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BUREAU OF INDIAN STANDARDS

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Draft Indian Standard

THERMOMETER FOR MEASUREMENT OF SEA SURFACE TEMPERATURE — SPECIFICATION

(*First Revision*)

भारतीय मानक मसौदा

समुद्र की सतह का तापमान मापने के लिए थर्मोमीटर — विशिष्टि

(पहला पुनरीक्षण)

ICS 17.200.20

Glass, Glassware & Laboratoryware Sectional Committee, CHD 10

Last date for Comments: 19 February 2024

FOREWORD

(*Formal clause to be added later*)

The accurate measurement of sea surface temperature is of great importance for meteorology. The most common method of measuring the temperature of the sea surface is by the 'bucket method' in which a suitably designed bucket is lowered into the sea and a sample of sea water from the surface is collected; the temperature of the sample is measured as quickly as possible with a sea surface thermometer enclosed in a metal sheath.

This standard was originally published in 1972. And in this first revision, Kerosene oil as a thermometric liquid has been added. A sampling plan for lot testing has been prescribed and several editorial changes such as the inclusion of the Reference clause, Hindi Title, ICS no, BIS certification marking clause, etc. have also been incorporated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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THERMOMETER FOR MEASUREMENT OF SEA SURFACE TEMPERATURE — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard prescribes the requirements for thermometer for measuring the temperature of water at the surface layers of the sea.

2 REFERENCE

The standards given below contain provisions which through reference in this text, constitute provisions of and necessary adjuncts to this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

IS No.	*Title*
IS 2627 : 1979	Glossary of terms relating to liquid - In - Glass thermometers (*first revision*)
IS 4610 : 1968	Specification for glass tubes for general purpose and reference thermometers
IS 6274 : 1971	Method of calibrating liquid - In - Glass thermometers

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 2627 shall apply.

4 TYPE, CALIBRATION AND IMMERSION

4.1 Type

The thermometer shall be of the liquid-in-glass solid-stem type.

4.2 Calibration and Immersion

The thermometer shall be calibrated in degrees Celsius for vertical total immersion.

5 REQUIREMENTS

5.1 Materials

5.1.1 *Glass*

The stem and bulb tubing of the thermometer shall conform to IS 4610: 1968.

5.1.2 *Thermometric Liquid*

5.1.2.1 The thermometric liquid shall be entirely free from contamination particularly of solid particles or of any liquid which produces a variation of volume with time.

5.1.2.2 Recommended thermometric liquids and the approximate temperature ranges covered by them are given in table 1.

TABLE 1 TEMPERATURE RANGES FOR VARIOUS THERMOMETRIC LIQUIDS

(*Clause* 5.1.2.2)

Sl No.	Thermometric Liquid	Approximate Temperature Range, *°C*
(1)	(2)	(3)
i.	Mercury	–38 to +600
ii.	Mercury-thallium alloy [8.5 percent (m/m) of thallium]	–55 to +600
iii.	Alcohol	–80 to +50
iv.	Toluene (IS 537)	–90 to +50
v.	Technical pentane	–200 to +30
vi.	Kerosene Oil	–20 to +150

5.1.2.3 The organic liquid used as the liquid filling shall, wherever possible, be coloured by means of light-fast dye which does not stain the glass. Alcohol shall comply in all respects with the provisions of Special Grade of IS 321 subject to the following modifications:

a) *Aldehydes and ketones* — Alcohol shall not contain more than 0.02 percent (m/m) of aldehydes and ketones, calculated as acetaldehyde (CH_3CHO); and

b) *Amines* — Alcohol shall give no indication of the presence of amines when tested by adding to 10 ml of alcohol, 10 ml of distilled water followed by 2 drops of a saturated solution of *p*-nitrophenol in water. Not more than 0.05 ml (1 drop) of 0.1 N sulphuric acid shall be required to discharge any yellow colour produced.

5.2 Construction

5.2.1 The thermometer shall conform to the shape prescribed in Fig. 1. The stem shall be straight and the cross section of the capillary tube shall be such that the mercury thread is easily distinguishable.

5.2.2 No enlargement of bore shall be permissible in the graduated portion of the stem or within 10 mm from either end of the scale.

5.2.3 *Bulb*

The shape and finish of the bulb shall be such as not to entrap the thermometric liquid.

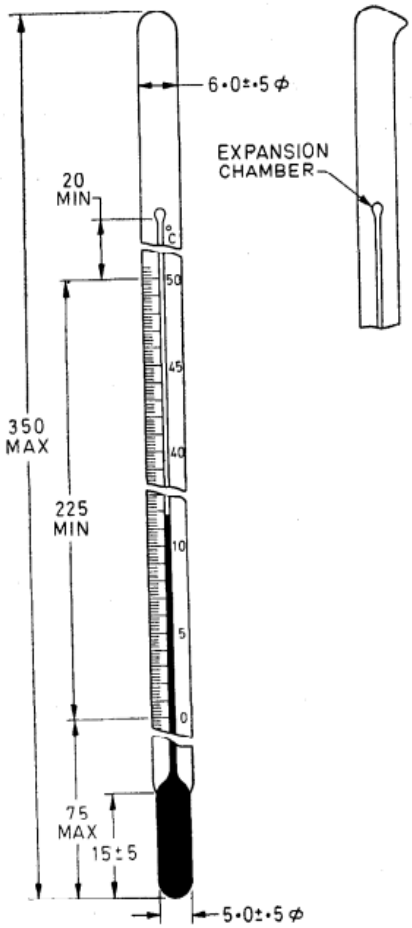
5.2.3.1 The bulb shall be cylindrical and in alignment with the stem.

