

COUNCIL DIRECTIVE

of 20 December 1979

on the approximation of the laws of the Member States relating to units of measurement
and on the repeal of Directive 71/354/EEC

(80/181/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to Council Directive 71/354/EEC of 18 October 1971 on the approximation of the laws of the Member States relating to units of measurement ⁽¹⁾, as last amended by Council Directive 76/770/EEC ⁽²⁾,

Having regard to the proposal from the Commission ⁽³⁾,

Having regard to the opinion of the European Parliament ⁽⁴⁾,

Having regard to the opinion of the Economic and Social Committee ⁽⁵⁾,

Whereas units of measurement are essential in the use of all measuring instruments, to express measurements or any indication of quantity; whereas units of measurement are used in most fields of human activity; whereas it is necessary to ensure the greatest possible clarity in their use; whereas it is therefore necessary to make rules for their use within the Community for economic, public health, public safety or administrative purposes;

Whereas, however, there exist international conventions or agreements in the field of international transport which bind the Community or the Member States; whereas these conventions or agreements have to be respected;

Whereas the laws which regulate the use of units of measurement in the Member States differ from one Member State to another and as a result hinder trade; whereas, in these circumstances, it is necessary to

harmonize laws, regulations and administrative provisions in order to overcome such obstacles;

Whereas units of measurement are the subject of international resolutions adopted by the General Conference of Weights and Measures (CGPM) set up by the Metre Convention signed in Paris on 20 May 1875, to which all the Member States adhere; whereas the 'International System of Units' (SI) was drawn up as a result of these resolutions;

Whereas the Council on 18 October 1971 adopted Directive 71/354/EEC on the approximation of the laws of the Member States in order to eliminate obstacles to trade by adopting the international system of units at Community level; whereas Directive 71/354/EEC was amended by the Act of Accession and by Directive 76/770/EEC;

Whereas these Community provisions have not overcome all the obstacles in this field; whereas Directive 76/770/EEC provides for the review before 31 December 1979 of the situation regarding units of measurement, names and symbols listed in Chapter D of the Annex thereto; whereas it has also proved necessary to review the situation regarding certain other units of measurement;

Whereas it is necessary, in order to avoid serious difficulties, to provide for a transitional period during which units of measurement which are not compatible with the international system can be phased out; whereas it is nevertheless essential to allow the Member States wishing to do so to bring into force as quickly as possible, on their territory, the provisions of Chapter I of the Annex; whereas it is therefore necessary to limit the duration of this transitional period at Community level while, at the same time, leaving the Member States free to curtail that period;

Whereas, during the transitional period, it is essential, particularly in order to protect the consumer, to maintain a clear position on the use of units of measurement in trade between the Member States; whereas the obligation on the Member States to allow use of supplementary indications on products and equipment imported from other Member States during this transitional period seems to serve this purpose well;

⁽¹⁾ OJ No L 243, 29. 10. 1971, p. 29.

⁽²⁾ OJ No L 262, 27. 9. 1976, p. 204.

⁽³⁾ OJ No C 81, 28. 3. 1979, p. 6.

⁽⁴⁾ OJ No C 127, 21. 5. 1979, p. 80.

⁽⁵⁾ Opinion delivered on 24/25 October 1979 (not yet published in the Official Journal).

Whereas the systematic adoption of a solution of this kind for all measuring instruments, including medical instruments, is however not necessarily desirable; whereas the Member States should therefore be able to require that, on their territory, measuring instruments bear indications of quantity in a single legal unit of measurement;

Whereas this Directive does not affect the continued manufacture of products already on the market; whereas it does, however, affect the placing on the market and use of products and equipment bearing indications of quantity in units of measurement which are no longer legal units of measurement, when such products and equipment are necessary to supplement or replace components or parts of such products, equipment and instruments already on the market; whereas it is therefore necessary for Member States to authorize the placing on the market and the use of such products and equipment to complete and replace components, even when they bear indications of quantity in units of measurement which are no longer legal units of measurement, so that products, equipment or instruments already on the market may continue to be used;

