

Specification for

Quantities, units and symbols

Part 3. Mechanics

Spécification des grandeurs, des unités et des
symboles
Partie 3. Le mécanique

Spezifikation für Grössen, Einheiten und
Formelzeichen
Teil 3. Mechanik

UDC 389.15 .16 : [531 + 532] : 006.72

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Systems Department Steering Committee (S/-) to Technical Committee S/1, upon which the following bodies were represented:

Chartered Institution of Building Services Engineers
Department of Trade and Industry (National Physical Laboratory)
Department of Trade and Industry (National Weights and Measures Laboratory)
EEA (the Association of Electronics, Telecommunications and Business Equipment Industries)
Institute of Physics
Institute of Trading Standards Administration
Institution of Chemical Engineers
Institution of Electrical Engineers
Institution of Mechanical Engineers
Institution of Structural Engineers
Royal Society
Royal Society of Chemistry
Schools Mathematics Project
Society of Chemical Industry

This British Standard, having been prepared under the direction of the Systems Department Steering Committee, was published under the authority of the Standards Board and comes into effect on
15 March 1993

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First published September 1979
Second edition March 1993

The following BSI references relate to the work on this standard:
Committee reference S 1
Draft for comment 90/53414 DC

ISBN 0 580 21997 6

Amendments issued since publication

Amd. No.	Date	Text affected

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National foreword

This Part of BS 5775 has been prepared under the direction of the Systems Department Steering Committee. It is identical with ISO 31-3 : 1992 *Quantities and units — Part 3 : Mechanics*, published by the International Organization for Standardization (ISO). ISO 31-3 was prepared by Technical Committee ISO/TC 12 'Quantities, units, symbols, conversion factors' with the active participation and approval of the UK.

This Part of BS 5775 supersedes BS 5775 : Part 3 : 1979, which is withdrawn. The principal changes made in this revised version are as follows:

- a) the decision by the International Committee for Weights and Measures (Comité International des Poids et Mesures, CIPM) in 1980 concerning the status of supplementary units has been incorporated;
- b) a number of new items have been added;
- c) the non-mechanical units watt hour and electrovolt have been deleted from this Part of BS 5775 (they have been transferred to BS 5775 : Part 5 and BS 5775 : Part 9, respectively);
- d) units in use temporarily have been transferred to the 'Conversion factors and remarks' column.

BS 5775 comprises the following Parts, each of which is identical with the corresponding Part of ISO 31.

Part 0 *General principles*

Part 1 *Space and time*

Part 2 *Periodic and related phenomena*

Part 3 *Mechanics*

Part 4 *Heat*

Part 5 *Electricity and magnetism*

Part 6 *Light and related electromagnetic radiations*

Part 7 *Acoustics*

Part 8 *Physical chemistry and molecular physics*

Part 9 *Atomic and nuclear physics*

Part 10 *Nuclear reactions and ionizing radiations*

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

Part 12 *Characteristic numbers*

Part 13 *Solid state physics*

Cross-reference

International standard	Corresponding British Standard
ISO 31-4 : 1992	BS 5775 <i>Specification for quantities, units and symbols</i> Part 4 : 1993 <i>Heat</i> (Identical)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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 (Conférence 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.

Quantities and units —

Part 3: Mechanics

1 Scope

This part of ISO 31 gives names and symbols for quantities and units of mechanics. 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.

ISO 31-4:1992, *Quantities and units — Part 4: Heat*.

3 Names and symbols

The names and symbols for quantities and units of mechanics are given on the following pages.

MECHANICS				Quantities
Item No.	Quantity	Symbol	Definition	Remarks
3-1	mass	m		Mass is one of the base quantities on which the SI is based.
3-2	volumic mass, mass density, density	ρ	Mass divided by volume	
3-3	relative volumic mass, relative mass density, relative density	d	Ratio of the density of a substance to the density of a reference substance under conditions that should be specified for both substances	
3-4	massic volume, specific volume	v	Volume divided by mass. $v = 1/\rho$	
3-5	lineic mass, linear density	ρ_l	Mass divided by length	
3-6	areic mass, surface density	$\rho_A, (\rho_S)$	Mass divided by area	
3-7 (3-9.1)	moment of inertia	I, J	The moment of inertia of a body about an axis is the sum (integral) of the products of its elements of mass and the squares of their distances from the axis	To be distinguished from 3-20.1 and 3-20.2. If there is a risk of confusion, the symbol J shall be used for the quantity 3-7.
3-8 (3-7.1)	momentum	p	Product of mass and velocity	