

---

**INTERNATIONAL STANDARD**



**387**

---

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

---

## **Hydrometers — Principles of construction and adjustment**

*Aréomètres — Principes de construction et d'étalonnage*

**First edition — 1977-09-01**

Corrected and reprinted —

## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject on which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 387 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, and was circulated to the member bodies in May 1976.

It has been approved by the member bodies of the following countries :

Australia	India	Romania
Austria	Ireland	South Africa, Rep. of
Belgium	Israel	Spain
Canada	Italy	Turkey
Chile	Korea, Rep. of	United Kingdom
Czechoslovakia	Mexico	U.S.A.
France	Netherlands	U.S.S.R.
Germany	Philippines	
Hungary	Poland	

No member body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 387-1964, of which it constitutes a technical revision.

# Hydrometers – Principles of construction and adjustment

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard sets out principles for the construction and adjustment of glass hydrometers of constant mass which do not incorporate a thermometer.

The corresponding International Standard for glass hydrometers with an incorporated thermometer is ISO . . .<sup>1)</sup>

## 2 REFERENCE

ISO 1768, *Glass hydrometers – Conventional value for the thermal cubic expansion coefficient (for use in the preparation of measurement tables for liquids)*.

## 3 BASIS OF SCALE

**3.1** The scale shall indicate density (mass per unit volume in kilograms per cubic metre (kg/m<sup>3</sup>). The gram per cubic centimetre (g/cm<sup>3</sup>) is an acceptable sub-multiple of the SI unit<sup>2)</sup>.

NOTE – The advantages of using density as the basis of hydrometer scales are explained in annex B.

**3.2** 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.

$$\text{relative density} = \frac{\rho_1}{\rho_2}$$

where

$\rho_1$  is the density of a liquid at a specified temperature  $t_1$ ;

$\rho_2$  is the density of water at a specified temperature  $t_2$ .

## 4 REFERENCE TEMPERATURE

**4.1** The standard reference temperature for density hydrometers shall be 20 °C.

NOTE – In special circumstances, either 15 °C or 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 27 °C.

**4.2** Where the relative density scale is used, the reference temperature for the purposes of this International Standard shall be 60 °F (15,56 °C) for both  $t_1$  and  $t_2$ , as defined in 3.2.

## 5 SURFACE TENSION

The hydrometer shall 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 shall be used.

For hydrometers of the highest precision, intended for use in particular liquids (for example alcohol solutions), the surface tension values appropriate to clean surfaces of these liquids and to the actual indications of the hydrometer shall be used [see 11 c) 3)].

## 6 REFERENCE LEVELS FOR ADJUSTMENT AND READING

**6.1** Hydrometers intended for use in translucent liquids shall be adjusted for readings taken at the level of the horizontal liquid surface. If a hydrometer so adjusted is used in an opaque liquid, readings may be taken at the top of the meniscus where it appears to meet the stem, but appropriate correction to the level of the horizontal liquid surface shall then be made.

To avoid the necessity for making such corrections, hydrometers intended for use in opaque liquids may alternatively be adjusted for readings taken at the top of the meniscus where it appears to meet the stem. If a hydrometer is so adjusted, this shall be clearly indicated on the scale [see 11 d)].

**6.2** The middle of the thickness of a scale line shall be taken as its definitive position.

1) In preparation.

2) The alternative g/ml is permitted.