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# COMMISSION OF THE EUROPEAN COMMUNITIES

COM(75) 577 final.

Brussels, 17 November 1975

PROPOSAL FOR A COUNCIL DIRECTIVE  
on the approximation of the laws of the Member States  
relating to  
MEASURING SYSTEMS FOR LIQUIDS OTHER THAN WATER

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(submitted to the Council by the Commission)

COM(75) 577 final.

## EXPLANATORY MEMORANDUM

This directive has been drawn up pursuant to Article 100 of the Treaty and the Council Directive of 26 July 1971 (1) 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 is to remove the technical barriers which are currently impeding intra-Community trade in measuring systems for liquids other than water as a result of disparities between national laws governing such systems in the Member States.

A comparative study of the regulations applying to measuring systems for liquids other than water in the Member States has shown that the differences are not confined to technical specifications on construction and operation but also extend to the accuracy and methods with which these systems are tested before being placed on the market.

Manufacturers wishing to export their systems are therefore obliged to diversify their production to take account of the regulations in force in the Member State where the systems are intended to be used and to undergo repeated inspections performed according to a variety of methods.

Since present national laws are justified by a legitimate desire to protect consumers and users, the only way of overcoming the disadvantages stemming from their divergency and of creating the conditions needed for the establishment of the Common Market seems to be to harmonize those laws.

The expression "measuring systems for liquids other than water" means systems whereby any liquid product other than water may be measured as it passes through them. In addition to one or more meters conforming to Council Directive N° 71/319/EEC and the ancillary equipment conforming to Council Directive N° 71/348/EEC which may be associated with them, these systems comprise devices to ensure correct measurement or to facilitate operation.

(1) O.J. N° L 202, 6 September 1971.

Measuring systems for liquids other than water are intended either to deliver or to receive particular liquids. These may obviously include all hydrocarbons such as domestic fuel oil, other fuel oil, petrol for road vehicles, aircraft and pleasure boats, and also liquid food products (wine, milk, etc.) which are delivered or collected in road tankers.

The importance of such measuring systems for liquids other than water is evident. The instruments may be mounted on lorries, or on fixed delivery equipment (petrol pumps, etc.) or on pipelines. With the aid of these instruments it is possible to measure liquids other than water fairly economically, without wasting time and in the case of pipelines, without interrupting the flow of liquid.

This directive lays down the general provisions for such measuring systems and the degree of accuracy and the nature of the inspections with which these systems must comply in order to receive the EEC marks and symbols and thus circulate freely in the Community.

This proposal for a directive has been drawn up at the request of the Council which, in its resolution of 21 December 1973 on industrial policy, invited the Commission to submit a proposal on the question before 1 January 1976. This Directive also constitutes a sequel to a number of Directives adopted by the Council on measuring instruments; it supplements the Council Directive of 1971 on meters for liquids other than water (71/319/EEC)

The type of harmonization adopted is the optional system, similar to that adopted for most of the separate Directives on measuring instruments.

This means that measuring systems for liquids other than water meeting the requirements of this Directive may be marketed and used freely between the Member States and inside the Member States as may the systems complying with national regulations in each of the Member States individually.

CONSULTATION OF THE EUROPEAN PARLIAMENT AND ECONOMIC AND SOCIAL COMMITTEE

The opinion of these two bodies is required in accordance with the second paragraph of Article 100 because the implementation of the provisions of the Directive will require the amendment of legislation in certain Member States.

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PROPOSAL FOR A COUNCIL DIRECTIVE

on the approximation of the laws of the Member States  
relating to measuring systems for liquids other than  
water

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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 each Member State the construction and methods of control of  
measuring systems for liquids are subject to mandatory provisions which  
differ from one Member State to another and consequently hinder trade in  
such systems; whereas it is therefore necessary to approximate these  
provisions;

Whereas the Council Directive of 26 July 1971 (1) on the approximation of  
the laws of the Member States relating to measuring instruments and methods  
of metrological control has laid down the EEC pattern approval and EEC initial  
verification procedure for measuring instruments; whereas, in accordance  
with that Directive, the technical requirements for the design and functioning  
of measuring systems for liquids other than water should be laid down;

Whereas the Council Directive of 26 July 1971 (2) on the approximation of  
the laws of the Member States relating to meters for liquids other than water  
and that of 12 October 1971 (3) on the approximation of the laws of the Member  
States relating to ancillary equipment for meters for liquids other than water  
have already laid down the technical requirements for design and functioning  
which instruments must meet; and whereas it is specified in the Directive on  
meters for liquids other than water that measuring systems including one or  
more meters for liquids other than water must be the subject of a separate  
Directive;

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(1) and (2) : O.J. N° L 202, 6 September 1971, p. 1 and p. 32.  
(3) : O.J. N° L 239, 25 October 1971, p. 9.

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HAS ADOPTED THIS DIRECTIVE :

Article 1

This Directive applies to measuring systems for liquids other than water incorporating volumetric meters with measuring chambers.

Article 2

Those measuring systems which may bear EEC marks and symbols are described in the Annex hereto. They shall be subject to EEC pattern approval and shall undergo EEC initial verification under the conditions laid down in the said Annex.

Under the conditions laid down in the Annex, EEC pattern approval may also be granted to components or sub-assemblies of a measuring system.

Article 3

No Member State may, for reasons connected with their metrological qualities, refuse, prohibit or restrict the placing on the market or entry into service of measuring systems for liquids other than water bearing the EEC pattern approval symbol and the EEC initial verification mark.

Article 4

1. The Member States shall put into force the laws, regulations and administrative provisions needed in order to comply with this Directive within eighteen months of its notification and shall forthwith inform the Commission thereof.
2. Member States shall communicate to the Commission the text of the provisions of national law which they adopt or intend to adopt in the field covered by this Directive.

Article 5

This Directive is addressed to the Member States.



## A N N E X

### 1. GENERAL REQUIREMENTS FOR MEASURING SYSTEMS

#### 1.1. Definitions

##### 1.1.1. Measuring system

A measuring system for liquids other than water comprises, in addition to the meter itself conforming to Council Directive 71/319/EEC and the ancillary equipment conforming to Council Directive 71/348/EEC which may be associated with it, all the equipment to ensure correct measurement or intended to facilitate the operation and all other equipment which can affect measurement in any possible way.

