COMMISSION OF THE EUROPEAN COMMUNITIES

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Brussels, 19 November 1974

PROPOSAL FOR A COUNCIL DIRECTIVE

on the harmonization of the laws of the Member States
concerning alcoholometers and hydrometers for alcohol and alcohol tables

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(submitted to the Council by the Commission)

EXPLANATORY MEMORANDUM

This directive has been drafted pursuant to Article 100 of the Treaty establishing the European Economic Community. It comes within the ambit of the removal of technical barriers to trade and is to be read closely with the Council Directive of 26 July 1971 on the approximation of the laws of the Member States relating to common provisions for both measuring instruments and methods of metrological control.

The aim of the directive is the harmonization of provisions laid down by law, regulation or administrative action concerning the definition of the proportion of alcohol in mixtures of water and alcohol and the design and procedures for the approval and testing of alcoholometers and hydrometers for alcohol which are used to measure these proportions.

Although one result of this directive will be the free movement of such measuring instruments, there is not sufficient trade in them to justify either the preparation of a directive or the priority which the Council, in its resolution on industrial policy of 19 December 1973, asked the Commission to observe in forwarding the corresponding proposal. The main benefit which will come from the adoption of this directive is that it should serve to eliminate any disagreements arising in trade in alcohol, wines, spirits, etc., as regards the determination of the proportion of alcohol in these mixtures.

This is why, even without the urgent demands made by several Member States, the preparation of such a directive was so keenly desired by the competent departments of the Commission, the Directorate-General for Agriculture and the Directorate-General for Financial Institutions and Taxation.

At present, regulations in this field differ from one country to another. Even within the Community the alcoholometric tables used are based on measurements performed by various authors and on equally varying ways of utilizing these measurements; this causes a certain amount of confusion and is clearly liable to give rise to disputes. The French tables, for example, refer to Gay-Lussac measurements (1824) even though a revised version has been operative since 1884.

In Germany, the "Reichsanstalt für Masse und Gewichte" worked out a table based on the work and measurements of Mendeleeff (yet this does not accord with the Soviet tables, which were also based on the work of Mendeleeff). The Alcohol Monopoly Department of the Federal German Republic has drawn up practical tables based on the table used by the "Reichsanstalt für Masse und Gewichte", but it also uses a table based on the work of O. Reichard. Moreover, the German spirits industry uses a volumetric concentration table based on the work of Tralles and adapted by the "Reichsanstalt für Masse und Gewichte".

In the United Kingdom, Sikes alcoholometers are normally used; these differ quite considerably in design and use from the glass alcoholometers used in other countries.

Furthermore, many tables differ as to the reference temperature adopted, i.e., 15°C - 15.556°C - 17.5°C - 20°C, and also in the range of temperature covered.

Confusion has been just as widespread outside the Community, and hence it is that the International Organization of Legal Metrology (IOLM) was given the task of standardizing the method of measuring the proportion of alcohol. It was the result of this work (which culminated in 1973 as regards a definition of alcohol proportion, although still awaiting official approval by the IOLM and is almost complete as far as instruments are concerned) which served as the basis for the preparation of this proposal for a directive.

The experts convened by the Commission as a working party were unanimous in considering the work basis selected by the Commission to be the best one. They also expressed unanimous agreement on virtually the whole of the proposed text, which was aligned as far as possible on the relevant IOLM recommendations.

Only a few minor technical points were not approved by the vast majority of experts present. It was impossible, however, for the texts of the IOLM recommendations and the Council directive to be identical: the entire section dealing with the use of alcoholometers and hydrometers for alcohol in the laboratory and corresponding in the IOLM text to the way the instruments are used had no place in the Community directive on the free movement of such appliances. On the other hand, everything to do with instrument marking to allow them free movement across frontiers could obviously be included in the Community directive only. Apart from these few points, general layout and minor details, the text of the technical annex to the directive is identical to the text of the IOLM recommendations.

