MINISTRY OF ECONOMY

MEXICAN Official Standard NOM-008-SCFI-2002, General System of Measurement Units.

On the margin, a seal with the National Coat of Arms reading: Mexican United States - Ministry of Economy.

The Ministry of Economy, through the Directorate General of Standards, pursuant to articles 34 sections XIII and XXX of the Organic Law on Federal Public Administration; 39 section V, 40 section IV, 47 section IV of the Federal Law on Metrology and Standardization, and 23 sections I and XV of this Ministry's Internal Regulations, and

WHEREAS

It is the responsibility of the Federal Government provide the needed measures to ensure that measuring instruments marketed within the national territory are safe and accurate, in order to provide an adequate service according to their metrological qualities, and ensure the accuracy of the measurings conducted in commercial operations;

On August 25th, 2000, the National Advisory Committee on User Safety Standardization, Commercial Information and Practices, approved the publication of the Mexican Official Standard Draft PROY-NOM-008-SCFI-2000, General system of measurement units, which was published on May 23rd, 2001 in the Federal Official Gazette so that the interested partied might submit their comments;

That within the 60-calendar-day term, from the date of publication of such Mexican official standard draft, the Regulatory Impact Statement, referred to in article 45 of the Federal Law on Metrology and Standardization, was available to the general public to be consulted; and that within the same term, the interested parties submitted their comment to the draft standard, which were analyzed by the mentioned Advisory Committee, and the applicable modifications were made;

On March 20th, 2002, the National Advisory Committee on User Safety Standardization, Commercial Information and Practices, unanimously approved the stated standard;

The Federal Law on Metrology and Standardization set forth that Mexican Official Standards constitute the most suitable instrument to protect the consumers' interests, the following is enacted: Mexican Official Standard NOM-008-SCFI-2002, General system of measurement units.

Mexico City, October 24th, 2002.- Managing Director for Standards, Miguel Aguilar Romo.- Signature.

MEXICAN OFFICIAL STANDARD NOM-008-SCFI-2002, GENERAL SYSTEM OF MEASUREMENT UNITS

PREFACE

The following institutions, organisms and companies took part in the preparation of this Mexican Official Standard:

- STANDARDIZATION AND CERTIFICATION ASSOCIATION, A.C. (Spanish acronym for non-for-profit organization) (ANCE)
- MEXICAN ASSOCIATION OF STORAGE WAREHOUSES (AMAGDE)
- NATIONAL CHAMBER OF THE ELECTRONICS, TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY INDUSTRY
- CENTER FOR TECHNOLOGICAL, INDUSTRIAL AND SERVICE STUDIES No. 26
- NATIONAL CENTER FOR METROLOGY (CENAM)
- FEDERAL ELECTRICITTY UTILITY COMMISSION

  Equipment and Materials Test Laboratory
- NATIONAL ADVISORY COMMITTEE OF STANDARDIZATION FOR DISEASE PREVENTION AND CONTROL
- NATIONAL METROLOGY STANDARDIZATION TECHNICAL COMMITTEE
- DIRECTORATE GENERAL OF MERCHANT NAVY
- NATIONAL HIGH SCHOOL

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- MEXICAN INSTITUTE FOR STANDARDIZATION AND CERTIFICATION, A.C.
- NATIONAL INSTITUTE FOR NUCLEAR RESEARCH
- MEXICAN INSTITUTE FOR TEXTILE STANDARDIZATION, A.C.
- NATIONAL POLYTECHNICAL INSTITUTE

  College of Engineering and Architecture, Campus Tecamachalco

  Coordination of Metrology, Standards and Industrial Quality

  College of Mechanical and Electric Engineering, Campus Azcapotzalco
- ELECTRONIC STANDARDIZATION AND CERTIFICATION, A.C.
- PETROLEOS MEXICANOS

  Petroleos Mexicanos' and Subsidiaries' Standardization Committee

- OFFICE OF THE FEDERAL PROSECUTOR FOR THE CONSUMER
- MINISTRY OF THE ENVIRONMENT AND NATURAL RESOURCES

  Undersecretary of Natural Resources

  National Institute of Ecology

  National Water Commission
- MINISTRY OF COMMUNICATIONS AND TRANSPORTATION

  Directorate General of Telecommunications Policy
- MINISTRY OF AGRICULTURE, LIVESTOCK AND RURAL DEVELOPMENT

  Directorate General of Plant Health

  Directorate General of Animal Health
- SUNBEAM MEXICANA, S.A. DE C.V.

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MEXICAN OFFICIAL STANDARD NOM-008-SCFI-2002, GENERAL SYSTEM OF MEASUREMENT UNITS

0. Introduction

This standard aims to set forth a common language conforming to the current demands of the scientific, technological, educational, industrial and commercial activities, for all the industries in the country.

The preparation of this Mexican Official Standard was based on the resolutions and agreement made on the International System of Units (SI) at the General Conference on Weights and Measures (CGPM), up to its 21st Convention held in 1999.

The SI is the first compatible measuring unit system, essentially complete and harmonized internationally; it is based on 7 base units, whose objective materialization and reproduction of the corresponding standards, facilitates the structuring of metrological systems at the highest levels of accuracy to all nations that adopt it. In addition, when compared to other systems of units, other advantages are evident, among them, the ease of learning thereof and the simplification in the formation of derived units.

1. Purpose and scope of application

This Mexican Official Standard sets forth the definitions, symbols and the writing rules of the units of the International System of Units (SI) and of other units not comprised by this System accepted by the CGPM, which together, constitute the General System of Measurement Units, used in different fields of science, technology, industry, education and trade.

2. References

To properly apply this Standard, the following valid Mexican official standard, or that superseding it, shall be referred to:

NMX-Z-055-1997:IMNC	Metrology-Vocabulary of general essential terms, validity statement published on January 17th, 1997 in the Federal Official Gazette.

3. Fundamental definitions

For the purpose of this Standard, the definitions contained in the standard referred to in paragraph 2, References, and the following are applied:

3.1 International System of Units (SI)

Coherent system of units adopted by the General Conference on Weights and Measures (CGPM).

This system comprises:

- Si base units; - SI derived units.

3.2 SI base units

Units of measurement of the base magnitudes of the International System of Units.

3.3 Magnitude

A phenomenon's, body's or substance's attribute susceptible of being distinguished qualitatively and determined quantitatively.

3.4 Coherent system of (measurement) units

System of units consisting of a set of compatible base units and derived units.

3.5 Base magnitudes

Magnitudes accepted within a system of magnitudes, by convention, to be independent from each other.

3.6 SI derived units

Units formed by combining base units, or, by combining base units with derived units according to algebraic expressions that relate the corresponding magnitudes according to simple laws of physics.

4. Tables of units

4.1 SI base units

Nowadays, SI has 7 base units, corresponding to the following magnitudes: length, mass, time, electric current strength, thermodynamic temperature, luminous intensity and amount of substance. The names of the units are: meter, kilogram, second, ampere, kelvin, candela, and mole. The magnitudes, units, symbols and definitions are described in Table 1.

4.2 SI derived units

These units are obtained from the base units, and are expressed using the mathematical symbols for multiplication and division. Three types of units can be distinguished: the first comprises SI derived units expressed based on base units, of which some examples are given in Tables 2 and 3; the second comprises SI derived units receiving a special name and a particular symbol, whose complete list is given in Table 4; the third comprises Si derived units expressed with special names, with some examples given in Table 5.

There is an important amount of derived units used in scientific areas that have been grouped in 10 tables, to facilitate the consultation thereof, corresponding to an equivalent number of the most important fields of physics, pursuant to the following list:

Table 6 Space and time main magnitudes and units.

Table 7 Periodic and related phenomena main magnitudes and units.

Table 8 Mechanics main magnitudes and units.

Table 9 Heat main magnitudes and units.

Table 10 Electricity and magnetism main magnitudes and units.

Table 11 Light and electromagnetic radiations main magnitudes and units.

Table 12 Acoustics main magnitudes and units.

Table 13 Physical-chemical and molecular physics main magnitudes and units.

Table 14 Atomic physics and nuclear physics main magnitudes and units.

Table 15 Nuclear reaction and ionizing radiations main magnitudes and units.

Note on units of dimension 1 (one)

The coherent unit of any dimensionless magnitude is number 1 (one), when the value of such magnitude is expressed, 1 (one) is usually not written explicitly.

Prefixes to form multiples and submultiples of the unit shall not be used, instead of prefixes powers of 10 shall be used.

5. Units not belonging to the SI

CGPM has classified some units not belonging to the SI, due to their common use, into three categories:

- units kept to be used with the SI;
- units kept to be temporarily used with the SI, and
- units that must not be used with the SI.

5.1 Units kept to be used with the SI

These are widely used units, thus, it is considered appropriate to keep them; however, it is not recommended to combine them with the units of the SI to avoid losing the advantages of consistency, these units are listed in Table 16.

5.2 Units kept to be temporarily used with the SI

These are units whose use must be avoided; they are kept due to their current widespread use though their use with SI units is not advised. They are listed in Table 17.

5.3 Units that must not be used with the SI

There are other units not belonging to the SI; nowadays, there are used somehow, some of them derived from the CGS system; such units do not correspond to any of the categories referred to before in this Standard, thus they must not be used as they cause the SI to lose consistency; the use of the corresponding SI units is recommended instead. Table 18 provides some examples of these units.

6. Prefixes

Table 19 lists the names and the symbols of the prefixes to form the units' decimal multiples and submultiples, ranging from 10^{-24} to 10^{24}.

7. General rules to write the symbols of the SI units

The rules to correctly write the units' and the prefixes' symbols are set forth in Table 20.

8. Rules to write numbers and their decimal sign

Table 21 contains these rules pursuant to the recommendations of the International Standardization Organization (ISO).

