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PUBLIC DECREE

As the authority with substantive and territorial jurisdiction for laying down metrological and technical requirements for specified measuring instruments and stipulating test methods for type approval and verification of specified measuring instruments pursuant to Article 14(1) of Act No 505/1990 on metrology, as amended (hereinafter the 'Metrology Act'), and in accordance with the provisions of Article 172 et seq. of Act No 500/2004, the Administrative Code (hereinafter the 'AC'), the Czech Metrology Institute (hereinafter the 'CMI') commenced ex officio proceedings on 1 July 2024 pursuant to § 46 of the AC, and, based on supporting documents, issues the following:

I.

DRAFT MEASURE OF A GENERAL NATURE

number: 0111-OOP-C035-26

laying down metrological and technical requirements for specified measuring instruments, including test methods for type approval, verification and checking of specified measuring instruments:

'instruments measuring water flow quantity' – water meters

With respect to relevant EU legislation and national legislation of the Czech Republic, instruments for measuring water flow quantity are a type of measuring instrument that from the perspective of the scope of authority of this legislation is split into two groups with respect to being placed on the market and into circulation, as follows:

a) water meters placed on the market according to special legislation[1],

b) water meters put into circulation pursuant to the Metrology Act according to point 2.1.1(a) and (b) of the Annex to Decree No 345/2002 of the Ministry of Industry and Trade *laying down measuring instruments for mandatory verification and measuring instruments subject to type approval* (hereinafter the 'Decree');

c) water meters put into circulation pursuant to the Metrology Act according to point 2.1.1(c) of the Annex to the Decree.

In the case of meters pursuant to point (a), the process of placing them on the market and putting them into service, including the technical and metrological requirements for measuring instruments and the methods used to test them, is regulated by special legislation[1].

In the case of water meters pursuant to points (b) and (c), this legislation lays down the metrological and technical requirements and test methods to be applied at the time they are placed into circulation, i.e. at the time of type approval pursuant to Chapter 5, and at the time of initial verification pursuant to Chapter 6.

The methods of testing for subsequent verification pursuant to Chapter 7, carried out after the measuring instruments have been put into circulation, and the test methods for measuring instruments according to Chapter 8, relate to all the above-mentioned groups of water meters.

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[1] Government Regulation No 120/2016 stipulating technical requirements for measuring instruments (hereinafter the 'Government Regulation'), and implementing Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on measuring instruments (MID)

1 Definitions

For the purposes of this Measure of a General Nature, terms and definitions according to VIM and VIML[2] and the terms and definitions below apply.

1.1
instrument measuring water flow quantity, water meter

a device intended for continuous measurement, recording, and display of the volume of water that has flowed through the measuring transducer under measurement conditions

1.2
flow rate

the ratio of the volume of water that has flowed through the water meter to the amount of time during which this volume flowed through the water meter; it is expressed in m^3/h

1.3
minimum flow rate Q_1

the lowest flow rate for which the water meter is required to operate within the limits of maximum permissible errors

NOTE Minimum flow rate was formerly designated q_{min} or Q_{min} (provisions concerning Q_1 therefore apply in a similar manner to q_{min} or Q_{min}).

1.4
transitional flow rate Q_2

a flow rate that lies between the permanent flow rate Q_3 and the minimum flow rate Q_1 and that splits the flow rate range into two regions, the 'lower flow rate region' and the 'upper flow rate region', each characterised by its own maximum permissible errors

NOTE The transitional flow rate was formerly designated q_t or Q_t (provisions concerning Q_2 therefore apply in a similar manner to q_t or Q_t).

1.5
permanent flow rate Q_3

the highest flow rate under rated operating conditions under which the water meter is required to operate within the limits of maximum permissible errors

NOTE The permanent flow rate was formerly designated q_p, Q_p, q_n or Q_n (provisions concerning Q_3 therefore apply in a similar manner to q_p, Q_p, q_p or Q_n).

1.6
overload flow rate Q_4

the maximum flow rate at which the meter is required to operate for a short period of time, within the limits of its maximum permissible errors, while its metrological function is maintained when subsequently operated within the limits of its specified operating conditions;

NOTE The overload flow was previously designated as q_s, Q_s or Q_{max} (provisions relating to Q_4 therefore also apply in a similar manner to q_s, Q_s or Q_{max}).

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

1.7
test flow
the average flow rate during the test, calculated from the indications of the calibrated reference device

1.8
nominal diameter (DN)
alphanumeric indication of the size of the components of the piping system used for reference purposes

NOTE The nominal diameter is expressed by the letters DN followed by a dimensionless integer that is inversely related to the physical size of the bore or outer diameter of the end connections in millimetres.

