INTERNATIONAL STANDARD

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AMENDMENT 1
1998-12-15

Quantities and units —

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 12: Characteristic numbers
Part 13: Solid state physics

AMENDMENT 1

Grandeurs et unités —

Partie 1: Espace et temps
Partie 2: Phénomènes périodiques et connexes
Partie 3: Mécanique
Partie 4: Chaleur
Partie 5: Électricité et magnétisme
Partie 6: Lumière et rayonnements électromagnétiques connexes
Partie 7: Acoustique
Partie 8: Chimie physique et physique moléculaire
Partie 9: Physique atomique et nucléaire
Partie 10: Réactions nucléaires et rayonnements ionisants
Partie 12: Nombres caractéristiques
Partie 13: Physique de l'état solide

AMENDEMENT 1

Reference number
ISO 31 (parts 1 to 10, 12 and 13):1992/Amd.1:1998(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Amendment 1 to parts 1 to 10, 12 and 13 of International Standard ISO 31:1992 was prepared by Technical Committee ISO/TC 12, *Quantities, units, symbols, conversion factors.*

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

ISO 31-1:1992/Amd.1:1998(E)
ISO 31-2:1992/Amd.1:1998(E)
ISO 31-3:1992/Amd.1:1998(E)
ISO 31-4:1992/Amd.1:1998(E)
ISO 31-5:1992/Amd.1:1998(E)
ISO 31-6:1992/Amd.1:1998(E)
ISO 31-7:1992/Amd.1:1998(E)
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ISO 31-9:1992/Amd.1:1998(E)
ISO 31-10:1992/Amd.1:1998(E)
ISO 31-12:1992/Amd.1:1998(E)
ISO 31-13:1992/Amd.1:1998(E)

Quantities and units —

Part 1: Space and time
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AMENDMENT 1

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Replace subclause 0.3.2 with the following text:

0.3.2 Remark on units for quantities of dimension one

The coherent unit for any quantity of dimension one is the number one, symbol 1. When the value of such a quantity is expressed, the unit symbol **1** is generally not written out explicitly.

EXAMPLE

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

Prefixes shall not be used to form multiples or submultiples of this unit. Instead of prefixes, powers of 10 may be used.

EXAMPLE

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

Considering that plane angle is generally expressed as the ratio of two lengths and solid angle as the ratio of two areas, in 1995 the CGPM has specified that, in the International System of Units, the radian, rad, and the steradian, sr, are "dimensionless" derived units. This implies that the quantities plane angle and solid angle are considered as derived quantities of dimension one. The units radian and steradian may be omitted, or they may be used in expressions for derived units to facilitate distinction between quantities of different nature but having the same dimension.

ICS 01.060

Price based on 1 page

INTERNATIONAL STANDARD

ISO 31-3

Second edition
1992-09-01

Quantities and units —

Part 3: Mechanics

Grandeurs et unités —
Partie 3: Mécanique

Reference number
ISO 31-3:1992(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 31-3 was prepared by Technical Committee ISO/TC 12, *Quantities, units, symbols, conversion factors.*

This second edition cancels and replaces the first edition (ISO 31-3:1978). The major technical changes from the first edition are the following:

— 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;

— a number of new items have been added;

— the non-mechanical units watt hour and electronvolt have been deleted from this part of ISO 31 (they have been transferred to ISO 31-5 and ISO 31-9, respectively);

— units in use temporarily have been transferred to the "Conversion factors and remarks" column.

The scope of Technical Committee ISO/TC 12 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. Standard conversion

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Printed in Switzerland

factors for converting between the various units also come under the scope of the TC. In fulfilment of this responsibility, ISO/TC 12 has prepared ISO 31.

ISO 31 consists of the following parts, under the general title *Quantities and units*:

— *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*

Annexes A, B and C of this part of ISO 31 are for information only.

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.

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. $v = 1/\varrho$	
3-5	lineic mass, linear density	ϱ_l	Mass divided by length	
3-6	areic mass, surface density	ϱ_A, (ϱ_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	