If several meters intended for separate measuring operations operate in conjunction with common components, each meter shall be considered as comprising, with the common components, a measuring system.

If several meters are intended for a single measuring operation, the meters are considered as forming a single measuring system.

##### 1.1.2. Minimum delivery

The minimum delivery of a measuring system is determined in conformity with the requirement specified in Council Directives 71/319/EEC and 71/348/EEC concerning meters for liquids other than water and ancillary equipment for meters for liquids other than water, having regard to the provisions of this Directive.

In measuring systems intended to measure liquid received into the system, the smallest volume of liquid for which measurement shall be authorized is called minimum reception. The preceding requirement relating to minimum delivery applies, by analogy, to minimum reception.

##### 1.1.3. Maximum rate of flow

The maximum permissible rate of flow of a measuring system is the maximum rate of flow of the meter, or, if several meters are connected in parallel, the sum of the maximum rates of flow of these meters, except in the case where particular conditions impose a smaller value.

#### 1.1.4. Gas separator

A gas separator is an apparatus for continuously separating and removing by an appropriate arrangement any air or gases contained in the liquid.

The gas evacuation arrangement is, in principle, automatic in operation. However, this requirement is waived if a mechanism is provided which automatically stops the flow of liquid when air or gas is likely to enter the meter. In this case, resumption of measurement shall be possible when the gas has been removed, either automatically or manually.

#### 1.1.5. Gas extractor

A gas extractor is an apparatus designed to extract air or gases accumulated in the pipe work upstream of the meter in the form of pockets no more than slightly mixed with the liquid.

The above requirements concerning the gas evacuation arrangement for the gas separator also apply to that of the gas extractor.

#### 1.1.6. Special gas extractor

A special gas extractor is an apparatus which on the one hand, like the gas separator but under less stringent operating conditions, continuously separates any air or gases contained in the liquid and on the other hand automatically stops the flow of liquid when air or gases accumulated in the form of pockets no more than slightly mixed with the liquid are likely to enter the meter.

#### 1.1.7. Condenser tray

A condenser tray is a closed tank designed to collect, in pressurized liquified gas measuring systems, the gases contained in the liquid to be measured and to condense them before measuring.

#### 1.1.8. Gas indicator

A gas indicator is an apparatus allowing easy detection of any gaseous formation that may be present in the liquid flow.

#### 1.1.9. Sight-glass

A sight-glass is a device allowing the level of the liquid to be checked in a part of the measuring system.

1.2. Field of application

The requirements of this Annex apply to all types of measuring system, provided that the special requirements in the Annex do not specify different requirements.

1.3. Meters

Meters incorporated in a measuring system, including any ancillary equipment, shall be of an EEC pattern approved for measurement of the liquid concerned in normal conditions of use.

These meters shall be the subject of a separate EEC pattern approval or of an approval included in the EEC pattern approval of the measuring system in which they are incorporated.

1.4. Point of transfer

1.4.1. Measuring systems shall incorporate a point defining the liquid delivered or received and called the point of transfer. This point of transfer is situated downstream of the meter in delivery systems, upstream of the meter in receiving systems.

1.4.2. Measuring systems may be of two types : "dry hose" systems and "full hose" systems; the term hose includes rigid pipework.

1.4.2.1. Dry hose systems are, in the case of delivery equipment, measuring systems in which the point of transfer is situated upstream of a delivery hose. This point of transfer takes the form of either a weir type sight glass or a closing device, combined, in both cases, with a system which ensures the complete emptying of the delivery hose after each measuring operation.

1.4.2.2. Full hose measuring systems are, in the case of delivery equipment, measuring systems of which the point of transfer comprises a closing device situated in the delivery pipework. When the pipework has a free end, the closing device shall be situated as close as possible to this end.

1.4.2.3. In the case of receiving equipment, the same requirements apply, by analogy, to the reception pipework upstream of the meter.

1.5. Filters

Measuring systems shall incorporate, upstream of the meters, a device intended to collect solid impurities from the liquids (filter).  
Filters shall as far as possible be so arranged as to be accessible.

1.6. Elimination of air or gases

1.6.1. General requirement

A measuring system shall be installed in such a way that it does not normally produce, upstream of the meter, entry of air nor release of gas in the liquid. If there is a risk that this requirement might not be met, measuring systems shall incorporate gas eliminating equipment permitting the proper elimination of any gases that may be contained in the liquid before it passes through the meter.

The gas eliminating equipment shall be suitable for the supply conditions and arranged in such a way that the error due to the influence of the gases on the measurement results shall not exceed :

- 0.5 % of the quantity measured for liquids other than potable liquids of a viscosity not exceeding 1 mPa.s ;
- 1 % of the quantity measured for potable liquids and those whose viscosity exceeds 1 mPa.s.

However there shall be no need for the error to be less than 1 % of the minimum delivery.

1.6.2. Pumped flow

1.6.2.1. Subject to the provisions in 1.6.6. below, when the pressure at the pump intake may, even momentarily, fall below atmospheric pressure or the vapour pressure of the liquid, a gas separator shall be provided.

1.6.2.1.1. A gas separator shall be subject to separate EEC pattern approval or to approval included in the EEC pattern approval of the measuring system of which it forms part.

1.6.2.1.2. The gas separator shall in principle be installed downstream of the pump. It may, however, be combined with the pump.

It shall always be positioned as close as possible to the meter so that the pressure drop due to the flow of liquid between the two components is negligible.

1.6.2.1.3. The limits of operation of a gas separator are as follows :

- a) the maximum rate or rates of flow for one or more specified liquids;
- b) the maximum and minimum pressure limits compatible with proper functioning of the gas eliminating apparatus.

1.6.2.1.4. When a gas separator is covered by a separate EEC pattern approval, it shall, within the limit of errors laid down in 1.6.1., ensure the elimination of air or gases mixed with the liquid to be measured, under the following conditions :

- a) the measuring system shall operate at the maximum rate of flow and the minimum pressure laid down for the gas separator;
- b) any proportion by volume of gases relative to the mixture of gas and liquid is permissible if the gas separator is designed for a rate of flow lower than or equal to  $20 \text{ m}^3/\text{h}$ ; it shall be limited to 30 % if the gas separator is designed for a rate of flow higher than  $20 \text{ m}^3/\text{h}$ . ( Gases shall be measured at atmospheric pressure to determine their percentage).