This is why the adoption of this directive, whilst creating the minimum of order necessary within the Community to permit free movement of alcoholic liquids for the greater benefit of consumers with no further confusion or disputes as to alcoholic content, will not be a protectionist measure since it complies with decisions taken in the widest international context. It is more or less certain that, sooner or later, the Member States concerned will adopt similar regulations and it would be desirable for the Community, which is closely affected by both the intra- and extra-Community trade in alcohol-based products, to be in the forefront as regards officially following the international recommendations in this field.

Consultation with the European Parliament and the Economic and Social Committee

In accordance with the provisions of the second paragraph of Article 100, the opinions of these two authorities are needed.

Implementation of the requirements of the directive will mean that some Member States will have to amend their legislation.

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on the harmonization of the laws of the Member States concerning alcoholometers and hydrometers for alcohol and alcohol tables

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 the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas in several Member States there are laws concerning the determination of the alcoholic strength of a mixture of water and alcohol; and whereas these laws differ from one Member State to another thus creating obstacles to trade; whereas, accordingly there is a need for harmonization at Community level in this field and the establishment of a common definition;

Whereas the definition, design and procedures for the approval and testing of alcoholometers and hydrometers for alcohol are the subject of mandatory provisions which vary from State to State and thus impede the movement of and trade in these instruments within the Community, and whereas, these provisions should therefore be approximated;

Whereas harmonization of the provisions laid down by law, regulation or administrative action concerning these instruments is also essential to complement that relating to a common method for determining the proportion of alcohol on the basis of measurements taken, in order to remove any ambiguity or risk of dispute over the result of such measurements;

Whereas the Council Directive* of 26 July 1971 on the approximation of the laws of the Member States concerning common provisions on measuring instruments and on methods of approval and testing has laid down EEC pattern approval and initial testing procedures; whereas, it is necessary in order to comply with that Directive to lay down in respect of alcoholometers and hydrometers for alcohol technical requirements in respect of design and operation to which these instruments must conform in order that they may be freely imported, marketed and used after being tested and provided with the prescribed marks and signs;

Whereas the abovementioned Directive also provides that, when conditions so permit, the relevant specific Directive may specify the date by which each Member State shall repeal the national provisions applying to instruments similar to those which comply with the Community provisions, and whereas in the present case it is not yet possible to fix this date;

HAS ADOPTED THIS DIRECTIVE:

Article 1

The purpose of this Directive is :

(a) to define the method of expressing the proportion of ethyl alcohol (ethanol) present in a mixture of water and alcohol and the measurements to be carried out for its determination, and to give a formula to enable tables to be drawn up for calculating this proportion on the basis of the measurements carried out;

(b) to lay down specifications concerning alcoholometers and hydrometers for alcohol used to determine the proportion of alcohol in mixtures of water and ethanol.

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* OJ No L 202, 6 September 1971

Article 2

The proportion of alcohol in a mixture of water and alcohol shall be calculated from measurements carried out with EEC alcoholometers or hydrometers for alcohol and using alcoholometric tables drawn up on the basis of the [illegible] in Annex I hereto.

Article 3

The alcoholometers and hydrometers for alcohol which may be accorded EEC marks and signs are described in Annex II hereto.

Such instruments shall be subject to EEC pattern approval and shall undergo EEC initial verification.

Article 4

No Member State may prevent, prohibit or restrict the sale or the use of any alcoholometer or hydrometer for alcohol bearing EEC marks and signs.

Article 5

1. Member States shall put into force the provisions laid down by law, regulation and administrative action which are necessary to comply with this Directive within eighteen months of its notification and shall forthwith inform the Commission thereof.

2. Member States shall ensure that the Commission is informed of the texts of the main provisions of national law which they adopt in the field covered by this Directive.

Article 6

This Directive is addressed to the Member States.

ANNEX I

ALCOHOL PROPORTION

1. DEFINITION

The "proportion of alcohol by volume" in a mixture of water and alcohol is the ratio of the volume of alcohol present in the mixture at 20°C to the total volume of the mixture at the same temperature.

The "proportion of alcohol by mass" in a mixture of water and alcohol is the ratio of the mass of alcohol present in this mixture to the total mass of the mixture.