Table 1.- SI base units' names, symbols and definitions

Magnitude	Unit	Symbol	Definition
length	meter	m	It is the length of the path traveled by light in vacuum during a time interval of 1/299 792 458 of a second (17th CGPM (1983) Resolution 1].
mass	kilogram	kg	It is the mass equal to the mass of the international prototype of the kilogram [1st and 3rd CGPM (1889 and 1901)].
time	second	s	It is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom [13th CGPM (1967), Resolution 1].
electric current	ampere	A	It is the intensity of a constant current which, if maintained in two straight parallel conductors of infinite length, whose circular cross section is negligible, placed 1 meter apart in the vacuum, would produce between these conductors a force equal to $2x10^{-7}$ newton per meter of length [9th CGPM (1948), Resolution 2].
thermodynamic temperature	kelvin	K	It is the fraction 1/273,16 of the thermodynamic temperature of the triple point of water [13th CGPM (1967) Resolution 4].
amount of substance	mole	mol	It is the amount of substance which contains as many elementary entities as there are atoms in 0,012 kg of carbon 12 [14th CGPM (1971), Resolution 3].
luminous intensity	candela	cd	It is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency $5410x10^{12}$ hertz and whose radiant intensity in that direction is of 1/683 watt per steradian (16th CGPM (1979), Resolution 3].

Table 2.- SI derived units' magnitude names, symbols and definitions

Magnitude	Unit	Symbol	Definition
plane angle	radian	rad	It is the plane angle comprised between two radii of a circle and that intercept on the circumference of this circle an arch whose length is equal to the length of the radius (ISO-31/1).
solid angle	steradian	sr	It is the solid angle whose vertex is located at the center of a sphere, and that intercepts on the surface of this sphere an area equal to the area of a square having the sphere's radius as one of its sides (ISO-31/1).

Table 3.- Examples of SI derived units without special name

Magnitude	IS Units	
	Name	Symbol
surface	square meter	m^2
volume	cubic meter	m^3
speed	meter per second	m/s
acceleration	meter per second squared	m/s^2
wavenumber	meter to the power of minus one	m^{-1}
mass density, density	kilogram per cubic meter	kg/m^3
specific volume	cubic meter per kilogram	m^3/kg
current density	ampere per square meter	A/m^2
electric field strength	ampere per meter	A/m

concentration (of amount of substance)	mole per cubic meter	mol/m^3
luminance	candela per square meter	cd/m^2

Table 4.- SI derived units with special name and symbol

Magnitude	Name of the SI derived unit	Symbol	Expression in SI base units	Expression in other SI units
frequency	hertz	Hz	s^{-1}	
force	newton	N	$m \cdot kg \cdot s^{-2}$	
pressure, stress	pascal	Pa	$m^{-1} \cdot kg \cdot s^{-2}$	N/m_2
work, energy, amount of heat	joule	J	$m^2 \cdot kg \cdot s^{-2}$	N·m
power, radiant flux	watt	W	$m^2 \cdot kg \cdot s^{-3}$	J/s
electric charge, amount of electricity	coulomb	C	s·A	
electric potential difference, voltage, electric potential, electromotive force	volts	V	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-1}$	W/A
capacitance	farad	F	$m^{-2} \cdot kg^{-1} \cdot s^3 \cdot A^2$	C/V
electric resistance	ohm	Ω	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-2}$	V/A
electric conductance	siemens	S	$m^{-2} \cdot kg^{-1} \cdot s^3 \cdot A^2$	A/V
magnetic flux[1]	weber	Wb	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$	V·s
magnetic induction[2]	tesla	T	$kg \cdot s^{-2} \cdot A^{-1}$	Wb/m^2
Inductance	henry	H	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-2}$	Wb/A
luminous flux	lumen	lm	cd · sr	
luminosity[3]	lux	lx	$m^{-2} \cdot cd \cdot sr$	lm/m^2
activity referred to a radionuclide	becquerel	Bq	s^{-1}	
absorbed dose	gray	Gy	$m^2 \cdot s^{-2}$	J/kg
Celsius temperature	Celsius degree	°C		K
dose equivalent	sievert	Sv	$m^2 \cdot s^{-2}$	J/kg

1 also called magnetic induction flux.

2 also called magnetic flux density.

3 also called illuminance.

Table 5.- Examples of SI derived units expressed by special names

Magnitude	SI unit		Expression in SI base units
	Name	Symbol	
dynamic viscosity	pascal second	Pa · s	m^{-1} kg · s^{-1}
moment of force	newton meter	N·m	m^{2} · kg · s^{-2}
surface tension	newton per meter	N/m	kg · s^{-2}
heat flux density, irradiance	watt per square meter	W/m^{2}	kg · s^{-3}
heat capacity, entropy	joule per kelvin	J/K	m^{2} · kg · s^{-2} · K^{-1}
specific heat capacity, specific entropy	joule per kilogram kelvin	J/(kg·K)	m^{2} · s^{-2} · K^{-1}
specific energy	joule per kilogram	J/kg	m^{2} · s^{-2}
thermal conductivity	watt per meter kelvin	W/(m·K)	m · kg · s^{-3} · K^{-1}
energy density	joule per cubic meter	J/m^{3}	m^{-1} · kg · s^{-2}
electric field strength	volt per meter	V/m	m · kg · s^{-3} · A^{-1}
electric charge density	coulomb per cubic meter	C/m^{3}	m^{-3} · s · A
electric flux density	coulomb per square meter	C/m^{2}	m^{-2} · s · A
permittivity	farad per meter	F/m	m^{-3} · kg^{-1} · s^{4} · A^{2}
permeability	henry per meter	H/m	m · kg · s^{-2} · A^{-2}
molar energy	joule per mole	J/mol	m^{2} · kg · s^{-2} · mol^{-1}
molar entropy, molar heat capacity	joule per mole kelvin	J/(mol·K)	m^{2} · kg · s^{-2} · K^{-1} · mol^{-1}
Exposure (x and γ rays)	coulomb per kilogram	C/kg	kg^{-1} · s · A
absorbed dose rate	gray per second	Gy/s	m^{2} ·s^{-3}

Table 6.- Space and time main magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
plane angle	, , , , , etc.	The angle comprised between two half-lines leaving from the same point, which is defined as the ratio of the length of the arch intersected by these lines on the circle (whose center is located in that point) and the circle's radius.	radian (see Table 2)	rad
solid angle	Ω	A cone's solid angle is defined as the ratio of the area cut on a spherical surface (whose center is located at the cone's vertex) and the square of the length of the radius of the sphere.	steradian (see Table 2)	sr
length width height thickness radio diameter path length	l, (L) b h d, r d, D s		meter (see Table 1)	m
area or surface	A, (S)		square meter	m^2
volume	V		cubic meter	m^3
Time, time interval, duration	t		second (see Table 1)	s
angular velocity		$\omega = \frac{d\varphi}{dt}$	radian per second	rad/s
angular acceleration		$\alpha = \frac{d\omega}{dt}$	radian per second squared	rad/s^2
speed	u, v, w, c	$v = \frac{ds}{dt}$	meter per second	m/s
acceleration	A	$a = \frac{dv}{dt}$	meter per second squared	m/s^2
free fall acceleration, acceleration due to gravity	g	Note: free fall normal acceleration is: $g_n = 9{,}806\ 65\ m/s^2$ (General Conference on Weights and Measures 1901)		

Table 7.- Periodic and related phenomena magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
period, periodic time	T	Cycle time	second	s
time constant of a magnitude varying exponentially		Time after which the magnitude might reach its limit if it maintains its initial speed of variation	second	s
frequency	f, ν	f = 1/T	hertz	Hz
rotation frequency(1)	n (1)	Number of revolutions divided by time	reciprocal second	s^{-1}
angular frequency circular frequency, pulsatance		= 2f	radian per second reciprocal second	rad/s s^{-1}
wavelength		Distance, in the direction of the propagation of a periodic wave, between two points where, in a given point, the phase difference is 2	meter	m
wavenumber		σ = 1/λ	reciprocal meter	m^{-1}
circular wavenumber	k	k = 2	reciprocal meter	m^{-1}
amplitude level difference, field level difference	LF	LF = ln (F_1 / F_2) Where F_1 and F_2 represent two amplitudes of the same class	neper* decibel*	Np* dB*
power level difference	LP	LP = 1/2 ln (P_1 / P_2) Where P_1 and P_2 represent two powers		
damping coefficient		If a magnitude is a function of time and is determined by $F(t) = Ae^{-\delta t} \cos[(t - t_0)]$ then is the damping coefficient	reciprocal second	s^{-1}
logarithmic decrement		Product of the damping coefficient and the period	neper*	Np*
attenuation coefficient		If a magnitude is a function of distance x and is determined by $F(x) = Ae^{-\alpha\chi} \cos[\S (x - x_0)]$	reciprocal meter	m^{-1}
phase coefficient		then is the attenuation coefficient and is the phase coefficient		
propagation coefficient		= + j		

NOTES:

(1) For the rotation frequency, the units revolutions per minute (r/min) and revolutions per second (r/s) are also used.