As regards separators designed to operate at a flow rate of more than  $100 \text{ m}^3/\text{h}$ , however, pattern approvals can be made by analogy with an approved pattern of the same design and smaller dimensions.

1.6.2.1.5. When a gas separator is approved as a component included in an approved measuring system, the above requirements may be applied to it.

However, when the measuring system incorporates a gas indicator conforming to the definition in 1.1.8., the gas separator need only meet the requirements of 1.6.2.1.4. until gas bubbles are clearly visible in the indicator.

These bubbles need not, however, be present in the case of minute quantities of gas and the separator shall operate under the conditions set out in 1.6.2.1.4. for any volumetric proportion of gas less than 20 %. Experience shows that this requirement is generally met by a properly built separator if its effective volume is at least equal to 8 % of the volume delivered in one minute at the maximum rate of flow indicated on the plate of the measuring system.

1.6.2.2. When the pressure at the pump inlet is always greater than atmospheric pressure and the vapour pressure of the liquid and there is no gas separator, a gas extractor or special gas extractor is necessary if gaseous formations are liable to occur between the pump and the meter during non-flow periods or if air pockets can be introduced into the pipework (e.g., when the supply tank is completely empty).

1.6.2.2.1. The gas extractor or special gas extractor shall be subject to EEC pattern approval or approval included in the EEC pattern approval of the measuring system of which it forms part.

1.6.2.2.2. The gas extractor or special gas extractor shall in principle be installed downstream of the pump. However, it may also be combined with the pump.

In both cases, it shall normally be installed at the highest point in the pipework, as close as possible to the meter and upstream of it. If it is installed below the level of the meter, a non-return device, fitted if necessary with a pressure limiting valve, shall be incorporated to prevent the emptying of the pipework between it and the meter.

If the pipework on the upstream side of the meter incorporates several high points, several gas extractors may be required.

1.6.2.2.3. The limits of operation of a gas extractor or special gas extractor are as defined for gas separators in 1.6.2.1.3.

1.6.2.2.4. A gas extractor or special gas extractor shall eliminate a gas pocket of a volume at least equal to the minimum delivery without an error greater than 1 % of the minimum delivery.

They shall also be capable of separating continuously a volume of gas equal to at least 5 % of the volume of the liquid delivered at the maximum rate of flow without the error in the measuring system varying by more than 0.5 %.

1.6.2.3. The requirements in 1.6.2.1. and 1.6.2.2. shall not prohibit the existence of manual or automatic extraction devices in fixed installations of large dimensions.

1.6.2.4. If the supply equipment is arranged in such a way that, whatever the conditions in which it is used, no gas can form in or penetrate into the reception pipework upstream of the meter during measurement no gas elimination device is required provided that the gas formation liable to occur during non-flow periods never causes an error exceeding 1 % of the minimum delivery.

### 1.6.3. Non-pumped flow

- 1.6.3.1. When a meter is supplied by gravity, without use of a pump, if the pressure of the liquid in all parts of the pipework upstream of the meter and in the meter itself is greater than the vapour pressure and atmospheric pressure, it is not necessary to provide a gas eliminator. However, some arrangement shall, after the measuring system has been brought into service, ensure its remaining correctly filled.
- 1.6.3.2. If this pressure is likely to be less than atmospheric pressure while remaining greater than the vapour pressure, an appropriate arrangement shall prevent the introduction of air into the meter.
- 1.6.3.3. In all circumstances the pressure of the liquid between the meter and the point of transfer shall be higher than the vapour pressure of the liquid.
- 1.6.3.4. When a meter is supplied under gas pressure, an appropriate arrangement shall prevent the entry of gas into the meter.

### 1.6.4. Gas removal

The gas removal pipe of a gas eliminator shall not include a manually controlled valve if the closing of this valve prevents the operation of the arrangement. If, however, a closing device of this kind is required for reasons of safety, a sealing device must ensure that, when open, it remains in this position.

### 1.6.5. Anti-swirl device

If it is intended as a general rule that the supply tank of a measuring system be completely emptied, the outlet orifice of the tank shall be provided with an anti-swirl device, except where the system incorporates a gas separator.

### 1.6.6. Viscous liquid

As the effectiveness of gas separators and gas extractors decreases with an increase in the viscosity of the liquid, these components should not be fitted in the case of liquids with a dynamic viscosity of more than 20mPa.s at 20°C. The pump shall be so arranged that the inlet pressure is always greater than the atmospheric pressure. If this condition is not likely to be fulfilled on all occasions, an arrangement shall be fitted to stop the flow of the liquid automatically as soon as the inlet pressure is less than atmospheric pressure. A manometer shall be used to monitor this pressure. These conditions are not necessary if the measuring system incorporates devices ensuring that no air can be introduced through the joints in the sections of pipework subjected to reduced pressure.

When the measuring system is not in use, the pipework shall be kept full of liquid up to the point defining the quantities measured.

1.7. Gas indicator

1.7.1. Measuring systems may be fitted with a gas indicator. These arrangements may be made obligatory in cases specified in Chapter 2.

1.7.2. The smallest type of gas indicator permissible for use is a transparent cylinder with an internal diameter equal to the diameter of the meter connecting pipe and with a length three times the internal diameter; the length need not, however, be more than 150 mm.

If the internal diameter of the connecting pipe is equal to or greater than 80 mm, it shall be regarded as adequate if the tube incorporates sufficiently large transparent sections for air or gas bubbles to be easily observed through them. If this is the case, the length of the transparent sections must be at least equal to 150 mm.

The gas indicator must be built and installed in such a way as to allow all the liquid through without any being left behind. When the gas indicator is installed on a by-pass, an instrument must be installed on the pipe so that, for all rates of flow within the measuring range, it is possible to establish the flow of the liquid.

1.7.3. The gas indicator shall be downstream of the meter.

1.7.4. In dry hose measuring systems the gas indicator may take the form of a weir-type sight glass and may also be used as a point of transfer.

