Australian Standard®

QUANTITIES, UNITS, AND SYMBOLS

Part 0—GENERAL PRINCIPLES CONCERNING QUANTITIES, UNITS AND SYMBOLS

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The following interests are represented on Committee MS/10:

Australian Institute of Physics
Bureau of Steel Manufacturers of Australia
CSIRO, Division of Applied Physics
Department of Defence
Department of Science
Electricity Commission of New South Wales
Monash University
National Association of Testing Authorities Australia
National Standards Commission
University of New South Wales
University of Sydney

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PREFACE

This standard was prepared by the Association's Committee on Quantities, Units and Conversions. It is identical with and has been reproduced from International Standard ISO 31/0, General Principles Concerning Quantities, Units and Symbols.

This standard is one of a series of 14 standards on quantities, units and symbols, and, where appropriate, conversion factors. The other standards in the series are as follows:

AS 2900.1 Quantities, Units and Symbols, Part 1—Quantities and Units of Space and Time

AS 2900.2 Quantities, Units and Symbols, Part 2—Quantities and Units of Periodic and Related Phenomena

AS 2900.3 Quantities, Units and Symbols, Part 3—Quantities and Units of Mechanics

AS 2900.4 Quantities, Units and Symbols, Part 4—Quantities and Units of Heat

AS 2900.5 Quantities, Units and Symbols, Part 5—Quantities and Units of Electricity and Magnetism

AS 2900.6 Quantities, Units and Symbols, Part 6—Quantities and Units of Light and Related Electromagnetic Radiations

AS 2900.7 Quantities, Units and Symbols, Part 7—Quantities and Units of Acoustics

AS 2900.8 Quantities, Units and Symbols, Part 8—Quantities and Units of Physical Chemistry and Molecular Physics

AS 2900.9 Quantities, Units and Symbols, Part 9—Quantities and Units of Atomic and Nuclear Physics

AS 2900.10 Quantities, Units and Symbols, Part 10—Quantities and Units of Nuclear Reactions and Ionizing Radiations

AS 2900.11 Quantities, Units and Symbols, Part 11—Mathematical Signs and Symbols for Use in the Physical Sciences and Technology

AS 2900.12 Quantities, Units and Symbols, Part 12—Dimensionless Parameters

AS 2900.13 Quantities, Units and Symbols, Part 13—Quantities and Units of Solid State Physics

For the purpose of this Australian standard, the text of the ISO standard used herein should be modified as follows:

(a) *Decimal sign:* A dot on the line should replace the comma wherever it appears as a decimal sign.

(b) *Cross-references:* The references to International Standards should be replaced by references to Australian Standards as follows:

Reference to International Standard	*Appropriate Australian Standard*
ISO 31, Part 0: General principles concerning quantities, units and symbols.	AS 2900.0—Quantities, Units and Symbols, Part 0—General Principles Concerning Quantities, Units and Symbols
ISO 31, Part 1: Quantities and units of space and time.	AS 2900.1—Quantities, Units and Symbols, Part 1—Quantities and Units of Space and Time
ISO 31, Part 2: Quantities and units of periodic and related phenomena.	AS 2900.2—Quantities, Units and Symbols, Part 2—Quantities and Units of Periodic and Related Phenomena
ISO 31, Part 3: Quantities and units of mechanics.	AS 2900.3—Quantities, Units and Symbols, Part 3—Quantities and Units of Mechanics
ISO 31, Part 4: Quantities and units of heat.	AS 2900.4—Quantities, Units and Symbols, Part 4—Quantities and Units of Heat
ISO 31, Part 5: quantities and units of electricity and magnetism.	AS 2900.5—Quantities, Units and Symbols, Part 5—Quantities and Units of Electricity and Magnetism

