

1. -----IND- 2018 0332 CZ- EN- ----- 20180803 --- --- PROJET

Executive summary for the EC (not part of this legislation)

Instruments and systems measuring the flow volume of liquids other than water – stationary measuring systems except for dispensers, are placed on the market and put into use in the Czech Republic in accordance with Directive 2014/32/EU (the Measuring Instruments Directive – MID). Once they have been put into use, they become subject to national metrological regulation – verification at specified intervals. This notified legislation only applies to the verification of measuring instruments that have already been put into use. It does not concern placing them on the market or putting them into use.

The requirements imposed on these measuring instruments when in use are fully compatible with the MID and are also based on OIML Recommendation 117.

(End of executive summary.)

Contact person: Mgr. Tomáš
Hendrych

Phone: +420 545 555 414

PUBLIC DECREE

As the authority with substantive and territorial jurisdiction in the matter of laying down metrological and technical requirements for legally controlled measuring instruments and stipulating the testing methods for type approval and verification of legally controlled measuring instruments pursuant to § 14(1) of Act No 505/1990, on metrology, as amended (hereinafter referred to as the ‘Metrology Act’), and in accordance with the provisions of § 172 et seq. of Act No 500/2004, the Administrative Procedure Code (hereinafter referred to as the ‘APC’), on 22 July 2016, the Czech Metrology Institute (hereinafter referred to as the ‘CMI’) commenced ex officio proceedings pursuant to § 46 APC, and, on the basis of supporting documents, issues the following:

I.

DRAFT GENERAL MEASURE

number: 0111-OOP-C066-16

laying down the metrological and technical requirements for legally controlled measuring instruments, including testing methods for type approval and verification of the following legally controlled measuring instruments:

‘measuring instruments and systems for measuring the flow of liquids other than water – stationary measuring systems except for dispensers’

This general measure lays down the metrological and technical requirements for systems measuring the flow volume of liquids other than water – stationary measuring systems except for dispensers, to be applied when verifying these instruments after they have been placed on the market or put into use. The requirements follow from the requirements of special legislation.

The verification of stationary measuring systems other than dispensers shall be subject to metrological requirements applicable at the time they were put into circulation.

1 Basic definitions

For the purposes of this general measure, terms and definitions pursuant to VIM and VIML,²⁾ special legislation¹⁾, and the terms and definitions below shall apply:

1.1

system for measuring the flow volume of liquids other than water or liquefied gases – measuring systems on a pipeline (hereinafter referred to as ‘measuring system’)

an assembly of devices for determining and recording the quantity (mass or volume, or volume under specified conditions, or volume of ethanol under specified conditions) of a given liquid other than water by measuring the necessary quantities when it is flowing through a fully charged conduit

NOTE The measuring systems under this regulation include all measuring instruments other than dispensers for fuels, LPG and CNG and the measuring systems on tanks.

2 Metrological requirements

The metrological requirements are based on the requirements of special legislation¹⁾ and the requirements of Recommendation OIML 117-1³⁾.

The verification of the measuring instruments shall be subject to metrological requirements applicable at the time they were put into circulation.

¹⁾ Government Regulation No 120/2016 on conformity assessment of measuring instruments when made available on the market (hereinafter referred to as the ‘Government Regulation on Measuring Instruments’). The regulation transposed into Czech legislation Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments

²⁾ TNI 01 0115 International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) and International Vocabulary of Legal Metrology (VIML) are part of the technical harmonisation compendium ‘Terminology in the field of metrology’, which is publicly available at www.unmz.cz

³⁾ OIML R 117-1 ‘Dynamic measuring systems for liquids other than water. Part 1: Metrological and technical requirements’ – publicly available at www.oiml.org

2.1 Rated operating conditions

2.1.1 Ambient temperature range

Every component of the measuring system shall operate properly over a range of ambient temperatures specified by the manufacturer as the operating temperature range where:

- the minimum temperature shall be +5 °C or –10 °C or –25 °C or –40 °C, and
- the maximum temperature shall be +30 °C or +40 °C or +55 °C or +70 °C or +85 °C.