1.7.5. The gas indicator may be provided with a bleed screw or some other blow-off arrangement when it forms a high point in the pipework. No pipe shall be connected to the blow-off arrangement. Flow indicators (e.g. spirals or bladed wheels) may be incorporated in the gas indicator, provided that such devices do not prevent the observation of any formations of gas which may be contained in the liquid.



1.8. Complete filling of the measuring system

1.8.1. The meter and the pipework from the meter to the point of transfer shall be automatically kept full of liquid during the measuring operation and when the system is not in use.

If this condition is not fulfilled, particularly in cases where the installation is fixed, it must be possible for the complete filling of the measuring system up to the point of transfer to be effected manually and monitored during measurement and when the system is not being used.

To ensure the complete elimination of air and gas from the measuring system, blow-off arrangements, if possible with small windows, shall be provided at appropriate positions.

1.8.2. The pipework between the meter and the point of transfer shall not, in general, induce errors of more than 1 % of the minimum delivery.

Chapter 2 shall specify in some particular cases the technical conditions to be fulfilled in order that this requirement can be met.

1.8.3. Subject to the provisions in 1.6.3.1., 1.6.3.2. and 1.6.3.3., a pressure maintaining device shall, if necessary, be placed downstream of the meter to ensure that the pressure in the gas eliminators and in the meter is always greater than atmospheric pressure and the vapour pressure of the liquid.

1.8.4. Measuring systems in which the liquid is likely to flow in the direction opposite to that for normal flow when the pump has stopped shall be provided with a non-return arrangement, fitted with a pressure limiting device if necessary.

1.8.5. In dry-hose measuring systems the pipework downstream from the meter and, if necessary, the pipework upstream of the meter shall comprise a high point so that all parts of the measuring systems remain constantly filled. Draining of the delivery hose referred to in 1.4.2.1. is assured by an air vent. In certain cases this facility may be replaced by special devices such as an auxiliary pump or a compressed-gas injector. In measuring systems designed for minimum deliveries of less than 10 cubic metres, such devices shall operate automatically.

- 1.8.6. In full-hose measuring systems the free end of the hose shall incorporate a device to ensure that the hose is not emptied during periods when the system is not used.  
This specification may not apply to liquefied gas.

When a closing device is placed downstream of this device, the volume of the space between them shall be as small as possible and in any case less than the maximum permissible error for the minimum delivery.

In this case, particularly for systems intended for measuring viscous liquids, the end of the nozzle shall be so designed that it cannot retain a quantity of liquid exceeding 0.4 times the maximum permissible error for the minimum delivery of the measuring system.

- 1.8.7. If the hose comprises several components, these shall be assembled either by means of a special connector to keep the hose full or by a connection system which is either sealed or ensures that the components cannot be separated with a commonly used tool.

1.9. Variation of internal volume of full hoses

In the case of full hoses in a measuring system, the increase in internal volume due to the change from the coiled position when not subjected to pressure to the uncoiled position when subjected to the pumping pressure without any flow of liquid shall not be more than twice the maximum permissible error for the minimum delivery.

If the measuring system is not provided with a hose stowage drum, the internal volume increase shall not exceed the maximal permissible error for the minimum delivery.

1.10. Branches

- 1.10.1. In measuring systems which are intended to deliver liquids, branches downstream of the meter are permitted only if they are so arranged as to ensure that the liquid is only discharged from one outlet at a time. In measuring systems which are to receive liquids, branches upstream of the meter are permitted only if they are so arranged that the intake of liquid is effected only through one pipe at a time.

Departures from these requirements can only be approved in the case of delivery systems which are installed so that they cannot supply more than one user at a time and receiving systems which cannot operate for more than one supplier at a time.

- 1.10.2. In measuring systems operating either with a dry hose or a full hose and having flexible pipes, a non-return valve shall be incorporated in the rigid pipework leading to the full hose immediately downstream from the selector valve. In addition the selector valve shall not in any position permit connection of the discharge hose operating as a dry hose with the pipework leading to the full hose.

- 1.11. By-passes

Any connections intended for by-passing the meter shall be closed by means of blanking flanges. However, if the operating requirements make such a by-pass necessary, it shall be closed either by means of a closing disc or by means of a double closing arrangement with a monitoring cock in between. Closure shall be capable of being ensured by means of stamped seals.

- 1.12. Valves and control arrangements

- 1.12.1. If the supply conditions are liable to overload the meter, a flow-limiting device shall be provided. This arrangement shall be placed downstream of the meter if it causes a pressure loss. It shall be capable of being sealed.
- 1.12.2. The various positions for the operating components of multi-way valves shall be easily visible and located by notches, stops or other secure arrangements. Departures from this requirement are acceptable whenever the adjacent positions of the operating handle form an angle of at least 90°.
- 1.12.3. Retaining valves and closing arrangements not used to define the quantity measured may have relief valves in order to dissipate any abnormally high pressures which may arise in the measuring system.

1.13. Layout of measuring systems

Measuring systems shall be installed in such a manner that the indicating device is clearly visible in normal conditions of use. If present, the gas indicator and the sight-glass of the gas separator shall as far as possible be observable from one position. Sealing devices shall be easily accessible, plates shall be fixed irremovably and the statutory markings shall be very legible and indelible.

1.14. On-site verification devices

1.14.1. The installation shall permit the performance of on-site testing of the various components and verification of the entire system in normal operating conditions. If necessary, pipework shall be provided to return the measured liquid to a storage tank. The installation shall, as necessary, be equipped with temperature and pressure tappings, especially when the operation or testing of the measuring systems requires a knowledge of these factors.

1.15. Characteristics of a measuring system

The characteristics of a measuring system are as follows :

- maximum rate of flow;
- minimum rate of flow;
- maximum operating pressure;
- minimum operating pressure;
- description of the liquid or liquids to be measured;
- minimum delivery.

1.16. Legends

1.16.1. A measuring system, component or sub-assembly having received pattern approval shall carry a special plate giving the following information :

- a) the EEC pattern approval symbol;
- b) the identification mark or name of the manufacturer;
- c) the description chosen by the manufacturer, if any;
- d) the serial number and year of manufacture;
- e) the characteristics of the model.