Units — MECHANICS

Item No.	Name of unit	International symbol for unit	Definition	Conversion factors and remarks
3-1.a	kilogram	kg	The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram	Names of decimal multiples and sub-multiples of the unit of mass are formed by attaching prefixes to the word "gram" [CIPM (1967)]. $1\ g = 10^{-3}\ kg$
3-1.b	tonne	t	$1\ t = 1\ 000\ kg$	In the English language also called metric ton.
3-2.a	kilogram per cubic metre	kg/m^3		
3-2.b	tonne per cubic metre	t/m^3		In the English language also called metric ton per cubic metre. $1\ t/m^3 = 1\ g/cm^3 = 1\ kg/l = 10^3\ kg/m^3$
3-2.c	kilogram per litre	kg/l		
3-3.a	one	1		See the introduction, subclause 0.3.2.
3-4.a	cubic metre per kilogram	m^3/kg		
3-5.a	kilogram per metre	kg/m		
3-6.a	kilogram per square metre	kg/m^2		
3-7.a	kilogram metre squared	$kg \cdot m^2$		
3-8.a	kilogram metre per second	$kg \cdot m/s$		

MECHANICS (*continued*)				Quantities
Item No.	**Quantity**	**Symbol**	**Definition**	**Remarks**
3-9.1 (*3-10.1*)	force	F	The resultant force acting on a body is equal to the derivative with respect to time of the momentum of the body	
3-9.2 (*3-10.2*)	weight	F_g, (G), (P), (W)	The weight of a body in a specified reference system is that force which, when applied to the body, would give it an acceleration equal to the local acceleration of free fall in that reference system	When the reference system is the Earth, the quantity defined here has commonly been called the local force of gravity on the body. It is noteworthy that this weight comprises not only the resultant of the gravitational forces existing at the place where the body is, but also the local centrifugal force due to the rotation of the Earth. The effect of atmospheric buoyancy is excluded, and consequently the weight defined is the weight in vacuum. [See also Comptes rendus, 3rd CGPM (1901), p. 70]. In common parlance, the word "weight" continues to be used to mean mass, but this practice is deprecated.
3-10 (—)	impulse	I	$\boldsymbol{I} = \int \boldsymbol{F}\, \mathrm{d}t$	For the time interval $[t_1, t_2]$, $\boldsymbol{I} = \boldsymbol{p}(t_2) - \boldsymbol{p}(t_1)$ where $\boldsymbol{p}$ is momentum.
3-11 (*3-8.1*)	moment of momentum, angular momentum	L	The moment of momentum of a particle about a point is equal to the vector product of the radius vector from this point to the particle and the momentum of the particle. $\boldsymbol{L} = \boldsymbol{r} \times \boldsymbol{p}$	

Units			MECHANICS (*continued*)	
Item No.	**Name of unit**	**International symbol for unit**	**Definition**	**Conversion factors and remarks**
3-9.a	newton	N	$1\ N = 1\ kg \cdot m/s^2$	1 N is that force which, when applied to a body having a mass of 1 kg, gives it an acceleration of 1 m/s^2.
3-10.a	newton second	$N \cdot s$		
3-11.a	kilogram metre squared per second	$kg \cdot m^2/s$		

MECHANICS (*continued*)				Quantities
Item No.	**Quantity**	**Symbol**	**Definition**	**Remarks**
3-12.1	moment of force	M	The moment of a force about a point is equal to the vector product of any radius vector from this point to a point on the line of action of the force, and the force. $\boldsymbol{M} = \boldsymbol{r} \times \boldsymbol{F}$	In the field of elasticity, M is used for bending moment and T for twisting or torsional moment.
3-12.2	moment of a couple	M	Sum of the moments of two forces of equal magnitude and opposite direction not acting along the same line	
3-12.3 (*3-12.2*)	torque	M, T	Generalization of the moment of a couple	
3-13 (—)	angular impulse	H	$\boldsymbol{H} = \int \boldsymbol{M}\, \mathrm{d}t$	For the time interval $[t_1, t_2]$, $\boldsymbol{H} = \boldsymbol{L}(t_2) - \boldsymbol{L}(t_1)$ where $\boldsymbol{L}$ is angular momentum.
3-14 (*3-11.1*)	gravitational constant	G, (f)	The gravitational force between two particles is given by $F = G\frac{m_1 m_2}{r^2}$ where r is the distance between the particles, and m_1 and m_2 are their masses	$G = (6{,}672\ 59 \pm 0{,}000\ 85) \times 10^{-11}\ \mathrm{N \cdot m^2/kg^2}$ [1]
1) CODATA Bulletin 63 (1986).				
3-15.1 (*3-13.1*)	pressure	p	Force divided by area	The symbol p_e is recommended for gauge pressure, defined as $p - p_{amb}$, where p_{amb} is the ambient pressure. Thus the gauge pressure is positive or negative according as p is larger or smaller than p_{amb} respectively.
3-15.2 (*3-13.2*)	normal stress	σ		
3-15.3 (*3-13.3*)	shear stress	τ		

Units				MECHANICS (*continued*)
Item No.	**Name of unit**	**International symbol for unit**	**Definition**	**Conversion factors and remarks**
3-12.a	newton metre	$N \cdot m$		The symbol for this unit shall be written in such a way that it cannot be confused with the symbol for the millinewton.
3-13.a	newton metre second	$N \cdot m \cdot s$		
3-14.a	newton metre squared per kilogram squared	$N \cdot m^2/kg^2$		
3-15.a	pascal	Pa	1 Pa = 1 N/m^2	bar (bar), 1 bar = 100 kPa (exactly) The use of the bar should be restricted to the existing uses in the field of fluid pressure.