* These are not SI units but are kept to be used with SI units

1 Np is the difference of the amplitude level when ln (F_1 / F_2) = 1

1 dB is the difference of the amplitude level when 20 lg (F_1 / F_2) = 1

Table 8.- Mechanics magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
mass	m		kilogram (see Table 1)	kg
density (mass density)		Mass divided by volume	kilogram per cubic meter	kg/m^3
relative density	d	Ratio of a substance's density to the density of a reference substance under conditions to be specified for both substances	one	1
specific volume	ν	Volume divided by mass	cubic meter per kilogram	m^3/kg
linear density	l	mass divided by length	kilogram per meter	kg/m
surface density	p_A, (ps)	Mass divided by area	kilogram per square meter	kg/m^2
momentum	p	Product of the multiplication of mass and speed	kilogram meter per second	kgm/s
momentum, angular momentum	L	A particle's moment of momentum with respect to a point is equal to the vectorial product of the radius vector from the point to the particle, and the particle's momentum	squared kilogram meter per second	kgm^2/s
moment of inertia (dynamic moment of inertia)	I, J	A body's (dynamic) moment of inertia in relation to an axis, is defined as the summation (the integration) of the products of the multiplication of their elemental masses by the squared distances of such masses to the axis	kilogram square meter	kgm^2
force weight	F G, (P), (W)	The resulting force applied on a body is equal to the ratio of change of the body's momentum A body's weight in a certain reference system is defined as the force that, applied to the body, gives an acceleration equal to the free fall local acceleration in this reference system	newton	N
gravitational constant	G, (f)	Gravitational force between two particles $F = G \frac{m1m2}{r2}$ Where r is the distance between the particles, m_1 and m_2 and their masses and the gravitational constant is:	newton square meter multiplies by squared kilogram	Nm^2/kg^2

		G= (6,672 59 ± 0,010) x 10^{-11} Nm^2/kg^2		
moment of force	M	A moment of force referred to a point is equal to the vectorial product of the radius vector, from such point to any other point located along the force's line of action, by the force	newton meter	Nm
twist moment, force couple	T	Summation of the moments of two forces of the same magnitude and opposed direction not acting along the same line		
pressure	P	Force divided by area	pascal	Pa
normal stress				
shear stress				
modulus of elasticity	E	E = /	pascal	Pa
modulus of rigidity, shear modulus	G	G = /		
bulk modulus	K	K = -p/		
compressibility	x	$x = -\frac{1}{V}\frac{dV}{dp}$	reciprocal pascal	Pa^{-1}
moment axial second of area	I_a, (I)	The moment axial second of area of a flat area, referred to an axis in the same plane, is the summation (integration) of the products of the elements of the area and the square of the distances measured from the axis	meter to the fourth power	m^4
moment polar second of area	I_p	The moment polar second of area of a flat area, referred to a point located in the same plane, is the integration of the products of the elements of the area and the square of the distances from the point to such elements of the area		
section module	Z, W	The section module of a flat area or section in relation to an axis located in the same plane, is defined as the axial second moment divided by the distance from the axis to the furthest point of the flat surface	cubic meter	m^3
dynamic viscosity	, ( )	xz = (dv_x/dz) where xz is the shear stress of a moving fluid with a gradient of velocity dv_x/dz perpendicular to the shear plane	pascal second	Pas
kinematic viscosity		= /	square meter per	m^2/s

		where is density	second	
surface tension	,	It is defined as the perpendicular force of a linear element on the surface, divided by the length of such linear element	newton per meter	N/m
work	W, (A)	Force multiplied by the displacement in the direction of the force	joule	J
power	E			
potential energy	E_p, V,			
kinetic energy	E_k, T			
power	P	Energy transfer ratio	watt	W
bulk flow, mass flow rate	q_m	Mass of matter that travels through a given surface divided by time	kilogram per second	kg/s
volumetric flow rate, volume flow	q_v	Volume of matter that travels through a given surface divided by time	cubic meter per second	m^3/s

Table 9.- Heat magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
thermodynamic temperature	T,	Thermodynamic temperature is defined according to the principles of thermodynamics	kelvin (see Table 1)	K
Celsius temperature	t,	$t = T - T_0$ Where T^o is conventionally fixed as $T_0 = 273{,}15$ K	Celsius degree	°C
linear expansion coefficient	α_1	$\alpha_l = \frac{1}{l}\frac{dl}{dT}$	reciprocal kelvin	K^{-1}
cubic expansion coefficient	α_v	$\alpha_v = \frac{1}{V}\frac{dV}{dT}$		
relative pressure coefficient	α_p	$\alpha_p = \frac{1}{p}\frac{dp}{dT}$		
pressure coefficient		= dp/dt	pascal per kelvin	Pa/K
isothermal compressibility	T	$K_T = -\frac{1}{V}\left(\frac{\delta V}{\delta p}\right)_T$	reciprocal pascal	Pa^{-1}
isentropic compressibility	S	$K_S = -\frac{1}{V}\left(\frac{\delta V}{\delta p}\right)_S$		
heat, amount of heat	Q		joule	J
thermal flux		Heat flow through a surface	watt	W
thermal flux density	q,	thermal flux divided by the area under study	watt per square meter	W/m^2
thermal conductivity	, (x)	Thermal flux density divided by temperature gradient	watt per meter kelvin	W/(mK)
heat transfer coefficient	h, k, K,	Thermal flux density divided by temperature difference	watt per square meter kelvin	$W/(m^2K)$
thermal insulation, thermal insulation	M	Difference of temperature divided by thermal flux density	Square meter kelvin per watt	$(m^2K)/W$

coefficient				
thermal resistance	R	Difference of temperature divided by thermal flux	kelvin per watt	K/W
thermal diffusivity	a	$a = -\frac{\lambda}{p c_p}$ where: is thermal conductivity; is density; c_p is the thermal capacity specified under constant pressure	square meter per second	m^2/s
thermal capacity	C	When a system's temperature increases in a differential quantity dT, as a result of the addition of a small amount of heat dQ, the magnitude dQ/dT is the thermal capacity	joule per kelvin	J/K
specific thermal capacity	c	thermal capacity divided by mass	joule per kilogram kelvin	J/(kgK)
specific thermal capacity under constant pressure	c_p			
specific thermal capacity under constant volume	c_v			
saturation specific thermal capacity	c_{sat}			
entropy	S	When a small amount of heat dQ is received by a system whose thermodynamic temperature is T, the system's entropy increases in dQ/T, considering that no irreversible change occurs in the system	joule per kelvin	J/K
specific entropy	s	Entropy divided by mass	joule per kilogram kelvin	J/(kgK)
internal energy	U, (E)		joule	J
enthalpy	H, (I)	H = U + pV		
Helmholtz free energy, Helmholtz function	A, F	A = U - TS		
Gibbs free energy, Gibbs	G	G = U + pV -TS		

function		G = H - TS		
specific internal energy	u, (e)	internal energy divided by mass	joule per kilogram	J/kg
specific enthalpy	h	Enthalpy divided by mass		
specific Helmholtz free energy, specific Helmholtz function	a, f	Helmholtz free energy divided by mass		
specific Gibbs free energy, specific Gibbs function	g	Gibbs free energy divided by mass		
Massieu function	J	J = - A/T	joule per kelvin	J/K
Planck function	Y	Y = - G/T	joule per kelvin	J/K

Table 10. - Electricity and magnetism magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
electric current	I		ampere (see table 1)	A
electric charge, amount of electricity	Q	Integral of the electric current with regard to time	coulomb	C
charge density, volumic charge density	, ( )	charge divided by volume	coulomb per cubic meter	C/m^3
areic charge density		charge divided by surface area	coulomb per square meter	C/m^2
electric field strength	E, (K)	strength exerted by an electric field on a particular electric charge, divided by charge value	volt per meter	V/m
electric potential	V,	In the case of electrostatic fields, a scalar magnitude, where the gradient has opposite sign and is equal to the value of the electric field strength E = - grad V	volts	V
potential difference, electric voltage	U, (V)	The voltage between two points 1 and 2 is the integral of the line from point 1 to point 2 of the electric field strength $\varphi_1 - \varphi_2 = \int_1^2 E_s \, ds$		
electromotive force	E	A source's electromotive force is the energy supplied by the source divided by the electric charge traveling through the source		
electric flux density, displacement	D	The electric flux density is a vectorial magnitude, whose divergence is equal to charge density	coulomb per square meter	C/m^2
electric flux,		Electric flux through a surface element is the scalar product of the surface	coulomb	C

(displacement flux)		element and the electric flux density		
capacitance	C	Charge divided by the difference of electric potential	farad	F
permittivity		Thermal flux density divided by the electric field strength	farad per meter	F/m
permittivity of vacuum, electric constant	0	$0 = 1 / \mu_0 c_0^2$ $0 = 8{,}854\ 187\ 817 \times 10^{-12}$ F/m		
relative permittivity	T	T = / 0	one	1
electric susceptibility	e	= T - 1	one	1
electric polarization	P	$P = D - {}_0E$	coulomb per square meter	C/m^2
electric dipole moment	p, (p_e)	The electric dipole moment is a vectorial magnitude whose vectorial product with the electric field strength is equal to the torque	coulomb meter	Cm
current density	J, (S)	It is the vectorial magnitude whose integral assessed for a specified surface is equal to the total current that travels through such surface	ampere per square meter	A/m^2
current linear density	A, ( )	Current divided by the thickness of the conduct plate	ampere per meter	A/m
electric field strength	H	The electric field strength is the axial vectorial magnitude whose rotation is equal to the current density, including the displacement current	ampere per meter	A/m
magnetic potential difference	U_m	The magnetic potential difference between point 1 and point 2 is equal to the integral of the line, from point 1 to point 2 of the electric field strength along its path.	Amperes	A
magnetomotive force	F, F_m	$F = \oint H \cdot dr$		
total current		Net conduction net electric current through a closed loop		
magnetic flux density, magnetic induction	B	The magnetic flux density is the axial vectorial magnitude so that the force applied on a current element, is equal to the vectorial product of this element and the magnetic flux density	tesla	T
magnetic flux		The magnetic flux traveling through a surface element is the scalar product of the surface element and the magnetic flux density	weber	Wb
magnetic vectorial potential	A	The magnetic vectorial potential is the vectorial magnitude, whose rotation is equal to the magnetic flux density	weber per meter	Wb/m
self-inductance	L	In a conductive coil, it is equal to the coil's magnetic flux, caused by the current traveling through the coil, divided by such current	henry	H
mutual inductance	M, L_{12}	In two conductive coils, it is the magnetic flux through a coil generated by the current that travels in the other coil, divided by the value of this current		

