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Edition 1

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Edition 1

Conduit systems for cable management

Part 24: Particular requirements — Conduit systems buried underground

This national standard is the identical implementation of IEC 61386-24:2004, and is adopted with the permission of the International Electrotechnical Commission.

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Table of changes

Change No.	Date	Scope

National foreword

This South African standard was prepared by National Committee SABS/TC 067/SC 03, *Electricity distribution systems and components – Electrical accessories*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

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**Systèmes de conduits pour la gestion
du câblage –**

**Partie 24:
Règles particulières –
Systèmes de conduits enterrés dans le sol**

Conduit systems for cable management –

**Part 24:
Particular requirements –
Conduit systems buried underground**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONDUIT SYSTEMS FOR CABLE MANAGEMENT –

Part 24: Particular requirements – Conduit systems buried underground

FOREWORD

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International Standard IEC 61386-24 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/446/FDIS	23A/459/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.

This Part 24, which specifies particular requirements for conduit systems buried underground, is to be used in conjunction with IEC 61386-1, *Conduit systems for cable management – Part 1: General Requirements*¹, and its amendments. It was established on the basis of the first edition (1996) of that standard and its Amendment 1 (2000).

This Part 24 supplements or modifies the corresponding clauses of IEC 61386-1. Where a particular clause or subclause of Part 1 is not mentioned in this Part 24, that clause or subclause applies as far as is reasonable. Where this Part 24 states "addition", "modification" or "replacement", the relevant text of Part 1 is to be adapted accordingly.

Subclauses, tables and figures which are in addition to those in Part 1 are numbered starting with 101.

A conduit system which complies with this standard, is deemed safe for use when installed in accordance with national wiring regulations, whilst applying the manufactures installation instructions and conduit classification.

NOTE The following print types are used:

- requirements: in roman type
- *test specifications: in italic type*
- notes: in small roman type

IEC 61386 consists of the following parts, under the general title *Conduits systems for cable management*:

Part 1: General requirements

Part 21: Particular requirements – Rigid conduit systems

Part 22: Particular requirements – Pliable conduit systems

Part 23: Particular requirements – Flexible conduit systems

Part 24: Particular requirements – Conduit systems buried underground

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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.

¹ Please note that the generic title of the IEC 61386 series has been changed to *Conduit systems for cable management* since the publication of Part 1, hence all other parts of the series are now published under this new title.

CONDUIT SYSTEMS FOR CABLE MANAGEMENT –

Part 24: Particular requirement – Conduit systems buried underground

1 Scope

Replacement:

This standard specifies requirements and tests for conduit systems buried underground including conduits and conduit fittings for the protection and management of insulated conductors and/or cables in electrical installations or in communication systems. This standard applies to metallic, non-metallic and composite systems including threaded and non-threaded entries which terminate the system.

2 Normative references

This clause of Part 1 is applicable except as follows:

IEC 60423, Not applicable

IEC 60670, Not applicable

Addition:

ISO 161-1:1996, *Thermoplastics pipes for the conveyance of fluids – Nominal outside diameters and nominal pressures – Part 1: Metric series*

ISO 2768-1:1989, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

3 Definitions

This clause of Part 1 is applicable.

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for tests

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable except as follows:

Modification:

NOTE Annex A is not applicable.

6.1 According to mechanical properties

Replacement:

6.1.1 Resistance to compression

6.1.1.1 Type 250 (code 250)

NOTE A conduit system according to 6.1.1.1 is intended to be installed with additional precautions as specified in the relevant national regulations

6.1.1.2 Type 450 (code 450)

NOTE A conduit system according to 6.1.1.2 is intended to be directly buried underground without additional precautions

6.1.1.3 Type 750 (code 750)

NOTE A conduit system according to 6.1.1.3 is intended to be directly buried underground without additional precautions

6.1.2 Resistance to impact

6.1.2.1 Light (code L)

6.1.2.2 Normal (code N)

6.1.3 Resistance to bending

6.1.3.1 Rigid

6.1.3.2 Pliable

6.2 According to temperature

Not applicable.

7 Marking and documentation

This clause of Part 1 is applicable except as follows:

7.1 Addition:

Moreover the conduit shall be marked with

- a) the code "L" or "N" according to 6.1.2;
- b) the code "250", "450" or "750" according to 6.1.1. This code shall be marked immediately after the code according to a).

