

COMMISSION OF THE EUROPEAN COMMUNITIES

SEC(91) 1047 final

Brussels, 20 June 1991

Proposal for a
COUNCIL DIRECTIVE
on [the approximation of the laws of the Member States
relating to] units of measurement

(presented by the Commission)

EXPLANATORY MEMORANDUM

1. In the context of a people's Europe, the Commission attaches great importance to simplifying and clarifying Community law so as to make it clearer and more accessible to the ordinary citizen, thus giving him new opportunities and the chance to make use of the specific rights it gives him.

This aim cannot be achieved so long as numerous provisions that have been amended several times, often quite substantially, remain scattered, so that they must be sought partly in the original instrument and partly in later amending ones. Considerable research work, comparing many different instruments, is thus needed to identify the current rules.

For this reason a consolidation of rules that have frequently been amended is essential if Community law is to be clear and transparent.

Nevertheless, at Parliament's express request, concerning simplification and clarity of Community law, and in view of the particular relevance of Council Directive 80/181/EEC 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 to national administrations, the Commission has agreed to draw up a consolidated version of this directive after its second amendment.

2. The proposal aims at legislative consolidation: the existing directives would be replaced by one new one, which would leave their substance untouched but would assemble them into a single text, with only the formal amendments required by the operation itself.
3. As in the past the text supplied here is collated from the original Directives as published in the Official Journal; the use of photocopies means that any improvements to the wording are immediately identifiable.

COUNCIL DIRECTIVE 80/181/EEC

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

(OJ No L 39, 15.2.1980, p. 40.)

amended by Directives

85/1/EEC (OJ No L 2, 3.1.1985, p. 11.)
89/617/EEC (OJ No L 357, 7.12.1989, p. 28.)

Proposal for a
COUNCIL DIRECTIVE
on [the approximation of the Laws of the Member States
relating to] units of measurement

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

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

Having regard to the proposal from the Commission

In cooperation with the European Parliament (1),

Having regard to the opinion of the Economic and Social Committee (2),

Whereas Council Directive 80/181/EEC 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 (3), as last amended by Directive 89/617/EEC (4), has been substantially amended; whereas for reasons of clarity and rationality the said Directive should be consolidated;

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;

1. 80/181/EEC

2.

3.

(1) OJ No C

(2) OJ No C

(3) OJ No L 243, 29.10.1971, p. 29.

(4) OJ No L 357, 7.12.1989, p. 28.

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;

4. 80/181/EEC

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 Annex I; 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;

7.

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;

8.

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;

9.

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;

10.

Whereas the International Organization for Standardization (ISO) on 15 May 1983 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 15 May 1983;

11. 89/617/EEC

89/617/EEC

Whereas in a recommendation of 22 May 1981 the World Health Organization requested that the millimetre of mercury be retained in addition to the kilopascal as a unit for the measurement of the pressure of blood and other body fluids; whereas it is advisable for the Community to adopt this solution;

2. 85/1/EEC

Whereas the barn is the unit universally used to measure the effective cross-sectional area on the occasion of nuclear reactions; whereas experience has shown that this specific unit could not easily be replaced by an SI unit; whereas it is therefore necessary to authorize its use in the nuclear field;

3.

Whereas this Directive must not affect the obligations on the Member States arising from Directives 80/181/EEC, 85/1/EEC (1) and 89/617/EEC,

HAS ADOPTED THIS DIRECTIVE:

(1) OJ No L 2, 3.1.1985, p. 11.

Article 1

The legal units of measurement within the meaning of this Directive which must be used for expressing quantities shall be those contained in Annex I:

- (a) those listed in Chapter I
- (b) those listed in Chapter II only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those States;
- (c) those listed in Chapter III only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those States. This date may not be later than 31 December 1994;
- (d) those listed in Chapter IV, only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those States. This date may not be later than 31 December 1999.

80/181/EEC

89/617/EEC

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.

80/181/EEC

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 Annex I 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 1999
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 of Annex I.

89/617/EEC

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 15 May 1983 '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.