coupling coefficient	k, (x)	$k = \left\| L_{12} \right\| / \sqrt{L_{12}}$	uno	1
scattering coefficient		= 1 - k^2		
permeability		Magnetic flux density divided by the electric field strength	henry per meter	H/m
vacuum permeability, magnetic constant	0	0 = 4 x 10^{-7} H/m 0 = (12,566 370 614) x 10^{-7} H/m		
relative permeability	r	r = / 0	one	1
magnetic susceptibility	x, (m)	x = r^{-1}	one	1
electromagnetic moment (magnetic moment)	m	The electromagnetic moment is a vectorial magnitude whose vectorial product with the magnetic flux density is equal to the torque	ampere square meter	Am^2
magnetization	M, (H_j)	M = (B/μ_0) - H	ampere per meter	A/m
magnetic polarization	J, (B_j)	J = B - $_0$H	tesla	T
electromagnetic energy density	w	Energy of the electromagnetic field divided by the volume	joule per cubic meter	J/m^3
Poynting vector	S	The Poynting vector is equal to the vectorial product of the electric field strength and the magnetic field strength	watt per square meter	W/m^2
electromagnetic waves propagation speed in the vacuum	c_0	$c_o = \frac{1}{\sqrt{\varepsilon_o \mu_o}}$ c_o = 299 792 458 m/s	meter per second	m/s
(direct current) resistance	R	The difference of the electric potential divided by the current, when the conductor lacks electromotive force	ohm	Ω
(direct current) conductance	G	G = 1/R	siemens	S
(direct current) power	P	P = UI	watt	W
resistivity		The electric field strength divided by current density, when the conductor lacks electromotive force	ohm meter	m
conductivity	,	= 1/ the symbol is used in electrochemistry	siemens per meter	S/m
reluctance	R, R_m	The difference of magnetic potential divided by the magnetic flux	henry to the power of minus one	H^{-1}
permeance	, (P)	= 1/ R_m	henry	H
phase difference phase displacement		When u = u_m cos t e i = i_m cos (t-)	radian	rad

		is the phase displacement	one	1
impedance, (complex impedance)	Z	The complex representation of the potential difference, divided by the complex representation of the current	ohm	Ω
impedance module (impedance)	|Z|	$\|Z\| = \sqrt{R^2 X^2}$		
reactance	X	Impedance imaginary part $X = \omega L - \frac{1}{\omega C}$	ohm	Ω
strength	R	The difference of the electric potential divided by the current, when the conductor lacks electromotive force (see direct current resistance)		
(alternate current) resistance	R	Impedance real part		
quality factor	Q	For a non-radiant system, if Z = R + jX then: Q = |X| /R	one	1
admittance (complex admittance)	Y	Y = 1/ Z	siemens	S
admittance module (admittance)	|Y|	$\|Y\| = \sqrt{G^2 + B^2}$		
susceptance	B	Admittance imaginary part		
conductance	G	Admittance real part (see direct current conductance)		
active power or instantaneous power	P	Product of the current and the difference of potential $P = \frac{1}{T} \int_0^T uidt$ When: $u = u_m \cos t = \sqrt{2}\, U \cos t$ e $i = i_m \cos (t -) = \sqrt{2}\ I \cos (t -)$ then: iu, is the instantaneous power (symbol p) IU cos, is the active power (symbol p)	watt	W
apparent power	S (P_s)	IU is the apparent power	voltampere	VA
reactive power	Q (P_q)	IU sen is the reactive power	var	var
power factor	λ	the name "power factor" (symbol λ) is used for the ratio P/S	one	1

Table 11.- Light and electromagnetic radiations magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
frequency	f, v	Number of cycles divided by time	hertz	Hz
Circular frequency		= 2f	reciprocal second	s^{-1}
wavelength		The distance in the direction of propagation of a periodic wave between two successive points whose phase is the same	meter	m
wavenumber		= 1/	reciprocal meter	m^{-1}
circular wavenumber	k	k = 2		
electromagnetic waves propagation speed in the vacuum	c, c_0	c = 299 792 458 m/s	meter per second	m/s
radiant energy	Q, W (U, Q_e)	Energy emitted, transferred o received as radiation	joule	J
radiant energy density	w, (u)	Radiant energy in a volume element, divided by such element	joule per cubic meter	J/m^3
spectral concentration of radian energy density (in terms of wavelength)	w	Radiant energy density in an infinitesimal wavelength interval, divided by such interval range	joule per meter to the fourth power	J/m^4
radiant power, radiant energy flux	P, , (e)	Power emitted, transferred o received as radiation	watt	W
radiant flux density, radiant energy flux ratio	,	In a point in the space, the radiant energy flux incident on a small sphere, divided by the area of such sphere’s cross section	watt per square meter	W/m^2
radiant intensity	I, (I_e)	For a source in a given direction, the radiant power flowing outwards from the source or from a source element, in a solid-angle element containing the given direction, divided by such solid-angle element	watt per steradian	W/sr
radiance	L, (L_e)	In a point on a surface and in a given direction, the radiant intensity of an element of such surface, divided by the area of such element’s orthogonal projection on a plane perpendicular to the given direction	watt per steradian square meter	$W/(srm^2)$
radiant exitance	M, (M_e)	In a point on a surface, the flux of radiant energy flowing outwards from an element of such surface, divided by the area of such element	watt per square meter	W/m^2
irradiance	E, (E_e)	In a point on a surface, the flux of radiant energy incident to an element of such surface, divided by the area of such element	watt per square meter	W/m^2
Stefan Boltzmann constant		The constant in the equation for radiant exitance of a total radiator (black body), at the thermodynamic temperature T. $M = \sigma T^4$	watt per square meter kelvin to the fourth power	$W/(m^2k^4)$
first radiation constant	c_1	The constants c_1 and c_2 in the equation of the spectral concentration in a total	watt per square meter	Wm^2

		radiator's radiant exitance at the thermodynamic temperature T:		
second radiation constant	c_2	$M_\lambda = c_1 f(\lambda,T) = c_1 \frac{\lambda^{-5}}{exp(c2)/\lambda T)-1}$ $c_1 = 2hc^2$ $c_2 = hc/ k$	meter kelvin	mK
emissivity		Ratio of a thermal radiator's radiant exitance and a total radiator's (black body) at the same temperature	one	1
spectral emissivity, emissivity at a specific wavelength	( )	Ratio of a thermal radiator's radiant exitance spectral concentration and a total radiator's (black body) at the same temperature		
directional spectral emissivity	(, ,)	Ratio of a thermal radiator's radiance spectral concentration in a given direction to a total radiator's (black body) at the same temperature		
luminous intensity	I, (I_v)		candela (see Table 1)	cd
luminous flux	, (v)	The luminous flux d of a source of luminous intensity I inside a solid-angle element d is: d = I d	lumen	lm
amount of light	Q, (Q_v)	Integral as a function of time of the luminous flux	lumen second	lms
luminance	L, (L_v)	Luminance in a point on a surface and in a given direction, is defined as the luminous intensity of an element of such surface, divided by the area of such element's orthogonal projection on a plane perpendicular to the considered direction	candela per square meter	cd/m
luminous exitance	M, (M_v)	Luminous exitance in a point on a surface, is defined as the luminous flux flowing outwards from an element of such surface, divided by the area of such element	lumen per square meter	lm/m^2
luminosity (illuminance)	E, (E_v)	Luminosity in a point on a surface, is defined as the luminous flux incident on an element of such surface, divided by the area of such element	lux	lx
light exposure	H	$H = \int Edt$	lux second	lxs
luminous efficacy	K	$K = \frac{\phi_v}{\phi_e}$	lumen per watt	lm/W
spectral luminous efficacy, luminous efficacy at a specific wavelength	K ( )	$K(\lambda) = \frac{\phi v_\lambda}{\phi e_\lambda}$		
maximum spectral luminous efficacy	K_m	K maximum value ( )		

luminous efficiency	V	$V = \frac{K}{K_m}$	one	1
spectral luminous efficiency, luminous efficiency at a specified wavelength	V ( )	$V(\lambda) = \frac{K_{(\lambda)}}{K_m}$		
CIE spectral tristimulus values	$\bar{x}(\lambda)$, $\bar{y}(\lambda)$, $\bar{z}(\lambda)$	Tristimulus values of the spectral components of an equi-energy stimulus of the trichromatic system (XYZ). These functions apply to observation fields between 1st and 4th. In this system: $\bar{y}(\lambda) = \frac{def}{V(\lambda)}$	one	1
Chromaticity coordinates	x, y, z	For light whose radian flux spectral concentration is $X = \frac{\int \varphi(\lambda)\bar{x}(\lambda)d\lambda}{\int \varphi(\lambda)\,\bar{x}(\lambda)d\lambda + \int \varphi(\lambda)\,\bar{y}(\lambda)d\lambda + \int \varphi(\lambda)\bar{z}(\lambda)d\lambda}$ The equations are defined the same way for y and z. For light sources ( ) = eλ ( ) / eλ (0) (relative spectral radiant flux) For colors of objects, it is calculated by one of the three products $\varphi(\lambda) = \frac{\varphi e\lambda(\lambda)}{\varphi e\lambda(\lambda 0)} * \begin{Bmatrix} \rho & (\lambda) \\ \tau & (\lambda) \\ \beta & (\lambda) \end{Bmatrix}$	one	1
spectral absorbance	α( )	Ratio of the spectral concentrations of the absorbed and incident radiant fluxes	one	1
spectral reflectance	( )	Ratio of the spectral concentrations of the reflected and incident radiant fluxes		
spectral transmittance	( )	Ratio of the spectral concentrations of the transmitted and incident radiant fluxes	one	1
spectral radiance coefficient	( )	The spectral radiance factor in a point on a surface and in a given direction, is the quotient of the radiance spectral concentration of a non self-radiant body and a perfect diffuser, equally radiated		
Linear attenuation coefficient, linear extinction coefficient		Relative decrease in the spectral concentration of an electromagnetic radiation collimated beam's luminous or radiant flux when traveling through a laminar medium of infinitesimal thickness, divided by the length traveled	reciprocal meter	m^{-1}
linear absorption coefficient	a	Part of the attenuation coefficient due to absorption		
molar absorption coefficient	x	x = a / c where c is the substance's amount concentration	square meter per mole	m^2/mol
refractive index	n	The refractive index of a non-absorbent medium for an electromagnetic radiation of a given frequency, is the ratio of waves (or radiation) speed in the vacuum and the medium phase speed.	one	1