7.1.1 Not applicable.

Addition:

7.1.101 Conduits shall be marked according to 7.1 at regular intervals along their length of preferably 1 m but not longer than 3 m.

7.3 and 7.4 Not applicable.

7.6 Addition:

Add the following note after Note 3:

NOTE 4 An alternative test is under consideration

Addition:

7.101 The manufacturer shall provide in his literature all information necessary for the proper and safe installation and use.

In addition, for conduit systems according to 6.1.1.1 the manufacturer shall give instruction for installation precautions following the relevant national technical rules, if any.

8 Dimensions

Replacement:

Conduit dimensions should preferably be according to Table 101.

Compliance of the minimum inside diameter is checked by measurement according to two perpendicular diameters on the same section and calculating the average value.

Compliance of the outside diameter is checked using a ring gauge or any suitable method.

9 Construction

This clause of Part 1 is applicable except as follows:

9.3 and 9.4 Not applicable.

10 Mechanical properties

This clause of Part 1 is applicable except as follows:

10.1.4 *Replacement:*

Compliance is checked by the tests of 10.2 to 10.4

10.2 Compression test

Replacement:

10.2.1 *Conduits are subjected to a compression test.*

NOTE Compression test on fittings is under consideration

The test for conduits containing non-metallic materials is not started until 10 days after manufacture.

10.2.2 *Samples are (200 ± 5) mm long.*

10.2.3 *Before the test, the outside and inside diameters of the samples are measured as specified in Clause 8.*

10.2.4 *The samples are compressed between two flat steel plates having minimum dimensions (100 x 220 x 15) mm, the length 220 mm being along the length of the sample. The samples are compressed at a rate of (15 ± 0,5) mm/min and the load recorded at the vertical deflection equivalent to 5% of the average value of the original inside diameter of the sample.*

10.2.5 *When reaching the deflection of 5 %, the applied force shall be at least:*

- 250 N for conduits according to 6.1.1.1 ;
- 450 N for conduits according to 6.1.1.2;
- 750 N for conduits according to 6.1.1.3.

NOTE The deflection is calculated with the inner diameter but the measurement of the outside diameter may be sufficient. In case of doubt, it will be necessary to measure the inner diameter.

10.2.6 *After the test, there shall be no crack allowing the ingress of light or water between the inside and the outside.*

10.3 Impact test

Replacement:

10.3.1 *Twelve samples of conduits each (200 ± 5) mm in length or conduit fittings are subjected to an impact test by means of the apparatus shown in Figure 101.*

Conduits are tested alone.

Fittings are tested when assembled with conduits.

NOTE 1 If necessary, for the test purposes conduit fittings may be trimmed as long as the test result is not affected.

NOTE 2 For determination of mass of hammer, the hammer is to be considered as the head of hammer plus the guidance carriage.

10.3.2 *The test apparatus is placed on a firm flat surface.*

The samples are conditioned in a cold chamber at the temperature of (–5 ± 1)°C for 2 h.

The samples are removed from the cold chamber and placed on the vee-block as shown in Figure 101.

The hammer falls once on each sample. The time between removal of the sample from the cold chamber and completion of impact does not exceed 10 s. The energy values are specified in Table 102.

The test is made on the weakest part of the conduit fitting except that it is not applied within 5 mm of any sample entry. Samples of conduit are tested on the centre of their length.

10.3.3 *After the test, when the samples have attained $(20 \pm 5) ^\circ\text{C}$, it shall be possible to pass the appropriate ball specified in 10.4.3 through the conduit, under its own weight and without any initial speed, with the sample in the vertical position. There shall be no sign of disintegration nor shall there be any crack allowing the ingress of light or water between the inside and the outside.*

At least nine of the twelve samples shall pass the test.

10.4 Bending test

Replacement:

10.4.1 *This test is carried out on pliable conduits.*

10.4.2 *The test is made on six samples having an appropriate length. Three samples are tested at room temperature, the other three are tested at $(-5 \pm 1) ^\circ\text{C}$.*

For the test at $-5 ^\circ\text{C}$, the samples are conditioned in a cold chamber for 2 h.

The test apparatus consists of a device as shown in Figure 102 allowing to bend the conduit with a bending radius equal to the minimum bending radius specified by the manufacturer.

One of the ends of the samples is fixed on the test apparatus by means of an appropriate device. The sample is then bent to an angle of approximately 90° . For samples which are conditioned in the cold chamber, the bending is carried out within 10 s after the removal from the cold chamber.