ISO 31, Part 6: Quantities and units of light and related electro-magnetic radiations.	AS 2900.6—Quantities, Units and Symbols, Part 6—Quantities and Units of Light and Related Electro-magnetic Radiations
ISO 31, Part 7: Quantities and units of acoustics.	AS 2900.7—Quantities, Units and Symbols, Part 7—Quantities and Units of Acoustics
ISO 31, Part 8: Quantities and units of physical chemistry and molecular physics.	AS 2900.8—Quantities, Units and Symbols, Part 8—Quantities and Units of Physical Chemistry and Molecular Physics
ISO 31, Part 9: Quantities and units of atomic and nuclear physics.	AS 2900.9—Quantities, Units and Symbols, Part 9—Quantities and Units of Atomic and Nuclear Physics
ISO 31, Part 10: Quantities and units of nuclear reactions and ionizing radiations.	AS 2900.10—Quantities, Units and Symbols, Part 10—Quantities and Units of Nuclear Reactions and Ionizing Radiations
ISO 31, Part 11: Mathematical signs and symbols for use in physical sciences and technology.	AS 2900.11—Quantities, Units and Symbols, Part 11—Mathematical Signs and Symbols for Use in the Physical Sciences and Technology
ISO 31, Part 12: Dimensionless parameters.	AS 2900.12—Quantities, Units and Symbols, Part 12—Dimensionless Parameters
ISO 31, Part 13: Quantities and units of solid state physics.	AS 2900.13—Quantities, Units and Symbols, Part 13—Quantities and Units of Solid State Physics
ISO 1000, The International System of Units (SI) and Its Application.	AS 1000—The International System of Units (SI) and Its Application.

Annex B of this standard deals briefly with the rounding of numbers, This subject is covered in greater depth in AS 2706, Numerical Values—Rounding and Interpretation of Limiting Values.

Contents

General principles concerning quantities, units and symbols

0 Introduction

The scope of Technical Committee ISO/TC 12, *Quantities, units, symbols, conversion factors and conversion tables*, is standardization of units and symbols for quantities and units (and mathematical symbols) used within the different fields of science and technology, giving, where necessary, definitions of these quantities and units. In fulfilment of this responsibility, ISO/TC 12 has prepared ISO 31, which contains the following parts:

Part 0: *General principles concerning quantities, units and symbols.*

Part 1: *Quantities and units of space and time.*

Part 2: *Quantities and units of periodic and related phenomena.*

Part 3: *Quantities and units of mechanics.*

Part 4: *Quantities and units of heat.*

Part 5: *Quantities and units of electricity and magnetism.*

Part 6: *Quantities and units of light and related electromagnetic radiations.*

Part 7: *Quantities and units of acoustics.*

Part 8: *Quantities and units of physical chemistry and molecular physics.*

Part 9: *Quantities and units of atomic and nuclear physics.*

Part 10: *Quantities and units of nuclear reactions and ionizing radiations.*

Part 11: *Mathematical signs and symbols for use in physical sciences and technology.*

Part 12: *Dimensionless parameters.*

Part 13: *Quantities and units of solid state physics.*

1 Scope and field of application

The purpose of this International Standard is to give general information about principles concerning physical quantities, equations, quantity and unit symbols, and coherent unit systems, especially the International System of Units, SI.

The principles laid down in this International Standard are intended for general use within the various fields of science and technology and as a general introduction to the other International Standards in the ISO 31 series.

2 Quantities and units

2.1 Physical quantity, unit and numerical value

Physical quantities are used for the quantitative description of physical phenomena. Quantities may be grouped together into categories of quantities which are mutually comparable. Lengths, diameters, distances, heights, wavelengths and so on would constitute such a category.

If a particular example of a quantity out of such a category is chosen as a reference quantity called *the unit*, then any other quantity from this category can be expressed in terms of this unit, as a product of this unit and a number. This number is called the *numerical value* of the quantity expressed in this unit.

Example: The wavelength of one of the sodium lines is

$$\lambda = 5{,}896 \times 10^{-7}\ \text{m}$$

Here λ is the symbol for the physical quantity: wavelength; m is the symbol for the unit of length: metre; and $5{,}896 \times 10^{-7}$ is the numerical value of the wavelength expressed in metres.

In formal treatments of quantities and units, this relationship may be expressed in the form

$$A = \{A\} \cdot [A]$$

where A is the symbol for the physical quantity, $[A]$ the symbol for the unit and $\{A\}$ symbolizes the numerical value of the quantity A expressed in the unit $[A]$. For vectors and tensors the components are quantities which may be expressed as described above.