Table 12.- Acoustics magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
period, periodic time	T	Cycle time	second	s
frequency	f, v	f = 1 / T	hertz	Hz
frequency interval		The frequency interval between two tones is the logarithm of the ratio of the highest frequency and the lowest frequency	octave*	
angular frequency circular frequency, pulsatance		= 2f	reciprocal second	s^{-1}
wavelength			meter	m
circular wavenumber	k	$k = 2\pi/\lambda = 2\pi\sigma$ where $\sigma = 1/\lambda$	reciprocal meter	m^{-1}
density		Mass divided by volume	kilogram per cubic meter	kg/m^3
static pressure	Ps	pressure that would exist in the absence of sound waves	pascal	Pa
sound pressure	p, (p_a)	The difference between the total instantaneous pressure and the static pressure		
displacement of a sound particle	, ( )	Instantaneous displacement of a particle of the medium, referred to the position that would fill in the absence of sound waves	meter	m
speed of a sound particle	u, v	u = / t	meter per second	m/s
acceleration of a sound particle	a	a = u / t	meter per second squared	m/s^2
volumetric flow rate, volume speed	q, U	volume flow instantaneous ratio due to a sound wave	cubic meter per second	m^3/s
sound speed	c, (c_a)	sound wave speed	meter per second	m/s
sound energy density	w, (w_a), (e)	average sound energy in a given volume, divided by such volume	joule per cubic meter	J/m^3
sound energy flux, sound power	P, (Pa)	Sound energy transferred in a given time interval, divided by the duration thereof	watt	W
sound intensity	I, J	For an unidirectional flux of sound energy, the sound energy flux through a normal surface in the direction of propagation, divided by the area of such surface	watt per square meter	W/m^2

*This unit does not belong to SI but its use with SI is temporarily accepted

characteristic impedance of a medium	Z_c	For a point in a medium and a flat progressive wave, the complex representation of the sound pressure divided by the complex representation of the particle's speed	pascal second per meter	Pas/m
specific acoustic impedance	Z_s	On a surface, the complex representation of the sound pressure divided by the complex representation of the particle's speed		
acoustic impedance	Z_a	On a surface, the complex representation of the sound pressure divided by the complex representation of volume flow ratio	pascal second per cubic meter	Pas/m^3
mechanic impedance	Z_m	The complex representation of the total force applied on a surface (or to a point) of a mechanical system, divided by the complex representation of the average speed of the particle on that surface (or the particle's speed at that point) in the direction of the force	newton second per meter	Ns/m
sound pressure level	L_p	$L_p = \ln (p/p_0) = \ln 10lg (p/p_0)$ where p is the mean quadratic value of the acoustic pressure and the reference value p_0 is equal to 20 μPa	decibel	dB
sound power level	L_w	$L_w= ½ \ln(P/P_0) = ½ \ln 10lg(P/P_0)$ where P is the mean quadratic value of the acoustic power and the reference value is equal to 1 pW	decibel	dB
damping coefficient		If a magnitude is a function of time t, determined by $F(t) = Ae^{-t}\cdot\cos [(t - t_0)]$ then is the damping coefficient	reciprocal second	s^{-1}
time constant, relaxation time		= 1 / where is the damping coefficient	second	s
logarithmic decrement		Product of the damping coefficient and the period	neper	Np
attenuation coefficient		If a magnitude is a function of distance x and is determined by $F( ) = Ae^{-} \cos[(x – x_0)]$ then is the attenuation coefficient and is the phase coefficient	reciprocal meter	m^{-1}
phase coefficient			reciprocal meter	m^{-1}
propagation coefficient		= + j		
dissipation coefficient	, ( )	Ratio of dissipated sound energy flux and incident sound energy flux	one	1
reflection coefficient	r,	Ratio of the reflected sound energy flux and the incident sound energy flux		
transmission coefficient		Ratio of the transmitted sound energy flux and the incident sound energy flux		
sound absorption	, (a)	= +		

coefficient				
sound reduction index, sound transmission loss	R	R= ½ ln(1/) = ½ ln 10lg(1/) where is the transmission coefficient	decibel	dB
A surface's or object's equivalent absorption area	A	It is the area of a surface whose absorption coefficient is equal to 1, and that absorbs the same power in the same diffused sound field, considering the diffraction effects as negligible	square meter	m^2
reverberation time	T	The time needed so that the average sound energy density in an enclosed space decreases up to 10-6 times its baseline value (or 60 dB), after the source has stopped producing sound waves	second	s
loudness level	L_N	The loudness level, in a point in a sound field, is defined by: $L_N = \ln \left(\frac{p_{eff}}{P_o}\right)_{1kHz} = \ln 10 \bullet \lg \left(\frac{P_{eff}}{P_o}\right)$ where P_{eff} is the effective sound pressure (root-mean-square value) of a 1-kHz standardized pure tone, that a normal observer under standardized listening conditions considers as load as the considered field, where P_0 = 20 Pa	fon*	
loudness	N	Loudness is a normal observer's auditive assessment of the ratio of the considered sound and a reference sound with a loudness level of 40 fon	son*	

* These units do not belong to SI but their use with SI is temporarily accepted.

Table 13.- Physical-chemical and molecular physics magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
amount of substance	n, (v)		mole (see table 1)	mol
Avogadro constant	L, N_A	Number of molecules divided by the amount of the substance $N_A = N/n = (6{,}022\ 141\ 99 \pm 0{,}000\ 000\ 47)\ 10^{23}\ mol^{-1}$	reciprocal mole	mol^{-1}
molar mass	M	Mass divided by the amount of the substance	kilogram per mole	kg/mol
molar volume	V_m	Volume divided by the amount of the substance	cubic meter per mole	m^3/mol
molar internal energy	U_m	Internal energy divided by the amount of the substance	joule per mole	J/mol
molar thermal capacity	C_m	Thermal capacity divided by the amount of the substance	joule per mole kelvin	J/(mol·K)
molar entropy	S_m	Entropy divided by the amount of the substance	joule per mole kelvin	J/(mol·K)
molecules' number density	n	Number of molecules or particles divided by volume	reciprocal cubic meter	m^{-3}
molecular concentration of substance B	C_B	Number of molecules of substance B divided by the volume of the mixture		
density		Mass divided by volume	kilogram per cubic meter	kg/m^3
mass concentration of substance B	$_B$	Mass of substance B divided by the volume of the mixture		
concentration of substance B, concentration of the amount of the substance of component B	c^B	Amount of substance of component B divided by the volume of the mixture	mole per cubic meter	mol/m^3
molality of solute substance B	b_B, m_B	The amount of the solute substance of substance B in a solution divided by the mass of the solvent	mole per kilogram	mol/kg
chemical potential of substance B	$_B$	For a mixture with component substances B, C, . . ., $_B = (G/n_B)_{T,\ p,\ nC,\ .\ .\ .}$, where n_B is the amount of substance B; and G is the Gibbs function	joule per mole	J/mol
partial pressure of	p_B	For a gas mixture,	pascal	Pa

substance B (in a gas mixture)		$p_B = x_B\ p$ where p is pressure		
fugacity of substance B (in a gas mixture)	P_B, f_B	For a gas mixture, f_B is proportional to absolute activity B. The proportionality factor, which is function only of the temperature, is determined by the condition that at a constant temperature and composition p_B/p_B tends to 1 for an infinitely diluted gas	pascal	Pa
osmotic pressure		The excess pressure required to maintain the osmotic balance between a solution and the pure solvent, separated by a membrane, permeable only for the solvent	pascal	Pa
affinity (of a chemical reaction)	A	$A = -v_{B\ B}$	joule per mole	J/mol
a molecule's mass	m		kilograms	kg
a molecule's electric dipole moment	,	A molecule's electric dipole moment is a vectorial magnitude whose vectorial product with the electric field strength is equal to the torque	coulomb meter	Cm
A molecule's electric polarizability		Induced electric dipole moment divided by the electric field strength	coulomb square meter per volt	Cm^2/V
gas molar constant	R	Proportionality universal constant in an ideal gas law $pV_m = RT$ R = (8,314 472 ± 0,000 015) J/(molK)	joule per mole kelvin	J/molK
Boltzmann constant	k	$k = R / N_A$ $k = (1{,}380\ 650\ 3 \pm 0{,}000\ 002\ 4)\ 10^{-23}$ J/K	joule per kelvin	J/K
mean free path	l ,	For a molecule, mean distance between two successive collisions	meter	m
diffusion coefficient	D	$C_B\ (v_B) = -D$ **grad** C_B Where C_B is the local molecular concentration of constituent B in the mixture and (v_B) is the local mean speed of the molecules of B	square meter per second	m^2/s
thermal diffusion coefficient	D_T	$D_T = k_T\ D$	square meter per second	m^2/s
atomic number	Z	Number of protons contained in a chemical element's nucleus.		

elementary charge	-	A proton's electric charge An electron's electric charge is equal to "-e" $e = (1{,}602\ 176\ 462 \pm 0{,}000\ 000\ 063)\ 10^{-19}$ C	coulomb	C
A ion's charge number, electrovalence	z	Coefficient of a ion's charge and the elementary charge	one	1
Faraday constant	F	$F = N_A{}^e$ $F = (96\ 485{,}341\ 5 \pm 0{,}003\ 9)$ C/mol	coulomb per mole	C/mol
ionic strength	I	A solution's ionic strength is defined as $I = (1/2)\ z_i^2 m_i$ where the summation includes all ions with molality m_i	mole per kilogram	mol/kg
Electrolytic conductivity	x,	Electrolytic current density divided by the electric field strength	siemens per meter	S/m
molar conductivity	$_m$	Conductivity divided by the concentration	siemens square meter per mole	Sm^2/mol

