IS 10810-35 (1984): Methods of Test for Cables, Part 35: Determination of Tin in Lead Alloy for Sheathing [ETD 9: Power Cables]

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(Reaffirmed 2001)

Indian Standard

METHODS OF TEST FOR CABLES

PART 35 DETERMINATION OF TIN IN LEAD ALLOY FOR SHEATHING

Power Cables Sectional Committee, ETDC 59; Panel for Methods of Tests for Cables, ETDC 59/P1 [Ref : Doc : ETDC 59 (2240)]

1. Scope — Covers the method for the quantitative determination of tin in lead alloy for sheathing of electric cables.

2. Significance — The purpose of this test is to ascertain the correct composition of tin present in lead alloy.

3. Terminology — *See* IS : 1885 (Part 32) - 1971 ' Electrotechnical vocabulary : Part 32 Cables, conductors and accessories for electricity supply '.

4. Apparatus

4.1 *Conical Flask* — 500 ml capacity.

4.2 *An Assembly* — Consisting of a rubber stopper fitted with a delivery tube. The size of the stopper shall be such that it fits to the mouth of the conical flask tightly preventing entry of traces of air into the flask.

4.3 *Beakers* — 250 and 400 ml capacity.

4.4 *Cooling Vessels*

4.5 *Hot Plate*

4.6 *Bunsen Burner*

4.7 *Chemical Balance* — Least count 1 mg.

4.8 *Volumetric Flask* — Capacity 1 000 ml.

4.9 *Thermometer* — Range 200°C, least count 1°C.

5. Materials

5.1 *Concentrated Sulphuric Acid AR Grade* (specific gravity 1·84).

5.2 *Concentrated Hydrochloric Acid AR Grade* (specific gravity 1·18).

5.3 *Test Pieces of Lead, Nickel or Iron*

5.4 *Indicator Starch Solution* — Obtained by mixing thoroughly, 0·5 g approximately of soluble starch, making a paste with a small quantity of cold distilled water and adding this paste to 100 ml of boiling distilled water. The boiling is continued for a few minutes till it becomes clear and the solution is filtered while hot. This clear solution is used as an indicator.

5.5 *Standard Potassium Iodate Solution (0·1 N)* — Obtained by dissolving 3 567 g of dried potassium iodate (obtained by heating twice crystallized AR grade material at 180°C for one hour) in 200 ml of distilled water containing 1 g of sodium hydroxide and 10 g of AR grade potassium Iodide and then diluting this solution to 1 000 ml in a volumetric flask.

5.6 *Sodium Bi-carbonate Solution* — 10 percent.

5.7 *Ice*

6. Test Specimen

6.1 The lead alloy sheath shall be cut into small pieces but making very small pieces or powder shall be avoided.

6.2 *Quantum of Test Specimen* : 4 g

7. Conditioning — No conditioning is required for this test.

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

8. Procedure

8.1 Weigh accurately 4 g of the alloy sample in a chemical balance and transfer it carefully to a 500 ml conical flask, add 20 ml concentrated sulphuric acid, digest first on a strongly heated hot-plate and then under a strong flame till the walls of the flask are clear and inside is free of sulphur dioxide fumes. Remove the flask from the flame, cool to room temperature and add 150 ml distilled water followed by 60 ml concentrate hydrochloric acid. Add some pieces of test lead or iron or nickel (8 g approx) to the solution and fit the assembly tightly to the mouth of the flask.

8.2 Put the flask alongwith the assembly on a hot plate and dip the free end of the delivery tube in 150 ml (approx) of sodium bi-carbonate solution taken in a beaker. Heat the solution of the flask to boiling and continue for one hour. When boiling is over, dip the free end of the delivery tube in another beaker containing sufficient volume of Na H CO_3 solution (150 ml approx), remove the flask, along with assembly from the hot plate and allow to cool in air for 10 to 15 minutes. Then place the flask in an ice-filled tray and cool the contents to about 10°C. Constant watch should be kept to ensure that neither the top of the delivery tube is out of Na H CO_3 solution nor any leakage of air through the stopper during the whole process of cooling. When cooled, remove the stopper from the flask, add 0·5 g of solid Na H CO_3 to the solution inside and immediately titrate with potassium iodate solution adding 5 ml of starch solution, to just blue colour end point.

A blank should be done for correction of titre value.

9. Tabulation of Observation

Sample No.	*Titre Value of Sample, X* ml	*Titre Value of Blank, Y* ml

10. Calculation

$$T = X - Y$$

$$\text{Tin percent} = \frac{T \times 0{\cdot}005\,935 \times 100}{4}$$

11. Report

11.1 Reference specification _____

Sample No.	*Percentage Tin*	
	Observed	Specified

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

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