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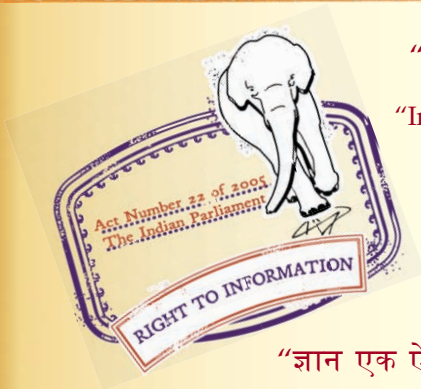
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IS 4289-2 (2000): Flexible Cables for Lifts and Other Flexible Connections, Part 2: PVC Insulated Circular Cables [ETD 9: Power Cables]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

लिफ्ट और अन्य अनुकूलन योग्य संयोजकों के
लिए लचीले केबल — विशिष्टि
भाग 2 पी वी सी रोधित गोलाकार केबल

Indian Standard

**FLEXIBLE CABLES FOR LIFTS AND OTHER
FLEXIBLE CONNECTIONS — SPECIFICATION
PART 2 PVC INSULATED CIRCULAR CABLES**

ICS 29.060.20; 91.140.90

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Power Cables Sectional Committee, ET 09 had been approved by the Electrotechnical Division Council.

The standard on lift cables was first published in 1967 which covered only rubber insulated cables. While revising that standard as IS 4289 (Part 1) : 1984 'Flexible cables for lifts and other flexible connections — Specification: Part 1 Elastomer insulated cables (*first revision*)', it was decided to bring out separate parts to cover PVC insulated cables. This standard (Part 2) pertains to PVC insulated circular cables. Requirements for PVC insulated flat cables are intended to be covered in a separate part later on, since their construction is different from the circular cables.

In preparing this standard, assistance has been derived from IEC Publication 60227-6 (1985) 'Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V: Part 6 Lift cables and cables for flexible connections' issued by the International Electrotechnical Commission.

Recommendations for installation of lift cables are given in Annex A for guidance only.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test or analysis 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 off value should be the same as that of the specified value in this standard.

Indian Standard

FLEXIBLE CABLES FOR LIFTS AND OTHER FLEXIBLE CONNECTIONS — SPECIFICATION

PART 2 PVC INSULATED CIRCULAR CABLES

SECTION 1 GENERAL

1 SCOPE

1.1 This standard (Part 2) covers the requirements and tests for circular, PVC insulated, overall braided and PVC sheathed lift cables of rated voltages up to and including 1 100 V.

1.2 These cables are suitable for use, where the combination of ambient temperature and temperature rise due to load, results in a steady conductor temperature not exceeding 70°C.

1.3 Cables covered in this standard are intended for installation where the freely suspended length does not exceed 35 m, and the speed of travel does not exceed the limits as given in the relevant Indian Standards on Lifts. The requirements of cables outside these limits is a matter of negotiation between the purchaser and the manufacturer.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

<i>IS/IEC No.</i>	<i>Title</i>
1885 (Part 32):	Electrotechnical vocabulary: Part 32
1993/IEC 60050	Electric cables (<i>first revision</i>)
(461) : 1984	
8130 : 1984	Conductors for insulated electric cables and flexible cords (<i>first revision</i>)
5831 : 1984	PVC insulation and sheath of electric cables (<i>first revision</i>)
10810	Methods of test for cables

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in 3.2 to 3.5, in addition to those given in IS 1885 (Part 32)/IEC 60050 (461), shall apply.

3.2 Type Tests — Tests required to be made before supply on a general commercial basis on a type of cable in order to demonstrate satisfactory performance characteristics to meet the intended application.

NOTE — These tests are of such a nature that after they have been made, they need not be repeated unless changes are made in the cable materials or design, which might change the performance characteristics.

3.3 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

3.4 Routine Tests — Tests made by the manufacturer on all finished cable lengths to demonstrate the integrity of the cable.

3.5 Optional Tests — Special tests to be carried out when required by agreement between the purchaser and the supplier.

SECTION 2 MATERIALS

4 CONDUCTOR

4.1 The conductor shall be composed of plain annealed copper wires complying with IS 8130 (*see also* 13.1).

5 SEPARATOR

5.1 The separator shall be of dry paper, polyester tape or any other suitable material.

6 INSULATION

6.1 The insulation shall be of PVC compound complying with the requirements for Type D of IS 5831.

7 CENTRAL HEART

7.1 The central heart shall consist of hemp, jute or similar material. If the central heart has a strain bearing member, the materials and construction of the central heart shall be as agreed to between manufacturer and the purchaser.