Annex A

Names and symbols of the chemical elements

Atomic number	Name	Symbol		Atomic number	Name	Symbol
1	hydrogen	H		32	germanium	Ge
2	helium	He		33	arsenic	As
				34	selenium	Se
3	lithium	Li		35	bromine	Br
4	beryllium	Be		36	krypton	Kr
5	boron	B				
6	carbon	C		37	rubidium	Rb
7	nitrogen	N		38	strontium	Sr
8	oxygen	Or		39	yttrium	Y
9	fluorine	F		40	zirconium	Zr
10	neon	Ne		41	niobium	Nb
				42	molybdenum	Mo
11	sodium	Na		43	technetium	Tc
12	magnesium	Mg		44	ruthenium	Ru
13	Aluminum	To		45	rhodium	Rh
14	silicon	If		46	palladium	Pd
15	phosphorus	P		47	silver	Ag
16	sulphur	S		48	cadmium	Cd
17	chlorine	Cl		49	indium	In
18	argon	Ar		50	tin	Sn
				51	antimony	Sb
19	potassium	K		52	tellurium	Te
20	calcium	Ca		53	iodine	I
21	scandium	Sc		54	xenon	Xe
22	titanium	Ti				
23	vanadium	V		55	cesium	Cs
24	chromium	Cr		56	barium	Ba
25	manganese	Mn		57	lanthanum	The
26	iron	Fe		58	cerium	Ce
27	cobalt	Co		59	praseodymium	Pr
28	nickel	Ni		60	neodymium	Nd
29	copper	Cu		61	promethium	Pm
30	zinc	Zn		62	samarium	Sm
31	gallium	Ga		63	europium	Eu
64	gadolinium	Gd		88	radio	Ra
65	terbium	Tb		89	actinium	Ac
66	dysprosium	Dy		90	thorium	Th
67	holmium	Ho		91	protactinium	Pa
68	erbium	Er		92	uranium	U
				93	neptunium	Np
69	thulium	Tm		94	plutonium	Pu
70	ytterbium	Yb		95	americium	Am
71	lutetium	Lu		96	curium	Cm
72	hafnium	Hf		97	berkelium	Bk
73	tantalum	Ta		98	californium	Cf
74	tungsten	W		99	einsteinium	Es
75	rhenium	Re		100	fermium	Fm
76	osmium	Os		101	mendelevium	Md
77	iridium	Ir		102	nobelium	No
78	platinum	Pt		103	lawrencium	Lr
79	gold	Au		104	unnilquadium	Unq
80	mercury	Hg		105	unnilpentium	Unp

81	thallium	Tl		106	unnilhexium	Unh
82	lead	Pb		107	unnilseptium	Uns
83	bismuth	Bi		108	unniloctium	Uno
84	polonium	Po		109	unnilennium	Une
85	astatine	At		110	ununnilium	Uun
86	radon	Rn		111	unununium	Uuu
87	francium	Fr				

Annex B

Symbol of the chemical elements and of the nuclides

The symbols of the chemical elements must be written in straight characters. The symbol is not followed by a point.

Examples: H He C Ca

Subscripts or superscripts affecting the symbol of the nuclids or of the molecules, they must have the following meanings and positions:

A nuclide's mass number is placed as left superscript; e.g.:

^{14}N

The number of atoms of a nuclid in a molecule is placed as right subscript; e.g.:

$^{14}N^{2}$

The atomic number may be placed as left subscript; e.g.:

$_{64}Gd$

When needed, an ionization or excited state may be indicated through a right superscript.

Examples:

Ionization state: Na^{+}, PO_4^{3-} o $(PO_4)^{3-}$

Excited electronic state: He*, NO*

Nuclear excited state: $^{110}Ag^{*}$ or $^{110}Ag^{m}$

Annex C

pH

pH is defined operationally. For a dissolution X, the electromotive force Ex of the galvanic cell is measured.

Reference electrode | KCl concentrated solution | solution X | H2 | Pt

and, likewise, the electromotive force of a galvanic cell differing from the foregoing only in the substitution off the dissolution X of unknown pH, designed by pH(X), by a standard solution S, whose pH is pH(S). In this conditions,

$$pH(X) = pH(S) + (E_s - E_x)F / (RT \ln 10).$$

The pH so defined lacks dimensions.

The IUPAC Manual on symbols and terminology for physical chemistry magnitudes and units (1997) provides the pH values for several standard solutions.

pH does not have a fundamental meaning; its definition is a practical definition. However, in the restricted interval of the diluted water solutions whose concentrations of amount of substance are lower than 0,1 ml,/dm^3 and that are not strongly acid nor strongly alkaline (2 < pH < 12), the definition is so that,

$$pH = -lg[c(H^{+})y_1 / (mol.dm^{-3})] \pm 0{,}02$$

where $c(H^{+})$ indicates the concentration in the amount of the substance of the ion of hydrogen H^{+} and y_1 indicates the coefficient of activity of a characteristic monovalent electrolyte in a dissolution.

Table 14.- Atomic physics and nuclear physics magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
Atomic number, protonic number	Z	Number of protons contained in a chemical element's nucleus.	one	1
neutronic number	N	Number of neutrons contained in a nuclid's nucleus.	one	1
nucleonic number mass number	A	Number of nucleons contained in a nuclid's nucleus.	one	1
atom mass, nuclide mass	m_a, m(X)	rest mass of an atom in ground state For ^1H $m(^1H) = (1,673\ 534\ 0 \pm 0,000\ 001\ 0)\ 10^{-27}$ kg $= (1,007\ 825\ 048 \pm 0,000\ 000\ 012)$ u*	kilogram (unified) atomic mass constant	kg u*
(unified) atomic mass constant	m_u	1/12 of the rest mass of a neutral atom of nuclide ^{12}C in ground state $m_u = (1,660\ 540\ 2 \pm 0,000\ 001\ 0)\ 10^{-27}$ kg = 1 u* m_a / m_u = is known as relative nuclide mass		
electron (rest) mass	m_e	me = $(9,109\ 381\ 88 \pm 0,000\ 000\ 72) \times 10^{-31}$ kg	kilogram	kg
proton (rest) mass	m_p	$m_p = (1,672\ 621\ 58 \pm 0,000\ 000\ 13)\ 10^{-27}$ kg		
neutron (rest) mass	m_n	$m_n = (1,674\ 927\ 16 \pm 0,000\ 000\ 13)\ 10^{-27}$ kg		
elementary charge	e	A proton's electric charge is: $e = (1,602\ 176\ 462 \pm 0,000\ 000\ 49)\ 10^{-19}$ C	coulomb	C
Plank constant	h	Elemental action quantum $h = (6,626\ 068\ 76 \pm 0,000\ 000\ 52)\ 10^{-34}$ Js h = h/2	joule second	Js

* This unit does not belong to SI but its use is temporarily accepted.

Bohr radius	a_0	$a_0 = \frac{4\pi\varepsilon_o\hbar^2}{m_e e^2}$ a_0 = (0,529 177 2083 ± 0,000 000 001924) 10^{-10} m	meter	m
Rydberg constant	R∞	$R\infty = \frac{e^2}{8\pi\varepsilon_o a_o hc}$ = (10 973 731, 568 549 ± 0,000 083) m^{-1}	reciprocal meter	m^{-1}
Hartree energy	E_h	$E_h = \frac{e^2}{4\pi\varepsilon_o a_o}$ = 2R∞ • hc = (4,359 743 81± 0,000 000 34) 10^{-18} J	joule	J
A particle's or nucleus' magnetic moment		Mean value of the electromagnetic component in the direction of the magnetic field in the quantum state corresponding to the maximum magnetic quantum number	ampere square meter	Am^2
Bohr magneton	B	μ_B = eh /2m_e = (9,274 015 4 ± 0,000 003 1) x 10^{-24} Am^2		
nuclear magneton	N	μ□ = eh /2m_p = (m_e / m_p) μ_B = (5,050 786 6 ± 0,000 0001 7) x 10^{-27} Am^2		
gyromagnetic coefficient (gyromagnetic ratio)		$\gamma = \frac{\mu}{Jh}$ where J is the quantum number of the angular moment	Ampere square meter per joule second	Am^2/(Js)
atom's or electron's g-factor	g	$\gamma = -g \frac{\mu B}{h} = -g \frac{e}{2m_e}$	one	1
nucleus' or nuclear particle g-factor	g	$\gamma = g \frac{\mu N}{h} = g \frac{e}{2m_p}$		
Larmor angular frequency (Larmor circular frequency)	L	$\omega_L = \frac{e}{2m_e}B$ where B is the magnetic flux density	radian per second	rad/s
Nuclear precession angular frequency	N	$^N = B$	reciprocal second	s^{-1}
cyclotronic angular frequency (cyclotronic circular frequency)	C	$\omega_c = \frac{q}{m}$ where: q/m is the ratio of charge to particle's mass B is the magnetic flux density	reciprocal second	s^{-1}

nuclear quadrupole moment	Q	Magnitude expected value $(1/e)\int(3z^2 - r^2) \bullet \rho(x, y, z)dV$ in the quantum state with the nuclear spin in the direction of field (z); (x, y, z) is the nuclear charge density and "e" is the elementary charge	square meter	m^2
nuclear radius	R	The mean radius volume where the nuclear material is included	meter	m
orbital angular moment quantum number, secondary quantum number, azimuthal quantum number	l_i, L		one	1
spin quantum number	s_i, S		one	1
total spin quantum number	j_i, J		one	
nuclear spin quantum number	I		one	1
hyperfine structure quantum number	F		one	1
main quantum number	n		one	1
magnetic quantum number	m_i, M		one	1
electron radius	r_e	$r_e = \frac{e^2}{4\pi\varepsilon_o m_e c^2}$ = 2,817 940 92 ± 0,000 000 38 1 10^{-15} m	meter	m
Compton wavelength	C	C = 2h / mc = h/mc where m is the particle's rest mass	meter	m
mass excess		$= m_a - Am_u$	kilogram	kg
mass defect	B	$B = Zm(^1H) + Nm_n - m_a$		