1.9
minimum allowable pressure (mAP) and maximum allowable pressure (MAP)
the minimum and maximum pressure of liquid that the water meter can resist on a permanent basis within the range of rated operating conditions without degrading its metrological functions

NOTE The minimum allowable pressure and maximum allowable pressure are the lower and upper limit of rated operating conditions for operating pressure.

1.10
minimum allowable temperature (mAT) and maximum allowable temperature (MAT)
the minimum and maximum pressure of liquid that the water meter can resist on a permanent basis within the range of rated operating conditions without degrading its metrological functions

NOTE The minimum allowable pressure and maximum allowable pressure are the lower and upper limit of rated operating conditions for operating pressure.

1.11
clean water
for the purposes of this legislation, pure water is water that may contain solid admixtures (particles) or admixtures only in solution. Cold drinking water and hot water as defined in point 2.1.1(a) and (b) of the Annex to the Decree are considered clean water for the purposes of this legislation

2 Metrological requirements

For water meters placed on the market pursuant to special legislation[1], the requirements laid down in this special legislation shall apply and the requirements set out in this chapter shall apply only for verification purposes.

Unless expressly stated otherwise, the requirements set out in special legislation[1] shall also apply to water meters put into circulation under the Metrology Act.

2.1 Rated operating conditions

The operating conditions for water meters are stipulated by the manufacturer.

Range of rated operating conditions:

a) the water temperature range must comply with at least the following conditions:
   - from 0.1 °C to 30 °C for water meters for cold water, or
   - from 30 °C to 90 °C for water meters for hot water, or
   - the water meter can be designed to operate in both ranges;

b) the range of relative operating water pressure is from 0.03 MPa (0.3 bar) to at least 1 MPa (10 bar) (for meters with DN ≥ 500, the maximum allowable pressure must be at least 0.6 MPa (6 bar));

c) the nominal value of the AC power supply or the limit values of the DC power supply must be specified for the power supply.

2.2 Measuring range

The water flow rate range must meet the following conditions:

a) Q_3 (expressed in m^3/h) must be chosen from the values in Table 1.

Table 1 – Values of Q_3 expressed in m^3/h

1.0	1.6	2.5	4.0	6.3
10	16	25	40	63
100	160	250	400	630
1 000	1 600	2 500	4 000	6 300

This list of values can be extended toward higher or lower values in the range.

b) Q_3/Q_1 ('R') $\geq$ 40, must be chosen from the values in Table 2.

Table 2 – Values of the ratio Q_3/Q_1 ('R')

40	50	63	80	100
125	160	200	250	315
400	500	630	800	1 000

This list of values can be extended toward higher values in the range.

c) $Q_2/Q_1 = 1.6$,

d) $Q_4/Q3 = 1.25$.

2.3 Maximum permissible error

For the water meters referred to in point (a) of Chapter I, the maximum permissible error according to 2.3.1.2 and 2.3.2.2 shall apply.

For the water meters referred to in point (b) of Chapter I, the meter manufacturer may specify accuracy class 1 or accuracy class 2. If the accuracy class is not specified, the maximum permissible error as per 2.3.1.2 and 2.3.2.2 applies.

For water meters referred to in point (c) of Chapter I, the maximum permissible error shall be as specified in 2.3.1.2 and 2.3.2.2 and temperature class T30.

2.3.1 Maximum allowable error for the lower flow rate region

2.3.1.1 Accuracy class 1

The maximum allowable error in volume delivered during a flow rate equal to or higher than the minimum flow rate Q_1 and up to but not including the transient flow rate Q_2 is ±3% for water of any temperature.

2.3.1.2 Accuracy class 2

The maximum permissible error in volume delivered during a flow rate equal to or higher than the minimum flow rate Q_1 and up to but not including the transient flow rate Q_2 is ±5% for water of any temperature.

2.3.2 Maximum allowable error for the upper flow rate region

2.3.2.1 Accuracy class 1

The maximum allowable error in the volume flowed at the flow rate between the transition flow rate Q_2 (inclusive) and the overload flow rate Q_4 (inclusive) is:

±1% for water of temperature ≤ 30 °C;
±2% for water of temperature > 30 °C.

2.3.2.2 Accuracy class 2

The maximum allowable error in the volume flowed at the flow rate between the transition flow rate Q_2 (inclusive) and the overload flow rate Q_4 (inclusive) is:

±2% for water of temperature ≤ 30 °C;
±3% for water of temperature > 30 °C.

2.3.3 Determining the measuring instrument error

The errors of indication shall not exceed the maximum permissible error.