MECHANICS (*continued*)				Quantities
Item No.	**Quantity**	**Symbol**	**Definition**	**Remarks**
3-16.1 (*3-14.1*)	linear strain, (relative elongation)	ε, e	$\varepsilon = \frac{\Delta l}{l_0}$ where Δl is the increase in length and l_0 is the length in a reference state to be specified	
3-16.2 (*3-14.2*)	shear strain	γ	$\gamma = \frac{\Delta x}{d}$ where Δx is the parallel displacement of the upper surface with respect to the lower surface of a layer of thickness d	
3-16.3 (*3-14.3*)	volume strain, (bulk strain)	ϑ	$\vartheta = \frac{\Delta V}{V_0}$ where ΔV is the increase in volume and V_0 is the volume in a reference state to be specified	
3-17 (*3-15.1*)	Poisson ratio, Poisson number	μ, ν	Lateral contraction divided by elongation	The quantity defined by Poisson was the reciprocal: $m = \frac{1}{\mu}$
3-18.1 (*3-16.1*)	modulus of elasticity	E	$E = \sigma/\varepsilon$	E is also called the Young modulus.
3-18.2 (*3-16.2*)	shear modulus, modulus of rigidity	G	$G = \tau/\gamma$	G is also called the Coulomb modulus.
3-18.3 (*3-16.3*)	bulk modulus, modulus of compression	K	$K = -p/\vartheta$	The strains ε, γ and ϑ in these definitions are those corresponding to the excess stresses σ and τ, and to the excess pressure p.
3-19 (*3-17.1*)	compressibility, bulk compressibility	$\varkappa$	$\varkappa = -\frac{1}{V}\frac{dV}{dp}$	See also ISO 31-4:1992, item No. 4-5.1.

Units				MECHANICS (*continued*)
Item No.	**Name of unit**	**International symbol for unit**	**Definition**	**Conversion factors and remarks**
3-16.a	one	1		See the introduction, subclause 0.3.2.
3-17.a	one	1		See the introduction, subclause 0.3.2.
3-18.a	pascal	Pa	1 Pa = 1 N/m^2	
3-19.a	reciprocal pascal, pascal to the power minus one	Pa^{-1}	1 Pa^{-1} = 1 m^2/N	

MECHANICS (*continued*)				Quantities
Item No.	**Quantity**	**Symbol**	**Definition**	**Remarks**
3-20.1 (*3-18.1*)	second moment of area, (second axial moment of area)	I_a, (I)	The second axial moment of area of a plane area (section) about an axis in its plane is the sum (integral) of the products of its elements of area and the squares of their distances from the axis	These quantities should be distinguished from 3-7. They have often been given the name "moment of inertia". The symbol I may be used for second moment of area when no danger of confusion exists with moment of inertia (3-7).
3-20.2 (*3-18.2*)	second polar moment of area	I_p	The second polar moment of area of a plane area (section) about a point in its plane is the sum (integral) of the products of its elements of area and the squares of their distances from the point	
3-21 (*3-19.1*)	section modulus	Z, W	The section modulus of a plane area (section) about an axis in its plane is the second moment of area divided by the distance from the axis to the most remote point of the area	
3-22.1 (*3-20.1*)	dynamic friction factor	μ, (f)	Ratio of frictional force to normal force, for a sliding body	The friction factor is also called the coefficient of friction.
3-22.2 (—)	static friction factor	μ_s, (f_s)	Maximum ratio of frictional force to normal force, for a body at rest	
3-23 (*3-21.1*)	viscosity, (dynamic viscosity)	η, (μ)	$\tau_{xz} = \eta \frac{dv_x}{dz}$ where τ_{xz} is the shear stress in a fluid moving with a velocity gradient dv_x/dz perpendicular to the plane of shear	This definition applies to laminar flow for which $v_z = 0$.
3-24 (*3-22.1*)	kinematic viscosity	ν	$\nu = \eta/\varrho$ where ϱ is the volumic mass	
3-25 (*3-23.1*)	surface tension	γ, σ	Force perpendicular to a line element in a surface divided by the length of the line element	