relative mass excess	r	$r = D/m_u$	one	1
relative mass defect	B_r	$B_r = B/m_u$		
packing fraction	f	$f = _r/A$	one	1
binding fraction, nucleon binding energy	b	$b = B_r/A$		
average life		For exponential decay, the average time required to reduce the N number of atoms or nuclei in a specific state up to N/e	second	s
level width		$\Gamma = \frac{\hbar}{\tau}$	joule	J
activity (radioactivity)	A	Average number of spontaneous nuclear transitions that occurred in a certain amount of a radionuclid in a short time interval, divided by the value of such interval	becquerel	Bq
a sample's specific activity	a	The activity of a radioactive nuclide present in a sample, divided by the total mass of the sample	becquerel per kilogram	Bq/kg
disintegration constant, decay constant		Decay constant is the probability of decay in a short time interval divided by this interval. $dN/dt = - \lambda N$ where: N is the number of radioactive atoms in time t = 1/	reciprocal second	s^{-1}
mean life	T½	For exponential decay, the average time required for the disintegration of the half of the atoms of a sample of a radioactive nuclid	second	s
alpha disintegration energy	Qα	The summation of the particle's kinetic energy produced in the disintegration process and the atom's residual energy produced in the reference framework where the emitting nucleus rests before its disintegration	joule	J
beta particle's maximum energy	E_β	Maximum energy of the energy spectrum in a beta disintegration process	joule	J

beta disintegration energy	Q_{β}	The summation of the beta particle's maximum energy E_{β} and the atom's residual energy produced in the reference framework where the emitting nucleus rests before its disintegration	joule	J

Table 15.- Nuclear and ionizing reactions magnitudes and units

Magnitude	Magnitude symbol	Magnitude definition	SI unit	SI unit symbol
reaction energy	Q	In a nuclear reaction, the summation of the kinetic and radiant energies of the reaction products, minus the summation of the reagents' kinetic and radiant energies.	joule	J
resonance energy	E_r, E_{res}	The kinetic energy of an incident particle, in the target's reference framework, corresponding to a resonance in a nuclear reaction	joule	J
cross section		For a specified target entity and for a reaction or process specified by incident, charged with energy or not, particles and specified type, the cross section is the quotient of the probability of this reaction or process for this target entity and the incident particles' particle fluence	square meter	m^2
total cross section	σ_{tot}, σ_T	The summation of all the cross sections corresponding to the different reactions or processes occurred between the incident particle and the target particle		
angular cross section	Ω	Cross section required to release or scatter a particle inside a solid-angle element, divided by such element $= _{\Omega}d\Omega$	square meter per steradian	m^2/sr
spectral cross section	E	Cross section for a process where the energy of a released or scattered particle is in an energy element, divided by such element $= _{E}dE$	square meter per joule	m^2/J
spectral angular cross section	$_{\Omega}$, E	Cross section required to release or scatter a particle inside a solid-angle element, with energy in an energy element, divided by the product of these two elements $= _{\Omega,E}\ d_{\Omega}\ d_{E}$	square meter per joule steradian	$m^2/(srJ)$
macroscopic cross section, cross section density		The summation of the cross sections of a specific-type reaction or process, for all the atoms of a given volume, divided by such volume	reciprocal meter	m^{-1}
total macroscopic cross section, total cross section density	tot, T	The total summation of the cross sections for all the atoms of a given volume, divided by such volume		
particle fluence		In a point in the space, the number of particles incident on a small sphere in a time interval, divided by the area of such sphere's cross section	reciprocal square meter	m^{-2}
particle fluence rate, particle flux density		$\varphi = \frac{d\phi}{dt}$	reciprocal square meter per second	m^{-2}/s
energy fluence		In a point in the space, the summation of the energies, excluding rest energy, of the particles incident on a small sphere in a time interval, divided by the area of such sphere's cross section	lumen per square meter	J/m^2

energy fluence rate, energy flux density		$\psi = \frac{d\psi}{dt}$	watt per square meter	W/m^2
Particle current density	J, (S)	The integral of a vectorial magnitude whose normal component on any surface is equal to the net number of particles traveling through that surface in a short interval of time, divided by such interval	reciprocal square meter per second	m^{-2}/s
linear attenuation coefficient	μ, μ_1	$\mu = -\left(\frac{1}{J}\right)\frac{dJ}{dx}$ where J is the current density of a particle beam parallel to the direction x	reciprocal meter	m^{-1}
mass attenuation coefficient	m	Linear attenuation coefficient divided by the substance's mass density	square meter per kilogram	m^2/kg
molar attenuation coefficient	c	c = /c where c is the substance's amount concentration	square meter per mole	m^2/mol
atomic attenuation coefficient	a at ,	a = /n where n is the number density of atoms in the substance	square meter	m^2
half-value thickness, half-value thickness value, half-value layer	d½	Attenuating layer thicknesses that reduces the current density of an unidirectional beam to the half of its baseline value	meter	m
Total linear stopping power	S, S_1	For an energy ionizing charged particle E, moving in the direction x $S = - dE/dx$	joule per meter	J/m
Total atomic stopping power	S_a	$S_a = S/n$ where n is the number density of atoms in the substance	joule square meter	Jm^2
Total mass stopping power	S_m	Total linear stopping power divided by the substance's mass density	joule square meter per kilogram	Jm^2/kg
mean linear range	R, R_1	Distance in a given substance penetrated by a particle, under averaged specific conditions of a group of particles having the same energy	meter	m
mean mass range	R_ρ, (R_m)	Total linear range multiplied by the substance's mass density	kilogram per square meter	kg/m^2
linear ionization by a particle	N_{il}	Number of elementary charges of the same sign, produced in an element of the length of the path of an ionizing charged particle divided by such element	reciprocal meter	m_{-1}
average energy loss per pair of formed ions	W_j	An ionizing charges particle's baseline kinetic energy, divided by such particle's total ionization	joule	J
mobility		Average drift speed caused by an electric field or a charged particle in medium, divided by the field strength	square meter per volt second	$m^2/(Vs)$

ion's number density, ion density	n^+, n^-	A volume element's number of positive or negative ions, divided by such element	reciprocal cubic meter	m^{-3}
recombination coefficient		Recombination law coefficient $- \frac{dn^+}{dx} = - \frac{dn^-}{dt} = \alpha n^+ n^-$	cubic meter per second	m^3/s
neutrons' number density	n	Number of free neutrons in a volume element, divided by such element	reciprocal cubic meter	m^{-3}
neutron speed	v	The magnitude of neutron speed	meter per second	m/s
neutron flux density, neutron flux speed		In a given point in the space, the number of neutrons incident on a small sphere in a short time interval, divided by the area of such sphere's cross section and by the time interval	reciprocal square meter per second	m^{-2}/s
diffusion coefficient, diffusion coefficient for neutrons' number density	D, D_n	$J_x = -D_n n/x$ where: Jx is the component x of the neutrons' current density n is the neutrons' number density	square meter per second	m^2/s
diffusion coefficient for neutron flux density, diffusion coefficient for neutron fluence speed	D, (D)	$J_x = -D/x$ Where: J_x is the component x of the neutrons' current density is the neutronic flux density	meter	m
total density of a neutron source	S	Ratio of neutron production in a volume element, divided by such element	reciprocal second reciprocal cubic meter	$s^{-1}m^{-3}$
stopping density	q	Delayed neutrons' number density, exceeding a given value of energy, during a short interval of time, divided by such interval	reciprocal cubic meter per second	m^{-3}/s
resonance escape probability	p	In an infinite medium, probability that a neutron of stopping through an energetic zone where there are resonances, moves beyond it without being absorbed	one	1
lethargy	u	In neutron stopping, Neperian logarithm of the quotient of a reference energy, E_0, usually the neutron's highest, and the neutron's energy, E	one	1
mean logarithmic decay		Mean value of the decrease of the Neperian logarithm of the neutrons' energy in their elastic conditions with nuclei whose kinetic energy is insignificant when compared with the neutrons'	one	1
average free path	l,	Average distance traveled by a particle between two successive specific reactions or processes	meter	m
lag area	L^2_s, L^2_{sl}	In an infinite homogeneous medium, the sixth of the mean quadratic distance between a neutron source and the point where the neutron reach a determined	square meter	m^2

		energy		
diffusion area	L^2	In an infinite homogeneous medium, the sixth of the mean quadratic distance between the point where the neutron enters into a specified class and the point where it abandons this class		
migration area	M^2	The summation of the lag area of the fission energy to thermal energy and the diffusion area for thermal neutrons		
lag length	L_s, L_{sl}	lag area's square root	meter	m
diffusion length	L	diffusion area's square root		
migration length	M	migration area's square root		
fission neutron efficiency	v	In the fission of a given nuclide, average of the number of immediate and delayed neutrons emitted in each fission	one	1
absorption neutron efficiency		Average of the number of fission neutrons, immediate and delayed, emitted for each neutron absorbed in a fissionable nuclid or in a nuclear fuel, as specified		
fast fission factor		For an infinite medium, ratio of the mean number of neutrons produced by all the fissions and of neutrons produced exclusively by thermal fissions	one	1
thermal utilization factor	f	For an infinite medium, ratio of the number of thermal neutrons absorbed in a nuclear fuel, as specified, and the total number of absorbed thermal neutrons	one	1
non-leakage probability		Probability that a neutron does not escape from a reactor's core during the moderation process or diffusion process in the thermal zone	one	1
multiplication factor	k	For a multiplying medium, ratio of the total number of neutrons produced during a time interval and the total number of neutrons lost due to absorption and escape during such interval	one	1
infinite multiplication factor, infinite medium multiplication factor	k_∞	multiplication factor of a medium without neutron leakage		
effective multiplication factor	k_{eff}	multiplication factor corresponding to a finite medium		
reactivity		In a multiplying medium, measure of the deviation between the state of the medium and its critical state $\rho = \frac{k_{eff}-1}{k_{eff}}$	one	1
reactor constant time	T	Time required for a reactor's neutron flux density to change in a factor "e" when the flux density increases or decreases exponentially	second	s