Whereas the International Organization for Standardization (ISO) on 1 March 1974 adopted an international standard on the representation of SI and other units for use in systems with limited sets of characters; whereas it is advisable for the Community to adopt the solutions which have already been approved on a wider international level by ISO Standard 2955 of 1 March 1974;

Whereas Community provisions relating to units of measurement are to be found in several Community texts; whereas the question of units of measurement is so important that it is essential that reference may be made to a single Community text; whereas this Directive thereby consolidates all the Community provisions on the subject and repeals Directive 71/354/EEC,

HAS ADOPTED THIS DIRECTIVE:

Article 1

The legal units of measurement within the meaning of this Directive which must be used for expressing quantities shall be:

- (a) those listed in Chapter I of the Annex;
- (b) those listed in Chapter II of the Annex, until a date to be fixed by the Member States; this date may not be later than 31 December 1985;
- (c) those listed in Chapter III of the Annex only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those Member States; this date may not be later than a date to be set by the Council before 31 December 1989 on the basis of Article 100 of the Treaty.

Article 2

- (a) The obligations arising under Article 1 relate to measuring instruments used, measurements made and indications of quantity expressed in units of measurement, for economic, public health, public safety or administrative purposes.
- (b) This Directive shall not affect the use in the field of air and sea transport and rail traffic of units, other than those made compulsory by the Directive, which have been laid down in international conventions or agreements binding the Community or the Member States.

Article 3

1. For the purposes of this Directive 'supplementary indication' means one or more indications of quantity expressed in units of measurement not contained in Chapter I of the Annex accompanying an indication of quantity expressed in a unit contained in that Chapter.
2. The use of supplementary indications shall be authorized until 31 December 1989.
3. However, Member States may require that measuring instruments bear indications of quantity in a single legal unit of measurement.
4. The indication expressed in a unit of measurement listed in Chapter I shall predominate. In particular, the indications expressed in units of measurement not listed in Chapter I shall be expressed in characters no larger than those of the corresponding indication in units listed in Chapter I.
5. The use of supplementary indications may be extended after 31 December 1989.

Article 4

The use of units of measurement which are not or are no longer legal shall be authorized for:

- products and equipment already on the market and/or in service on the date on which this Directive is adopted,

— components and parts of products and of equipment necessary to supplement or replace components or parts of the above products and equipment.

However, the use of legal units of measurement may be required for the indicators of measuring instruments.

Article 5

International standard ISO 2955 of 1 March 1974, 'Information processing — Representations of SI and other units for use in systems with limited character sets' shall apply in the field covered by paragraph 1 thereof.

Article 6

Directive 71/354/EEC shall be repealed on 1 October 1981.

However, by way of derogation from Directive 71/354/EEC, Member States shall authorize or continue to allow on the terms specified in Article 1 of this Directive the use of the following units of measurement after 31 December 1979:

millimetre of mercury	(Chapter II)
poise	(Chapter II)
stokes	(Chapter II)
yard	(Chapter III)
square yard	(Chapter III)
therm	(Chapter III).

Article 7

(a) Member States shall adopt and publish before 1 July 1981 the laws, regulations and administrative provisions necessary to comply with this Directive and shall inform the Commission thereof.

They shall apply these provisions from 1 October 1981.

(b) As from the date of notification of this Directive, Member States shall also ensure that the Commission is informed, in sufficient time to enable it to submit its comments, of any draft laws, regulations or administrative provisions which they intend to adopt in the field covered by this Directive.

Article 8

This Directive is addressed to the Member States.

Done at Brussels, 20 December 1979.

For the Council

The President

J. TUNNEY

ANNEX

CHAPTER I

LEGAL UNITS OF MEASUREMENT REFERRED TO IN ARTICLE 1 (a)

1. SI UNITS AND THEIR DECIMAL MULTIPLES AND SUBMULTIPLES

1.1. SI base units

Quantity	Unit	
	Name	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Definitions of SI base units:

Unit of length

The metre is the length equal to 1 650 763.73 wavelengths in vacuum of the radiation corresponding to the transition between the levels $2p_{10}$ and $5d_5$ of the krypton 86 atom.

(Eleventh CGPM (1960), resolution 6).

Unit of mass

The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram.