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

2.4 Measuring instrument classification

2.4.1 Pressure classes

The minimum allowable pressure (mAP) must be 0.030 MPa (0.3 bar).

Measuring instruments are classified by the maximum allowable pressure (MAP) class that corresponds to values in the range MAP 6 (only for DN ≥ 500), MAP 10, MAP 16, MAP 25, and MAP 40 chosen by the manufacturer. The water meter must be capable of withstanding the internal pressure of the relevant class.

2.4.2 Temperature classes

Measuring instruments are classified by water temperature class corresponding to various ranges selected by the manufacturer:

a) water meters specified only by the maximum allowable working temperature (MAT):
T30, T50, T70, T90, T130 and T180;

b) water meters specified by minimum allowable operating temperature (mAT) and maximum allowable operating temperature (MAT): T30/90, T30/130 and T30/180.

2.4.3 Flow profile sensitivity classes

Water meters must be able to withstand the influence of abnormal velocity fields caused by flow disturbances.

The meter manufacturer must specify the flow profile sensitivity class:

a) in front of the meter:

U0, U3, U5, U10 and U15 without a current conditioner;

U0S, U3S, U5S, and U10S with a current conditioner;

b) past the meter:

D0, D3, and D5 without a current conditioner;
D0S and D3S with a current conditioner;

where the value expresses the required straight length of pipe with the same nominal diameter (DN) as the connected measuring instrument (hereinafter straight length). The straight length is expressed in multiples of DN.

Every section that modifies current, including conditioners and/or straight sections, that is to be used, must be completely defined by the manufacturer and is considered auxiliary equipment connected to the tested meter type.

2.4.4 Pressure drop

The maximum pressure drop between Q_1 and Q_3 must not exceed 0.063 MPa (0.63 bar). A pressure drop of 0.1 MPa (1 bar) is permitted for water meters referred to in point (c) of Chapter I. This value includes any filter or conditioner. The class must be selected from among the following:

ΔP 63, ΔP 40, ΔP 25, ΔP 16 and ΔP 10,
in addition, for water meters referred to in point (c) of Chapter I, ΔP 100,

where the number means the highest pressure drop in bars multiplied by a hundred.

Concentric meters of any type or measurement principle must be tested together with their appropriate manifold pipes.

2.5 Other significant metrological characteristics

2.5.1 Absence of flow or water

The sum of the water meter volumes must not change in the absence of either flow or water.

2.5.2 Backflow

For meters designed to measure backflow, the permanent flow rate and the measurement range may be different in each direction.

The manufacturer must specify whether the meter is designed to measure backflow. If so, the backflow volume must either be subtracted from the indicated volume or recorded separately. The maximum allowable error pursuant to Articles 2.3.1 and 2.3.2 must be met for both forward flow and backflow.

Water meters that are not designed to measure backflow must either prevent backflow or must be capable of resisting accidental backflow up to Q_3 without any deterioration or changes in their metrological properties for forward flow.

3 Technical requirements

For water meters placed on the market pursuant to special legislation[1], the requirements laid down in this special legislation shall apply and the requirements set out in this chapter shall apply only for verification purposes.

Unless expressly stated otherwise, the requirements set out in special legislation[1] shall also apply to water meters put into circulation under the Metrology Act.

3.1 Meter size and overall dimensions

The size of a water meter is designated by its nominal diameter (DN). For a meter with a threaded end connection, the minimum dimensions of the thread are specified.

3.2 Indication devices

A water meter indicator must facilitate easy reading, and reliable and unambiguous visualisation of the indicated volume. Combined water meters may have two indicators, the sum of which provides the indicated volume.

The indicator may contain elements for testing using other methods, for example for automatic testing.

Water volume must be displayed in cubic meters. The ‘m^3’ symbol must be shown on the numerical display or immediately adjacent to it. The indication range specified in Table 3 must make it possible to record the indicated volume in cubic metres without crossing zero.

Table 03 – Water meter indication range

Q_3 (m^3/h)	**Indication range (minimum values)** (m^3)
$Q_3 \leq 6.3$	9 999
$6{,}3 < Q_3 \leq 63$	99 999
$63 < Q_3 \leq 630$	999 999
$630 < Q_3 \leq 6\,300$	9 999 999

Every indicator must be equipped with means of visual and clear testing when verifying the control element.

The size of the verification graduation must not exceed:

a) 0.25% of the volume corresponding to the volume that flows through in 90 minutes at minimum flow Q_1 for accuracy class 1

b) 0.5% of the volume corresponding to the volume that flows through in 90 minutes at the minimum flow rate Q_1 for accuracy class 2; also applies to water meters pursuant to point (c) of Chapter I.

