

Australian/New Zealand Standard™

Conduit systems for cable management

Part 1: General requirements



AS/NZS 61386.1:2015

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-004, Electrical Accessories. It was approved on behalf of the Council of Standards Australia on 16 January 2015 and on behalf of the Council of Standards New Zealand on 20 January 2015.

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Australian Chamber of Commerce and Industry
Australian Industry Group
Consumer Electronics Suppliers Association
Consumers Federation of Australia
Electrical Compliance Testing Association
Electrical Regulatory Authorities Council
Engineers Australia
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Conduit systems for cable management

Part 1: General requirements

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-004, Electrical Accessories. This Standard will run in parallel to AS/NZS 2053.1:2001, *Conduits and fittings for electrical installations*, Part 1: *General requirements*. It is the intention of Committee EL-004 that AS/NZS 2053.1 will be withdrawn at some appropriate future time.

The objective of this Standard is to provide Australian and New Zealand electrical industries with general requirements for conduit systems for cable management.

This Standard is Part 1 of the following series:

AS/NZS

61386 Conduit systems for cable management

61386.1 Part 1: General requirements (this Standard)

61386.21 Part 21: Particular requirements—Rigid conduit systems

61386.22 Part 22: Particular requirements—Pliable conduit systems

61386.23 Part 23: Particular requirements—Flexible conduit systems

This Part 1 needs to be used in conjunction with the appropriate particular Standard (Part 21, 22 or 23) for each application.

This Standard is based on but not equivalent to IEC 61386-1, Ed.2.0 (2008), *Conduit systems for cable management*, Part 1: *General requirements*.

The main areas of variation from IEC include the following:

- (a) Classification.
- (b) Marking requirements.
- (c) Test for pull out strength.
- (d) Dimensions.
- (e) UV resistance.
- (f) Moisture absorption.

The essential safety requirements in AS/NZS 3820, *Essential safety requirements for electrical equipment*, that could be applicable to cable management systems are covered by this Standard.

The term 'normative' has been used in this Standard to define the application of the Appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard

Conduit systems for cable management

Part 1: General requirements

1 SCOPE

This Standard 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 1000 V a.c. and/or 1500 V d.c. This Standard specifies general requirements and is intended to be used in conjunction with the appropriate particular Standard, AS/NZS 61386, Part 21, 22 or 23, for each application.

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 AS/NZS IEC 60670.

NOTES:

- 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.
- 2 Earthing conductors may or may not be insulated.

2 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard.

AS

- | | |
|-------|--|
| 60417 | Graphical symbols for use on equipment (series) |
| 60529 | Degrees of protection provided by enclosures (IP Code) |

AS/NZS

- | | |
|------------|---|
| 61386 | Conduit systems for cable management |
| 61386.21 | Part 21: Particular requirements—Rigid conduit systems |
| 61386.22 | Part 22: Particular requirements—Pliable conduit systems |
| 61386.23 | Part 23: Particular requirements—Flexible conduit systems |
| 60695 | Fire hazard testing |
| 60695.11.2 | Part 11.2: Test flames—1 kW nominal pre-mixed flame—Apparatus, confirmatory test arrangement and guidance |

AS/NZS IEC

- | | |
|-------|---|
| 60670 | Boxes and enclosures for electrical accessories for household and similar fixed electrical installations (series) |
|-------|---|

IEC

- | | |
|---------|--|
| 60754 | Test on gases evolved during combustion of materials from cables |
| 60754-1 | Part 1: Determination of the amount of halogen acid gas |

3 DEFINITIONS

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

3.1 Composite conduit and/or conduit fitting

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

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 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.

3.5 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.

3.6 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.

3.7 Flexible conduit

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

3.8 Metallic conduit and/or conduit fitting

Conduit or conduit fitting which consists of metal only.

3.9 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.

3.10 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.

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

3.11 Non-threadable conduit and conduit fitting

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

3.12 Plain conduit

Conduit in which the profile is even in the longitudinal section (see Note to Definition 3.10).

3.13 Pliable conduit

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

3.14 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.

3.15 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.

3.16 Terminating conduit fitting

Conduit fitting that terminates a conduit system.

3.17 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.

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 Design and construct

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 Protective properties

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 Stresses

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

4.4 Compliance

Compliance is checked by carrying out all specified tests.

5 GENERAL CONDITIONS FOR TESTS

5.1 Type tests

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 Ambient temperature

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

5.3 Number of test pieces

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 Conditioning

Samples of non-metallic and composite conduits and conduit fittings shall be conditioned for at least 240 h, at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity between 40% and 60%. All tests shall be carried out immediately after general conditioning.

5.5 Assembly

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 Detachable or loose type

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 Requirements for a satisfied test

Unless otherwise specified, three samples shall be subjected to the tests, and the requirements are satisfied if the test criteria are met.

If only one of the samples does not satisfy test criteria, 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 Safety

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

5.9 Other equipment

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

6.1 According to mechanical properties

6.1.1 *Resistance to compression*

Classifications shall be as follows:

- (a) 1 Very light mechanical stresses.
- (b) 2 Light mechanical stresses.
- (c) 3 Medium mechanical stresses.
- (d) 4 Heavy mechanical stresses.
- (e) 5 Very heavy mechanical stresses.