5.2.4 *Top Finish*

The top of the thermometer stem shall be finished smooth and shall have a bent nib as shown in Fig. 1.

5.2.5 *Expansion Chamber*

The thermometer shall be so constructed as to withstand a temperature of 65 °C without damage. An elongated or pear-shaped expansion chamber with a hemispherical top and without reentrant shoulders shall be provided at the top end of the capillary in line with the capillary bore to enable the thermometer to withstand the above temperature.



All dimensions in millimetres.

FIG. 1 THERMOMETER FOR MEASUREMENT OF SEA SURFACE TEMPERATURE

6 DIMENSIONS

The dimensional and scale requirements of the thermometer shall be as given in Table 2 read with Fig. 1.

TABLE 2 DIMENSIONAL AND SCALE REQUIREMENTS OF THERMOMETER FOR MEASUREMENT OF SEA SURFACE TEMPERATURE

(*Clause* 6)

Sl. No.	**PARTICULARS**	**REQUIREMENTS**
(1)	(2)	(3)
i)	Nominal range	0 to 50 °C
ii)	Smallest scale division	0.2 °C
iii)	Overall length, *Max*	350 mm
iv)	Length of scale, *Min*	225 mm
v)	Length of the bulb	(15 ± 5) mm
vi)	External diameter of the bulb	(5.0 ± 0.5) mm
vii)	External diameter of the stem	(6.0 ± 0.5) mm

viii)	Distance of the 0 °C mark from the bottom of the bulb, *Max*	75 mm

7 GRADUATION AND FIGURING

7.1 The thermometer shall be suitably annealed before graduation.

7.2 The graduation lines shall be clearly engraved on the stem. They shall be of uniform thickness not exceeding 0.15 mm. They shall be filled with a pigment which shall not fade or chip off on wiping with a soft cloth after the thermometer has been dipped for 20 minutes in a 16 percent (*m/v*) solution of sodium chloride in water, maintained at (50 ± 2) °C.

7.3 The graduation lines shall be at right angles to the axis of the thermometer when the thermometer is viewed from the front in a vertical position. They shall all finish on an imaginary line parallel to the axis on the left hand side.

7.4 Every small division shall be shown by a line 2 mm long. Long graduation lines shall be 4 mm long.

7.4.1 The main scale shall extend on either side of the nominal range by at least 3 smallest scale divisions.

7.4.2 The small graduation lines shall not extend beyond the bore.

7.5 The graduation at 0 °C and subsequent marks in steps of 5 degrees of the scale shall be figured on the stem on the right hand side as shown in Fig. 1.

7.6 The figures shall be upright and placed in such a way that they are bisected by an extension of the line. Alternately, the figures shall be placed immediately above the extended line to which they refer.

8 ACCURACY

Every thermometer shall be accurate to within 1 smallest scale division of the scale.

9 MARKING AND PACKING

9.1 Packing

Each thermometer shall be-packed as agreed to between the purchaser and the supplier.

9.2 Marking

9.2.1 Each thermometer shall be legibly and permanently marked with the following information:

a) The letter ‘C’ near the top of the scale;
b) Maker’s name or recognized trade-mark, if any, at the back of the thermometer; and
c) Serial number and year of manufacture.

9.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

10 SAMPLING

10.1 Lot

10.1.1 All thermometers of the same type in a single consignment and produced under similar conditions of manufacture shall constitute a lot.

10.1.2 Thermometers constituting the sample shall be drawn from each lot separately for deciding the conformity of the lot to the requirements of the specification.

10.2 Scale of Sampling

Number of thermometers to be selected at random from the lot shall depend on the lot size and shall be in accordance with co1 3 of Table 3. In order to ensure randomness of selection, procedures given in IS 4905 may be followed.

TABLE 3 SCALE OF SAMPLING
(*Clause* 10.2, 10.3.2)

Sl No.	**No. of thermometers in the lot**	**Sample size**	**Rejection Number**
(1)	(2)	(3)	(4)
i.	Less than 150	20	1
ii.	151 to 280	32	2
iii.	281 to 500	50	3
iv.	501 to 1 200	80	5
v.	1 201 and above	125	7

10.3 Criteria for conformity

10.3.1 For deciding the conformity of the lot to the requirements of this specification, the test results of each characteristic shall meet the corresponding requirements specified in the relevant clauses.

10.3.2 The lot shall be declared as conforming to the requirements of the specification, if the number of defectives is equal or less than the number given in col 4 of Table 3.