3.3 Electronic device counter

The counter may be equipped with an interface that allows connection of other devices. If these interfaces are used, the water meter's hardware and software must continue to operate properly and it must be impossible to influence its metrological properties.

3.4 Auxiliary equipment

In addition to indicators, water meters may contain auxiliary devices. Addition of these devices, either temporary or permanent, must not change the meter's metrological properties.

The auxiliary device may be used to detect the operation of the flow sensor previously displayed on the indicator.

3.5 Software

Software that is critical for the metrological characteristics of electronic equipment, termed legally relevant software, must be readily identifiable and must be secured. It must be possible to identify the software in a simple manner. Identification and security shall be in accordance with WELMEC Manual 7.2,[3] as amended.

3.6 Ambient conditions:

3.6.1 Climatic and mechanical environment

For water meters that use electronic devices, climate and mechanical environment classes are defined:

- Class B for fixed meters installed in buildings;
- Class O for fixed meters installed outdoors;
- Class M for mobile meters.

3.6.2 Electromagnetic environment

For water meters with electronic devices, electromagnetic environment class E2 for an industrial environment applies.

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[3] WELMEC 7.2: Software Guide (Measuring Instruments Directive 2014/32/EU) – *publicly available at* www.welmec.org

The water meter must be immune to electrical and electromagnetic interference or it must respond to it in a defined manner, e.g. by reporting an error, inhibition of measurement, etc. It also must not emit unwanted electromagnetic fields.

3.7 Power supply

The manufacturer specifies how a water meter with electronic devices is powered.

Water meters with electronic devices must be designed so that if the external power source (AC or DC) fails, the volume indicated by the meter immediately prior to the fault is not lost, and remains accessible for at least one year. Relevant storage in memory must take place at least once a day, or after every volume equivalent to 10 minutes of flow at Q_3. All other characteristics or parameters of the meter must not be affected by changes in the power supply or interruption of the power supply.

The back-up battery, if used, shall ensure that the meter, if there is a malfunction of the external power supply, operates for at least one month in loading under normal conditions of measurement. Battery lifespan must be marked on the meter.

The manufacturer must prove that the specified lifespan of a non-replaceable battery guarantees proper operation of the meter for at least one year more than the meter's operating lifespan.

In the case of a replaceable battery, the meter's properties and parameters must not be affected by a power interruption when the battery is being replaced. This does not apply to measurement and recording of flow while the battery is being replaced. Battery lifespan must be marked on the meter.

3.8 Correction device.

Water meters may be equipped with correction devices in order to reduce (indication) errors as much as possible to zero. Such devices are always considered an integral part of the meter that must comply with all relevant tests and requirements.

3.9 Material and construction

A water meter must be made of materials whose strength and lifespan are appropriate to the water meter's purpose. The materials must not be adversely affected by changes in water temperature within the operating temperature range, must be resistant to internal and external corrosion or protected by suitable surface treatment, and all parts of the water meter in contact with the flowing water must be made of materials that are non-toxic, contamination-free and biologically inert.

The water meter's indicator must be protected by a transparent window and can also be additionally protected by a suitable lid. The water meter must contain a device to eliminate the effects of condensation where there is a risk of condensation forming on the inner face of the water meter indicator window.

3.10 Protection against solid particulates

If the water meter's accuracy is susceptible to being affected by the presence of solid particulates in the water, it may be equipped with a conditioner or filter.

3.11 Measuring instrument security and fraud protection

3.11.1 Mechanical protection devices

Water meters must contain protective devices that must be sealed in such a way that after being sealed, before and after the water meter has been correctly installed, there is no way the meter can be disassembled or modified or its settings changed using an adjustment apparatus without damaging the seal or protective devices.

3.11.2 Electronic seals

If access to the modification of the parameters affecting the measurement results is not protected mechanically, then the access must be protected electronically by means of codes, passwords or the like and at the same time at least the most recent change must be stored in memory. In the case of

interchangeable parts and disconnection of parts that are not interchangeable, the insertion of any parts that could affect measurement results must be prevented.

3.12 Grounding of induction water meters

To ensure measurement accuracy and prevent galvanic corrosion, the electrodes of an induction water meter and the measured liquid must be electrically connected and grounded. Even though in general this means of grounding is water, individual installation instructions from the manufacturer for special meter designs must be followed.

3.13 Conductivity of the liquid

If the electrical conductivity of the liquid can affect measurement results, the manufacturer must stipulate a requirement for minimum operating conductivity.

The conductivity of test water for testing inductance water meters must comply with requirements in the type-approval certificate, if it was type-approved.

