IS 14768-1 (2000): Conduit Fittings for Electrical Installations, Part 1: General Requirements [ETD 14: Electrical Wiring Accessories]

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REAFFIRMED

2003 IS 14768 (Part 1) : 2000

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भाग 1 सामान्य अपेक्षाएँ

Indian Standard

CONDUIT FITTINGS FOR ELECTRICAL INSTALLATIONS — SPECIFICATION

PART 1 GENERAL REQUIREMENTS

ICS 29.120.10

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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TO
IS 14768 (PART 1) : 2003 CONDUIT FITTINGS FOR ELECTRICAL INSTALLATIONS — SPECIFICATION
PART 1 GENERAL REQUIREMENTS

(*Page* 4, *clause* **8.2,** *para* 2, *line* 2) — Substitute 'Fig. 4' *for* 'Fig. 3'.

(*Page* 4, *clause* **8.2**, *para* 3) — Substitute 'Gauges for female threads shall be designed according to Fig. 5 of IS 14763' *for* 'Gauges for female threads shall be designed according to IS 14763'.

(ET 14)

Reprography Unit, BIS, New Delhi, India

Electrical Wiring Accessories Sectional Committee, ETD 14

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Wiring Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

This standard (Part 1) covers the general requirements for conduit fittings for use with conduits for the protection of conductors and/or cables in electrical installations, and test for the quality of joints of conduit fittings to conduit.

This standard (Part 1) is one of the series of Indian Standards which deals with the conduit fittings of electrical installations. After examination of the standards covering many types of conduit fittings for electrical installations, it has been observed that Physical, mechanical, and electrical properties as well as test methods are similar. Hence it has been felt desirable to formulate a standard covering general requirements of various types of conduit fittings. However, a standard of this kind without reference to any particular type of conduits, cannot possibly cover in detail all the requirements with which the individual type of conduit should comply. Reference to this standard shall be made only after the specification on individual type of conduit fittings are revised or formulated and aligned with this standard.

It is intended to cover the individual type of conduit fittings by the following standards:

a) Conduit fittings for electrical Installations : Part 2 Metal conduit fittings (*second revision* of IS 2667 : 1988)

b) Conduit fittings for electrical Installations : Part 3 Conduit fittings for electrical installations (*third revision* of IS 3419 : 1989)

c) Conduit fittings for electrical Installations : Part 4 Fittings for flexible conduits of metal insulating or composite materials and for pliable conduits of metal or composite material

While preparing this standard considerable assistance has been derived from IEC Publication 61035-1(1990) 'Specification for conduit fittings for electrical installations — Part 1 : General requirements', issued by the International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirements of this standard is complied with, the final value observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded of value should be the same as that of the specified value in this standard.

Indian Standard

CONDUIT FITTINGS FOR ELECTRICAL INSTALLATIONS — SPECIFICATION

PART 1 GENERAL REQUIREMENTS

1 SCOPE

This standard (Part 1) specifies requirements for conduit fittings for use with conduits for the protection of conductors and/or cables in electrical installations, and tests for the quality of joints of conduit fittings to conduit.

This standard also applies to conduit fittings used for assembling conduits to conduit boxes.

Connecting couplers, bends, reducing couplers, tees, crosspieces, threaded stoppers and the like are within the scope of the standard.

NOTE — Certain conduit fittings may also be suitable for use in hazardous atmospheres. Consideration should, therefore, be given to the extra requirements necessary for equipment to be installed in such conditions.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
9537 (Part 1) : 1980	Conduits for electrical installations: Part 1 General requirements
12063 : 1987	Classification of degrees of protection provided by enclosures of electrical equipment
14772 : 1999	General requirements for enclosures for accessories for household and similar fixed electrical installations
14763 : 2000	Conduits for electrical purposes — Outside diameters of conduits for electrical installation and threads for conduits and fittings

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Conduit Fitting

Device designed to join or terminate one or more portions of a conduit installation.

3.2 Metal Conduit Fitting

Conduit fitting which consists of metal only.

3.3 Insulating Conduit Fitting

Conduit fitting which consist of insulating materials and which has no conductive components.

3.4 Composite Conduit Fitting

Conduit fitting comprising both conductive and insulating materials.

3.5 Non-flame Propagating Conduit Fitting

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

NOTE — Certain flame propagating conduit fittings if installed with non-flame propagating conduit according to the manufacturer's instructions do not propagate flame.

3.6 External Influences

Presence of water or building material, low and high temperatures, corrosive or polluting substances and solar radiation.

3.7 Threadable Entry for Conduit

Aperture or projection in or on which a screw thread has been formed complying with IS 14763.

3.8 Non-threadable Entry for Conduit

Aperture or projection suitable for connection to conduit complying with IS 9537 (Part 1) and its relevant parts as applicable by means other than a screw thread according to IS 14763.

