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RESISTANCE THERMOMETERS AND THEIR ELEMENTS (PLATINUM, COPPER, NICKEL)

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

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THE FOLLOWING INDUSTRIAL, SCIENTIFIC AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Medical Association

Bureau of Meteorology

Chambers of Commerce, N.S.W. and Vic.

Chief Secretary's Department, Vic.

Commonwealth Serum Laboratories

Confederation of Australian Industry

Department of Agriculture, N.S.W.

Department of Science and Technology

Government Chemical Laboratories, W.A.

National Measurement Laboratory

National Standards Commission

Railways of Australia Committee

Royal Australian Chemical Institute

University of Sydney

Victorian State Laboratories

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AUSTRALIAN STANDARD

RESISTANCE THERMOMETERS AND THEIR ELEMENTS (PLATINUM, COPPER, NICKEL)

AS 2091—1981

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PREFACE

This standard was prepared by the Association's Committee on Laboratory Glassware and Related Apparatus under the direction of the Chemical Standards Board following a recommendation from the subcommittee on thermometers that such a project be undertaken.

The standard is one of a series of standards for thermometers, others being—

AS 1006	Solid Stem General Purpose Thermometers
AS 1030	Dial-type General Purpose Thermometers for Use in the Dairying Industry
AS 1031	Metal-cased Mercury-in-glass Thermometers for Use in the Dairying Industry
AS 1286	Right-angled Earth Thermometers
AS 2190	Clinical Maximum Thermometers
AS R13	Maximum, Minimum and Ordinary Meteorological Thermometers
AS R33	Short Solid-stem Thermometers for Precision Use
AS R34	Long Solid-stem Thermometers for Precision Use

In preparing this standard the responsible committee took cognizance of the requirements specified in—

BS 1904	Industrial Platinum Resistance Thermometer Elements
OIML*	Recommendation Electrical Resistance Thermometers (Platinum, Copper, Nickel)

and acknowledgement is made of the assistance obtained therefrom.

Attention is drawn to BS 1041, Code for Temperature Measurement, Part 3—Industrial Resistance Thermometry, which sets out the principles and methods of resistance thermometry, constructional features, installation procedures and measuring circuitry.

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*International Organization of Legal Metrology.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
RESISTANCE THERMOMETERS AND THEIR ELEMENTS (PLATINUM, COPPER, NICKEL)

SECTION 1. SCOPE AND GENERAL REQUIREMENTS

1.1 SCOPE. This standard specifies requirements for platinum, copper and nickel resistance thermometers and requirements for their temperature-sensitive elements when energized by direct current or alternating current at frequencies up to limits imposed by the dielectric properties of the insulation used. The frequency would normally be less than 1000 Hz.

NOTES:

1. Thermometers manufactured in accordance with the recommendations of the International Practical Temperature Scale are not included.
2. Specifications for the electrical instruments needed for the measurement of the resistance or change in resistance of these thermometers are not included.

1.2 APPLICATION. This standard applies to resistance thermometers in terms of—

Section 2—Design considerations

Section 3—Performance requirements.

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

1.3.1 Thermometer—a device for ascertaining the temperature of the substance presented to it.

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, in force under the Weights and Measures (National Standards) Act 1960-1966.

1.3.2 Resistance thermometer—a device, containing one or more electrical resistors, which change resistance with temperature and having two, three or four leads for connection to an electrical instrument measuring resistance or change in resistance.

1.3.3 Resistance at any temperature—the resistance measured at any temperature, t° C, denoted by the symbol R_t.

1.3.4 Resistance ratio—the ratio of the resistance at any temperature, t° C, to that at 0° C (expressed as R_t/R_0).

1.3.5 Sealed thermometer—a thermometer supplied by a manufacturer, the stem of which is suitable for use without further protection.

1.3.6 Element—that part of the thermometer which responds to the temperature of the substance presented to it.

1.3.7 Calibration immersion depth—the minimum immersion depth within the medium at which the element of the thermometer complies with the appropriate specification contained within this standard.

1.3.8 $|t|$—the value of the temperature without regard to sign.

1.3.9 Thermal response time—the time taken for the element to attain a temperature which is 63 percent of the final temperature change.

1.4 TEMPERATURE RANGE

NOTE: Ranges other than those specified in Clauses 1.4.1 to 1.4.3 may be specified by the manufacturer. For platinum thermometers temperatures up to 850° C can be measured but it should be emphasized that temperatures above 660° C can only be measured reliably with specialized techniques.

1.4.1 Platinum Resistance Thermometers and Elements. Platinum resistance thermometers and/or elements shall be suitable for measuring temperatures within the overall range − 200° C to + 660° C.

1.4.2 Copper Resistance Thermometers and Elements. Copper resistance thermometers and/or elements shall be suitable for measuring temperatures within the overall range 0° C to + 180° C.

1.4.3 Nickel Resistance Thermometers and Elements. Nickel resistance thermometers and/or elements shall be suitable for measuring temperatures within the overall range 0° C to + 180° C.

1.5 CLASSIFICATION. Electrical resistance thermometer elements shall be classified according to their accuracy as follows, elements designated Category I being of the highest order of accuracy:

(a) Platinum resistance thermometer element—Category I and Category II.

(b) Copper resistance thermometer element—Category II and Category III.

(c) Nickel resistance thermometer element—Category III.

1.6 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER. Each thermometer shall be accompanied by the following information:

(a) The nominal resistance at 0° C and the nominal α value (see Section 2).

(b) The maximum working temperature.

(c) The designation of the class of accuracy (i.e. the category of the thermometer).

(d) Identification of the lead wires.

(e) The capacitance to earth, inductance, and maximum frequency of excitation at each of—

(i) a temperature not exceeding ambient temperature;

(ii) the stated maximum temperature usable with a.c. excitation.