2.1.2 Flow rate range

The flow rate range of the measuring system between minimum flow rate Q_{\min} and maximum flow rate Q_{\max} shall be specified by the manufacturer. This flow rate range shall be within the flow rate range of each element of the measuring system.

The ratio of $Q_{\max} : Q_{\min}$ flow rates of a measuring system on a pipeline and a measuring system for loading ships may be specified for all liquids according to the conditions of use.

The minimum required flow rate ratio $Q_{\max} : Q_{\min}$ of a measuring system for cryogenic liquids shall be 5 : 1.

The minimum required flow rate ratio $Q_{\max} : Q_{\min}$ for other measuring systems specified in Table 1 shall be 4 : 1.

2.1.3 Measured liquid

The measured liquid shall be specified either by specifying the name or type of the liquid for liquids whose physical properties are identified and generally known, or directly by providing the ranges of the relevant physical properties with which these liquids are supplied by manufacturers, such as density range or viscosity range. In addition, the temperature and pressure ranges of the measured liquids and, where appropriate, Reynolds numbers shall be specified.

2.1.4 Minimum measured quantity (*mmq*)

The minimum quantity of liquid measured by the measuring system shall be expressed as the smallest scale interval in the form 1×10^n , 2×10^n or 5×10^n units of measurement of volume or mass, where n is a positive or negative whole number, or zero.

The minimum measured quantity of a measuring system shall not be less than the largest of the minimum measured quantities of any of its parts.

2.2 Accuracy of measuring systems

The measuring system shall meet the requirements for maximum permissible errors over the entire flow rate measurement range specified by the manufacturer.

2.2.1 Accuracy class of measuring systems

Measuring systems shall be classified in accuracy classes given by the maximum permissible error according to Table 1.

The manufacturer may specify higher accuracy for a certain type of measuring system.

Table 1 – Accuracy classes

Accuracy class	Types of measuring systems
0.3	Measuring systems on pipeline
0.5	All measuring systems, if not stated otherwise elsewhere in this table, in particular: <ul style="list-style-type: none"> • measuring systems for (un)loading ships;

	<ul style="list-style-type: none"> • measuring systems for milk; • measuring systems for refuelling aircraft.
1.0	<p>Measuring systems for liquefied gases under pressure measured at a temperature equal to or above -10 °C.</p> <p>Measuring systems normally in class 0.3 or 0.5 but used for liquids:</p> <ul style="list-style-type: none"> • whose temperature is less than -10 °C or greater than +50 °C; • whose dynamic viscosity is higher than 1 000 mPa·s; • whose maximum volumetric flow rate is not higher than 20 L/h.
1.5	<p>Measuring systems for liquefied carbon dioxide.</p> <p>Measuring systems for liquefied gases under pressure measured at a temperature below -10 °C (except for cryogenic liquids).</p>
2.5	Measuring systems for cryogenic liquids (temperature below -153 °C).

2.2.2 Maximum permissible errors

Maximum permissible errors for volumes of two litres or more are given in Table 2.

Table 2 – Maximum permissible errors for $V \geq 2$ litres

Accuracy class	Maximum permissible errors				
	0.3	0.5	1.0	1.5	2.5
Measuring systems (A) (entire system)	0.3 %	0.5 %	1.0 %	1.5 %	2.5 %
Meters (B) (flow meter)	0.2 %	0.3 %	0.6 %	1.0 %	1.5 %

Maximum permissible errors for volumes of less than two litres are given in Table 3.

Table 3 – Maximum permissible errors for $V < 2$ litres

Measured volume V	MPE
$V < 0.1$ L	4× the value in Table 2, applied to 0.1 L
$0.1 \text{ L} \leq V < 0.2$ L	4× the value in Table 2
$0.2 \text{ L} \leq V < 0.4$ L	2× the value in Table 2, applied to 0.4 L
$0.4 \text{ L} \leq V < 1$ L	2× the value in Table 2
$1 \text{ L} \leq V < 2$ L	the value in Table 2, applied to 2 L

Regardless of the measured quantity, the maximum permissible error shall be the larger of the following two values:

- the absolute value of the maximum permissible error specified in Table 2 or Table 3;
- the absolute value of the maximum permissible error for the minimum measured quantity E_{\min} .