3.9 Conduit Joint

Interface between two or more components of a conduit system, or between a conduit system and another equipment.

4 GENERAL REQUIREMENTS

Conduit fittings shall be so designed and constructed that, when assembled according to the manufacturer's instructions, they provide mechanical protection of the conductors and cables contained therein. Where applicable, conduit fittings shall also provide electrical protection. They shall join or end a conduit system reliably.

Conduit fittings shall be suitable with regard to both material and properties for use with one or more of the classes of conduit according to IS 9537 (Part 1).

The protective properties of the joint between the conduit and conduit fitting shall be not less than claimed for the conduit or conduit fitting whichever is the lower.

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

In general, compliance is checked by carrying out all the tests specified.

5 GENERAL CONDITIONS FOR TESTS

5.1 Tests according to this standard are type tests.

5.2 Unless ostherwise specified, the tests shall be carried out at an ambient temperature of 27 ± 5°C.

5.3 Unless otherwise specified, each test shall be made on three new samples.

Certain test, for instance the checking of dimensions, clearly do not effect a change in the property of the samples, and therefore these samples shall be considered as new samples and can be used for further tests.

5.4 Insulating and composite conduit fitting shall be conditioned in a heating cabinet with an atmosphere having the composition and pressure of the ambient air and ventilated by Natural circulation, at a homogeneous temperature of 60 ± 2°C for a period of 10 days before commencing any test.

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 **8** and unless otherwise specified in the relevant test, the conduit fittings shall be assembled with adequate length of conduit of the type for which they are intended, due consideration being given to the manufacturer's instructions, especially where force is required in the assembly of the joint.

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

If the connection of the conduit entries and the relevant conduit fitting depend on the thickness of the conduit fitting, the test shall be carried out to ensure its effectiveness for the normal use of the conduit fitting.

5.7 Unless otherwise specified, conduit fittings are deemed not to comply with this specification if there are more failures than of one sample in any one of the tests. If one sample fails in a test, that test and those preceding, which may have influenced the result of that test, shall be repeated on another set of samples of the number specified, all of which shall then comply with the repeated tests.

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

5.8 When toxic or hazardous processes are used, due consideration should be given to the safety of the persons within the test area.

5.9 Requirements for conduit fittings which are part of an enclosure are specified in IS 14772.

6 CLASSIFICATION

6.1 *According to Material*

6.1.1 Metal conduit fittings

6.1.2 Insulating conduit fittings

6.1.3 Composite conduit fittings

6.2 *According to Type of Conduit Entry*

6.2.1 Threadable conduit entry

6.2.2 Non-threadable conduit entry

6.3 *According to Mechancial Properties*

6.3.1 Conduit fittings for very light mechanical stresses

6.3.2 Conduit fittings for light mechanical stresses

6.3.3 Conduit fittings for medium mechanical stresses

6.3.4 Conduit fittings for heavy mechanical stresses

6.3.5 Conduit fittings for very heavy mechanical stresses

6.4 *According to Suitability for Suspended Load*

6.4.1 Conduit fitting not suitable for a suspended load

6.4.2 Conduit fittings suitable for a suspended load (The load is specified by the manufacturer)

6.5 *According to Temperature* (*see* Table 1).

6.6 *According to Resistane to Flame Propagation*

6.6.1 Non-flame propagation conduit fittings

Table 1 Temperature Classification
(*Clause* 6.5)

Sl No.	Temperature not Normally Less Than			
	Temperature Classification °C	Storage and Transport °C	Use and Installation °C	Permanemt Application Temperature Range °C
(1)	(2)	(3)	(4)	(5)
i)	−45	−45	−15	−15 to +60
ii)	−25	−25	−15	−15 to +60
iii)	−5	−5	−5	−5 to +60
iv)	+90	−5	−5	−5 to +60*
v)	+90/−25	−25	−15	−15 to +60*
vi)	+90/−5	−5	−5	−5 to +90

NOTE — Conduit fittings of insulating materials for temperatures up to 200°C are under consideration.
* These types, for use in prefabricated concrete, will temporarily withstand temperatures up to +90°C.