8 FILLERS

8.1 The fillers shall be of natural or synthetic fibres. The material shall be suitable for operating temperature and compatible with the insulating material.

9 TAPE

9.1 Proofed or polyester tape or plain cotton tape may be used. Proofed tape shall be closely woven cotton, without selvedge, proofed on one side with any elastomeric material.

10 BRAID

10.1 Textile braid shall consist of textile material (natural or synthetic) excluding jute or hemp.

11 SHEATH

11.1 The sheath shall be of PVC compound complying with the requirements for Type ST 3 of IS 5831.

SECTION 3 CONSTRUCTION

12 GENERAL DETAILS OF CONSTRUCTION

12.1 The cables shall comprise of the following:

- a) Central heart with an optional strain bearing material,
- b) Up to 30 flexible conductors,
- c) A separator around each conductor (optional),
- d) PVC insulation,
- e) Optional fillers as required for core assembly,
- f) Optional tape applied on the core assembly,
- g) Textile braid over core assembly, and
- h) PVC sheath.

13 CONDUCTOR

13.1 The conductor shall comply with the requirements for class 5 conductors given in IS 8130 except that the value of maximum resistance of the conductor at 20°C shall be increased by 5 percent on account of short lay of the core assembly. The nominal cross-sectional area of conductor shall be 0.75 mm² or 1 mm² as required. A separator may be applied around each conductor.

14 INSULATION

14.1 The conductor (with or without separator) shall be provided with PVC insulation applied by extrusion. It shall be possible to remove the insulation without damaging the conductor.

14.2 Thickness of Insulation

The average thickness of the insulation shall be not less than the nominal value (t_i) of 0.7 mm.

14.3 Tolerance on Thickness of Insulation

The smallest of the measured value of the thickness of insulation shall not fall below the nominal value (t_i) specified in 14.2 by more than 0.1 mm + 0.1 t_i .

15 CORE IDENTIFICATION

15.1 The cores shall be identified by colours or by printed numerals.

15.2 Colour identification shall be by means of

coloured insulation. The colour scheme shall be agreed to between the purchaser and manufacturer.

15.3 In case of identification by printed numerals, the insulation of the cores shall be of the same colour and the cores shall be numbered sequentially starting with number 1 in the inner layer.

The number shall be legibly printed in Hindu-Arabic numerals at regular intervals on the outer surface of the cores with an ink of contrasting colour.

The numerals shall be legible and not easily erasable.

16 CORE ASSEMBLY

16.1 The cores with the fillers, if any, shall be twisted around the central heart, so as to form one layer for cables having up to 12 cores, and two layers for cables having more than 12 cores.

17 OVERALL COVERING

17.1 The core assembly shall be covered by a textile braid and then covered by PVC sheath applied by extrusion.

17.1.1 Thickness of Sheath

The average thickness of sheath shall be not less than the nominal value (t_s) specified in Table 1.

17.1.2 Tolerance on Thickness of Sheath

The smallest of the measured values of the thickness of sheath shall not fall below the nominal value (t_s) specified in Table 1 by more than 0.2 mm + 0.2 t_s .

SECTION 4 TESTS

18 CLASSIFICATION OF TESTS

18.1 Type Tests

The following shall constitute the type tests:

- a) Tests on conductor
 - i) Annealing test,
 - ii) Conductor resistance test,
- b) Test for thickness of insulation and sheath,
- c) Physical tests for insulation and sheath,
 - i) Tensile strength and elongation at break,
 - ii) Ageing in air oven,
 - iii) Loss of mass test,
 - iv) Heat shock test,
 - v) Shrinkage test,
 - vi) Thermal stability test,
- d) High voltage (water immersion test),
- e) Insulation resistance test,
- f) Static flexibility test, and
- g) Flammability test.

18.2 Acceptance Tests

The following shall constitute acceptance tests:

- Annealing test,
- Conductor resistance test,
- Test for thickness of insulation and sheath,
- Tensile strength and elongation at break of insulation and sheath,
- High voltage test,
- Insulation resistance test, and
- Flammability test.

18.3 Routine Tests

The following shall constitute routine tests:

- Conductor resistance test, and
- High voltage test.

18.4 Optional Tests

The following shall constitute optional tests:

Cold bend/Cold impact test (as applicable)

19 METHODS OF TESTS

19.1 Unless otherwise specified, the tests shall be carried out in accordance with relevant part of IS 10810, taking into account additional information given in this standard.

19.2 High Voltage Test

The values of test voltage, duration and test conditions

are given in Table 2. Cables shall withstand the appropriate high voltage without breakdown.