4 Markings

The measuring instrument must be clearly and visibly marked with the information pursuant to Article 4.1 in such a way that:

a) it is grouped together on one data plate; or
b) It is distributed on the housing, the dial of the indicating device, the identification plate, or the lid of the measuring instrument if it is not removable.

These markings must be visible without dismantling the water meter after it has been placed on the market or put into service.

4.1 Markings on the meter

A water meter must be clearly and visibly marked with the following information:

a) unit of measurement: cubic metre;
b) accuracy class;
c) the numerical value of Q_3;
d) the ratio Q_3/Q_1 (expressed as ‘R’, e.g. R160);
e) a type-approval mark pursuant to the Metrology Act;
f) the name or trade mark of the manufacturer and postal address;
g) the year of manufacture; at least the last two digits of the year of manufacture or the month and year of manufacture;
h) serial number (as close as possible to the indicator);
i) the direction of flow (depicted on both sides of the unit, or only on one side with an arrow indicating the direction of flow that is easily visible under all circumstances);
j) the maximum allowable pressure, if different from 1 MPa (10 bar) or 0.6 MPa (6 bar) for DN ≥ 500;
k) the letter ‘V’ or ‘H’ if the meter can operate only in a vertical or horizontal position;
l) the temperature class, if is not T30;
m) the pressure drop class, if it is not ΔP 63;
n) the class of sensitivity to irregularities in the velocity field, if different from U0D0.

For water meters with electronic devices, the following additional inscriptions must be used (if applicable):

o) for an external power supply: voltage and frequency;

p) for replaceable batteries: the latest date by which the battery should be replaced;
q) for non-replaceable batteries: the latest date by which the meter should be replaced;
r) the environmental class (climactic and physical);
s) electromagnetic environment class E2;
t) output signals for auxiliary equipment (type/levels), if any.

4.2 Official mark placement

Placement of official marks is stipulated in the type approval certificate or the EC (EU) type-examination certificate or other document applied within the context of conformity assessment when placing the device on the market and into operation.

5 Measuring instrument type approval

The provisions of the Metrology Act on type approval shall not apply to water meters placed on the market with conformity assessment according to special legislation[14] .

Water meters put into circulation pursuant to the Act are subject to the same requirements and tests at type-approval as for measuring instruments placed on the market with conformity assessment in accordance with special legislation[2], unless otherwise specified below.

In addition, the test for resistance to solid particulates shall be applied to water meters referred to in point (c) of Chapter I.

5.1 Test of resistance to solid particulates

The influence of solid particulates on the error of water meters is tested in accordance with point (c) of Chapter I. Water with particulates with the following characteristics shall be used:

Particulate material:	glass or ceramics
Particulate shape:	spherical
Particulate material density:	2.5 to 3 Mg/m^3
Particulate content in water:	10 g/l to 20 g/l
Particulate size:	80% of particulates between 100 and 300 µm

The test are carried out at continuous flow Q_3 for 600 hours.

The relative error of the water meter is determined before and after the start of the discontinuous test.

The change in the error curve must not exceed:

a) 3% for flow rates in the lower region ($Q_1 \leq Q < Q_2$); and
b) 1.5% for flow rates in the upper region ($Q_2 \leq Q \leq Q_4$);

i.e. for every flow rate, the error obtained prior to the test is subtracted from the error obtained after the test.

For the purposes of stipulating these requirements, the average error values at each flow rate must be used and the water meter error must not exceed the maximum error limit:

c) ±6% for flow rates in the lower region ($Q_1 \leq Q < Q_2$); and
d) ±2.5% for flow rates in the upper region ($Q_2 \leq Q \leq Q_4$).

[4] see § 24b of Act No 505/1990 *on metrology*

6 Initial verification

The provisions of the Metrology Act on initial verification shall not apply to water meters placed on the market with conformity assessment pursuant to special legislation[1.]

During verification, water meters are subject to the requirements applicable at the time they were put into circulation.

6.1 Overview of the tests conducted

During initial verification the following activities and tests are performed:

a) visual inspection;

b) functional tests:
   - static pressure test;
   - accuracy test

6.2 Visual inspection

A visual inspection is performed to assess whether:

- the meter submitted for verification and its parts conform to the approved type, and attention must be paid to checking labelling pursuant to Chapter 4;
- the meter is not physically damaged and its metal parts bear no traces of corrosion;
- the condition and lifetime of the power batteries shall guarantee the power supply for the period of validity of the verification.

If the gauges fail to meet visual inspection requirements, no further tests are performed.