6.6.2 Flame propagation conduit fittings

6.7 *According to Electrical Characteristics*

6.7.1 Conduit fittings without electrical continuity characteristics

6.7.2 Conduit fittings with electrical continuity characteristics

6.7.3 Conduit fittings without electrical insulating characteristics

6.7.4 Conduit fittings with electrical insulating characteristics

6.8 *According to Resistance to External Influence*

6.8.1 According to protection against ingress of solid objects

6.8.1.1 Conduit fittings giving protection against ingress of solid objects greater than 12 mm (IP2X);

6.8.1.2 Conduit fittings giving protection against ingress of solid objects greater than 2.5 mm (IP3X)

6.8.1.3 Conduit fittings giving protection against ingress of solid objects greater than 1.0 mm (IP4X)

6.8.1.4 Conduit fittings giving protection against dust (IP5X)

6.8.1.5 Dust-tight conduit fittings (IP6X)

NOTES

1 The standard test sphere and not the test finger is to be used for category IP2X.

2 Conduit fittings with a rating of less than IP3X cannot be subject to the test of 12.2.

3 Access to live parts is under consideration.

6.8.2 According to protection against ingress of Water

6.8.2.1 Conduit fittings giving no protection(IPX0)

6.8.2.2 Conduit fittings giving protection against dripping water (IPX2)

6.8.2.3 Conduit fittings giving protection against splashing water (IPX3)

6.8.2.4 Conduit fittings giving protection against splashing water (IPX4)

6.8.2.5 Conduit fittings giving protection against water jets (IPX5)

6.8.2.6 Conduit fittings giving protection against heavy seas (IPX6)

6.8.2.7 Conduit fittings giving protection against Immerssion (IPX7)

6.8.2.8 Conduit fittings giving protection against submersion (IPX8)

6.8.3 *According to protection against solar radiation*

6.8.3.1 Conduit fittings without protection

6.8.3.2 Conduit fittings with low protection

6.8.3.3 Conduit fittings with medium protection

6.8.3.4 Conduit fittings with high protection

6.9 *According to Tensile Strength*

6.9.1 Conduit fittings without declared tensile strength

6.9.2 Conduit fittings with declared tensile strength for 3 kg load

6.9.3 Conduit fittings with declared tensile strength for 10 kg load

6.9.4 Conduit fittings with declared tensile strength for 50 kg load

6.10 *According to Cantilever Strength*

6.10.1 Conduit fittings without cantilever strength

6.10.2 Conduit fittings with cantilever strength

6.11 *According to Transverse Load Strength*

6.11.1 Conduit fittings without transverse load

6.11.2 Conduit fittings with transverse load strength

7 MARKING

7.1 Conduit fittings shall be marked, either on the article itself or on the containing package, with the following:

a) the name of the manufacturer or responsible vendor, or trade-mark or other identifying symbol ; and

b) a classification code in accordance with **A-1** and any other mark or symbol required by the relevant Part of this standard.

So far as is reasonably practicable, the marking of (a) and (b) shall be on the article itself.

Conduit fittings may also be marked with an additional classification code in accordance with **A-2**.

An indication may also be given of the classification code of the conduits to which the conduit fitting is intended to be connected.

Flame propagating material shall be coloured orange. It shall not be coloured orange by painting or other means.

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

7.2 Marking shall be durable and easily legible.

Marking according to **7.1** 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.

NOTE — Petroleum spirit is defined as the aliphatic solvent hexane with a content of aromatics of maximum 0.1 percent volume, a kauri-butanol value of 29, initial boiling point 65°C, dry point 69°C and specific gravity 0.68 kg/l.

8 DIMENSIONS

8.1 Conduit entries in conduit fittings shall be suitable for conduits according to the relevant parts of IS 9537 (Part 1), or for conduit fittings according to the relevant part of this standard.

8.2 If the conduit entry is threaded, the threads shall comply with IS 14763.

Gauges for male threads shall be designed according to Fig. 3 of IS 14763.

Guages for female threads shall be designed according to IS 14763.

8.3 Other dimensions of conduit fittings shall comply with the specifications given in the relevant part of this standard.

Compliance is checked by measurement and by the tests specified in the relevant part of this standard.

9 CONSTRUCTION

9.1 There shall be no sharp edges, burrs or surface projections which can damage the conductors or cables, or are likely to inflict injury to the installer or user.

Surface treatments are not intended to be part of the requirements of this standard, other than for protection against corrosive or polluting substances.

Means may be provided within the conduit entry for securing the conduit to the conduit fittings, provided that such means are not likely to damage insulated conductors.

Means shall be provided within the conduit entry to prevent the conduit entering the conduit fitting to such a degree as to damage the conductors or cables.

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

NOTE — Slight defects resulting from the method of manufacture are not taken into account if they are not likely to damage insulated conductors.

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 or be of the thread forming type; thread cutting screws shall not be used.

Fixing screws and small clips for use with insulating or composite conduit fittings need not be of insulating material if they are isolated from live parts and are not capable of transmitting a fault current between equipment connected to the conduit fittings.

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

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

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

9.3 Screws used with preformed threads are tightened and loosened ten times for screws in engagement with

a thread of insulating material and for screws of insulating material, and five times in all other cases.

The test is made by using a suitable screwdriver or spanner applying a torque in accordance with Table 2. The screws 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.

9.4 Thread-forming screws are tightened and loosened ten times for screws in engagament 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 a torque in accordance with Table 2. 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 of damage to the head or thread that will impair the further use of the screw.