10.4.3 *During the test, the samples shall not flatten.*

Compliance is checked by passing a ball having a diameter equal to (95^{+1}_0) % of the minimum inner diameter of the sample declared by the manufacturer, through the sample whilst it is bent around the test apparatus.

10.5, 10.6, 10.7 and 10.8 Not applicable.

11 Electrical properties

This clause of Part 1 is applicable except as follows:

11.1 to 11.3 Under consideration.

12 Thermal properties

This clause of Part 1 is not applicable.

13 Fire effects

This clause of Part 1 is applicable except as follows:

13.1.2 Under consideration.

14 External influences

This clause of Part 1 is applicable.

15 Electromagnetic compatibility

This clause of Part 1 is applicable.

Table 101 – Conduits diameters

Nominal size mm	Nominal outside diameter mm	Tolerances mm	Min. inside diameter mm
25	25	+ 0,5 0	18
32	32	+ 0,6 0	24
40	40	+ 0,8 0	30
50	50	+ 1,0 0	37
63	63	+ 1,2 0	47
75	75	+ 1,4 0	56
90	90	+ 1,7 0	67
110	110	+ 2,0 0	82
125	125	+ 2,3 0	94
140	140	+ 2,6 0	106
160	160	+ 2,9 0	120
180	180	+ 3,3 0	135
200	200	+ 3,6 0	150
225	225	+4,1 0	170
250	250	+ 4,5 0	188

NOTE The nominal outside diameters are taken from ISO 161-1.

Tolerances on outside diameters (OD) are given as follows :

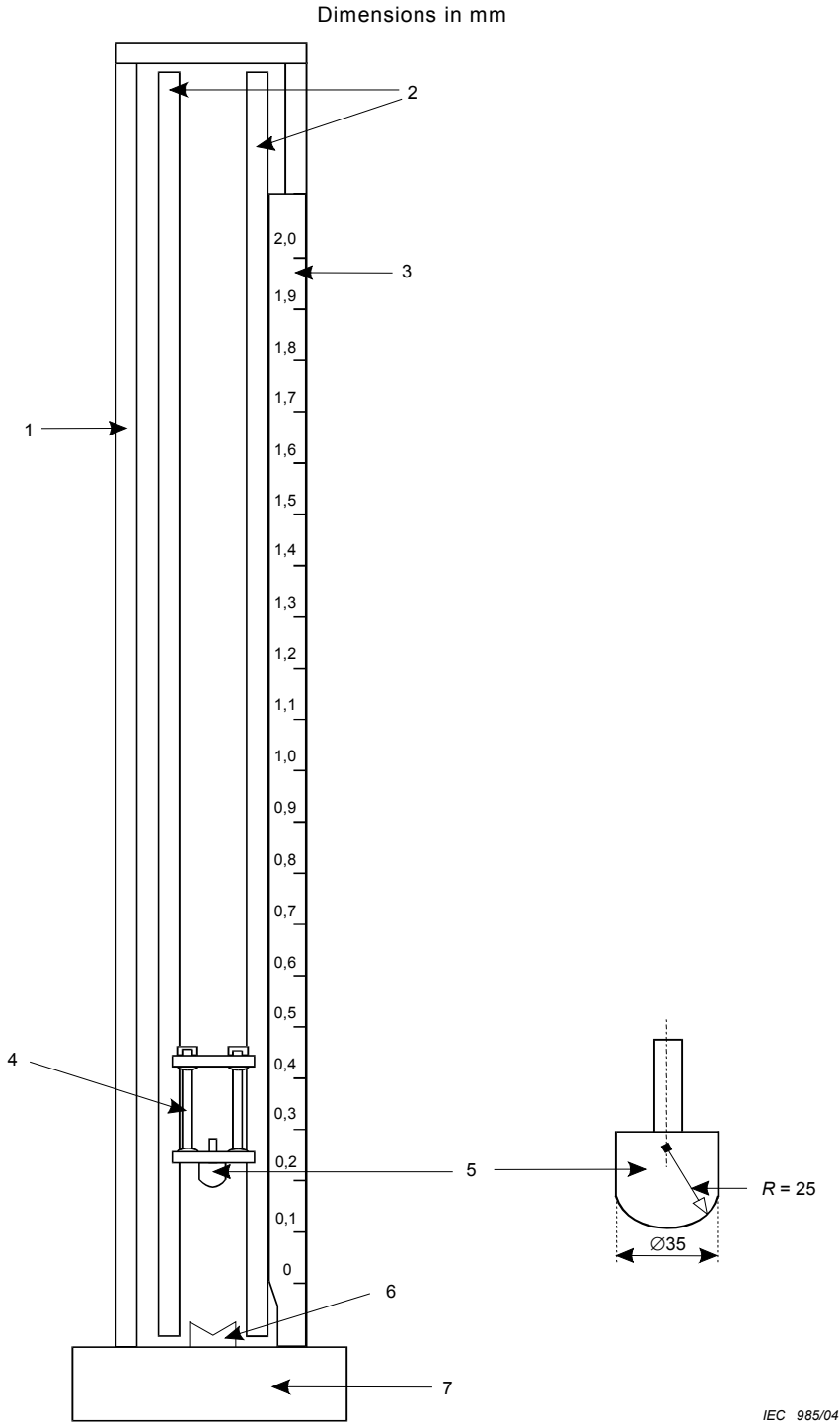
OD min: nominal outside diameter;