6.3 Functional tests

6.3.1 Test methods and equipment

The extended measurement uncertainty of the true volume indicated by the test equipment must not exceed $^1/_3$ of the water meter's maximum allowable error.
The 'collection' or volume method is used to determine the measurement error of the tested water meter.

Collection method

During an accuracy test performed using the collection method, the amount of water flowing through the water meter is collected in a measuring container and its amount is determined on the measuring container's scale.

The measurement error is detected by comparing the volume indication of the test instrument with the indication of the water flow quantity on the measuring container.

Adjustment of the flow rates Q_1, Q_2 and Q_3 in accordance with Article 6.3.3 is performed by throttling the control valve.

Volume method

During an accuracy test performed using the volume method, the volume that has passed through the water meter is compared with the volume that has passed through a flow quantity reference standard, for example an induction flow meter, with valid calibration. The flow quantity standard must be calibrated, including the calming sections, if required. Calibration uncertainty must not exceed ±0.2%.

Flow rates Q_1, Q_2 and Q_3 pursuant to Article 6.3.3 are adjusted by throttling the control valve.

The stipulated minimum volume that must flow through the water meter during the test depends on requirements determined by a test of the effects of starting and stopping (time error) and the type and construction of the indicator (the value of the verification scale interval).

Meters are tested either individually or in groups. In the latter case, the individual properties of the meter must be precisely determined. Mutual influences between the meters and the test equipment must be eliminated. If the meters are tested in series, the pressure at the outlet of each meter must be sufficient to prevent cavitation and must not fall below 0.03 MPa (0.3 bar).

6.3.2 Static pressure test

Water meters are tested for tightness and damage resistance at the test water pressure according to the selected maximum allowable pressure class.

The test is conducted at room temperature. The water pressure must be equivalent to at least 1.6× the maximum allowable pressure (MAP) for 1 minute. For concentric meters the static pressure test must be performed on the meter and manifold pipes together.

During or after completion of the test, there must be no visible leak from the meter, leak from the indicator, or physical damage to the water meter due to testing.

6.3.3 Accuracy test

Water meter measurement errors must be determined for at least the following three flow rates:

- between Q_2 and $1.1Q_2$;
- between Q_2 and $1.1Q_2$;
- between $0.9Q_3$ and Q_3;

for combined water meters between $1.05Q_{x2}$ and $1.15Q_{x2}$.

Additional flow rates may be specified in the type approval certificate.

The test water temperature during meter verification must be the following depending on temperature class:

T30, T50:	(20 ± 10) °C
T70 to T180:	(20 ± 10) °C and temperature (50 ± 10) °C
T30/90 to T30/180:	(50 ± 10) °C

Errors found at each of the above-mentioned flow rates must not exceed the maximum allowable error specified in Articles 2.3.1. and 2.3.2 under conditions specified by Article 2.3.3.

For water meters with continuous flow $Q_3 > 20$ m^3/h classified in any temperature class, the use of a test water temperature of (20 ± 10) °C is permitted. The errors determined at each of the above flow rates must not exceed the maximum permissible errors

a) at a flow rate between the minimum flow rate Q_1 (inclusive) and the transitional flow rate Q_2 (exclusive), positive or negative, 5%; and
b) at a flow rate greater than or equal to the transient flow rate Q_2 and less than or equal to the overload flow rate Q_4, positive or negative, 2%

under conditions specified in Article 2.3.3.

7 Subsequent verification

Subsequent verification, i.e. every verification of a meter performed after initial verification, is performed pursuant to this article.

During verification, water meters are subject to the requirements applicable at the time they were put into circulation.

7.1 Overview of the tests conducted

During subsequent verification the following activities and tests are performed:

a) visual inspection;

b) functional tests:
   - static pressure test;
   - accuracy test

7.2 Visual inspection

A visual inspection is performed to assess whether:

- the meter is not physically damaged and its metal parts bear no traces of corrosion;
- for water meters with an electronic indicator, the meter did not lose volume indication prior to disconnection of power in the place of use, and has remained accessible pursuant to Article 3.7;
- the condition and lifetime of the power batteries shall guarantee the power supply for the period of validity of the verification.

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

7.3 Functional tests

7.3.1 Test equipment

The test equipment requirements are the same as in Article 6.3.1.

7.3.2 Static pressure test

The static pressure test is performed using the same procedure as for initial verification pursuant to Article 6.3.2.

Static pressure testing is not required for measuring instruments with non-moving parts.

7.3.3 Accuracy test

The static pressure test is performed using the same procedure as for initial verification pursuant to Article 6.3.3.