9.5 Any material, for example, rubber, fibre, etc, within, the joint which may be exposed to external influences when assembled according to the manufacturer's instructions shall have at least the same level of resistance to each of the external influences as either the conduit or the conduit fittings.

9.6 Terminals of metal conduit fittings, used for the connection of the protective conductor shall be marked with the symbol 1.

Compliance is checked in inspection.

9.7 Conduit fittings designed to be assembled by snap action shall be capable of being disassembled only by the use of a general purpose tool.

Compliance is checked by inspection and by manual test.

10 MECHANICAL PROPERTIES

10.1 Conduit fittings shall have adequate mechanical strength.

Compliance is checked by the test specified in **10.3**.

10.2 Conduit fittings intended as a mounting for other equipment shall have adequate mechanical strength to support such equipment and to withstand the force required to operate the equipment, either during or after installation.

Compliance is checked by the test specified in **10.4**.

10.3 Impact Test

Twelve samples are subjected to an impact test by means of the apparatus shown in Fig. 1.

Before the test the samples are assembled with all the components as for normal use, including conduits required for conducting the test.

Table 2 Torque Values for Screw Tests

(*Clause* 9.3)

Sl No.	Nominal Diameter of Thread, mm		Torque, nm	
	Over	Up to and Including	I	II
(1)	(2)	(3)	(4)	(5)
i)	—	2.8	0.4	0.4
ii)	2.8	3.0	0.5	0.5
iii)	3.0	3.2	0.6	0.6
iv)	3.2	3.6	0.8	0.8
v)	3.6	4.1	1.2	1.2
vi)	4.1	4.7	1.8	1.8
vii)	4.7	5.3	2.0	2.0
viii)	5.3	6.0	2.5	3.0
ix)	6.0	8.0	3.5	6.0
x)	8.0	10.0	4.0	10.0

NOTES

1 Col 4 applies to screws which are tightened by means of a screwdriver.
2 Col 5 applies to screws and nuts which are tightened by means other than a screwdriver.