6.1.2 *Resistance to impact*

Classifications shall be as follows:

- (a) 1 Very light.
- (b) 2 Light duty.
- (c) 3 Medium duty.
- (d) 4 Heavy duty.
- (e) 5 Very heavy.

6.1.3 *Resistance to bending*

Classifications shall be as follows:

- (a) 1 Rigid.
- (b) 2 Pliable.
- (c) 3 Pliable/self-recovering.
- (d) 4 Flexible.

6.1.4 *Tensile strength*

Classifications shall be as follows:

- (a) 1 Very light.
- (b) 2 Light.
- (c) 3 Medium.
- (d) 4 Heavy.
- (e) 5 Very heavy.

6.2 According to temperature

Conduits and fittings shall be classified in accordance with the maximum and minimum permanent service temperatures specified by the manufacturer.

The preferred values for minimum permanent service temperatures are +5°C, -5°C, -15°C, -25°C and -45°C.

The preferred values for maximum permanent service temperatures are 60°C, 90°C, 105°C, 120°C, 150°C, 250°C and 400°C.

6.3 According to electrical characteristics

Classifications shall be as follows:

- (a) With electrical continuity characteristics.

- (b) With electrical insulating characteristics.
- (c) With electrical continuity and insulating characteristics.

6.4 According to resistance to external influences

6.4.1 *Protection against ingress of solid objects*

Protection shall be in accordance with AS 60529 to a minimum of IP3X.

6.4.2 *Protection against ingress of water*

Protection shall be in accordance with AS 60529 to a minimum of IPX0.

6.4.3 *Resistance against corrosion*

6.4.3.1 *General*

Conduits and fittings may be classified according to their protection against corrosive and polluting substances in accordance with Clauses 6.4.3.2 and 6.4.3.3.

6.4.3.2 *Conduits and fittings with the same protection on the outside and inside*

Conduits and fittings may be classified as having—

- (a) medium protection; or
- (b) high protection.

6.4.3.3 *Conduits and fittings with greater protection on the outside than on the inside*

Conduits and fittings may be classified as having—

- (a) medium protection outside and no protection inside;
- (b) high protection outside and no protection inside; or
- (c) high protection outside and medium protection inside.

6.5 According to resistance to flame propagation

Classifications shall be as follows:

- (a) Non-flame propagating.
- (b) Flame propagating.

6.6 According to material

Classifications shall be as follows:

- (a) Metal.
- (b) Insulating.
- (c) Composite.
- (d) Fibre-reinforced concrete.

6.7 According to method of connection

Classifications shall be as follows:

- (a) Threadable.
- (b) Non-threadable.

6.8 Acid-gas emission properties

Conduits and fittings may be classified according to their acid-gas emission properties as low acid gas (LAG) emission.

7 MARKING AND DOCUMENTATION

7.1 Information to be marked on conduits

Conduits shall be marked with the following:

- (a) The name of the manufacturer or responsible vendor, or a trademark, or other identifying symbol.
- (b) 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.
- (c) The conduit shall be marked with the classification code, which shall be in accordance with Appendix B, and which shall include at least the first four digits.

Conduit may also be marked with the following:

- (i) The nominal size.
- (ii) The word 'ELECTRICAL'.
- (iii) One of the following:
 - (A) 'VERY LIGHT DUTY' or 'VLD'.
 - (B) 'LIGHT DUTY' or 'LD'.
 - (C) 'MEDIUM DUTY' or 'MD'.
 - (D) 'HEAVY DUTY' or 'HD'.
 - (E) 'VERY HEAVY DUTY' or 'VHD'.

These markings can only be applied where there is compliance with both compression and impact classifications.

- (iv) The letters 'HF' or the word 'LAG', if appropriate.
- (v) The letter 'T', indicating protection against solar radiation, if appropriate.
- (vi) The minimum and maximum service temperatures as specified by the manufacturer, in degrees Celsius, in the form '5/60'.

7.2 Marking of fittings

The conduit fitting shall be marked in accordance with Clause 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 Earthing facilities marking

Earthing facilities shall be indicated by the symbol for protective earth in accordance with AS 60417. This marking shall not be placed on easily removable parts, for example screws.

7.4 Compliance

Compliance with Clause 7.1 to 7.3 shall be checked by inspection.

7.5 Method of marking

The marking shall be durable and clearly legible before and after testing.

Compliance shall be 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.

NOTES:

- 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.
- 2 Marking may be applied, for example, by moulding, pressing, engraving, printing, adhesive labels, or water slide transfers.
- 3 Marking made by moulding, pressing or engraving is not subjected to this test.

8 DIMENSIONS

Dimensions shall comply with the relevant particular requirements of AS/NZS 61386, Part 21, 22 or 23.

9 CONSTRUCTION**9.1 Freedom from defects**

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 shall be checked by inspection, if necessary after cutting the samples apart.

9.2 Screws

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 shall be checked by the test in Clause 9.3, followed by inspection.

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

9.3 Test for screws with preformed threads

When tested in accordance with the following method, 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.

The test shall be 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.

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.

9.4 Test for thread forming screws

When tested in accordance with the following method, 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.

The test shall be carried out by using a suitable screwdriver or spanner applying with the relevant torque given in Table 1. The screw shall not be tightened by sudden or jerky motions.