For the accuracy test, verification is permitted within the above limited range of flow rates, unless this conflicts with the specified operating conditions of the measuring instrument and if it is not possible to achieve a permanent flow rate on the test equipment. The meter shall be labelled 'Verified over a limited range of flows Q = (...) m^3/h' and the label shall be secured with an official mark.

Errors found at each of the above-mentioned flow rates must not exceed the maximum allowable error specified in Articles 2.3.1. and 2.3.2 under conditions specified by Article 2.3.3.

8 Measuring instrument examination

Testing of measuring instruments pursuant to § 11a of the Metrology Act at the request of a person who may be affected by its incorrect measurement is carried out in a laboratory or at the place of installation if this is technically possible and if the metrological integrity of the water meter is ensured. The following articles shall be followed:

8.1 Examination of a water meter in a laboratory

8.1.1 Tests to be conducted

The test of a water meter during the verification validity period consists of:

a) a visual inspection of the tested water meter;
b) leak checks;
c) accuracy tests.

8.1.2 Visual inspection

During the visual inspection of the water meter, the following is determined:

- whether the water meter under test conforms to the approved type;
- whether it is mechanically damaged;
- whether the readings on the water meter are in accordance with this measure;
- whether it is properly secured with official marks.

In the case of water meters that have failed the visual inspection, this fact is recorded in the test report with sufficient specification of the non-compliance. The test of the water meter shall continue if the meter is eligible for the technical test and if the metrological integrity of the water meter is ensured.

8.1.3 Leak check

The leak check is carried out visually during the accuracy test and the leakage and possible leakage of water from the water meter is monitored. In the case of water meters that have failed the visual inspection, this fact is recorded in the test report with sufficient specification of the concrete non-compliance.

8.1.4 Accuracy test

The accuracy test shall be performed pursuant to Article 7.3.3. The test equipment shall be used pursuant to Article 7.3.1.

The accuracy test shall always be carried out if the instrument is suitable for the technical test and if the metrological integrity of the water meter is ensured. In the case of water meters that have failed the visual inspection, this fact is recorded in the test report with sufficient specification of the concrete non-compliance. The maximum allowable errors used are double the maximum permissible errors pursuant to Chapter 2.

8.1.5 Evaluation of the examination results

If the water meter fails the visual inspection or accuracy test, it is considered to be in non-compliance with stipulated requirements.

8.2 Examining a water meter at the installation site

Examination of a water meter at the place of installation shall be carried out only in cases where specific legislation so stipulates[5].

The examination verifies whether the meter, operating as the specified measuring instrument, complies with the metrological and technical requirements of this Measure of a General Nature, is correctly installed, and complies with requirements for measurement accuracy during operation. The examination shall be carried out only if this is technically feasible and the metrological integrity of the water meter is ensured.

8.2.1 Tests to be conducted

The examination of the meter at the place of installation during the verification validity period consists of:

a) a visual inspection of the tested water meter and its installation;
b) preliminary operating tests;
c) leak checks;
d) accuracy tests.

8.2.2 Visual inspection

During the visual inspection of the meter, the following is determined:

[5] Act No 274/2001 *on water supply and sewerage for public use and amending other acts (Water Supply and Sewerage Act), as amended.*

- whether the tested water meter conforms to the approved type;
- whether it is properly installed and is not physically damaged;
- whether the readings on the water meter are in accordance with this measure;
- whether it is properly secured with official markings and installation seals.

In the case of water meters that have failed the visual inspection, this fact is recorded in the test report with sufficient specification of the non-compliance. The test of the water meter shall continue if technically feasible.

8.2.3 Test equipment

When testing a water meter at the installation site, the following test equipment shall be used:

a) a technically suitable reference standard flow meter with verified metrological traceability, with metrological parameters that correspond to the tested water meter, and with a shut-off valve; or

b) reference standard measuring containers with a regulation valve for setting the flow rate during the test, which must have a verification scale interval of 0.01 L for volumes up to and including 10 L, and 0.03 L for volumes greater than 10 L, with 4 mm scale spacing;

c) a connection hose with a suitable connection to the pipe system outlet and the container's regulation valve;

d) a thermometer with secured metrological continuity with an accuracy of ±1 °C.

The measurement uncertainty of the entire test apparatus is at most $^1/_3$ of the water meter's maximum allowable error.

8.2.4 Leak check

A flow quantity reference standard is connected past the tested water meter to one water pipe outlet using a connection hose. All other outlets must be closed.

The tested water meter is not subject to manipulation in order to maintain its current state and possible installation influence during the test.

The shut-off valve and of all other valves and outlets from the water system that could cause leaks of the measured water between the tested water meter and the reference standard are checked for leaks. It must be ensured that all water passing through the tested water meter passes through the reference standard.