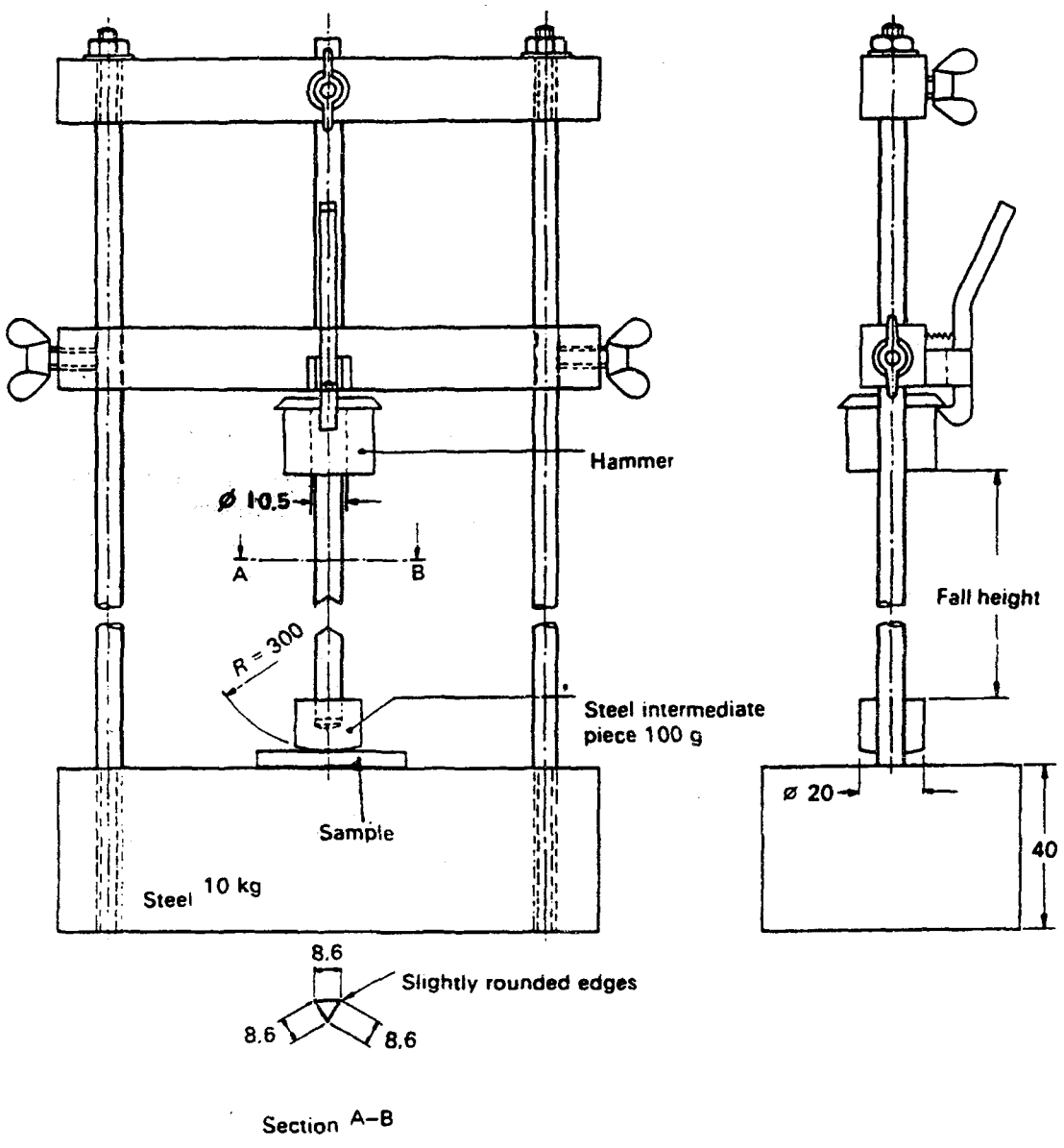

FIG. 1 IMPACT TEST APPARATUS

Parts which are not accessible when mounted as in normal use, and small conduit fittings whose maximum dimension is less than 30 mm are not subjected to this test.

The test apparatus is placed on a pad of closed cell expanded EPR sponge 40 mm thick when uncompressed, and having a density of 450 to 550 kg/m^3.

The test apparatus, together with the samples are placed in a refrigerator, the temperature within which is maintained at the relevant temperatures as specified in the col 2 of Table 1.

The test temperature shall have tolerance of ±1°C.

When the samples have attained the temperature specified, or after 2 h, whichever is the longer period, each shall be placed in position on the steel base as shown in Fig. 1. The hammer shall be allowed to fall whereby an impact energy according to Table 3 is applied. The mass of the hammer and the fall height shall also be as specified in Table 3.

The test is made on the weakest part of the conduit fitting except that it is not applied within 5 mm of any conduit entry.

After the test, in at least nine of the samples there shall be no sign of disintegration, nor shall there be any crack visible to normal or corrected vision without additional magnification, and there shall be no reduction in properties.

Table 3 Impact Test Values
(*Clause* 10.3)

Sl No.	Fittings for Mechanical Stresses	Energy J	Mass of Hammer kg	Fall Height mm
(1)	(2)	(3)	(4)	(5)
i)	Very light	0.5	0.5	100 + 1
ii)	Light	1.0	1.0	100 + 1
iii)	Medium	2.0	2.0	100 + 1
iv)	Heavy	6.0	2.0	300 + 1
v)	Very Heavy	20.0	6.8	300 + 1

10.4 Suspended Load Test

The conduit fitting suitable for a suspended load is secured to a rigid structure with the suspension means pointing downwards, using a method provided by the manufacturer.

A load, equal to three times the load stated by the manufacturer, is suspended from the suspension means for a period of 48 h. At the end of this period, there shall be no appreciable distortion of the conduit fitting. The distortion is checked by the test pin or test finger appropriate to the classification specified in **6.8.1**, and there shall be no damage visible to normal or corrected vision without addition magnification.

For conduit fittings other than those wholly made of metal, the test is carried out in a heating cabinet, the temperature within which is maintained at a temperature of 60 ± 2°C.

11 RESISTANCE TO HEAT

Insulating and composite conduit fittings shall have adequate resistance to heat.

Compliance is checked by the tests specified in the relevant parts of this standard.

12 RESISTANCE TO FLAME PROPAGATION

Under consideration.

13 ELECTRICAL CHARACTERISTICS

13.1 Conduit fittings with electrical continuity characteristics shall be so constructed that they can be used in an installation system as part of an earthing or protective conductor.

Compliance is checked by the tests specified in **13.7** and **13.8.**

13.2 Conduit fittings with electrical insulating characteristics shall have adequate electrical insulating strength and insulation resistance.

Parts which are not accessible when mounted as in normal use, and small conduit fittings whose maximum dimension is less than 30 mm are not subjected to this test.

Compliance is checked by the tests specified in **13.3** to **13.6** inclusive.

13.3 Conduit fittings are assembled in the manner prescribed by the manufacturer, where screws project inside the conduit fitting. For the purpose of the test, the screws shall be of insulating material.

All conduit entries except one are closed with plugs of insulating material, one of the plugs allowing a cable to penetrate to the approximate centre of the sample, the cable within the sample being without insulation.

The inside of the sample is then filled with spheroidal metal object, preferably of lead, of a maximum size of 2.5 mm, and the remaining entry is closed.