80/181/EEC

89/617/EEC

Article 6

The Directives listed in Annex II are hereby repealed, without prejudice to the obligations of the Member States concerning the implementation of the said Directives.

References to the said Directives shall be construed as references to this Directive.

Article 7

This Directive is addressed to the Member States.

Done at Brussels,

For the Council
The President

ANNEX I

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

A metre is the length of the path travelled in a vacuum by light during 1/299 792 458 seconds.

(Seventeenth CGPM (1983), Resolution 1).

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)).

80/181/EEC

85/1/EEC

80/181/EEC

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 - 1, 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 - 1, 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 ^(*) , 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	$A \cdot V^{-1}$	$m^{-2} \cdot kg^{-1} \cdot s^4 \cdot A^2$
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 · 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	$J \cdot kg^{-1}$	$m^2 \cdot s^{-2}$

^(*) 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 watt (symbol 'W'), when it is used to express real electric power. The 'VA' is not included in CIPM resolutions.

Units derived from SI base units or supplementary units may be expressed in terms of the units listed in Chapter 1.

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 $m^2 \cdot kg^{-1} \cdot s^{-1}$ 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* (*) (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

(*) 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	1 eV \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.

80/181/EEC

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 ^a	tex ^a	1 tex = 10 ⁻⁶ kg · m ⁻¹
Blood pressure and pressure of other body fluids	Millimetre of mercury	mm Hg ^(*)	1 mm Hg = 133,322 Pa
Effective cross-sectional area	Barn	b	1 b = 10 ⁻²⁸ m ²

85/1/EEC

Note:

The prefixes and their symbols listed in 1.3 may be used in conjunction with the above units and symbols, with the exception of the millimetre of mercury and its symbol. The multiple of 10²a is, however, called a "hectare".

5. COMPOUND UNITS

Combinations of the units listed in Chapter 1 form compound units.

80/181/EEC

CHAPTER II

LEGAL UNITS OF MEASUREMENT REFERRED TO IN ARTICLE 1 (b), PERMITTED FOR SPECIFIC USES ONLY

89/617/EEC

Field of application	Unit		
	Name	Approximate value	Symbol
Road traffic signs, distance and speed measurement	mile	1 mile = 1 609 m	mile
	yard	1 yd = 0,9144 m	yd
	foot	1 ft = 0,3048 m	ft
	inch	1 in = 2,54 × 10 ⁻² m	in
Dispense of draught beer and cider; milk in returnable containers	pint	1 pt = 0,5683 × 10 ⁻³ m ³	pt
Land registration	acre	1 ac = 4 047 m ²	ac
Transaction in precious metals	troy ounce	1 oz tr = 31,10 × 10 ⁻³ kg	oz tr

Until the date to be fixed under Article 1 (b), the units listed in this Chapter 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
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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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.

CHAPTER IV

LEGAL UNITS OF MEASUREMENT REFERRED TO IN ARTICLE 1 (d), PERMITTED IN SPECIALIZED FIELDS ONLY

Field of application	Unit		
	Name	Approximate value	Symbol
Marine navigation	fathom	1 fm = 1,829 m	fm
Beer, cider, waters, lemonades and fruit juices in returnable containers	pint	1 pt = $0,5683 \times 10^{-3} \text{m}^3$	pt
	fluid ounce	1 fl oz = $28,41 \times 10^{-6} \text{m}^3$	fl. oz
Spirit drinks	gill	1 gill = $0,142 \times 10^{-3} \text{m}^3$	gill
Goods sold loose in bulk	ounce	1 oz = $28,35 \times 10^{-3} \text{kg}$	oz
	(avoir dupois) pound	1 lb = 0,4536 kg	lb
Gas supply	therm	1 therm = $105,506 \times 10^6 \text{J}$	therm

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

ANNEX II

Directive

Deadline for implementation

80/181/EEC (OJ No L 39 , 15.02.1980, p. 40)
85/ 1/EEC (OJ No L 2 . 3.01.1985, p. 11.)
89/617/EEC (OJ No L 357 , 7.12.1989, p. 28.)

1 July 1981
1 July 1985
30 November 1991