2. EXPRESSION OF THE PROPORTION OF ALCOHOL per hundred parts of the mixture.

The symbols are:

"% vol" for the proportion of alcohol by volume,
"% mass" for the proportion of alcohol by mass.

3. DETERMINATION OF THE PROPORTION OF ALCOHOL

The procedures to be carried out to determine the proportion of alcohol are:

- the reading of an alcoholometer or hydrometer for alcohol, or the weighing of a pycnometer, at the temperature of the mixture;
- the measurement of the temperature of the mixture.

The results are obtained from the international alcohol tables.

4. FORMULA for the calculation of ALCOHOL TABLES for mixtures of ethyl alcohol and water.

The density "ϱ", expressed in kilograms per cubic metre (kg/m^3), of a mixture of ethyl alcohol and water at a temperature t, expressed in degrees Celsius, is given by the following formula as a function of:

- the proportion by mass p, expressed as a decimal number*
- the temperature t, expressed in degrees Celsius (IPTS-68),
- the numerical coefficients given below

The formula is valid for temperatures in the range −20°C to +40°C

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* Example: for a proportion by mass of 12%, p = 0.12

$$Q = A_1 + \sum_{k=2}^{12} A_k \, p^{k-1} + \sum_{k=1}^{6} B_k \, (t - 20\,^{\circ}\mathrm{C})^k + \sum_{i=1}^{n} \sum_{k=1}^{m_i} C_{i,k} \, p^k \, (t - 20\,^{\circ}\mathrm{C})^i.$$

$n = 5$
$m_1 = 11$
$m_2 = 10$
$m_3 = 9$
$m_4 = 4$
$m_5 = 2$

NUMERICAL COEFFICIENTS IN ETA FORMULA

k	A_k kg/m³	B_k
1	9,982 012 300 · 10²	— 2,061 851 3 · 10⁻¹ kg/(m³ · °C)
2	— 1,929 769 495 · 10²	— 5,268 254 2 · 10⁻³ kg/(m³ · °C²)
3	3,891 238 958 · 10²	3,613 001 3 · 10⁻⁵ kg/(m³ · °C³)
4	— 1,668 103 923 · 10³	— 3,895 770 2 · 10⁻⁷ kg/(m³ · °C⁴)
5	1,352 215 441 · 10⁴	7,169 354 0 · 10⁻⁹ kg/(m³ · °C⁵)
6	— 8,829 278 388 · 10⁴	— 9,973 923 1 · 10⁻¹¹ kg/(m³ · °C⁶)
7	3,062 874 042 · 10⁵	
8	— 6,138 381 234 · 10⁵	
9	7,470 172 998 · 10⁵	
10	— 5,478 461 354 · 10⁵	
11	2,234 460 334 · 10⁵	
12	— 3,903 285 426 · 10⁴	

	$C_{1,k}$ kg/(m³ · °C)	$C_{2,k}$ kg/(m³ · °C²)
1	1,693 443 461 530 087 · 10⁻¹	— 1,193 013 005 057 010 · 10⁻²
2	— 1,046 914 743 455 169 · 10¹	2,517 399 633 803 461 · 10⁻¹
3	7,196 353 469 546 523 · 10¹	— 2,170 575 700 536 993
4	— 7,047 478 054 272 792 · 10²	1,353 034 988 843 029 · 10¹
5	3,924 090 430 035 045 · 10³	— 5,029 988 758 547 014 · 10¹
6	— 1,210 164 659 068 747 · 10⁴	1,096 355 666 577 570 · 10²
7	2,248 646 550 400 788 · 10⁴	— 1,422 753 946 421 155 · 10²
8	— 2,605 562 982 188 164 · 10⁴	1,080 435 942 856 230 · 10²
9	1,852 373 922 069 467 · 10⁴	— 4,414 153 236 817 392 · 10¹
10	— 7,420 201 433 430 137 · 10³	7,442 971 530 188 783
11	1,285 617 841 998 974 · 10³	