13.4 The samples are then subjected to humidity treatment, which is carried out in a humidity cabinet containing air with a relative humidity maintained between 91 percent and 95 percent at a temperature maintained within 1°C of any convenient value between 15°C and 35°C.

Before being placed in the humidity cabinet, the samples are brought to a temperature between t and $t + 4$°C; this may be achieved by keeping them at this temperature for at least 4 h before the humidity treatment.

The samples are kept in the cabinet for 48 h.

A relative humidity between 91 percent and 95 percent can be obtained by placing in the humidity cabinet a saturated solution of sodium sulphate (Na_2SO_4) or potassium nitrate (KNO_3) in water having a sufficiently large contact surface with the air.

In order to achieve the specified conditions within the cabinet, it is necessary to ensure constant circulation of the air within and, in general, to use a cabinet which is thermally insulated.

13.5 Immediately after the humidity treatment, the sample is placed in a container and completely enclosed by spheroidal metal objects of a maximum size of 2.5 mm.

An electrode is immersed in the metal objects external

to the sample and the electrical insulating strength of the samples is then checked by applying a voltage of 2 000 V of substantially sine wave form and having a frequency of 50 Hz for 15 min between the electrode and the cable. No breakdown shall occur during the test.

13.6 The insulation resistance of the sample is then measured by applying a dc voltage of at least 500 V between the electrode and the cable. The measurement is made 1 min after the application of the voltage.

The insulation resistance shall be not less than 5 MΩ

13.7 Electrical Impedance Test

For conduits and conduit fittings designed for use in installation systems as an accessible metal part to be protected against electric shock, the test is made on conduits and conduit fittings assembled in accordance with Fig. 2 and with the manufacturer's instruction.

If screws are used in the assembly of a joint, they are tightened to the manufacturer's recommended torque. If there is no manufacturer's recommended torque, they shall be tightened to 2/3 of the torque specified in Table 2. An ac current of 25 A, having a frequency of 50 Hz is passed through the assembly for a period of 1 min, after this time the voltage is measured between the two measuring points of the conduit assembly only (excluding the cable).

The assembly is deemed to have passed the test if the electrical impedance of the assembly, as measured by the voltage/current ratio, does not exceed 5×10^{-3} ohm/m.

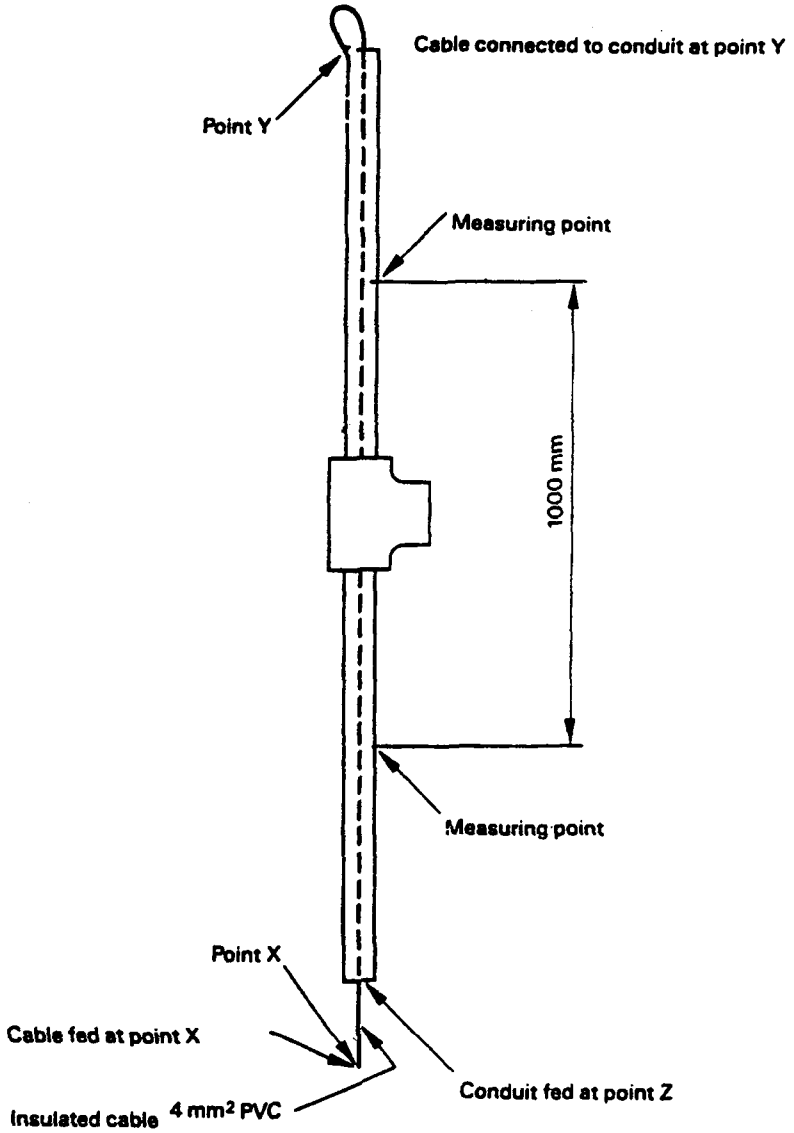

FIG. 2 ASSEMBLY OF CONDUIT AND CONDUIT FITTINGS FOR IMPEDANCE TEST

13.8 Fault Current Test

For conduits and conduit fittings designed for use in an installation system as part of a protective conductor, the test is made on an assembly of conduit and conduit fittings assembled in accordance with the manufacturer's instructions.

