

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 387

PRINCIPLES OF CONSTRUCTION AND ADJUSTMENT OF HYDROMETERS

1st EDITION

September 1964

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Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 387, *Principles of Construction and Adjustment of Hydrometers*, 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 1951 and led, in 1960, to the adoption of a Draft ISO Recommendation.

In April 1960, this Draft ISO Recommendation (No. 350) 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 :

Australia	Germany	Romania
Austria	Greece	Spain
Belgium	India	Sweden
Canada	Israel	United Kingdom
Chile	Netherlands	U.S.A.
Colombia	New Zealand	U.S.S.R.
Czechoslovakia	Poland	

Two Member Bodies opposed the approval of the Draft :

France
Japan.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in September 1964, to accept it as an ISO RECOMMENDATION.

PRINCIPLES OF CONSTRUCTION AND ADJUSTMENT OF HYDROMETERS

1. SCOPE

This ISO Recommendation is intended to provide guidance for drawing up specifications for glass hydrometers of constant mass.

2. BASIS OF SCALE

- 2.1** The scale should indicate density (mass per unit volume) in grammes per cubic centimetre (g/cm^3), for which the symbol g/ml may be used.

NOTES

1. The millilitre (ml) is commonly used as a special name for the cubic centimetre (cm^3); it is acceptable, in general, for reference to volumetric glassware in ISO Recommendations and, in particular, the abbreviation g/ml may be used for describing density hydrometers.
However, for articles of high accuracy,* only the cubic centimetre (cm^3) should be used, in accordance with the decision of the Twelfth Conférence Générale des Poids et Mesures.
 2. The advantages of using density as the basis of hydrometer scales are explained in Appendix Z.
- 2.2** The use of a scale other than one based on density is not recommended but, in view of its importance in trade between various countries, the scale based on relative density** with reference to water is permitted:

$\frac{\text{density of liquid at a specified temperature}}{\text{density of water at a specified temperature}}$

density of water at a specified temperature

3. REFERENCE TEMPERATURE

- 3.1** The standard reference temperature for density hydrometers should be 20°C .

NOTE. — In special circumstances, either the temperature of 15°C or the temperature of 27°C may be substituted for 20°C . When it is necessary in tropical countries to work at an ambient temperature considerably above 20°C , and these countries do not wish to use the standard reference temperature of 20°C , it is recommended that they should adopt a temperature of 27°C .

- 3.2** Where the relative density scale is used, the reference temperature should be exclusively 15.56°C (60°F)

4. SURFACE TENSION

The adjustment should be related to specific capillary conditions as follows:

- 4.1** When the hydrometer is slightly displaced from its equilibrium position in a liquid, the stem should pass through the liquid surface without causing any apparent alteration in the shape of the meniscus.
- 4.2** The hydrometer should be adjusted with regard to surface tension. Except where the highest precision is required, one of the standard categories of surface tension given in Annex A should be used.

For hydrometers of the highest precision, intended for use in particular liquids (e.g. alcohol solutions), the surface tension values appropriate to clean surfaces of these liquids and to the actual indications of the hydrometer should be used (see clause 10 (c) (iii)).

* That is, a precision approximately equal to or better than 1 part in 36000 (which corresponds to the difference between the cubic centimetre and the millilitre as formerly defined).

** The expression "relative density" complies with ISO Recommendation R 31, Part III, *Quantities and Units of Mechanics*. The expression "specific gravity" is often used in English instead of "relative density", when the reference substance is water.