The following conditions apply for minimum measured quantities greater than or equal to two litres:

Condition 1: E_{\min} shall fulfil the condition: $E_{\min} \geq 2R$, where R is the smallest scale interval of the indication device.

Condition 2: E_{\min} is given by the formula: $E_{\min} = (2 \text{ mmq}) \times (A/100)$, where *mmq* is the smallest measured quantity and *A* is the numerical value for measuring systems (A) in Table 2.

For minimum measured quantities of less than two litres, the above-mentioned condition 1 applies and E_{\min} is twice the value specified in Table 3 for measuring systems (A) from Table 2.

The measuring system shall not exploit the maximum permissible error or systematically favour any party.

2.2.3 Converted indication

In the case of a converted indication, the maximum permissible error for measuring systems (A) in Table 2 shall apply.

2.2.4 Conversion devices

Maximum permissible errors on converted indications caused by a conversion device shall equal to $\pm(A - B)$, A and B being the values specified in Table 2.

Parts of conversion devices that can be tested separately:

- a) Calculator: Maximum permissible errors on indications of the characteristic quantities of the liquid applicable to calculation, positive or negative, are equal to one tenth of the maximum permissible error for measuring systems (A) in Table 2.
- b) Associated measuring instruments shall have an accuracy at least as good as the values in Table 4.

Table 4 – Maximum permissible errors of associated measuring instruments

MPE on measurements	Accuracy class of the measuring system				
	0.3	0.5	1.0	1.5	2.5
Temperature	$\pm 0.3 \text{ }^\circ\text{C}$	$\pm 0.5 \text{ }^\circ\text{C}$			$\pm 1 \text{ }^\circ\text{C}$
Pressure	less than 1 MPa: $\pm 50 \text{ kPa}$ from 1 to 4 MPa: $\pm 5 \%$ greater than 4 MPa: $\pm 200 \text{ kPa}$				
Density	$\pm 1 \text{ kg/m}^3$	$\pm 2 \text{ kg/m}^3$			$\pm 5 \text{ kg/m}^3$
NOTE These values apply to the indication of the characteristic quantities of the liquid displayed by the conversion device.					

- c) Accuracy for calculating function: The maximum permissible error for the calculation of each characteristic quantity of the liquid, positive or negative, is equal to two fifths of the value under (b).

3 Technical requirements

The technical requirements are based on the requirements of the Government Regulation on Measuring Instruments and the requirements of Recommendation OIML R 117³⁾.

Verification of the measuring instruments shall be subject to technical requirements applicable at the time they were put into circulation.

3.1 Design of the measuring system

The measuring system shall always consist of the following components:

- a) flow rate or flow volume meter (flow meter);
- b) a transfer point;
- c) a hydraulic circuit with particular characteristics ensuring proper functioning of the measuring system.

Where required for correct operation of the measuring system, appropriate components shall be used as part of the system, for example:

- d) a gas elimination device;
- e) a filter;
- f) a pump;
- g) a differential valve;
- h) correction devices.

The measuring system may be provided with other ancillary and additional devices.

If several flow meters intended for separate measuring operations share common elements (for example, the calculator, filter, gas elimination device, liquid quantity conversion device etc.), each flow meter is considered to form, with the common elements, a separate measuring system.

3.2 Indicating device

The measuring system shall be equipped with an indicating device giving the flow quantity of the liquid at metering conditions.

Volume shall be indicated in units of volume appropriate for the measuring range, e.g. in m³, dm³ (litres), cm³ or millilitres. Mass shall be indicated in kg, g or t.

Where influence quantities are measured, temperature shall be displayed in °C or K, density in kg/m³ and pressure in bar or Pa (kPa, MPa).