If several meters operate in a single system with the use of common components, the legends required for each part of the system may be combined on a single plate.

The legends on the dial of the indicating mechanism of the meter forming part of the measuring system must not contradict those on the rating plate of the measuring system.

- 1.16.2. The indications, legends or diagrams required by the directives concerning the measurement of liquids other than water (\*) or by the pattern approval certificate shall be marked very visibly either on the dial of the indicating mechanism or very close to it.

1.17. Placing of seals and verification marks

Sealing devices shall be constructed so as to allow the application by stamping of the EEC initial verification marks. Sealing devices requiring the use of sealing pincers shall be permitted only on instruments that are too fragile to allow the marks to be applied by stamping. In all cases, the sealing devices shall be easily accessible.

The stamp-date referred to in 3.3.2.1. of Annex II of the Council Directive 71/316/EEC of 26 July 1971 shall be sealed to a support of the measuring system.

It may be combined with the rating plate of the measuring system referred to in 1.16. In order to allow dismantling for cleaning purposes, the seals shall not be applied when the measuring system is used for portable liquids.

(\*) Directives 71/319/EEC and 71/348/EEC and this Directive.

Access to parts which allow the measuring result to be modified and dismantling of the various component instruments of the measuring system shall be prevented by means of sealing devices.

However, sealing devices need not be installed on connections made in such a way that it is virtually impossible to dismantle them with a commonly used tool. Furthermore, exceptions may be provided for in the certificate of approval for measuring systems which need to be dismantled in the course of use (measuring systems for potable liquids, for example).

2. PROVISIONS SPECIFIC TO DIFFERENT TYPES OF MEASURING SYSTEMS

2.1. Liquid fuel measuring system (\*)

2.1.1. Liquid fuel measuring systems are measuring systems intended for the delivery of liquid fuel into the fuel tanks of road vehicles.

These measuring systems may be used for refuelling pleasure boats and small aircraft with liquid fuel.

They may include their own supply arrangement or be designed for installation in a central supply system.

2.1.2. When the measuring system comprises its own supply arrangement, a gas separator shall be placed immediately upstream of the meter inlet.

This gas separator shall meet the requirements set out in 1.6.2.1.4. or in 1.6.2.1.5. In the latter case, experience shows that the requirement is generally met if the effective volume of the separator is at least equal to 5 % of the volume supplied in one minute at the maximum rate of flow indicated on the meter plate.

2.1.3. When the measuring system is designed for installation in a central supply system, the general rules in 1.6. shall be applied.

2.1.4. These measuring systems shall incorporate a device for resetting to zero the volume indicator conforming to items 1.1., 1.2., 1.3. and 1.5. of the Annex to Council Directive 71/348/EEC, as well as a volume totalizer.

If these systems also incorporate a price indicator, this shall be fitted with a device for resetting it to zero, as well as a price totalizer.

Devices for resetting the price indicator and volume indicator to zero shall be incorporated in such a way that the resetting of either of these indicators to zero automatically causes the resetting of the other to zero.

- (\*) Measuring systems incorporating :
- motor fuel blending meters;
  - motor fuel and lubricant blending meters;
  - electric and electronic indicators and ancillary devices;
  - self-service devices;
  - measuring systems intended for the supply of liquefied gas,

are not included under this heading.

- 2.1.5. When the road fuel measuring system comprises its own supply arrangement operated by an electric motor, a mechanism shall, after the motor has been stopped, prevent any further delivery of the liquid until the indicator has been returned to zero.

Under no circumstances may resetting to zero be possible during delivery.

In measuring systems supplied by a central system the preceding requirement shall be met by means of an automatic closing mechanism.

- 2.1.6. The non-return device referred to in 1.8.4. shall be obligatory. It shall be placed between the gas eliminator and the meter. However it may be placed immediately after the meter if the gas eliminator is installed above the meter. In this case, it may be combined with the device provided for in 1.8.3. When the non-return device is placed between the gas eliminator and the meter, the resulting pressure loss must be negligible.

- 2.1.7. Hoses shall incorporate a manual closing mechanism which meets the requirements of 1.8.6. An automatic closing mechanism may also be incorporated.

In full-hose measuring systems which are supplied solely by means of a hand-operated pump, only the closing mechanism referred to in 1.8.6. is required.

- 2.1.8. The liquid fuel measuring systems defined in 2.1.1. above shall be subject to pattern approval.

When such systems are intended for installation in a central supply system, pattern approval shall be supplemented by one or more typical drawings showing the installation conditions at the point of use.

- 2.1.9. Measuring systems with a maximum flow rate ( $Q_{max}$ ) equal to or less than 100 l/min must have a minimum delivery not exceeding 5 l.

- 2.1.10. Initial verification

In accordance with 3.2., initial verification of liquid fuel measuring systems shall be carried out in one or two stages depending on whether or not they have their own supply system.



2.2. Measuring systems fitted to road tankers for the transport and delivery of liquids with low viscosity and low vapour pressure (except potable liquids)

2.2.1. The following provisions shall apply to measuring systems fitted to road tankers or transportable tanks.

2.2.2. Tanks fitted with a measuring system may incorporate one or more compartments.

2.2.3. Where a tank incorporates more than one compartment, each compartment shall have its own lock (manual or automatic).

2.2.4. In accordance with national rules on use, if any, each measuring system shall be used for a specified product or for a class of products for which the meter has received the EEC initial verification marks.

The pipework shall be so designed that the mixing of products in the measuring system is easily prevented.

2.2.5. Where tanks are fitted to trailers or semi-trailers, the measuring systems may be affixed either to the tractor or to the trailer or semi-trailer.

2.2.6. A measuring system fitted to a road tanker may be of the dry-hose or full-hose type. It may also have either one dry hose and one full hose or two full hoses of different dimensions arranged so as to operate alternately.

In the latter case, change-over shall not be possible during delivery. To this end, change-over may be coupled with the resetting to zero of the volume indicator.

2.2.7. Where the meter is fitted with a ticket-printer, the printing of the ticket shall be coupled with the resetting to zero of the volume indicator.

2.2.8. A measuring system fitted to a road tanker may be designed to operate solely by pump, solely by gravity, either by pump or by gravity, or by gas pressure.

