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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 656

SHORT ENCLOSED-SCALE THERMOMETERS FOR PRECISION USE

1st EDITION

February 1968

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BRIEF HISTORY

The ISO Recommendation R 656, *Short enclosed-scale thermometers for precision use*, was drawn up by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question by the Technical Committee began in 1954 and led, in 1959, to the adoption of a Draft ISO Recommendation.

In October 1963, this Draft ISO Recommendation (No. 674) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Argentina	Hungary	Poland
Australia	India	Spain
Austria	Israel	Switzerland
Belgium	Italy	U.A.R.
Chile	Japan	United Kingdom
Czechoslovakia	Korea, Rep. of	U.S.S.R.
France	Netherlands	Yugoslavia
Greece	New Zealand	

Two Member Bodies opposed the approval of the Draft:

Germany
U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1968, to accept it as an ISO RECOMMENDATION.

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ISO Recommendation R 656 February 1968

SHORT ENCLOSED-SCALE THERMOMETERS FOR PRECISION USE

INTRODUCTION

This ISO Recommendation is based on ISO Recommendation R 386, *Principles of construction and adjustment of liquid-in-glass laboratory thermometers.* It is one of four ISO Recommendations specifying requirements for basic series of long and short solid-stem and enclosed-scale thermometers, intended for general use for precision work.

For ease of reference, each thermometer of the series has been allocated a combination of letters and figures indicating the type of thermometer, the value of the smallest graduation interval and the upper and lower limits of the nominal scale range. The letter abbreviations given below have been selected, after taking into account the descriptions in various languages usually given to these types of thermometer:

STL . . . . . Long solid-stem thermometers,
STC . . . . . Short solid-stem thermometers,
EL . . . . . Long enclosed-scale thermometers,
EC . . . . . Short enclosed-scale thermometers.

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1. SCOPE

This ISO Recommendation specifies requirements for a basic series of short enclosed-scale thermometers, not exceeding 250 mm in length, for general use in precision work.

NOTE. — There are in existence many different specifications for thermometers of the general types covered by this series. It is intended that this series should replace all such specifications except those for which there is a well-established justification.

2. TYPE OF THERMOMETER

The thermometer should be of the liquid-in-glass enclosed-scale type.

3. TEMPERATURE SCALE

The temperature scale to which the thermometers refer is the International Practical Scale of Temperature, adopted by the Conférence Générale des Poids et Mesures in 1960 as the revised edition of the International Temperature Scale of 1948.

4. IMMERSION

The thermometers should be adjusted for use at total immersion (i.e., the reading should be correct when the thermometer is immersed at least to the end of the liquid column in the medium whose temperature is required to be measured).

NOTE. — If thermometers divided to 0.1 or 0.2 degree Celsius are required to read correctly when the complete thermometer is immersed in the medium, this should be stated in the purchasing contract and the thermometer should be specially marked.

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5. GLASS

The glass should be selected so that the finished thermometer shows the following characteristics:

5.1 Strain in the glass should be reduced to a level sufficient to minimize the possibility of fracture due to thermal or mechanical shock.

5.2 The bulb glass should be stabilized by suitable heat treatment to ensure that the accuracy requirements of section 10 can be met.

5.3 The errors in the finished thermometer resulting from the thermometric properties of the glass used for the bulb should be within the limits specified in section 10.

NOTE. — The maximum temperature up to which a glass may be used depends on the degree of stability required and is related to the viscosity of glass at the temperature concerned.

5.4 The accuracy of the reading should not be impaired by devitrifying or clouding during manufacture.

5.5 The meniscus should be distorted as little as possible by defects or impurities in the glass.

6. LIQUID FILLING

Mercury should be used as liquid filling, except for thermometers with a scale extending below −38 °C. For temperatures down to −55 °C, the eutectic alloy of mercury and thallium (8.5 % thallium by mass) should be used.

7. GAS FILLING

Only a dry, inert gas may be used as gas filling. It is essential that thermometers intended for use above 100 °C should be gas-filled. The pressure of the gas should be high enough to raise the boiling point of the mercury sufficiently to ensure that reliable readings are obtained over the complete thermometer scale.

8. CONSTRUCTION

8.1 Shape

The thermometers should be straight and their external cross-section approximately circular.

8.2 Top finish

The top of the thermometer should be finished with a spherical end separated by a constricted neck, or with a glass ring.

8.3 Strip bearing the scale

The strip bearing the scale should be of translucent material suitable for the temperature to be measured. It should be placed tightly against the capillary tube inside the sheath, in such a way that it can freely expand in length; a suitable method of fixing is by fusing a glass tube to the sheath and to the upper end of the strip bearing the scale.

8.4 Capillary tube

The inside of the capillary tube should be smooth. The cross-sectional area of the bore should not show variations from the average greater than 10 %, and the bore should be wide enough to ensure that jumping of the meniscus does not exceed one-fifth of the graduation interval.

8.5 Expansion chamber (safety chamber)

A thermometer should not be heated above its top normal working temperature. To avoid serious results from momentary accidental overheating, a safety volume should be provided

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