If the measuring system is fitted with a conversion device to convert the measured flow quantity of the liquid to the given reference conditions, it shall also be fitted with a device for displaying this converted quantity.

One indicating device may be used for several measuring systems provided that it is impossible to use any two measuring systems simultaneously and it is clear for which measuring system the indication is displayed.

3.3 Gas elimination device

The possible occurrence of undissolved air or gases in the measured liquid upstream of the flow meter shall be minimised, in particular by suitable hydraulic circuit arrangement, including a pump and pressure conditions, or by using a gas elimination device for liquids with a dynamic viscosity of less than 20 mPa·s at 20 °C, which is suitable for the given conditions of measurement.

The effect of undissolved air or gases on the measurement result shall not exceed:

- a) 1 % of the measured quantity for milk, beer and other potable liquids that tend to foam and for liquids with a viscosity exceeding 1 mPa·s at 20 °C, or
- b) 0.5 % of the measured quantity for other liquids.

However, it is not necessary for this effect to be less than 1 % of the minimum measured quantity.

3.4 Protection against unauthorised tampering

The necessary number of spaces shall be provided on the measuring system for the placement of official marks and the main official mark allowing easy placement of the marks and visual inspection without the need for disassembly.

The measuring system shall be designed so that the measuring, indicating, conversion or other devices of the measuring system cannot be tampered with in any manner that could affect the accuracy of measurement without visible damage to the official mark.

4 Marking

All information on the label of the measuring system shall be indelible, irremovable and legible throughout the duration of its use.

4.1 Markings

Each measuring system shall bear at least the following information on a special label:

- a) the manufacturer's name or trade mark and contact mail address;
- b) identification of the type of the measuring system;
- c) the serial number and year of manufacture;
- d) minimum flow rate Q_{\min} and maximum flow rate Q_{\max} ;
- e) the minimum and maximum operating pressures;
- f) the minimum measured quantity (*mmq*);
- g) the name or type of measured liquid, or, if applicable, the range of relevant characteristics;
- h) the minimum and maximum temperature of the measured liquid;
- i) the minimum and maximum ambient temperature (if applicable, specified for different parts of the measuring system);
- j) the mechanical and electromagnetic class of the ambient environment (if applicable, specified for different parts of the measuring system);
- k) the nominal voltage of the AC power supply and the limit voltage of the DC power supply;
- l) accuracy class;
- m) the type-approval certificate or conformity marking number;
- n) identification of the positions of individual dispensation points.

This label shall be firmly affixed to the measuring system in a visible location and sealed. It shall not be possible to remove the label without damaging the seal.

4.2 Marking of metrologically relevant components

The following information shall be provided (e.g. in the form of another label) on each separate metrologically relevant component of the measuring system, such as the flow meter, measurement transducers, the calculator, the gas elimination device, or indication and conversion devices:

- o) serial number;
- p) the manufacturer's name or trade mark;
- q) the type-approval certificate or conformity marking number;
- r) other relevant characteristics for the particular device type.

5 Type approval of the measuring instrument

The measuring systems shall be placed on the market and put into use in accordance with other legislation¹⁾, therefore, they are not subject to type approval.

6 Initial verification

These measuring instruments shall be placed on the market and put into use after conformity assessment in accordance with other legislation¹⁾. Initial verification is not relevant for these measuring instruments.

7 Subsequent verification

7.1 In general

The verification of a measuring system may be carried out in a single stage or multiple stages. If the final verification of a complete measuring system is preceded by one or more stages, the test results from the preceding stages shall be taken into account during the final stage.

The verification of a measuring system may be carried out in a single stage if the entire measuring system has been manufactured by one manufacturer and if it can be transported without dismantling and tested under the intended conditions of use, or the verification can be carried out completely at the place of installation.