activity	A	Average number of spontaneous nuclear transactions that occurred in a certain amount of a radionuclid in a short time interval, divided by the value of such interval	becquerel	Bq
energy imparted		The energy imparted by ionizing radiation to the matter in a volume, is, the difference of the summation of the energy of all the directly ionizing (charged) or indirectly ionizing (without charge) particles that have filled the volume and the summation of the energies of those energies emerging from it, minus the equivalent energy of any increase of the resting mass that takes place in reactions of elementary or nuclear particles	joule	J
mean energy imparted	ε□	average of energy imparted	joule	J
specific energy imparted	z	For any ionizing radiation, the energy imparted to an element of irradiated matter, divided by the mass of that element	gray	Gy
absorbed dose	D	For any ionizing radiation, the energy imparted to an element of irradiated matter, divided by the mass of this element		
dose equivalent	H	Dose equivalent is the product of D,Q and N in the point of interest, where D is the absorbed dose, Q is the quality factor and N is the product of any other determinant factors H = DQN	sievert	Sv
absorbed dose rate	D	Dose absorbed in a short time interval, divided by such interval	gray per second	Gy/s
linear energy transfer	L	For an ionizing charged particle, the local energy imparted to a mass, through a short distance, divided by such distance	joule per meter	J/m
kerma	K	For indirectly ionizing (without charge) particles, the summation of the baseline kinetic energies of all the charged particles released in an element of matter, divide by the mass of such kerma element in a short time interval, divided by that interval	gray	Gy
kerma rate	K	$K = \frac{dK}{dt}$	gray per second	Gy/s
mass energy transfer coefficient	tr/	For an indirectly ionizing (without charge) particle beam $\mu_{tr} / \rho = \frac{K}{\psi}$ where is the energy flux density	square meter per kilogram	m^2/kg
exposition	X	For X or gamma radiation, the total electrical charge of ions of the same sign produced when all the photon-released electrons (positive and negative) in an air element are stopped in the air, divided by the mass of that element	coulomb per kilogram	C/kg
exposure rate	X	Exposure in a short time interval, divided by such interval	coulomb per kilogram second	C/(kgs)

TABLE 16.- Units not belonging to the SI, kept to be used with the SI

Magnitude	Unit	Symbol	Equivalent
time	minute	min	1 min = 60 s
	Time	h	1 h = 60 min = 3 600 s
	day	d	1 d = 24 h = 86 400 s
	year	a	1 a = 365,242 20 d = 31 556 926 s
angle	degree	°	1° = (/180) rad
	minute	‘	1' = (/10 800) rad
	second	“	1” = (/648 000) rad
volume	liter	l, L	1 L = 10^{-3} m^3
mass	ton	t	1 t = 10^3 kg
work, energy	electronvolt	eV	1 eV = 1,602 177 x 10^{-19} J
mass	atomic mass unit	u	1 u = 1,660 540 x 10^{-27} kg

Table 17.- Units not belonging to the SI, kept to be temporarily used with the SI

Magnitude	Unit	Symbol	Equivalence
surface	area	a	1 a = 10^2 m^2
	hectare	ha	1 ha = 10^4 m^2
	barn	b	1 b = 10^{-28} m^2
length	angströn	Å	1 Å = 4 x 10^{-10} m
length	nautical mile		1 nautical mile = 1852 m
pressure	bar	bar	1 bar = 100 kPa
speed	knot		1 knot = (0,514 44) m/s
radiation dose	röntgen	R	1 R =2,58 x 10^{-4} C/kg
absorbed dose	rad*	rad (rd)	1 rad = 10^{-2} Gy
radioactivity	curie	Ci	1 Ci = 3,7 x 10^{10} Bq
acceleration	gal	Gal	1 gal = 10^{-2} m/s^2
dose equivalent	rem	rem	1 rem = 10^{-2} Sv

* rad is the special unit to express ionizing radiation's absorbed dose. When there is risk of confusion with the symbol of radian, rd may be used a symbol for rad.

Table 18.- Examples of units that must not be used

Magnitude	Unit	Symbol	Equivalence
length	fermi	fm	10^{-15} m
length	X unit	X unit	1,002 x 10^{-4} nm
volume	stere	st	1 m^3
mass	metric carat	CM	2 x 10^{-4} kg
force	kilogram-force	kgf	9,806 65 N
pressure	torr	Torr	133,322 Pa
power	calorie	sch.	4,186 8 J
force	dina	dyn	10^{-5} N

power	erg	erg	10^{-7} J
luminance	stilb	sb	10^{4} cd/m^{2}
dynamic viscosity	poise	P	0,1 Pas
kinematic viscosity	stokes	St	10^{-4} m^{2}/s
luminosity	phot	ph	10^{4} lx
induction	gauss	Gs, G	10^{-4} T
magnetic field strength	oersted	Oe	(1000 / 4) A/m
magnetic flux	maxwell	Mx	10^{-8} Wb
induction	gamma		10^{-9} T
mass	gamma		10^{-9} kg
volume	lambda		10^{-9} m^{3}

Table 19.- Prefixes to form multiples and submultiples

Name	Symbol	Heating Value	
yotta	Y	10^{24} =	1 000 000 000 000 000 000 000 000
zetta	Z	10^{21} =	1 000 000 000 000 000 000 000
exa	E	10^{18} =	1 000 000 000 000 000 000
peta	P	10^{15} =	1 000 000 000 000 000
tera	T	10^{12} =	1 000 000 000 000
giga	G	10^{9} =	1 000 000 000
mega	M	10^{6} =	1 000 000
kilo	k	10^{3} =	1 000
hecto	h	10^{2} =	100
deca	da	10^{1} =	10
deci	d	10^{-1} =	0,1
centi	c	10^{-2} =	0,01
mili	m	10^{-3} =	0,001
micro	µ	10^{-6} =	0,000 001
nano	n	10^{-9} =	0,000 000 001
peak	p	10^{-12} =	0,000 000 000 001
femto	f	10^{-15} =	0,000 000 000 000 001
atto	a	10^{-18} =	0,000 000 000 000 000 001
zepto	z	10^{-21} =	0,000 000 000 000 000 000 001
yocto	y	10^{-24} =	0,000 000 000 000 000 000 000 001

Table 20.- General rules to write the symbols of the SI units

1.- The symbols of the units must be expressed in Roman characters, usually in lower case letters, with the exception of the symbols derived from personal names, where capitalized Roman characters are used

Examples: m, cd, K, A

2.- A point shall not be written after the unit's symbol

3.- Unit symbols can not be written in plural

Examples: 8 kg, 50 kg, 9 m, 5 m

4.- The multiplication sign to indicate the product of two or more units shall preferably be a point. This point may be suppressed when the lack of space between the symbols of the units intervening in the product does not lead to misunderstandings

Example: N.m or Nm, also m.N but not: mN which is mistaken as milinewton, submultiple of the unit of force, with the unit of moment of force or torque (newton meter)

5.- When a derived unit is made by the quotient of two units, a slash, an horizontal line or negative powers may be used

Example:m/s o ms^{-1} to design the unit of speed: meter per second

6.- More than one slash may not be used, except when parentheses are used. In complicated cases, negative power or parentheses must be used

Examples: m/s^2 o ms^{-2}, but not: m/s/s

$mkg / (s^3 A)$ o $mkgs^{-3} A^{-1}$, pero no: $mkg/s^3/A$

7.- The units' multiples and submultiples are made placing the corresponding prefixes before the names thereof, with the exception of the multiples and submultiples of the unit of mass, where the prefixes are followed by the word "gram"

Example: dag, Mg (decagram; megagram)

ks, dm (kilosecond; decimeter)

8.- The symbols of the prefixes must be printed in (straight) Roman characters, without spaces between the symbol of the prefix and the symbol of the unit

Example: mN (milinewton) and not: m N

9.- If a symbols contains a prefix with an exponent, it indicates that the multiple of the unit is raised to the power expressed by the exponent

Example: $1\ cm^3 = (10^{-2}\ m)^3 = 10^{-6}\ m^3$

$1\ cm^{-1} = (10^{-2}\ m)^{-1} = 10^2\ m^{-1}$

10.- Composite prefixes must be avoided

Example: 1 nm (one nanometer)

but not: 1 mμm (one milimicrometer)

Table 21.- Rules to write numbers and their decimal sign

Numbers	Numbers must be usually printed in Roman characters. To enable reading numbers with several digits, they must be separated in appropriate groups, preferably of three digits, from the decimal to the right and to the left; groups must be separated by a small space, never a comma, a point or through another means.
Decimal sign	The decimal sign must be a comma on the line (,). If the magnitude of the number is inferior to the unit, the decimal sign must be preceded by a zero.

9. Enforcement

The enforcement of this Mexican Official Standard is responsibility of the Ministry of Economy, through the Directorate General of Standards and the Office of the Federal Prosecutor for the Consumer.

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IUPAC Pure Appl. Chem., 51, 381-384 (1997)

11. Consistency with International Standards

This Standard is consistent with the provisions of the documents of the Bureau International des Poids et Mesures [International Bureau of Weights and Measures] and with the ISO standards referred to in the bibliography. The tables have been prepared using the most commonly used units.

PROVISIONAL ARTICLES

ONE.- This Mexican Official Standard shall enter into effect 60 days after its publication in the Federal Official Gazette.

TWO. Mexican Official Standard NOM-008-SCFI-1993, General System of Measurement Units [International Bureau of Weights and Measures].

Mexico City, October 24th, 2002.- Managing Director for Standards, Miguel Aguilar Romo.- Signature.