AS 2900.2—2002
ISO 31-2:1992/Amd.1:1998

Australian Standard™

Quantities and units

Part 2: Periodic and related phenomena

Standards Australia

This Australian Standard was prepared by Committee ME-071, Quantities, Units and Conversions. It was approved on behalf of the Council of Standards Australia on 21 June 2002 and published on 5 August 2002.

The following are represented on Committee ME-071:

CSIRO, Telecommunications and Industrial Physics

National Standards Commission

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Part 2: Periodic and related phenomena

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-071, *Quantities, Units and Conversions*, to supersede AS 2900.2—1986, *Quantities, units, and symbols*, Part 2: *Quantities and units of periodic and related phenomena*.

This Standard is identical with, and has been reproduced from, ISO 31-2:1992/Amd.1:1998, *Quantities and units*, Part 2*: Periodic and related phenomena*.

The amendment to ISO 31-2:1992 is included in this document and is shown by a bar line set against the affected text.

The objective of this Standard is to provide users with names and symbols for quantities and units of periodic and related phenomena.

Users of this Standard are advised by Standards Australia, under arrangements with ISO and IEC, as well as certain other Standards organizations, that the number of this Standard is not reproduced on each page; its identity is shown only on the cover and title pages.

For the purpose of this Standard, the ISO text should be modified as follows:

(a) *Terminology* The words 'this Australian Standard' should replace the words 'this International Standard' wherever they appear.

(b) *Decimal marker* Substitute a full point for a comma where it appears as a decimal marker.

(c) *References* The reference to the International Standards should be replaced by reference to the following Australian Standard:

Reference to International Standard or other Publication		*Australian Standard*	
IEC		AS	
27	Letter symbols to be used in electrical technology	1046	Letter symbols for use in electrotechnology
27-1	Part 1: General	1046.1	Part 1: General

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INTRODUCTION

0.1 Arrangement of the tables

The tables of quantities and units in ISO 31 are arranged so that the quantities are presented on the left-hand pages and the units on the corresponding right-hand pages.

All units between two full lines belong to the quantities between the corresponding full lines on the left-hand pages.

Where the numbering of an item has been changed in the revision of a part of ISO 31, the number in the preceding edition is shown in parentheses on the left-hand page under the new number for the quantity; a dash is used to indicate that the item in question did not appear in the preceding edition.

0.2 Tables of quantities

The most important quantities within the field of this document are given together with their symbols and, in most cases, definitions. These definitions are given merely for identification; they are not intended to be complete.

The vectorial character of some quantities is pointed out, especially when this is needed for the definitions, but no attempt is made to be complete or consistent.

In most cases only one name and only one symbol for the quantity are given; where two or more names or two or more symbols are given for one quantity and no special distinction is made, they are on an equal footing. When two types of italic (sloping) letter exist (for example as with ϑ, θ; φ, ϕ; g, g) only one of these is given. This does not mean that the other is not equally acceptable. In general it is recommended that such variants should not be given different meanings. A symbol within parentheses implies that it is a "reserve symbol", to be used when, in a particular context, the main symbol is in use with a different meaning.

0.3 Tables of units

0.3.1 General

Units for the corresponding quantities are given together with the international symbols and the definitions. For further information, see ISO 31-0.

The units are arranged in the following way:

a) The names of the SI units are given in large print (larger than text size). The SI units have been adopted by the General Conference on Weights and Measures (Conference Générale des Poids et Mesures, CGPM).

The SI units and their decimal multiples and sub-multiples are recommended, although the decimal multiples and sub-multiples are not explicitly mentioned.

b) The names of non-SI units which may be used together with SI units because of their practical importance or because of their use in specialized fields are given in normal print (text size).