2.2.8.1. Measuring systems supplied solely by pump may operate as full-hose or as dry-hose systems.

2.2.8.1.1. If there is a risk that the condition in 1.6.2.4. may not be met, the meter shall be preceded by a gas eliminator such as :

- a) a suitable gas separator;
- b) a gas extractor;
- c) a special gas extractor.

When the meter outlet pressure in the measuring system may be lower than atmospheric pressure but higher than the vapour pressure of the liquid measured, these devices shall be combined with an automatic system to slow down and stop the flow to prevent any air passing into the meter.

When, on the other hand, there is no risk that the meter outlet pressure may be lower than atmospheric pressure (which is the case, in particular, in systems operating only on full-hose) the use of automatic mechanisms to slow down and stop the flow is not obligatory.

2.2.8.1.2. If the separator conforms to the requirements of 1.6.2.1.5., the effective volume of the gas separator shall be equal to at least 5 % of the volume delivered in one minute at the maximum rate of flow of the measuring system.

2.2.8.1.3 The special gas extractor with an automatic stop device shall be fitted with a sight-glass conforming with 1.1.9. Experience shows that in this case the gas indicator provided for in 1.1.8. is not necessary.

2.2.8.1.4. The compartments in road tankers shall be fitted with an anti-swirl device, except when the measuring system has a gas separator conforming to the requirements of 1.6.2.1.4.

2.2.8.1.5. Where a measuring system is fitted to a tank of the calibrated-container type, this tank may cease to be considered as a calibrated container.

For a tank to continue to be regarded as a calibrated container, the pipework must be organized in such a way that the requirements concerning calibrated containers continue to be met and fraudulent manipulation of the installation is precluded. If the installation incorporates a pump and the pump is arranged so as to allow direct delivery from a full compartment without use of the meter, that pump must be installed so that it empties wholly by gravity.

2.2.8.2. Measuring systems operating solely by gravity shall meet the following requirements :

2.2.8.2.1. The equipment must be so designed that the total content of the compartment or compartments can be measured at a rate of flow greater than or equal to the minimum rate of flow through the measuring system.

2.2.8.2.2. If there are links with the gas phase in the tank, appropriate devices shall prevent any gas from entering the meter.

2.2.8.2.3. The compartments of the tank shall be fitted with an anti-swirl device.

2.2.8.2.4. The provisions of 1.6.3.1., 1.6.3.2. and 1.6.3.3. shall apply. An accelerating pump may be used downstream of the point of transfer if the foregoing conditions are satisfied. Such a pump shall not have the effect of increasing the rate of flow at the meter.

2.2.8.2.5. In some measuring systems, particularly those having a special gas extractor with an automatic stop device and those having a means of permanent venting to the atmosphere immediately downstream of the point of transfer, a gas indicator shall not be required.

On the other hand, in measuring systems with a manual release into the atmosphere immediately downstream of the point of transfer, a gas indicator shall be obligatory.

2.2.8.3. Measuring systems which can operate either by pump or by gravity shall satisfy the requirements laid down in 2.2.8.1. and 2.2.3.2.

2.2.3.4. Measuring systems fed by means of gas pressure may operate as dry-hose or as full-hose systems. The pipework linking the device referred to in 1.6.3.4. (1) above with the meter shall not incorporate any constriction or component likely to cause a pressure loss generating gas formation by releasing the gas dissolved in the liquid.

Such systems shall incorporate a gauge showing the pressure inside the tank. The dial of this pressure shall indicate the zone of permissible pressures.

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(1) Arrangement to prevent gas entering the meter, as specified in 1.6.3.4.

2.3. Reception measuring systems for the unloading of ships, tank wagons and road tankers :

- 2.3.1. Measuring systems designed to measure liquids unloaded from tanker ships, tank wagons and road tankers shall incorporate an intermediate tank in which the level of the liquid determines the point of transfer.

This intermediate tank may be fitted with gas elimination equipment.

- 2.3.1.1. In the case of road tankers and tank wagons, the intermediate tank shall automatically maintain a constant level which is visible or otherwise detectable at the start and on completion of the measuring operation. The permissible variations in the constant level shall correspond to a volume equal to no more than the maximum permissible error for the minimum reception.

- 2.3.1.2. In the case of tanker ships provision for automatic maintenance of a constant level is not necessary; in that case, variations in the content shall be measurable.

If the tanker ship is emptied with the aid of pumps located in the bottom of the ship, the intermediate tank need only be used at the beginning and end of reception.

- 2.3.1.3. In the two latter cases, the cross-section of the intermediate tank shall be such that a quantity equal to the maximum permissible error for the minimum reception corresponds to a difference in level of at least 2 mm.

2.4. Pressurized liquefied gas measuring systems, whether stationary or fitted to road tankers

- 2.4.1. There shall be a permanent link along rigid pipework between these measuring systems and their feed tanks. A non-return valve shall be fitted between the feed tanks and the meter.

- 2.4.2. A pressure maintenance device located downstream of the meter shall ensure that the product is in a liquid state inside the meter during the measuring process. The required pressure may be maintained either at a fixed value or at a value adjusted to suit measurement conditions.

- 2.4.2.1. Where the pressure is maintained at a fixed value, the latter shall be at least equal to the vapour pressure of the product at a temperature 15° C higher than the highest possible in-service temperature. The setting of a pressure-maintenance device shall be sealable.
- 2.4.2.2. Where the pressure is adjusted to suit measurement conditions, it shall exceed the vapour pressure of the liquid by a least one bar during measurement. This function shall be automatic.
- 2.4.2.3. In the case of stationary measuring systems for industrial use, the competent Metrology Service may authorize the use of manually adjustable pressure-maintenance devices, in which case the pressure at the meter outlet shall not be less than the vapour pressure of the product at a temperature 15° C above the temperature of the liquid during measurement. A diagram should be affixed to the measuring system to show the vapour pressure of the product measured as a function of its temperature. If it is anticipated that these measuring systems may have to operate unsupervised for long periods, the temperature and pressure shall be registered continuously by recording equipment.
- 2.4.3. Upstream of the meter there shall be a gas-elimination device consisting of either a gas separator or a condenser tray.
  - 2.4.3.1. The gas separator shall satisfy the general requirements laid down in section 1 for either the liquefied gas itself or a liquid of greater viscosity.