(Third CGPM (1901), page 70 of the conference report).

Unit of time

The second 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 caesium 133 atom.

(Thirteenth CGPM (1967), resolution 1).

Unit of electric current

The ampere is that constant current which if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section and placed one metre apart in a vacuum, would produce between the conductors a force equal to 2×10^{-7} newton per metre of length.

(CIPM (1946), resolution 2, approved by the ninth CGPM (1948)).

Unit of thermodynamic temperature

The kelvin, unit of thermodynamic temperature, is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water.

(Thirteenth CGPM (1967), resolution 4).

Unit of amount of substance

The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kg of carbon 12.

When the mole is used the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles or specified groups of such particles.

(Fourteenth CGPM (1971), resolution 3).

Unit of luminous intensity

The candela is the luminous intensity, in a given direction, of a source which emits monochromatic rays with a frequency of 540×10^{12} hertz and whose energy intensity in that direction is $1/683$ watt per steradian.

(Sixteenth CGPM (1979), resolution 3).

1.1.1. Special name and symbol of the SI unit of temperature for expressing Celsius temperature

Quantity	Unit	
	Name	Symbol
Celsius temperature	degree Celsius	°C

Celsius temperature t is defined as the difference $t = T - T_0$ between the two thermodynamic temperatures T and T_0 where $T_0 = 273.15$ kelvins. An interval of or difference in temperature may be expressed either in kelvins or in degrees Celsius. The unit of 'degree Celsius' is equal to the unit 'kelvin'.

1.2. Other SI units**1.2.1. Supplementary SI units**

Quantity	Unit	
	Name	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

(Eleventh CGPM, 1960, resolution 12).

Definitions of supplementary SI units:

Plane angle unit

The radian is the plane angle between two radii which, on the circumference of a circle, cut an arc equal in length to the radius.

(International standard ISO 31 - I, December 1965).

Solid angle unit

The steradian is the solid angle which has its apex at the centre of a sphere and which describes on the surface of the sphere an area equal to that of a square having as its side the radius of the sphere.

(International standard ISO 31 - I, December 1965).

1.2.2. Derived SI units

Units derived coherently from SI base units and supplementary SI units are given as algebraic expressions in the form of products of powers of the SI base units and/or supplementary SI units with a numerical factor equal to 1.

1.2.3. Derived SI units having names and symbols

Quantity	Unit		Expression	
	Name	Symbol	In other SI units	In terms of base or supplementary SI units
Frequency	hertz	Hz		s^{-1}
Force	newton	N		$m \cdot kg \cdot s^{-2}$
Pressure, stress	pascal	Pa	$N \cdot m^{-2}$	$m^{-1} \cdot kg \cdot s^{-2}$
Energy, work; quantity of heat	joule	J	$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
Power ⁽¹⁾ , radiant flux	watt	W	$J \cdot s^{-1}$	$m^2 \cdot kg \cdot s^{-3}$
Quantity of electricity, electric charge	coulomb	C		$s \cdot A$
Electric potential, potential difference, electromotive force	volt	V	$W \cdot A^{-1}$	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-1}$
Electric resistance	ohm	Ω	$V \cdot A^{-1}$	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-2}$
Conductance	siemens	S	$A \cdot V^{-1}$	$m^{-2} \cdot kg^{-1} \cdot s^3 \cdot A^2$
Capacitance	farad	F	$C \cdot V^{-1}$	$m^{-2} \cdot kg^{-1} \cdot s^4 \cdot A^2$
Magnetic flux	weber	Wb	$V \cdot s$	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$
Magnetic flux density	tesla	T	$Wb \cdot m^{-2}$	$kg \cdot s^{-2} \cdot A^{-1}$
Inductance	henry	H	$Wb \cdot A^{-1}$	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-2}$
Luminous flux	lumen	lm		$cd \cdot sr$
Illuminance	lux	lx	$lm \cdot m^{-2}$	$m^{-2} \cdot cd \cdot sr$
Activity (of a radionuclide)	becquerel	Bq		s^{-1}
Absorbed dose, specific energy imparted, kerma, absorbed dose index	gray	Gy	$J \cdot kg^{-1}$	$m^2 \cdot s^{-2}$
Dose equivalent	sievert	Sv	$J \cdot kg^{-1}$	$m^2 \cdot s^{-2}$

⁽¹⁾ Special names for the unit of power: the name volt-ampere (symbol 'VA') when it is used to express the apparent power of alternating electric current, and var (symbol 'var') when it is used to express reactive electric power. The 'var' is not included in CGPM resolutions.