k	$C_{3,k}$ kg/(m³ · °C³)	$C_{4,k}$ kg/(m³ · °C⁴)	$C_{5,k}$ kg/(m³ · °C⁵)
1	— 6,802 995 733 503 803 · 10⁻⁴	4,075 376 675 622 027 · 10⁻⁶	— 2,788 074 354 782 409 · 10⁻⁸
2	1,876 837 790 289 664 · 10⁻²	— 8,763 058 573 471 110 · 10⁻⁶	1,345 612 883 493 354 · 10⁻⁸
3	— 2,002 561 813 734 156 · 10⁻¹	6,515 031 360 099 368 · 10⁻⁶	
4	1,022 992 966 719 220	— 1,515 784 836 987 210 · 10⁻⁶	
5	— 2,895 696 483 903 638		
6	4,810 060 584 300 675		
7	— 4,672 147 440 794 683		
8	2,458 043 105 903 461		
9	— 5,411 227 621 436 812 · 10⁻¹		

ANNEX II

ALCOHOLOMETERS AND HYDROMETERS FOR ALCOHOL

1. DEFINITION OF THE INSTRUMENTS

1.1 Alcoholometers are instruments made of glass which indicate, as a percentage:

(a) the proportion of alcohol by mass (% mass)
(b) the proportion of alcohol by volume (% vol)

According to which entity they measure, they are designated as mass alcoholometers or as volume alcoholometers.

Hydrometers for alcohol are glass instruments designed to measure density in kilograms per cubic metre, of a mixture of water and alcohol.

1.2 The instruments referred to in this Directive are graduated at the standard temperature of 20°C and in accordance with the values which appear in the international alcohol tables published by the International Organization of Legal Metrology.

1.3 They are graduated for readings made at the free horizontal surface of the liquid.

2. DESCRIPTION OF THE INSTRUMENTS

2.1 Alcoholometers and hydrometers for alcohol are glass instruments, each consisting of:

a cylindrical body, the bottom of which is cone-shaped or hemispherical so that it does not entrap air bubbles,

a hollow cylindrical stem fused to the upper part of the body : its upper end is closed.

2.2 The external surface of each instrument shall be symmetrical about its main axis.
The cross section shall not exhibit any abrupt alteration.

2.3 The lower part of the body contains the loading material, whose purpose is to adjust the mass of the hydrometer.

2.4 The stem carries a scale marked on a cylindrical support which is rigidly fixed to the inside of the stem.

3. PRINCIPLES OF CONSTRUCTION

3.1 The glass used for making the instruments shall be transparent and free from any defect liable to interfere with the reading of measurements from the scale.

The glass shall have a coefficient of cubic expansion of $(25 \pm 2)\ 10^{-6} {}^{\circ}C^{-1}$.

3.2 The loading material shall be confined within the lower part of the body.

If the loading material is solid, it shall not soften when its temperature is raised to 80°C.

There shall be no loose material whatsoever in any other part of the instrument.

3.3 The instrument shall float with its axis close to the vertical. The maximum permitted angle between the axis and the vertical is 1.5 degrees of arc.

4. SCALE

4.1 No instrument shall have more than one scale.

4.2 The scale and the inscriptions shall be marked on a support which shall have a smooth matt surface.

This support shall be held rigidly in place in the stem and reference marks shall be provided so that any displacement of the scale and its support relative to the stem is apparent.

Neither the support, the scale nor the inscriptions shall show any trace of distortion, discoloration or charring when maintained at 70°C for 24 hours.

4.3 The graduation marks shall be:

situated in planes perpendicular to the axis of the instrument,
black* and marked clearly and indelibly,
fine, clear-cut and of a uniform thickness not greater than 0.2 mm.

4.4 The short graduation lines shall extend to at least one fifth of the circumference of the stem, and the medium lines to at least one third and the long lines to at least one half of the circumference.

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* N.B. Beyond the range of the nominal scale the graduations may be of a different colour

4.5 The nominal scales of individual alcoholometers shall cover a range not greater than 10% of alcohol (by mass or by volume).

The scales shall be marked in steps of 0.1%.

Each scale shall include 5 -- 10 additional graduations beyond its upper and lower nominal limits.

4.6 The nominal scales of hydrometers for alcohol shall cover a range not greater than 20 kg/m^3. The scales shall be marked in steps of 0.2 kg/m^3.

