

BUREAU OF INDIAN STANDARDS

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*Draft Indian Standard***THERMOMETER FOR WHIRLING PSYCHROMETERS
— SPECIFICATION***(First Revision)**भारतीय मानक मसौदा***व्हरलिंग साइकोमीटर के लिए थर्मोमीटर — विशिष्टि***(पहला पुनरीक्षण)*

ICS 17.200.20

Glass, Glassware & Laboratoryware Sectional Committee, CHD 10

Last date for Comments: 21 February 2024**FOREWORD***(Formal clause to be added later)*

The Psychrometer is the most common instrument for measuring atmospheric humidity. It consists essentially of two similar thermometers exposed side by side. One of these is an ordinary thermometer known as the 'dry-bulb' thermometer and the other (with its bulb covered by a single layer of muslin, moistened with water) is called the 'wet-bulb' thermometer. The temperature indicated by the wet-bulb thermometer is lower than that indicated by the dry-bulb thermometer because of the cooling caused by evaporation of water from the wet muslin. The relative humidity of air is calculated from the readings of the dry-and-wet bulb thermometers using appropriate psychrometric tables.

The psychrometers are either of the stationary screen type or of the portable ventilated type. In the whirling psychrometer (which belongs to the latter type) two similar thermometers are fitted side by side in a wooden frame and ventilation is provided by whirling the psychrometer rapidly by hand at the rate of about 3 to 4 rev/s to have an air speed of at least 4 m/s past the bulbs. This standard is intended for thermometers to be fitted in whirling psychrometers.

This standard was first published in 1971. 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.

Draft Indian Standard

**THERMOMETER FOR WHIRLING PSYCHROMETERS —
SPECIFICATION**

(First Revision)

1 SCOPE

This standard prescribes the requirements for thermometer for use in whirling psychrometers.

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.

<i>IS No.</i>	<i>Title</i>
IS 2627 : 1979	Glossary of terms relating to liquid - In - Glass thermometers (<i>first revision</i>)
IS 4529 : 1968	Specification for glass tubes for medical thermometers

3 TERMINOLOGY

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

4 TYPE

The thermometer shall be of the liquid-in-glass solid-stem type with enamel back. They shall be in pairs of similar thermometers.

5 REQUIREMENTS

5.1 Materials

5.1.1 Glass

The glass tubing used in the manufacture of thermometers shall conform to the requirements laid down in IS 4529.

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)

SI 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 (CH₃CHO); 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 Pattern

The thermometer shall conform to the shape prescribed in Fig. 1.

5.2.2 Stem

No enlargement of bore shall be permissible in the graduated portion of the stem or within 5 mm from either end of the scale.

5.2.2.1 A small notch about 3 mm above the top of the bulb shall be provided on the stem for tying the muslin securely round the bulb.

5.2.3 Bulb

5.2.3.1 The bulb shall be cylindrical and in alignment with the stem. The bulb glass shall be stabilized before calibration of the thermometers.

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

5.2.4 Top Finish

The top of the thermometer stem shall end in a button as shown in Fig. 1. It shall have dimensions specified in the figure.

7.2 The graduation lines shall be clearly engraved on the stem at each half degree Celsius and shall be of uniform thickness not exceeding 0.15 mm. They shall be filled with black pigment.

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 start from an imaginary line parallel to the axis on the left hand side

7.4 The numerals —10, 0, 10, 20, 30, 40 and 50 shall be etched on the stem on the right hand side as shown in Fig 1.

7.5 The figures shall be placed in such a way that they are bisected by an extension of the line to which they refer; alternately, they shall be placed immediately above the extended line.

8 ACCURACY

8.1 Scale Error

The maximum permissible scale error at any point below 0 °C shall be within $\begin{matrix} -0.3 \\ +0.2 \end{matrix}$ °C and above 0 °C within $\begin{matrix} -0.2 \\ +0.1 \end{matrix}$ °C

8.2 Interval Error

The maximum change of error between two points separated by an interval of 17 °C on the stem shall not exceed 0.3 °C below 0 °C and 0.2 °C above 0 °C.

9 MARKING AND PACKING

9.1 Packing

Each thermometer shall be wrapped in a piece of thin tissue paper and packed in a circular cardboard case approximately 13 mm in diameter, alternately, they shall be suitably packed as agreed to between the purchaser and the supplier.

9.2 Marking

9.2.1 Each thermometer shall be marked legibly 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 col 3 of Table 2. In order to ensure randomness of selection, procedures given in IS 4905 may be followed.

TABLE 2 SCALE OF SAMPLING

(Clause 10.2, 10.3.2)

SI 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 2.