Units derived from SI base units or supplementary units may be expressed in terms of the units listed in Chapter I.

In particular, derived SI units may be expressed by the special names and symbols given in the above table; for example, the SI unit of dynamic viscosity may be expressed as $m^{-1} \cdot kg \cdot s^{-1}$ or $N \cdot s \cdot m^{-2}$ or $Pa \cdot s$.

1.3. Prefixes and their symbols used to designate certain decimal multiples and submultiples

Factor	Prefix	Symbol	Factor	Prefix	Symbol
10^{18}	exa	E	10^{-1}	deci	d
10^{15}	peta	P	10^{-2}	centi	c
10^{12}	tera	T	10^{-3}	milli	m
10^9	giga	G	10^{-6}	micro	μ
10^6	mega	M	10^{-9}	nano	n
10^3	kilo	k	10^{-12}	pico	p
10^2	hecto	h	10^{-15}	femto	f
10^1	deca	da	10^{-18}	atto	a

The names and symbols of the decimal multiples and submultiples of the unit of mass are formed by attaching prefixes to the word 'gram' and their symbols to the symbol 'g'.

Where a derived unit is expressed as a fraction, its decimal multiples and submultiples may be designated by attaching a prefix to units in the numerator or the denominator, or in both these parts.

Compound prefixes, that is to say prefixes formed by the juxtaposition of several of the above prefixes, may not be used.

1.4. Special authorized names and symbols of decimal multiples and submultiples of SI units

Quantity	Unit		
	Name	Symbol	Value
Volume	litre	l or L ⁽¹⁾	1 l = 1 dm ³ = 10 ⁻³ m ³
Mass	tonne	t	1 t = 1 Mg = 10 ³ kg
Pressure, stress	bar	bar ⁽²⁾	1 bar = 10 ⁵ Pa

⁽¹⁾ The two symbols 'l' and 'L' may be used for the litre unit.
(Sixteenth CGPM (1979), resolution 5).

⁽²⁾ Unit listed in the International Bureau of Weights and Measures booklet as among the units to be permitted temporarily.

Note: The prefixes and their symbols listed in 1.3 may be used in conjunction with the units and symbols contained in Table 1.4.

2. UNITS WHICH ARE DEFINED ON THE BASIS OF SI UNITS BUT ARE NOT DECIMAL MULTIPLES OR SUBMULTIPLES THEREOF

Quantity	Unit		
	Name	Symbol	Value
Plane angle	revolution* ⁽¹⁾ (a)		1 revolution = 2π rad
	grade* or gon*	gon*	1 gon = $\frac{\pi}{200}$ rad
	degree	°	1° = $\frac{\pi}{180}$ rad
	minute of angle	'	1' = $\frac{\pi}{10\,800}$ rad
	second of angle	"	1" = $\frac{\pi}{648\,000}$ rad
Time	minute	min	1 min = 60 s
	hour	h	1 h = 3 600 s
	day	d	1 d = 86 400 s

(¹) The character (*) after a unit name or symbol indicates that it does not appear in the lists drawn up by the CGPM, CIPM or BIPM. This applies to the whole of this Annex.

(a) No international symbol exists.

Note: The prefixes listed in 1.3 may only be used in conjunction with the names 'grade' or 'gon' and the symbol 'gon'.

3. UNITS DEFINED INDEPENDENTLY OF THE SEVEN SI BASE UNITS

The unified atomic mass unit is one-twelfth of the mass of an atom of the nuclide ¹²C.

The electronvolt is the kinetic energy acquired by an electron passing in a vacuum from one point to another whose potential is one volt higher.