These units are separated by a broken line from the SI units for the quantities concerned.

c) The names of non-SI units which may be used temporarily together with SI units are given in small print (smaller than text size) in the "Conversion factors and remarks" column.

d) The names of non-SI units which should not be combined with SI units are given only in annexes in some parts of ISO 31. These annexes are informative and not integral parts of the standard. They are arranged in three groups:

1) special names of units in the CGS system;

2) names of units based on the foot, pound and second and some other related units;

3) names of other units.

0.3.2 Remark on units for quantities of dimension one

The coherent unit for any quantity of dimension one is the number one (1). When the value of such a quantity is expressed, the unit 1 is generally not written out explicitly. Prefixes shall not be used to form multiples or sub-multiples of this unit. Instead of prefixes, powers of 10 may be used.

EXAMPLES

Refractive index $n = 1,53 \times 1 = 1,53$

Reynolds number $Re = 1,32 \times 10^3$

Considering that plane angle is generally expressed as the ratio between two lengths and solid angle as the ratio between an area and the square of a length, the CIPM specified in 1980 that, in the International System of Units, the radian and steradian are dimensionless derived units. This implies that the quantities plane angle and solid angle are considered as dimensionless derived quantities. The units radian and steradian may be used in expressions for derived units to facilitate distinction between quantities of different nature but having the same dimension.

0.4 Numerical statements

All numbers in the "Definition" column are exact.

When numbers in the "Conversion factors and remarks" column are exact, the word "exactly" is added in parentheses after the number.

0.5 Special remark on logarithmic quantities and units

The expression for the time dependence of a damped harmonic oscillation can be written either in real notation or as the real part of a complex notation

$$F(t) = A\,e^{-\delta t}\cos(\omega t) = \mathrm{Re}\left(A\,e^{(-\delta+j\omega)t}\right)$$

This simple relation involving δ and ω can be obtained only when e (base of natural logarithms) is used as the base of the exponential function. The coherent SI unit for the damping coefficient δ and the angular frequency ω is second to the power minus one, 1/s. Using the special names neper, Np, and radian, rad, for the units of δt and ωt respectively, the units for δ and ω become neper per second, Np/s, and radian per second, rad/s, respectively. Neper and radian are special names for the "dimensionless" unit one, 1. The neper is used as a unit for logarithmic quantities; the radian is used as a unit for plane angles and for the phase of circular functions.

Corresponding variation in space is treated in the same manner

$$F(x) = A\ \mathrm{e}^{-\alpha x} \cos(\beta x) = \mathrm{Re}(A\ \mathrm{e}^{-\gamma x}), \qquad \gamma = \alpha + \mathrm{j}\beta$$

where the unit for α is neper per metre, Np/m, and the unit for β is radian per metre, rad/m.

In ISO 31, the level of a field quantity is therefore defined as the natural logarithm of a ratio of two amplitudes, $L_F = \ln(F/F_0)$, and is hence a quantity of dimension one. The unit neper (= the number 1) is the level of a field quantity when $F/F_0 = \mathrm{e}$.

Since power is often proportional to the square of an amplitude, a factor 1/2 is introduced in the definition of the level of a power quantity $L_P = (1/2) \ln(P/P_0)$ in order to make the level of the power quantity under these circumstances equal to the level of the field quantity.

In practice the non-coherent unit degree, ...°, (1° = π/180 rad) is often used for angles and the non-coherent unit bel, B, [1 B = (1/2) ln 10 Np ≈ 1,151 293 Np] based on common logarithms (base 10) for logarithmic quantities. Instead of the bel, its sub-multiple the decibel, dB, is commonly used.

AUSTRALIAN STANDARD

Quantities and units —

Part 2:
Periodic and related phenomena

1 Scope

This part of ISO 31 gives names and symbols for quantities and units of periodic and related phenomena. Where appropriate, conversion factors are also given.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 31. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 31 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 27-1: 1992, *Letter symbols to be used in electrical technology — Part 1: General.*

3 Names and symbols

The names and symbols for quantities and units of periodic and related phenomena are given on the following pages.