However, because of verification difficulties, it is permissible for a gas separator to be approved if its effective volume is not less than 1.5 % of the volume delivered in one minute at maximum rate of flow in cases where the pipe connecting the meter to the storage tank is not longer than 25 m. When it exceeds 25 m in length, the effective volume of the gas separator shall be not less than 3 % of the volume delivered in one minute at maximum rate of flow.

It is not necessary to fit either a gas indicator or a sight-glass to liquefied gas measuring systems.

The gas evacuation duct may be connected to the space containing the gas phase in the feed tank or to a self-contained pressure-maintenance device set at a pressure 0.5 to 1 bar below the pressure at the meter outlet. This duct may incorporate a shut-off valve, but it must not be possible to close this valve during the measuring process.

- 2.4.3.2. The volume of the condenser tray shall depend on the volume of the pipework between the feed-tank valve and the pressure-maintenance valve downstream of the meter. It shall not be less than twice the reduction in volume of the liquid liable to occur if the temperature drops by a value conventionally fixed at 10° C for pipe work exposed to the atmosphere and 2° C for buried or thermally insulated pipework. To calculate the contraction, the coefficient of thermal expansion shall be rounded off to  $3 \cdot 10^{-3}$  per degree Celsius for propane and propylene and to  $2 \cdot 10^{-3}$  per degree Celsius for butane and butadiene. For other products with a high vapour pressure, the values of the coefficient to be adopted shall be fixed by the competent Metrology Service.

The condenser tray shall be fitted with a manually operated blow-off arrangement.

In a measuring system, the condenser tray shall be located at the highest point in the pipework.

The volume calculated by the foregoing method may be spread over several condenser trays located at the highest points in the pipework.

- 2.4.4. A thermowell shall be provided in the immediate vicinity of the meter.

The user shall be in possession of a verified thermometer graduated at intervals not exceeding 0.5° C.

A pressure gauge shall be fitted between the meter and the pressure-maintenance valve.

For measuring systems incorporated in road tankers, a pressure gauge socket will be regarded as adequate.

- 2.4.5. During measurement, there shall be no connection between the gas phases in the storage tank and the reception tank.

- 2.4.6. Safety valves may be incorporated into measuring systems for the purpose of preventing abnormally high pressure. If these valves are located downstream of the meter, they shall open into the atmosphere or be connected to the reception tank.

Under no circumstances shall the safety valves located upstream of the meter be connected by piping which by-passes the meter to the valves located downstream.

- 2.4.7. Where operating conditions necessitate the use of detachable hoses, these hoses shall remain full if their volume is greater than the maximum permissible error for the minimum delivery.

Detachables full hoses shall be equipped with special "coupler" connections for full hoses. Manually operated blow-off arrangements shall be provided, if necessary, at the ends of these hoses.

- 2.4.8. The monitoring cock of the double closing arrangement specified in 1.12 for any pipework by-passing the meter must be capable of being shut off for safety reasons. In such cases, leaktightness shall be monitored by a pressure gauge fitted between the two shut-off valves or by any other equivalent system.

#### 2.5. Measuring systems fitted to pipelines

- 2.5.1. The measuring systems referred to are those fitted on either piping connecting two stationary tanks or piping leading to or from a pipeline or depot.
- 2.5.2. If several pumps are mounted in series in a pumping station, an automatic locking mechanism shall ensure that the pumps are set in operation in the correct order. If necessary, this mechanism shall be sealable.
- 2.5.3. An appropriate device shall prevent the liquid flowing against the normal direction of flow.
- 2.5.4. If safety valves are fitted on the pipework upstream and downstream of the meter, the discharge pipes from the valves located upstream of the meter shall not lead to the same tank as those from the valves downstream of the meter.
- 2.5.5. Meters fitted to pipelines to measure in succession liquids of different natures must, if possible, be equipped with automatic correcting device to ensure that the requirements of item 6.2. of Council Directive N° 71/319/EEC on meters for liquids other than water are satisfied. These correcting devices shall be subject to pattern approval.

However, if the measurement results are used solely for commercial operations or for fiscal operations concerning a limited number of persons or bodies designated in contracts, pipeline operators may be authorized to measure in succession liquids of different natures using the same meter, even if the variations in the error due to the variations in the properties of the liquids are such that the requirements of item 6.2. of the abovementioned Directive N° 71/319/EEC cannot be satisfied. In this case, the user shall correct the measurement results by applying the correction coefficients laid down for various viscosity zones within which the provisions specified above must be complied with.

## 2.6. Measuring systems for milk

2.6.1. The following requirements apply to portable measuring systems used for the reception of milk by collecting tankers, to fixed measuring systems used for reception in dairies and to portable or fixed measuring systems used for the delivery of milk.

2.6.2. In reception equipment, the point of transfer consists of a constant level in a tank located upstream from the meter. This constant level must be visible before and after each measuring operation. It must be automatically re-established.

2.6.2.1. When the meter is supplied by a pump, the constant-level tank may be placed before the pump or between the pump and the meter.

2.6.2.1.1. In the first case the tank may itself be supplied by gravity, by the emptying of churns, with the aid of an auxiliary pump or a vacuum system.

If the milk is delivered into the tank with the aid of a pump or a vacuum system, a gas eliminator is necessary; this eliminator may be combined with the constant-level tank.

2.6.2.1.2. In the second case, the constant-level tank must act as a gas eliminator.



- 2.6.2.2. Notwithstanding the provisions of 1.8.3., the meter may be supplied by a vacuum system. In this case, since the pressure inside the pipework between the constant-level tank and the meter is lower than atmospheric pressure, the pipework connections must be perfectly leaktight. It must be possible to verify this leaktightness.
- 2.6.2.3. In all cases of reception, the pipework upstream of the constant-level must be completely emptied by an automatic mechanism in usual operating conditions.
- 2.6.2.4. The constant level shall be monitored by means of a sight-glass or level indicator. The level will be regarded as constant when it settles within a zone lying between two lines corresponding to a difference in volume of not more than twice the maximum permissible error on minimum delivery. The distance between the two lines must be at least 20 mm.
- 2.6.2.5. If, to meet the aforementioned requirement, decelerating mechanisms are incorporated in the measuring system, the rate of flow during the decelerating period must not descend below the minimum flow rate of the meter.
- 2.6.2.6. If, in reception equipment in dairies, the liquid measured is conveyed at a level lower than that of the meter, an automatic mechanism shall ensure a pressure higher than atmospheric pressure at the meter outlet.
- 2.6.3. Measuring systems used for the delivery of milk must meet the requirements of section 1.
- 2.6.4. Notwithstanding the general provisions of section 1 on the elimination of air or gas, gas elimination mechanisms must meet the requirements of 1.6.1. solely in operating conditions, i.e. when air enters at the beginning and end of each measuring operation.