If screws are used in the assembly of a joint, they are tightened to the manufacturer's recommended torque. If there is no manufacturer's recommended torque, they shall be tightened to 2/3 of the torque specified in Table 2. An ac current of substantially sine wave form and having a frequency of 50 Hz and a value and

Table 4 Fault Current Test Value

Sl No.	Nominal Size of Conduit mm	Current A	
		0.4s	5s
(1)	(2)	(3)	(4)
i)	16	400	200
ii)	20	550	280
iii)	25	1 100	600
iv)	32 and above	140	750

time duration in accordance with Table 4, is passed through the assembly.

A time interval of 5 min shall elapse between the 0.4 s and 5 s tests.

The assembly is deemed to have passed the test if it can pass the test of **13.7** after a period of 2 min.

13.9 Earth Terminal Test

If a conduit fitting has an earthing terminal for connection to the earthing conductor it is checked by the following test.

An ac current of 25 A having a frequency of 50 Hz is passed between the earthing terminal and the accessible metal parts of the conduit fitting.

The conduit fitting is deemed to have passed the test if the resistance calculated from the current and the voltage drop does not exceed 10×10^{-3} ohm.

14 EXTERNAL INFLUENCES

14.1 Conduit joints in conduit fittings and any covers shall be tested in accordance with the requirements of **14.2**, **14.3** and **14.4**. If necessary the conduits used for the test shall have an outside diameter of the lower tolerance limit.

If the conduit fitting is used with a conduit of a lower category than tested, the assembly is classified at the lower category.

14.2 Degree of Protection — Ingress of Solid Objects

An assembly is made of a conduit fitting with a short length of conduit assembled in each conduit entry in accordance with the manufacturer's instructions.

Where necessary, the open ends of the assembly are plugged or are not part of the test. The assembly is tested in accordance with the appropriate test of IS 12063.

The assembly tested for numeral 5 is deemed to have passed the test if the ingress of dust is less than 0.1 percent of the internal volume of the sample under test.

14.3 Degree of Protection — Ingress of Water

An assembly is made of a conduit fitting with a short length of conduit assembled in each conduit entry in accordance with the manufacturer's instructions.

Where necessary, the open end of the conduit is plugged, or is not part of the test.

The assembly is tested in accordance with the appropriate test of IS 12063.

The assembly is deemed to have passed the test if the ingress of water is less than 0.1 percent of the internal volume of the sample under test.

14.4 Solar Radiation

Under consideration.

15 TESTS ON JOINTS

15.1 Tensile Strength Test

In some cases it may be necessary to use conduit fittings with tensile strength, Conduit fittings which claim to have tensile strength shall be tested according to the following tests.

An assembly, comprising a series of joints, is made by connecting together a number of conduit fittings and short length of conduit in accordance with the manufacturer's instructions.

Assemblies including insulating or composite conduit fittings are tested at the lowest and highest temperatures given in the fourth column for the assigned classification of Table 1.

If screws are used in the assembly of a joint, they are tightened to the manufacturer's recommended torque. If there is no manufacturer's recommended torque, they shall be tightened to 2/3 of the torque specified in Table 2. When testing joints using plain conduit, the outside diameter of the conduit shall be on the lower tolerance limit.

The extremities of the assembly are then clamped securely to an apparatus capable of applying a tensile force. The connection between the assembly and the loading apparatus is not deemed to be part of the assembly.

The assembly is then subjected to a tensile force according to Table 5, applied smoothly and axially for a period of 15 min. The force is then removed.

Table 5 Test Forces for Tensile Strength Tests

Classification Load kg	Test Force N
3	90
10	300
50	1 500

After the test there shall be no damage visible to normal or corrected vision without additional magnification. It shall also be possible to pass through the joint without undue force the gauge for checking the conduit in the bent condition, and the joint between the conduit and the conduit fitting shall not become disengaged.

15.2 Cantilever Strength Test For Rigid Conduits Only

In some cases it may be necessary to use conduit fittings with cantilever strength; conduit fittings which claim to have cantilever strength shall be tested according to the following test.

