembled with adequate lengths of conduit of the type for which they are intended. Due regard shall be taken of the manufacturer's instructions, especially where force is required in the assembly of the joint.

NOTE Where similarities are claimed, the selection of representative fittings for test purposes can be agreed between the manufacturer, or responsible vendor, and the testing station.

5.6 Where the conduit entries are part of the detachable or loose type conduit fitting, the detachable conduit fitting shall be capable of being assembled again, after the test, according to the manufacturer's instructions without loss of the declared properties according to Clause 6.

5.7 Unless otherwise specified, three samples are subjected to the tests, and the requirements are satisfied if the tests are met.

If only one of the samples does not satisfy a test, due to an assembly or a manufacturing defect, that test and any preceding one which may have influenced the result of the test shall be repeated, and also the tests which follow shall be carried out in the required sequence on another full set of samples, all of which shall comply with the requirements.

NOTE If the additional set of samples is not submitted at the same time, a failure of one sample will entail a rejection. The applicant, when submitting the first set of samples, may also submit an additional set of samples which may be used, should one sample fail. The testing station will then, without further request, test the additional set of samples and will reject them only if a further failure occurs.

5.8 When toxic or hazardous processes are used, due regard shall be taken of the safety of the persons within the test area.

5.9 Conduit systems which are used as an integral part of other equipment shall also be tested in accordance with the relevant standard for that equipment.

6 Classification

NOTE Annex A shows the classification coding format for declared properties of the conduit system, which may be incorporated in the manufacturer's literature.

6.1 According to mechanical properties

6.1.1 Resistance to compression

- 1 Very light
- 2 Light
- 3 Medium
- 4 Heavy
- 5 Very heavy

6.1.2 Resistance to impact

- 1 Very light
- 2 Light
- 3 Medium

- 4 Heavy
- 5 Very heavy

6.1.3 Resistance to bending

- 1 Rigid
- 2 Pliable
- 3 Pliable/Self-recovering
- 4 Flexible

6.1.4 Tensile strength

- 1 Very light
- 2 Light
- 3 Medium
- 4 Heavy
- 5 Very heavy

6.1.5 Suspended load capacity

- 1 Very light
- 2 Light
- 3 Medium
- 4 Heavy
- 5 Very heavy

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6.2 According to temperature

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6.2.1 Lower temperature range

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Table 1 – Lower temperature range

Classification	Transport, installation and application – Temperature not less than: °C
1	+ 5
2	– 5
3	– 15
4	– 25
5	– 45

6.2.2 Upper temperature range

Table 2 – Upper temperature range

Classification	Application and installation – Temperature not more than: °C
1	60
2	90
3	105
4	120
5	150
6	250
7	400

6.3 According to electrical characteristics

6.3.1 With electrical continuity characteristics

6.3.2 With electrical insulating characteristics

6.3.3 With electrical continuity and insulating characteristics

6.4 According to resistance to external influences

6.4.1 Protection against ingress of solid objects: protection in accordance with IEC 60529 to a minimum of IP3X

6.4.2 Protection against ingress of water: protection in accordance with IEC 60529 to a minimum of IPX0

6.4.3 Resistance against corrosion

6.4.3.1 Without protection

6.4.3.2 With protection as detailed in Table 10

6.5 According to resistance to flame propagation

6.5.1 Non-flame propagating

6.5.2 Flame propagating

In Australia and Austria, conduits and conduit fittings may be classified with low acid gas emission.

7 Marking and documentation

7.1 Each conduit shall be marked with

- the manufacturer's or responsible vendor's name or trade mark or identification mark,
- a product identification mark, which may be, for example, a catalogue number, a symbol or the like, in such a way that it can be identified in the manufacturer's or responsible vendor's literature.

7.1.1 The conduit may also be marked with the classification code, which shall be in accordance with Annex A, and which shall include at least the first four digits.

7.1.2 The manufacturer shall be responsible for indicating the compatibility of parts within a conduit system.

7.1.3 The manufacturer shall provide in his literature its classification in accordance with Clause 6 and all information necessary for the proper and safe transport, storage, installation and use.

7.2 The conduit fitting shall be marked in accordance with 7.1, on the product wherever possible, but, where this is impractical, then the mark may be on a label attached to the product, or on the smallest supplied package.

7.3 Flame propagating material shall be orange in colour. It shall not be coloured orange by painting or other superficial means.

Non-flame propagating material may be of any colour except yellow, orange or red, unless clearly marked on the product to be of non-flame propagating material.

7.4 Earthing facilities shall be indicated by the symbol for protective earth in accordance with IEC 60417, symbol IEC 60417-5019 (2006-08). This marking shall not be placed on easily removable parts, for example screws.

7.5 Compliance with 7.1 to 7.4 is checked by inspection.

7.6 The marking shall be durable and clearly legible.

Compliance is checked by inspection and 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.

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NOTE 1 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 65 °C, a dry point 69 °C, and density of approximately 0,68 g/cm³.

NOTE 2 Marking may be applied, for example, by moulding, pressing, engraving, printing, adhesive labels, or water slide transfers.

NOTE 3 Marking made by moulding, pressing or engraving is not subjected to this test.

After the test, the marking shall be legible.

8 Dimensions

8.1 Threads and outside diameters, where appropriate, shall comply with IEC 60423.

Compliance is checked by means of the gauges specified in IEC 60423.

8.2 Other dimensions shall comply with the requirements of the relevant Part 2 of IEC 61386.

9 Construction

9.1 Within the conduit system, there shall be no sharp edges, burrs or surface projections which are likely to damage insulated conductors or cables, or inflict injury on the installer or user.

Compliance is checked by inspection, if necessary after cutting the samples apart.

9.2 Screws, if any, used for attaching components or covers to conduit fittings, or in joints to conduits, shall not cause damage to cable insulation when correctly inserted. They shall have ISO metric threads. Thread-cutting screws shall not be used.

Fixing screws and small clips for use with non-metallic or composite conduit fittings need not be of non-metallic material if they are isolated from insulated conductors or cables.

Screw fixing means shall be so designed to withstand the mechanical stresses occurring during installation and normal use.

Compliance for screw fixing using preformed threads is checked by the test in 9.3, followed by inspection.

Compliance for screw fixing using thread-forming screws is checked by the test in 9.4, followed by inspection.

9.3 Screws used with preformed threads shall be tightened and loosened 10 times for screws in engagement with a thread of non-metallic material and for screws of non-metallic material, and five times in all other cases.

The test is carried out using a suitable screwdriver or spanner to apply a torque, as specified by the manufacturer. In case the manufacturer does not specify the torque, the values of Table 3 apply. The screws shall be tightened in one smooth and continuous motion.

After the test, there shall be no damage sustained by the screw or nut, such as breakage of the screw or damage to the head or thread, that will impair the further use of the screw or nut.

9.4 Thread-forming screws are tightened and loosened 10 times for screws in engagement with a thread of insulating material, and five times in all other cases. Screws in engagement with a thread of insulating material shall be completely removed each time.

The test is made by using a suitable screwdriver or spanner applying with the relevant torque given in Table 3. The screw shall not be tightened by sudden or jerky motions.

After the test, there shall be no damage such as breakage of the screw or damage to the head or thread, that will impair the further use of the screw.