Quantity	Unit		
	Name	Symbol	Value
Mass	unified atomic mass unit	u	1 u \approx 1.660 565 5 \times 10 ⁻²⁷ kg
Energy	electronvolt	eV	1eV \approx 1.602 189 2 \times 10 ⁻¹⁹ J

The value of these units, expressed in SI units, is not known exactly.

The above values are taken from CODATA Bulletin No 11 of December 1973 of the International Council of Scientific Unions.

Note: The prefixes and their symbols listed in 1.3 may be used in conjunction with these two units and with their symbols.

4. UNITS AND NAMES OF UNITS PERMITTED IN SPECIALIZED FIELDS ONLY

Quantity	Unit		
	Name	Symbol	Value
Vergency of optical systems	dioptré*		1 dioptré = 1 m ⁻¹
Mass of precious stones	metric carat		1 metric carat = 2 × 10 ⁻⁴ kg
Area of farmland and building land	are	a	1 a = 10 ² m ²
Mass per unit length of textile yarns and threads	tex*	tex*	1 tex = 10 ⁻⁶ kg · m ⁻¹

Note: The prefixes listed in 1.3 may be used in conjunction with the above units. The multiple 10² a is, however, called a 'hectare'.

5. COMPOUND UNITS

Combinations of the units listed in Chapter I form compound units.

CHAPTER II

LEGAL UNITS OF MEASUREMENT REFERRED TO IN ARTICLE 1 (b)

QUANTITIES, NAMES OF UNITS, SYMBOLS AND VALUES

Quantity	Unit		
	Name	Symbol	Value
Blood pressure	millimetre of mercury (*)	mm Hg(*)	1 mm Hg = 133.322 Pa
Plane angle		g* (1)	1 g = $\frac{\pi}{200}$ rad
Activity (of a radionuclide)	curie	Ci	1 Ci = 3.7×10^{10} Bq
Absorbed dose	rad	rad (2)	1 rad = 10^{-2} Gy
Equivalent dose	rem*	rem*	1 rem = 10^{-2} Sv
Exposure (X and γ rays)	röntgen	R	1 R = $2.58 \cdot 10^{-4}$ C · kg ⁻¹
Dynamic viscosity	poise	P	1 P = 10^{-1} Pa · s
Kinematic viscosity	stokes	St	1 St = 10^{-4} m ² · s ⁻¹

(1) Symbol for 'grade'.

(2) When there is risk of confusion with the symbol for radian, rd may be used as symbol for rad.

Note: The prefixes and their symbols listed in 1.3 of Chapter I may be used in conjunction with the units and symbols contained in this section, with the exception of millimetre of mercury and its symbol and the symbol 'g'.

Until the date indicated in Article 1 (b), the units listed in Chapter II may be combined with each other or with those in Chapter I to form compound units.

CHAPTER III

LEGAL UNITS OF MEASUREMENT REFERRED TO IN ARTICLE 1 (c)

QUANTITIES, NAMES OF UNITS, SYMBOLS AND APPROXIMATE VALUES

Length

inch	1 in	= 2.54×10^{-2} m
foot	1 ft	= 0.3048 m
fathom ⁽¹⁾	1 fm	= 1.829 m
mile	1 mile	= 1 609 m
yard	1 yard	= 0.9144 m

Area

square foot	1 sq ft	= 0.929×10^{-1} m ²
acre	1 ac	= 4 047 m ²
square yard	1 sq yd	= 0.8361 m ²

Volume

fluid ounce	1 fl oz	= 28.41×10^{-6} m ³
gill	1 gill	= 0.1421×10^{-3} m ³
pint	1 pt	= 0.5683×10^{-3} m ³
quart	1 qt	= 1.137×10^{-3} m ³
gallon	1 gal	= 4.546×10^{-3} m ³

Mass

ounce (avoirdupois)	1 oz	= 28.35×10^{-3} kg
troy ounce	1 oz tr	= 31.10×10^{-3} kg
pound	1 lb	= 0.4536 kg

Energy

therm	1 therm	= 105.506×10^6 J
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⁽¹⁾ For marine navigation only.

Until the date to be fixed under Article 1 (c), the units listed in Chapter III may be combined with each other or with those in Chapter I to form compound units.