For reception equipment, the user must be able to ascertain the leaktightness of the connections so that no air is admitted upstream of the meter during measuring. For delivery equipment, the system must be assembled so that the liquid pressure is always positive in the connecting pipes running from the supply tank.

3. EEC PATTERN APPROVAL AND EEC INITIAL VERIFICATION

3.1. EEC Pattern approval

- 3.1.1. EEC Pattern approval shall relate either to a measuring system capable of being transported to the installation site without prior dismantling or to a component, approval of which is laid down by a directive (meter, ancillary equipment, gas eliminator), or to a sub-assembly that can be transported without dismantling consisting of one or more components, pattern approval of which is laid down in a directive.

For the measuring systems referred to in the above paragraph, EEC pattern approval may be based on plans indicating the characteristics of the various components and their relative positions.

3.1.2. Tests to be carried out

- 3.1.2.1. The EEC pattern approval examination shall include inspection of the piping diagrams and drawings of the measuring system.

In addition, tests shall be carried out in accordance with the following specifications.

In the execution of these tests, the work standards and their use shall be determined in such a way that the measuring inaccuracy of the calibration method does not exceed one-fifth of the maximum permissible error for the instrument tested.

3.1.2.2. Meter test

It is first necessary to determine the curve of errors as a function of rate of flow, using a sufficiently large number of measuring points in the flow zone. It is necessary to verify in particular the width of the range of errors of the meter in the zone; the position of the error curve in relation to the zero line is of lesser importance.

It may also be necessary to carry out tests outside the flow zone, especially for meters and measuring systems for low viscosity liquids (dynamic viscosity not over 17 cP).

Tests must also be carried out at the limits of operating conditions, i.e., for the maximum and minimum temperatures and viscosities specified and for minimum delivery.

In all cases, the test volume shall be selected so as to be large enough to ensure that the value of the scale of the indicator is never greater than one-third of the maximum permissible error.

### 3.1.2.3. Test of air or gas elimination.

Where there are gas separators and special gas extractors, continuous elimination shall be checked by comparison of the measurement results of a suitable volumetric meter inserted downstream of the separator (special extractor) with or without the addition of air or gas.

For special extractors, it is also necessary to test complete emptying of the tank. If possible, the tests should be carried out with the least favourable liquid. In tests on mock-ups or models on a different scale from the actual equipment, account shall be taken of the laws of similarity concerning viscosity (Reynolds), gravity (Froude) and surface tension (Weber). As a general rule tests on models shall be used only for applications where they are justified.

### 3.1.2.4. Tests on special measuring systems

#### 3.1.2.4.1. Liquid fuel measuring systems

The tests shall comprise :

- a) checking of the meter, including determination of the influence of ancillary equipment (price indicator, printer, presetting device, etc..);
- b) checking of the gas eliminator;
- c) checking of the constancy of the hose volume;
- d) a special check to verify regular advance of the price indicator (irregular advance may be induced in the first component of the price indicator by sudden closing of the delivery valve).

#### 3.1.2.4.2. Liquefied gas measuring systems

The examination shall comprise :

- a) verification on drawings of gas separators as regards area of efficiency and mounting;
- b) an operating test on the gas eliminator (level regulator) incorporated in the gas separator.

The pressurizing device shall also be verified on the drawing. A model test may possibly be required in special cases by the inspection authority.

### 3.2. EEC initial verification

#### 3.2.1. General

##### 3.2.1.1. EEC initial verification is compulsory for the measuring systems referred to in 3.1.1.

It is also compulsory for meters, whether alone or accompanied by items of ancillary equipment, and for sub-assemblies incorporating a meter when such equipment is mounted in measuring systems constructed outside the factory where they were manufactured.

##### 3.2.1.2. EEC initial verification of a measuring system may be carried out in one or two stages.

###### 3.2.1.2.1. It is carried out in one stage when the system is entirely manufactured by a single manufacturer, when it can be transported without being dismantled and when it is verified under the conditions in which it is intended to be operated.

###### 3.2.1.2.2. It is carried out in two stages in all other cases.

The first stage concerns the meter only or the meter fitted with any ancillary equipment which must be associated with it, whether or not incorporated in a sub-assembly.

The second stage concerns the measuring system in the actual operating state.

It is carried out in a place selected by the Metrology Service concerned when the measuring system can be transported without being dismantled and the tests can be carried out under the conditions in which the measuring system is intended to be operated.

If these two conditions are not met, the second stage is carried out at the place of installation under operating conditions.

3.2.2. Tests to be carried out

3.2.2.1. When the tests are carried out in two stages :

The first stage consists of :

- an external examination of the volumetric meter, including any ancillary equipment (conformity with the respective patterns);
- a metrological examination of the volumetric meter, including built-in ancillary equipment.

The second stage consists of :

- an external examination of the measuring system including the volumetric meter and ancillary equipment;
- a metrological examination of the volumetric meter and ancillary equipment in the measuring system;
- an operating test on the gas eliminator, if there is one;
- inspection of the adjustment of the required pressure-maintenance devices;
- verification of variations in the internal volume of hoses in full-hose systems;
- determination of residual quantities in empty-hose systems.

3.2.2.2. When EEC initial verification is carried out in one stage, the tests referred to in 3.2.2.1. must be performed.

3.2.2.3. The first-stage tests may be carried out on a test bench (possibly in the manufacturer's factory) or on the installed measuring system. The metrological examinations may then be carried out with liquids other than those for which the system is intended.

The second-stage tests must be carried out on the measuring system in the place of installation and with the liquid that the system is intended to measure.