The hose connection is checked visually for absence of leaks.

8.2.5 Preliminary operating test

The test is carried out for at least 5 minutes at the maximum achievable flow rate from the water supply system. During the test, the water system is checked to ensure it has no air pockets.

8.2.6 Accuracy test

The accuracy test must be performed at a minimum flow rate Q_1 and transient flow rate Q_2 calculated from the water meter's markings and at maximum achievable flow rate from the water system, which must be at least within the range of ($2\times Q_2$ to Q_3). The test flow rates for a test of water meter accuracy at the installation location are as follows:

a) minimum flow rate Q_1 of the tested water meter, the average flow rate during the test must be within the range (Q_1 to $1{,}1\times Q_1$);

b) transient flow rate Q_2 of the tested water meter, the average value during the test must be within the range (Q_2 to $1.1\times Q_2$);

c) maximum achievable flow rate, the average value during the test must be within the range ($2\times Q_2$ to Q_3).

If a flow rate of $2\times Q_2$ cannot be achieved due to the water meter being unsuitable for the specific installation and due to insufficient water pressure at the installation location, this fact will be recorded in the test report.

If even a flow rate of Q_1 cannot be achieved, this fact will also be recorded in the test report, and the test is ended.

The water temperature during the cold water meter test, i.e. water at a temperature of (0.1 to 30) °C, and during the hot water meter test, i.e. water at a temperature of (30 to 90) °C, shall be measured with a thermometer with an accuracy of ±1 °C.

The minimum volume of water that must flow through the water meter during the test depends on the requirements determined by the start-up and stopping effects test (time error), the type and the design of the water meter indicating device.

During the accuracy test, at least one measurement must be performed at each test flow rate. Errors found at each of the above-mentioned flow rates must not exceed double the maximum permissible errors specified in Articles 2.3.1. and 2.3.2.

The accuracy test may be performed using the collection or volume method.

8.2.6.1 Collection method

During an accuracy test performed using the collection method, the amount of water flowing through the water meter is collected in a measuring container and its amount is determined on the measuring container's scale.

The measurement error is detected by comparing the volume indication of the tested water meter with the indication of the water flow quantity on the measuring container.

The flow rate Q_1, Q_2, and the maximum achievable flow rate from the water system pursuant to Article 8.2.6(a) to (c) is set by adjusting the regulation valve on the measuring container inlet.

8.2.6.2 Volume method

During an accuracy test performed using the volume method, the volume that has passed through the water meter is compared with the volume that has passed through a flow quantity reference standard, for example an induction flow meter, with valid calibration. The flow quantity standard must be calibrated, including the calming sections, if required. Calibration uncertainty must not exceed ±0.2%.

The flow rate Q_1, Q_2, and the maximum achievable flow rate from the water system pursuant to Article 8.2.6(a) to (c) is set by adjusting one of the regulation valves on the outlet past the reference standard with calming sections.

8.2.6.3 Evaluation of the results of an accuracy test at the installation location

If the water meter fails the external inspection or accuracy test, it is considered to be in non-compliance with stipulated requirements.

9 Notified standards

For the purposes of specifying the metrological and technical requirements for measuring instruments and specifying the testing methods for their type approval and verification arising from this General Measure, the CMI shall notify Czech technical standards, other technical standards or technical documents of international or foreign organisations, or other technical documents containing more detailed technical requirements (hereinafter 'notified standards'). The CMI shall publish a list of these notified standards associated with the relevant measure, together with the measure of a general nature, in a manner accessible to the public (at www.cmi.cz).

Compliance with notified standards or parts thereof is considered, to the extent and under the conditions stipulated by a general measure, to be compliance with the requirements stipulated by this measure to which these standards or parts thereof apply.

Compliance with a notified standard is one of the ways to demonstrate compliance. These requirements may also be met by using another technical solution guaranteeing an equivalent or higher level of protection of legitimate interests.

II.

G R O U N D S

Pursuant to § 14(1)(j) of the Metrology Act, the CMI has issued this General Measure to implement § 6(2), § 9(1) and (9), and § 11a(3) of the Metrology Act, defining metrological and technical requirements for specified measuring instruments and tests for type approval and verification of specified measuring instruments – 'Instruments measuring water flow quantity' – water meters

Implementing Decree No 345/2002 specifying measuring instruments for mandatory verification and measuring instruments subject to type approval, as amended, classifies the measuring instruments under item 2.1.1(a), (b) and (c) in the annex entitled 'List of specified measuring instrument types' as measuring instruments subject to type approval and mandatory verification.

This legislation (Measure of a General Nature) shall 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.

Director General of the Czech Metrology Institute