19.3 Static Flexibility Test

A sample of sufficient length of cable shall be unreeled from the drum and tested in an apparatus similar to that shown in Fig. 1. The clamps *A* and *B* shall be located at a height of not less than 1.5 m above ground level. Clamp *A* shall be fixed and clamp *B* shall be movable horizontally at the level of clamp *A*. After the cable has been allowed to be hung in the position indicated in Fig. 1 for 3 min, movable clamp *B* shall be relocated to position shown in Fig. 2 without disturbing cable in clamp *A* and the loop inside diameter shall be measured. The loop shall now be reversed to position shown in Fig. 3 by rotating the movable clamp *B* through 360° in the plane of the loop; care shall be taken that the cable is not rotated about its own axis. The loop inside diameter shall be measured once again.

19.3.1 The average loop inside diameter of the two readings corresponding to Fig. 2 and 3 shall be within the limits specified in Table 3.

19.4 Flammability Test

The period of burning after removal of flame shall not exceed 60 sec and the unaffected (uncharred) portion from the lower edge of the top clamp shall be at least 50 mm.

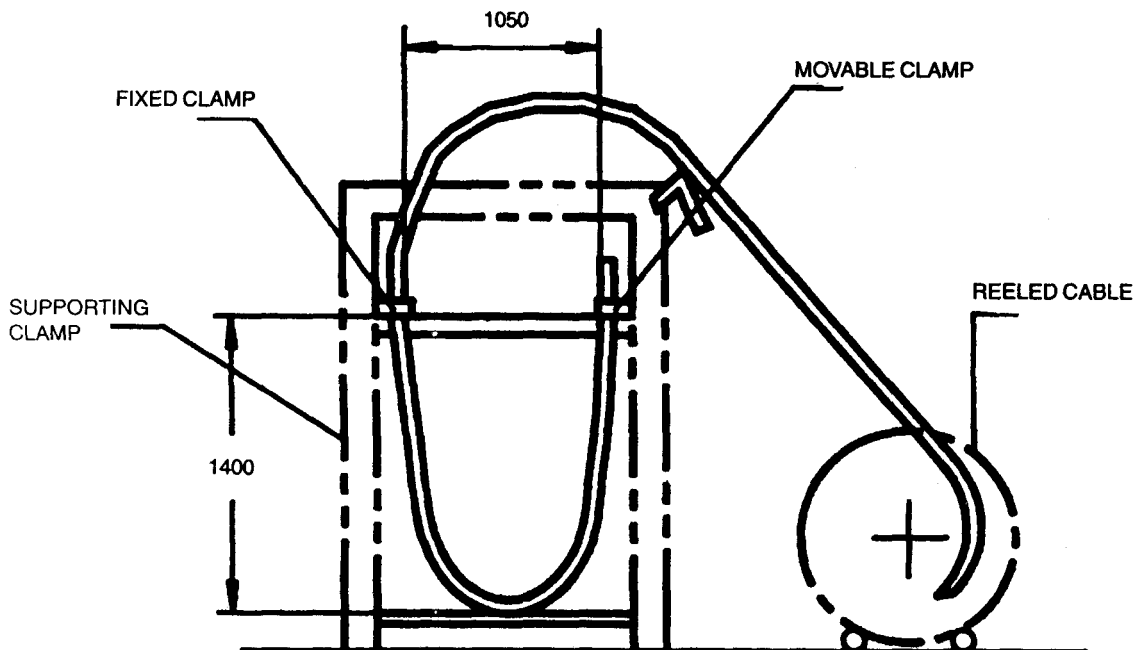


FIG. 1 STATIC FLEXIBILITY TEST ARRANGEMENT

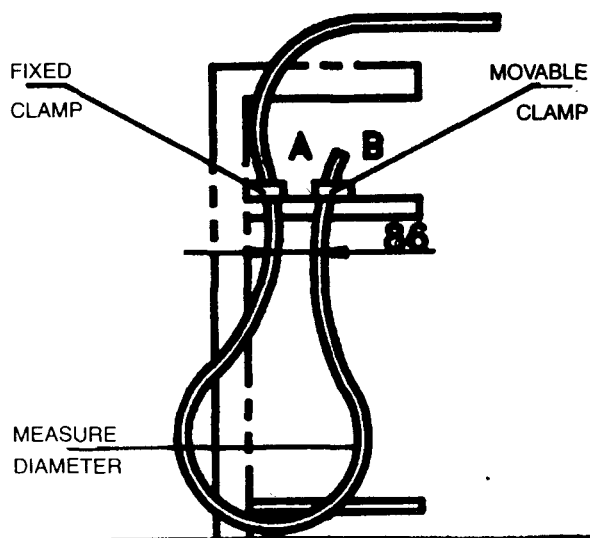


FIG. 2 RELOCATED POSITION

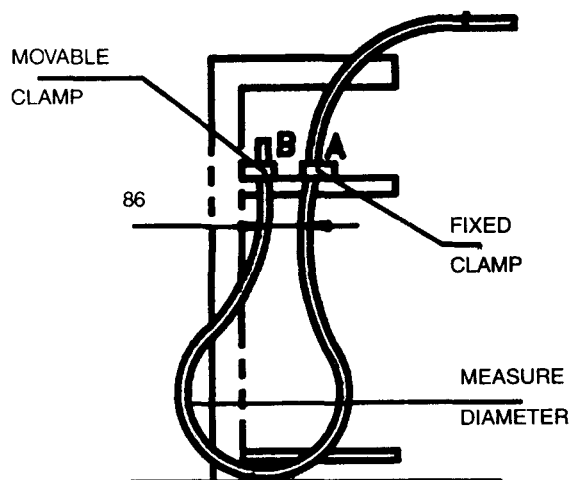


FIG. 3 RELOCATED POSITION WITH LOOP REVERSED

SECTION 5 IDENTIFICATION, PACKING AND MARKING

20 IDENTIFICATION

20.1 Manufacturer's Identification

The manufacturer shall be identified throughout the length of the cable by means of a tape bearing manufacturer's name or trade-mark or by manufacturer's name or trade-mark being printed, indented or embossed on the cable. In case none of these methods can be employed or if the purchaser so desires, colour identification thread(s) in accordance with a scheme to be approved by the Bureau of Indian Standards shall be employed. The indentation, printing or embossing shall be done only on the sheath. The distance between any two consecutive printings, indentations or embossings shall be not more than 1 m.

20.2 Cable Code

The following code shall be used for designating the cable:

Constituent	Cable Letter
PVC Insulation	Y
PVC Sheath	Y

NOTE — No code letter is required when the conductor material is copper.

21 PACKING AND MARKING

21.1 The cable shall be either wound on drums or supplied in coils/reels, packed and labelled.

21.2 The cable shall carry the following information either stenciled on the drum or contained in a label attached to drum or coil.

- Reference to this Indian Standard;
- Manufacturer's name, brand name or trade-mark;