In all other cases, the verification shall be conducted in two stages:

- I. The first stage concerns only measuring instruments used as components or, if applicable, associated ancillary devices of the measuring system. Tests of the first stage may be carried out with different liquids than those which the system is intended to measure. Tests of the first stage may be carried out on a test bench.
- II. The second stage shall be carried out at the place of installation and at actual working conditions with the intended liquid of use.

Regardless of the number and place of the stages and regardless of the means of the test, it shall be possible to conclude that the measuring system installed at the site of use complies with all the requirements applied under the specified working conditions.

Verification with a liquid other than the liquid the system is intended to measure may be carried out only under the condition that the measuring instrument's type-approval or conformity assessment documentation so allows. Measuring systems for milk and other beverages or liquid food products may be tested with water.

The final stage of subsequent verification shall consist of the following actions and tests:

- a) visual inspection;
- b) functional test of the gas elimination device, if practicable;
- c) accuracy test;
- d) test of ancillary and additional devices.

7.2 Test equipment

The error of measurement of the test equipment used to carry out accuracy tests shall be less than $\frac{1}{3}$ of the maximum permissible error referred to in Article 2.2.2.

7.3 Visual inspection

The purpose of visual inspection of the measuring system shall be to check that:

- a) the measuring system submitted for verification and its components conform to the approved type or the design of the measuring instrument for which conformity was declared in the context of placing it on the market, and attention shall be paid to checking the markings referred to in Chapter 4;
- b) the measuring system and its components, including rubber hoses or connected pipe-work, are not mechanically damaged or do not exhibit signs of corrosion;
- c) the content and implementation of markings and inscriptions correspond to the information and requirements specified in the type-approval certificate for the measuring instrument.

If the measuring instrument fails to meet the visual inspection requirements, no further tests are performed.

7.4 Functional test of the gas elimination device

As far as possible or practicable, the proper functioning of the gas elimination device shall be tested; it is not necessary to verify compliance with maximum permissible errors applicable to this device.

7.5 Accuracy test

7.5.1 Flow meter accuracy test in the case of two-stage verification

The accuracy test of a flow meter shall be carried out using either the volumetric method, by transferring the specified quantity of the liquid into a standard capacity measure, or the mass method, by transferring the specified quantity of the liquid into a measure on standard scales, or using a reference flow meter at the specified flow rate.

The test shall be conducted at least at the following flow rates:

- Q_{\min} ,
- $(0.20-0.25)Q_{\max}$,
- $(0.8-1)Q_{\max}$,

Depending on the type of the measuring system, other flow rates may be specified.

In order for the flow meter to pass the accuracy test, the quantity indicated for each flow rate shall not exceed the maximum permissible error referred to in Article 2.2.2.

If all actual errors of the measuring instrument are only positive or only negative, at least one of them shall be less than half the maximum permissible error (MPE).

7.5.2 Measuring system accuracy test in the case of one-stage verification

The accuracy test of a measuring system shall be carried out using either the volumetric method, by transferring the specified quantity of the liquid into a standard capacity measure, or the mass method, by transferring the specified quantity of the liquid into a measure on standard scales, or using a reference flow meter at the specified flow rate.

The test shall be conducted at least at the characteristic flow rate within the flow rate range of the measuring system. Depending on the type of the measuring system, other flow rates may be specified.

The test shall be repeated at least $2\times$ for each flow rate.

In order for the measuring system to pass the accuracy test, the average quantity indicated for each flow rate shall not exceed the maximum permissible error referred to in Article 2.2.2.

If all actual errors of the measuring instrument are only positive or only negative, at least one of them shall be less than half the maximum permissible error (MPE) if the accuracy test is carried out for at least three flow rates.

7.6 Tests of ancillary and additional devices

Proper functioning of ancillary and additional devices shall be checked if the measuring system is provided with them. The relevant test shall only be carried out once; tests of ancillary and additional devices may be combined with the accuracy test.

7.6.1 Printer test

Indications provided by the printing device shall be compared with indications for the same measurement on the indicating device.

The difference between these indications shall not be more than one scale interval of the indicating device.