The test is carried out on metal conduits at a temperatures of 27± 5°C. The test is carried out on insulating or composite conduits at the relevant temperature given in the third column of Table 1, the sample being conditioned at this temperature for 30 min before commencing the test.

An assembly is made of a 600 mm length of rigid conduit and a conduit fitting, in accordance with the manufacturer's instructions.

If screws are used in the assembly of a joint, they are tightened to the manufacturer's recommended torque. If there is no manufacturer's recommended torque, they shall be tightened to 2/3 of the torque specified in Table2.

When testing a joint using non-threadable conduits, the outside diameter of the conduit is on the lower tolerance limit for one sample and on the upper tolerance limit for two samples, and the sample is assembled according to the manufacturer's instructions.

The assembly is supported by firmly securing the conduit fitting to a rigid structure capable of supporting the assembly and the test load, and the conduit is in a horizontal plane.

A cantilever load, equal to four times the weight of a 4 m length of conduit under test, is then applied at a distance of 500 mm from the joint between the conduit and the conduit fitting, at right angles to the conduit.

The load is applied for 15 min after the test, the conduit shall not have become disconnected from the assembly and there shall be no damage visible to normal or corrected vision without additional magnification.

It shall be possible to pass the gauge for checking the conduit in the bent condition without undue force.

15.3 Transverse Load Test for Pliable Conduits Only

In some cases it may be necessary to use conduit fittings with transverse load strength; conduit fittings which claim to have transverse load strength shall be checked by the tests specified in the relevant Parts of this standard.

ANNEX A

(*Clause* 7.1)

CONDUIT FITTING MARKING CLASSIFICATION CODE

A-1 MANDATORY MARKING CODE

Metal conduit fittings shall be marked with a single digit code denoting mechanical properties.

Conduit fittings containing insulating material shall be marked with a three digit code, the first digit denotes mechanical properties, and the second and third digits denote temperature classification.

The code shall be in accordance with the following table:

First digit — Mechanical Properties

Very light mechanical stresses.....1
Light mechanical stresses.....2
Medium mechanical stresses.....3
Heavy mechanical stresses.....4

Vary heavy mechanical stresses.....5

Second and third digits — Temperature Classification

–5 conduit fittings.....05
–25 conduit fittings.....25
–45 conduit fittings.....45
+90 conduit fittings.....90
+90/25 conduit fittings.....95
90/–5 conduit fittings.....99

A-2 ADDITIONAL MARKING CODE

Conduit fittings may be marked with an additional code denoting properties other than mechanical or temperature classification.

The additional marking, if used, shall follow immediately after the code marking required by **A-1** and shall be separated from it by an oblique stroke (/).

The additional code shall consist of seven digits; if code markings in respect of any of the additional properties are not required they shall be replaced by zeros in the seven digit sequence.

The code shall be in accordance with the following table:

First additional digit — Suitability for bending

The first additional digit is not applicable.

Second additional digit — Electrical properties

Conduit fittings with electrical continuity.....1
Conduit fittings suitable for use as supplementary insulation.....2
Conduit fittings with electrical continuity and suitable for use as supplementary insulation.....3
Conduit fittings suitable for use as a protective conductor.....4

Third additional digit — Resistance to ingress of water

Conduit fittings giving protection against dripping water.....2
Conduit fittings giving protection against spraying water.....3
Conduit fittings giving protection against splashing water.....4
Conduit fittings giving protction against water jets.....5
Conduit fittings giving protection against heavy seas.....6
Conduit fittings giving protection against the effects of immersion.....7
Conduit fittings giving protection against the effects of submersion.....8

Fourth additional digit — Ingress of solid objects

Conduit fittings giving protection against solid objects greater than 12 mm.....2
Conduit fittings giving protection against solid objects greater than 2.5 mm.....3
Conduit fittings giving protection against solid objects greater than 1.0 mm.....4
Conduit fittings giving protection against dust.....5
Dust-tight conduit fittings.....6

Fifth additional digit — Resistance to corrosion

The Fifth additional digit is not applicable.

Sixth additional digit — Resistance to solar radiation

Conduit fittings with low protection.....1
Conduit fittings with medium protection.....2
Conduit fittings with high protection.....3

Seventh additional digit — Suitability to support a suspended load

Conduit fittings suitable for a suspended load (manufacturer to specify load).....6

A-3 EXAMPLE OF CODE MARKING

A marking of 3 denotes a metal conduit fitting suitable for medium mechanical stress, no other property being claimed.

A marking of 225 denotes an insulating or commposite conduit fitting suitable for light mechanical stress, with a temperature classification of –25, no other property being claimed.

A marking of 390/025 503 6 denotes an insulating or composite conduit fitting suitable for medium mechanical stress, with a temperature classification of +90, suitable for use as supplementary insulation, giving protection against water jets, is dust-protected, has a high resistance to solar radiation, and can support a load.

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