Each scale shall include 5 -- 10 additional graduations beyond the nominal limits of the scale. However, prolongation of the scale beyond 1000 kg/m^3 is not obligatory.

5. GRADUATION AND NUMBERING

5.1 On alcoholometers, every tenth line counting from one of the nominal limits of the scale, is a long line. There is a medium line between each successive pair of long lines and four short lines between each long line and the nearest medium line.

Only the long lines are numbered.

5.2 On hydrometers for alcohol, every fifth line counting from one of the nominal limits of the scale is a long line. There are four short lines between two consecutive long lines.

The fifth and tenth long lines are numbered.

5.3 The graduations corresponding to the nominal limits of the scale shall be numbered in full. On hydrometers for alcohol the intermediate numbers may be abbreviated.

6. CLASSIFICATION AND PRINCIPAL DIMENSIONS OF INSTRUMENTS

6.1 The instruments are divided into two precision classes as follows:

Class 1: The minimum mean length of a scale division shall be 1.5 mm. Instruments of this class shall not have a thermometer built in.

Class 2: The minimum mean length of a scale division shall be 1.05 mm. Instruments of this class may have a built-in thermometer.

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6.2 The external diameter of the body of any instrument shall be at least 19 mm and not greater than 40 mm.

The external diameter of the stem shall be at least 3 mm for Class 1 instruments and at least 2.5 mm for Class 2 instruments. The stem shall extend for at least 15 mm above the uppermost graduation of the scale. The cross-section of the stem must remain unchanged for at least 5 mm below the lowest graduation of the scale.

7. INSCRIPTIONS

7.1 The following inscriptions shall be legibly and indelibly marked inside the instrument:

Class 1 or 2
kg/m^3 or % vol or % mass
20°C
ethanol
the name or mark of the manufacturer
the identification number of the instrument.

7.2 The mass of the instrument, expressed in milligrams may, if desired, be marked on the body.

8. MAXIMUM PERMISSIBLE ERRORS AND VERIFICATION

8.1 The maximum permissible error for alcoholometers and hydrometers for alcohol shall be:

for Class 1 instruments, $\pm$ one half scale division for each point tested.
for Class 2 instruments, $\pm$ one scale division at each point tested.

8.2 The scale shall be verified at not less than three points along its nominal length.

9. THERMOMETERS

9.1 If the instrument being used to measure the proportion of alcohol belongs to Class 1, the thermometer used shall be

of the metallic resistance or the mercury-expansion type with glass casing,

graduated to 0.1 or 0.05°C.

The maximum permissible error is ± 0.05°C at all points on the scale. Mercury thermometers shall include a graduation at 0°C.

9.2. If the instrument being used to measure the proportion of alcohol belongs to Class 2, the thermometer shall be :

of the mercury-expansion type, with a glass casing and a scale including a graduation at 0°C,
graduated to 0.1 or 0.2°C.

The maximum permissible error, plus or minus, shall be :

0.1°C if the thermometer is graduated to 0.1°C,
0.15°C if the thermometer is graduated to 0.2°C.

The thermometer may be incorporated in the instrument used to measure the proportion of alcohol.

10. MARKINGS

On the back of alcoholometers and hydrometers for alcohol a space must be left in the upper third of the body for the EEC initial verification mark.

Pursuant to Section 3.1.1. of Annex II to the Council Directive of 26 July 1971 on the approximation of laws of the Member States relating to common provisions for both measuring instruments and methods of metrological control, (71/316/EEC) and by way of derogation from the general rule laid down in Section 3 of the same Annex, the initial verification mark, because of mandatory provisions for marking glass instruments, must consist of a series of signs having the following meaning :

- a small letter "e";
- the last two digits of the year of verification;
- the identifying letter or letters of the State where the initial verification was carried out;
- if necessary, the identifying number of the verification office.

When the marking is done by sandblasting, the letters and numbers shall be applied so as not to impair their legibility.

Example : e 75 D 48 : initial verification carried out in 1975 by Bureau 48 in West Germany.