7.6.2 Test of the attached temperature measuring device

During the test, the deviation of the attached temperature measuring device at three temperatures is determined: T_{\min} , 15 °C and T_{\max} .

The difference between temperature T_i (°C) indicated on the dispenser and temperature T_n (°C) indicated by the standard temperature measuring device is determined.

The identified deviations of the attached temperature measuring device shall not exceed the maximum permissible error given in Table 4.

7.6.3 Conversion device test

During the test, conversion device accuracy shall be determined at the actual temperature of the test liquid.

The relative deviation of the indicated volume at base temperature E_{bv} shall not exceed the maximum permissible error referred to in Article 2.2.4.

8 Measuring instrument examination

When examining measuring instruments pursuant to § 11a of the Metrology Act at the request of a person who may be affected by incorrect measurement, the procedure under Chapter 7 shall be followed, except for the last sentence of Article 7.3. The maximum permissible error applied shall be double the maximum permissible errors referred to in Chapter 2.

9 Notified standards

For the purposes of specifying the metrological and technical requirements for measuring instruments and specifying the testing methods for verification stemming from this general measure, the CMI shall notify the Czech technical standards, other technical standards or technical documents of international or foreign organisations, or other technical documents containing more detailed technical requirements (hereinafter referred to as ‘notified standards’). The CMI shall publish a list of these notified standards attached to the relevant measures, together with the general measure, in a manner accessible to the public (at www.cmi.cz).

Compliance with notified standards or parts thereof shall be considered, to the extent and under the conditions laid down in this general measure, as compliance with those requirements laid down in this measure to which these standards or parts thereof apply.

Compliance with notified standards is one way of demonstrating compliance with the requirements. These requirements may also be met by using another technical solution guaranteeing an equivalent or higher level of protection of legitimate interests.

II. GROUNDS

The CMI has issued this general measure laying down metrological and technical requirements for legally controlled measuring instruments and tests for verification of legally controlled measuring instruments – ‘measuring instruments and systems for measuring the flow of liquids other than water – stationary measuring systems except for dispensers’, in accordance with § 14(1)(j) of the Metrology Act to implement § 9(1) and (9) and § 11a of the Metrology Act.

Implementing Decree of the Ministry of Industry and Trade No 345/2002 specifying measuring instruments for mandatory verification and measuring instruments subject to type approval, as amended, classifies the measuring instruments in question under items 1.3.11 i, l, m, 1.3.12 and 1.3.13 in the annex entitled ‘List of the types of legally controlled measuring instruments’:

1.3.11 Elements of measuring instruments and systems for measuring the flow volume of liquids

- i) calculator units for liquids other than water or liquefied gases,
- l) flow volume sensors for liquids other than water or liquefied gases,
- m) flow volume sensors for liquefied gases,

1.3.12 Measuring instruments and systems for measuring the flow volume of liquids other than water or liquefied gases,

1.3.13 Measuring instruments and systems for measuring the flow volume of liquefied gases.

This legislation (general measure) will be notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.

III. INSTRUCTIONS

In accordance with § 172(l) APC, in conjunction with § 39(l) APC, the CMI has stipulated a time limit for comments of 30 days as of the date of posting the draft on the official notice board. Comments submitted after this time limit will not be considered.

The persons concerned are hereby invited to comment on this draft general measure. With a view to § 172(4) APC, the comments shall be submitted in writing.

According to § 174(l) APC, in conjunction with § 37(l) APC, it must be clearly stated who is making the comments, which general measure the comments concern, how the draft contradicts legislation or how the general measure is inaccurate and must contain the signature of the person making the comments.

The supporting documents for this draft general measure may be consulted at the Czech Metrology Institute, Legal Metrology Department, Okružní 31, 638 00 Brno, after making arrangements by telephone.

This general measure shall be posted for 15 days.

.....

RNDr. Pavel Klenovský
Director-General

Person responsible for accuracy: Mgr. Tomáš Hendrych

Posted on:

Signature of the authorised person confirming posting:

Removed on:

Signature of the authorised person confirming removal: