

Australian Standard<sup>®</sup>

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**THERMOMETERS—SOLID STEM—  
LONG AND SHORT—  
FOR PRECISION USE**

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The preparation of this Australian standard was commenced by Committee CH/1, Laboratory Glassware and Related Apparatus and completed by Committee CH/30, Temperature Measurement. It was approved on behalf of the Council of the Standards Association of Australia on 30 September 1985 and published on 2 December 1985.

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## PREFACE

This standard was initially prepared by the Association's Committee on Laboratory Glassware and Related Apparatus and finalized by the new committee on Temperature Measurement. It replaces AS R33—1969, Short Solid-stem Thermometers for Precision Use and AS R34—1969, Long Solid-stem Thermometers for Precision Use.

It is one of a series of revisions being undertaken of standards for thermometers and was originally based on ISO Recommendations R653, Long Solid-stem Thermometers for Precision Use and R654, Short Solid-stem Thermometers for Precision Use. It is part of the drafting committee's intention that thermometers which meet the specification of this standard (with due regard for the assessment procedure outlined in Appendix E) would be eligible for carrying the Standards mark.

This standard integrates the current Australian standards for short solid-stem thermometers and long solid-stem thermometers, into a single standard, fulfilling the motion made at the November 1982 meeting of Committee CH/1, that those two standards had so many common properties that only one standard was justified.

This form of standard resulted mainly from consideration of the comments received on the Public Comment draft. Major changes include a simple test procedure for assessing the permanence of pigmented fillers used to highlight thermometer markings and consideration of the ongoing effects of secular change on thermometer accuracy.

Enquiries relating to facilities for the calibration testing of thermometers for compliance with the standard should be directed to the National Measurement Laboratories CSIRO, to the National Association of Testing Authorities (NATA), or to a laboratory appropriately registered by NATA for that purpose.

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## STANDARDS ASSOCIATION OF AUSTRALIA

**Australian Standard**  
for  
**THERMOMETERS—SOLID STEM—LONG AND SHORT—FOR PRECISION USE**

**1 SCOPE.** This standard specifies requirements for long solid-stem thermometers not exceeding 375 mm in length, and short solid-stem thermometers not exceeding 250 mm in length, intended for general use in precision temperature measurement. Nominal temperature ranges covered by these thermometers are from  $-55^{\circ}\text{C}$  to  $420^{\circ}\text{C}$  for long thermometers and from  $-55^{\circ}\text{C}$  to  $410^{\circ}\text{C}$  for short thermometers.

**2 REFERENCED DOCUMENTS.** The following documents are referred to in this standard:

AS 1199	Sampling Procedures and Tables for Inspection by Attributes
AS 1399	Guide to AS 1199, Sampling Procedures and Tables for Inspection by Attributes
AS 1821-23	Suppliers Quality Control Systems, Levels 1, 2 and 3
AS 2000	Guide to AS 1821-23, Suppliers Quality Control Systems
AS 2243	Safety in Laboratories Part 1—General Part 2—Chemical
AS 2508	Safe Storage and Handling Information Cards for Hazardous Materials
	2508.3.001 Acetone
	2508.3.009 Hydrocarbon Solvents
	2508.3.015 Toluene
	2508.3.017 Ethanol/Methylated Spirits
	2508.8.002 Hydrochloric Acid
	2508.8.004 Acetic Acid
	2508.8.006 Sodium Hydroxide
	2508.8.007 Nitric Acid
	2508.8.014 Mercury Metal

National Measurement Laboratory Technical Paper, 'Techniques used at NML for Calibration of Liquid-in-Glass Thermometers' By M Beavis, CSIRO, Australia, 1981.

National Measurement Laboratory Technical Paper, 'The Melting Point of Ice as a Reference Temperature for Mercury-in-Glass Thermometers, Thermocouples and Platinum Resistance Thermometers' by M Beavis, CSIRO, Australia, 1981.

Weights and Measures (National Standards) Regulations, Weights and Measures (National Standards) Act, 1960-1966.

**3 DEFINITIONS.** For the purpose of this standard, the following definitions apply:

**3.1 Complete immersion**—the condition when the entire thermometer is immersed in the medium whose temperature is being measured.

**3.2 Permanent markings**—thermometer markings which endure for the useful life of the thermometer in routine applications such as immersion in water,

acids, salt solutions, solvents and oils at ambient and elevated temperatures, as well as immersion in molten salt baths. Such markings may be applied by any suitable process, providing that specified parameters, e.g. stem diameter, and freedom from stress, remain within the limits prescribed by this standard.

**NOTES:**

1. Although markings defined here are intended to include both the glass-etched type as well as the pigmented type, the method of test set out in Appendix C is most unlikely to be meaningful in relation to the first type of marking as this would require dissolution of the glass surface. However, it is considered to be a minimal requirement that the second type of marking does not show deterioration when exposed to that test. See also Note to Clause 9.1.
2. Markings should not be applied by any process which causes localized weakening of the glass and promotes ready fracturing and/or breakage by mechanical or thermal strain. Engraving is particularly advised against.

**3.3 Secular change**—a decrease in the volume of the bulb of a glass thermometer and the consequent gradual rise in the scale reading with time due to the continuing release of strains induced during the working of the glass at the time of manufacture of the thermometer. The rate of change is relatively rapid in the first year or two after manufacture and gradually decreases thereafter.

**3.4 Stiction**—the tendency of the meniscus of liquid filling to stick in the capillary bore of a thermometer when experiencing a temperature change, particularly cooling. This property is most apparent in thermometers which have a fine bore.

**3.5 Thermometer**—an instrument for determining the temperature of a fluid.

NOTE: Temperatures are measured in terms of the Commonwealth legal units of measurement of temperature which in this case are Celsius degrees as defined in the Weights and Measures (National Standards) Regulations.

**3.6 Total immersion**—the condition when a thermometer is immersed in the medium whose temperature is being measured, so that the top of the liquid column of the thermometer is in the same plane as, or no more than two scale divisions above, the surface of the medium.

**4 THERMOMETER TYPE.** Thermometers shall be of the liquid-in-glass type with an enamel back (see Fig. 1).

**5 SCALE AND DESIGNATION.**

**5.1 General.** The scale shall be graduated in degrees Celsius as defined in the Weights and Measures (National Standards) Regulations.

**5.2 Auxiliary scale.** Where the range of the main scale of the thermometer does not include the zero point ( $0^{\circ}\text{C}$ ), an auxiliary scale shall be provided in accordance with column 4 of Table 1(a) or 1(b), as appropriate.