Units				MECHANICS (*continued*)
Item No.	**Name of unit**	**International symbol for unit**	**Definition**	**Conversion factors and remarks**
3-20.a	metre to the fourth power	m^4		
3-21.a	metre cubed	m^3		
3-22.a	one	1		See the introduction, subclause 0.3.2.
3-23.a	pascal second	Pa · s		
3-24.a	metre squared per second	m^2/s		
3-25.a	newton per metre	N/m		1 N/m = 1 J/m^2

MECHANICS (*concluded*)				Quantities
Item No.	**Quantity**	**Symbol**	**Definition**	**Remarks**
3-26.1 (*3-24.2*)	energy	E	All kinds of energy	
3-26.2 (*3-24.1*)	work	W, (A)	$W = \int \boldsymbol{F} \cdot \mathrm{d}\boldsymbol{r}$	
3-26.3 (*3-24.3*)	potential energy	E_p, V, Φ	$E_\mathrm{p} = -\int \boldsymbol{F} \cdot \mathrm{d}\boldsymbol{r}$ where $\boldsymbol{F}$ is a conservative force	
3-26.4 (*3-24.4*)	kinetic energy	E_k, T	$E_\mathrm{k} = \frac{1}{2} mv^2$	
3-27 (*3-25.1*)	power	P	Rate of energy transfer	
3-28 (—)	efficiency	η	Ratio of an output power to an input power	The output power and the input power shall be specified.
3-29 (*3-26.1*)	mass flow rate	q_m	Mass of matter which crosses a given surface divided by time	
3-30 (*3-27.1*)	volume flow rate	q_V	Volume of matter which crosses a given surface divided by time	

Units			MECHANICS (*concluded*)	
Item No.	**Name of unit**	**International symbol for unit**	**Definition**	**Conversion factors and remarks**
3-26.a	joule	J	1 J = 1 N · m	1 J is the work done when the point of application of a force of 1 N is displaced through a distance of 1 m in the direction of the force.
3-27.a	watt	W	1 W = 1 J/s	
3-28.a	one	1		See the introduction, subclause 0.3.2.
3-29.a	kilogram per second	kg/s		
3-30.a	cubic metre per second	m^3/s		

Annex A
(informative)

Units in the CGS system with special names

Quantity item No.	Quantity	Unit item No.	Name of unit with symbol	Definition and conversion factors
3-9.1	force	3-9.A.a	dyne: dyn	1 dyn is that force which, when applied to a body having a mass of 1 g, gives it an acceleration of 1 cm/s^2. 1 dyn = 10^{-5} N
3-23	viscosity, (dynamic viscosity)	3-23.A.a	poise: P	1 P is the viscosity of a fluid in which the velocity under a shear stress of 1 dyn/cm^2 has a gradient of 1 (cm/s)/cm perpendicular to the plane of shear. 1 P = 1 dyn · s/cm^2 = 1 g · cm^{-1} · s^{-1} = 10^{-1} Pa · s
3-24	kinematic viscosity	3-24.A.a	stokes: St	1 St is the kinematic viscosity of a fluid with dynamic viscosity 1 P and volumic mass 1 g/cm^3. 1 St = 10^{-4} m^2/s
3-26.1	energy	3-26.A.a	erg: erg	1 erg is the work done when the point of application of a force of 1 dyn is displaced through a distance of 1 cm in the direction of the force. 1 erg = 1 dyn · cm = 10^{-7} J

Annex B
(informative)

Units based on the foot, pound and second and some other units

The use of these units is deprecated.

Quantity item No.	Quantity	Unit item No.	Name of unit with symbol	Conversion factors and remarks
3-1	mass	3-1.B.a	pound: lb	1 lb = 0,453 592 37 kg (exactly)
		3-1.B.b	grain: gr	1 gr = $\frac{1}{7\,000}$ lb = 64,798 91 mg (exactly)
		3-1.B.c	ounce: oz	1 oz = $\frac{1}{16}$ lb = 437,5 gr (exactly) = 28,349 52 g
		3-1.B.d	hundredweight: cwt	1 cwt (UK) = 1 long cwt (US) = 112 lb (exactly) = 50,802 35 kg 1 cwt (US) = 100 lb (exactly) = 45,359 237 kg (exactly)
		3-1.B.e	ton	1 ton (UK) = 1 long ton (US) = 2 240 lb (exactly) = 1 016,047 kg = 1,016 047 t 1 ton (US) = 2 000 lb (exactly) = 907,184 7 kg = 0,907 184 7 t
		3-1.B.f	troy ounce or apothecaries' ounce	1 troy ounce = 480 gr (exactly) = 31,103 476 8 g (exactly)
3-2	volumic mass, mass density, density	3-2.B.a	pound per cubic foot: lb/ft^3	1 lb/ft^3 = 16,018 46 kg/m^3
3-9.1	force	3-9.B.a	pound-force: lbf	1 lbf = 4,448 222 N based on the (standard) value of g_n = 9,806 65 m/s^2. This unit must be distinguished from the local weight of a body having a mass of 1 lb.
3-12.1	moment of force	3-12.B.a	foot pound-force: ft · lbf	1 ft · lbf = 1,355 818 N · m

Units based on the foot, pound and second and some other units (*concluded*)				
Quantity Item No.	**Quantity**	**Unit Item No.**	**Name of unit with symbol**	**Conversion factors and remarks**
3-15.1	pressure	3-15.B.a	pound-force per square inch: lbf/in^2	1 lbf/in^2 = 6 894,757 Pa
3-20.1 3-20.2	second moment of area second polar moment of area	3-20.B.a	inch to the fourth power: in^4	1 in^4 = 41,623 14 × 10^{-8} m^4
3-21	section modulus	3-21.B.a	inch cubed: in^3	1 in^3 = 16,387 064 × 10^{-6} m^3 (exactly)
3-24	kinematic viscosity	3-24.B.a	foot squared per second: ft^2/s	1 ft^2/s = 0,092 903 04 m^2/s
3-26.1	energy	3-26.B.a	foot pound-force: ft · lbf	1 ft · lbf = 1,355 818 J
3-27	power	3-27.B.a	foot pound-force per second: ft · lbf/s	1 ft · lbf/s = 1,355 818 W 1 horsepower (hp) = 550 ft · lbf/s (exactly) = 745,699 9 W

Annex C
(informative)

Other units given for information, especially regarding the conversion factor

The use of these units is deprecated.

Quantity item No.	Quantity	Unit item No.	Name of unit with symbol	Conversion factors and remarks
3-1	mass	3-1.C.a	metric carat	1 metric carat = 200 mg (exactly)
3-5	lineic mass, linear density	3-5.C.a	tex	1 tex = 10^{-6} kg/m
3-9.1	force	3-9.C.a	kilogram-force: kgf	1 kgf = 9,806 65 N (exactly) The symbols kgf (kilogram-force) and kp (kilopond) are both used. This unit must be distinguished from the local weight of a body having a mass of 1 kg. 9,806 65 m/s^2 is the standard acceleration of free fall [3rd CGPM, (1901)].
3-12.1	moment of force	3-12.C.a	kilogram-force metre: kgf · m	1 kgf · m = 9,806 65 N · m (exactly)
3-15.1	pressure	3-15.C.a	standard atmosphere: atm	1 atm = 101 325 Pa (exactly)
		3-15.C.b	kilogram-force per square metre: kgf/m^2	1 kgf/m^2 = 9,806 65 Pa (exactly)
		3-15.C.c	torr: Torr	1 Torr = $\frac{1}{760}$ atm (exactly) = 133,322 4 Pa
		3-15.C.d	conventional millimetre of mercury: mmHg	1 mmHg = 13,595 1 mmH_2O = 133,322 4 Pa
		3-15.C.e	technical atmosphere: at	1 at = 1 kgf/cm^2 = 98 066,5 Pa (exactly) = 0,967 841 atm
		3-15.C.f	conventional millimetre of water: mmH_2O	1 mmH_2O = 10^{-4} at = 9,806 65 Pa (exactly)

Other units given for information, especially regarding the conversion factor (*concluded*)				
Quantity Item No.	**Quantity**	**Unit Item No.**	**Name of unit with symbol**	**Conversion factors and remarks**
3-26.1	energy	3-26.C.a	kilogram-force metre: kgf · m	1 kgf · m = 9,806 65 J (exactly)
3-27	power	3-27.C.a	kilogram-force metre per second: kgf · m/s	1 kgf · m/s = 9,806 65 W (exactly)
		3-27.C.b	metric horsepower	1 metric horsepower = 75 kgf · m/s (exactly) = 735,498 75 W (exactly)

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

Descriptors: system of units, international system of units, units of measurement, quantities, mechanics, symbols, definitions, conversion of units, conversion factor.

Price based on 18 pages