OD max: nominal outside diameter + (0,018 x nominal outside diameter values) rounded up to 0,1 mm.

Minimum inside diameter: nominal outside diameter divided by 1,33.

Table 102 – Impact test energy values

Nominal size of conduit mm	Light (L)			Normal (N)		
	Mass of hammer kg (⁺¹ ₀) %	Fall height mm (⁰ ₋₁) %	Energy J	Mass of hammer kg (⁺¹ ₀) %	Fall height mm (⁰ ₋₁) %	Energy J
≤ 60	3	100	3	5	300	15
61 to 90	3	200	6	5	400	20
91 to 140	3	400	12	5	570	28
> 140	3	500	15	5	800	40

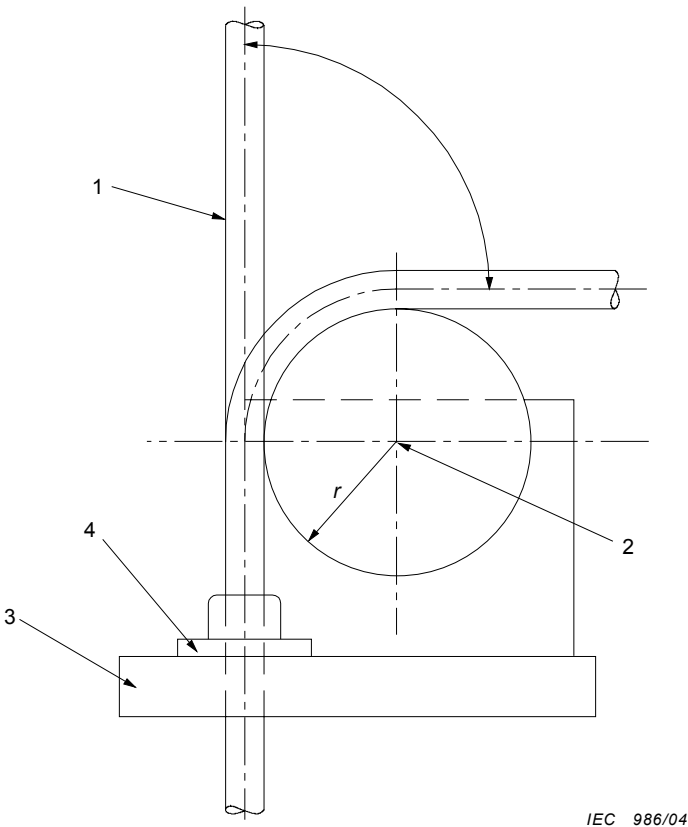


- Key**
- 1 Frame
 - 2 Guide rails
 - 3 Graduated scale
 - 4 Guidance carriage
 - 5 Head of hammer
 - 6 120° vee block
 - 7 Rigid base

Tolerances as per class m of ISO 2768-1

NOTE This drawing is not intended to govern design except as regards the dimensions shown

Figure 101 – Impact test apparatus



- Key**
- 1 Sample
 - 2 Centre of bending cylinder
 - 3 Support
 - 4 Guide for conduit

Figure 102 – Bending test apparatus

Annex A
(normative)

Classification coding for conduit systems

This annex of Part 1 is not applicable.

Annex B
(normative)

Determination of material thickness

This annex of Part 1 is applicable.

