IS 10810-37 (1984): Methods of Test for Cables, Part 37: Tensile Strength and Elongation at Break of Armouring Materials [ETD 9: Power Cables]

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*Indian Standard*

# METHODS OF TEST FOR CABLES

## PART 37 TENSILE STRENGTH AND ELONGATION AT BREAK OF ARMOURING MATERIALS

**1. Scope** — Covers method for determination of tensile strength and elongation at break of armouring materials for electric cables.

**Note** — This method applies to the armouring material, before their application in the cable as well as after taking them out from the finished cable. The armouring materials used for electric cables are in the form of tape, wire or strip.

**2. Significance** — During laying, cables are pulled from one end along trenches. In certain type of installations, cable in mine shaft, bridges, vertical runs, etc, the cables, by virtue of their supporting methods, are subjected to permanent tensile stress. It is therefore necessary to ensure that armouring material has adequate tensile strength and capacity to get elongated.

**3. Terminology** — As given in **3.1** to **3.4** of IS : 10810 ( Part 7 ) - 1984 ' Methods of test for Cables: Part 7 Tensile strength and elongation at break of thermoplastic and elastomeric insulation and sheath '.

**4. Apparatus**

**4.1** *Tensile Testing Machine* — The machine shall be automatic. It shall have the capacity to meet the requirements of this test and shall have rate of separation of jaws as specified in **8.1**.

**4.2** *Grips* — Shall be such as to hold the test specimen firmly.

**4.3** *Plain Micrometer* — Least count 0·01 mm.

**4.4** *Vernier Callipers* — Least count 0·01 mm.

**4.5** *Scale* — Least count 1 mm.

**4.6** *Weighing Balance* — Sensitivity 0·1 g.

**5. Material** — No material other than the test specimen is required for these tests.

**6. Test Specimen**

**6.1** *Wire and Strips* — The test specimen shall have the full cross-sectional area.

**6.2** *Steel Tape* — For tapes up to 50 mm width, the test specimen shall have the full cross-sectional area. For tapes of width more than 50 mm it shall be permissible to cut a longitudinal strip from the tape. The width of such a strip shall be not less than half the original width of the tape.

**6.3** *Length of the Specimen* — The gauge length of the test specimen shall be 250 mm. The total length of the specimen shall be not less than gauge length plus the length required for the full use of the grips. The gauge length shall be marked centrally on the length of the specimen by lightly stamping with a punch, scribed lightly with divider or marked with ink. Care shall be taken that gauge length marks do not become the points of fracture.

**7. Conditioning**

**7.1** For materials to be tested before their application in the cable, no conditioning is called for, except that the specimen should be straight.

**7.2** For materials taken out from the finished cable, specimen shall be made straight, if necessary by tapping with a wooden/rubber hammer. The test specimen shall be cleaned to remove extraneous coatings, if any. Care shall be taken that the specimen is not damaged.

**8. Procedure**

**8.1** The test specimen is fixed between the two jaws of the machine by means of grips. The load is applied gradually and uniformly to the test specimen until the fracture occurs. The rate of separation of jaws of the machine shall be not greater than 100 mm/minute. When the test specimen fractures, the breaking load is noted.

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**8.2** The elongation shall be measured on the gauge length after the fractured ends have been fitted together. The determination shall be valid irrespective of the position of the fracture, if the specified value is not reached. If the specified value is not reached, the determination shall be valid only if the fracture occurs between the gauge marks and not closer than 25 mm to either mark.

**9. Tabulation of Observation**

| *Sl No.* | *Material* | *Nominal Size* | *Measured Dimensions for Tape/Wire/Strip* | | | *Gauge Length* | | *Breaking Load* |
|---|---|---|---|---|---|---|---|---|
| | | | Dia-meter mm | Width mm | Thick-ness mm | Original mm | After Fracture mm | N |
| | | | | | | | | |

**10. Calculations**

**10.1** *Cross Sectional Area :*

a) *Of tape* ( $mm^2$ ) = width ( mm ) × thickness ( mm )

b) *Of wire* ( $mm^2$ ) = $\pi d^2$ ( where '*d*' is diameter, mm )

c) *Of galvanized steel strips* ( $mm^2$ ) = $\frac{1\,000 \times m}{S \times L}$

where

$m$ = mass of a given length of the strip ( g );

$S$ = specific gravity of the material of the strip g/$cm^3$ ( 7·86 for galvanized steel strips ); and

$L$ = Length of the strip ( mm ).

**10.2** *Tensile Strength, N/mm²* = $\frac{\text{Breaking load ( N )}}{\text{Cross sectional area ( mm}^2\text{ )}}$

**10.3** *Elongation at Break ( Percent )*

$$= \frac{\text{Gauge length after fracture} - \text{Original gauge length}}{\text{Original gauge length}} \times 100$$

**11. Report**

**11.1** *Reference specification* _____

Type and size of armouring material :

Date of testing :

| *Sl No.* | *Coil No.* | *Nominal Size* | *Tensile Strength* N/mm² | | *Elongation at Break*, percent | |
|---|---|---|---|---|---|---|
| | | | Obtained | Specified | Obtained | Specified |
| | | | | | | |

**11.2** *Conclusion* — Specimen meets/does not meet the requirements of the specification.



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