- Type of cable and voltage grade;
- Number of cores;
- Nominal cross-sectional area or the conductor;
- Length of the cable on the drum, reel or coil;
- Number of lengths on the drum, reel or coil (if more than one);
- Direction of rotation of drum (by means of arrow);
- Approximate gross mass;
- Country of manufacture; and
- Year of manufacture.

21.3 The cable (reel, drum or label) may also be marked with the Standard Mark.

21.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

SECTION 6 TABLES

Table 1 Thickness of Sheath
(Clauses 17.1.1 and 17.1.2)

Number of Cores	Nominal Thickness of Sheath (t_s) mm
6	1.4
9	1.5
12	1.6
18	1.6
24	1.8
30	1.8

Table 2 High Voltage Test Requirements
(Clause 19.2)

Sl No.	Type of Test	Voltage kV	Duration of Immer- sion in Water h	Test Tem- perature °C	Duration of Voltage on Each Conductor min
(1)	(2)	(3)	(4)	(5)	(6)
i)	Type and acceptance test on finished cable and cores taken from finished cable	3	12	27±2	5
ii)	Routine test	3	—	Ambient	5

Table 3 Requirements for Flexibility Test
(Clause 19.3.1)

Sl No.	Number of Cores	Loop Diameter	
		Min m	Max m
i)	6	0.46	0.52
ii)	9 and 12	0.44	0.50
iii)	18 and above	0.40	0.47

ANNEX A

(Foreword)

RECOMMENDATIONS FOR THE INSTALLATION OF PVC INSULATED,
CIRCULAR, FLEXIBLE CABLES

A-1 It is necessary to uncoil and hang the cable in such a manner as to avoid twisting or kinking. It is desirable to hang the cable in the lift well, suspended from one end only, for a few days prior to final installation.

A-2 It is desirable to provide a facility on both car and well-cable anchorage to permit each cable to be rotated to counter accumulated twist. To maintain best performance it may be necessary to do so several times during the first few months of service, and the design of the clamping device should be such as to facilitate this without disturbing the cables or disconnecting them.

A-3 The characteristics of the cable (loop size, running performance and liability to twist) vary with the number of cores. For these reasons, all cables that are grouped together should be preferably of the same size. Very small cables tend to be less satisfactory, therefore, cables with 12 or more cores should be preferred.

A-4 Where ledges are present in the well behind the travelling cables, such as trimmer beams running from back to front of multiple lift wells, against or on to which the swinging cable of a descending car may fall, further precautions are necessary. A recommended method is to provide a continuous screen of adequate width extending from the well cable anchorage to the lowest projection.

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