

WELMEC

European Cooperation in Legal Metrology

Measuring Instruments Directive 2014/32/EU Common Application for Utility Meters (Water Meters and Thermal Energy Meters)



For information:

This guide is available to the Working Group Measuring Instruments for future reference on the Europa Website.

WELMEC

European Cooperation in Legal Metrology

WELMEC is cooperation between the legal metrology authorities of the Member States of the European Union and EFTA.

This document is one of a number of Guides published by WELMEC to provide guidance to manufacturers of measuring instruments and to Notified Bodies responsible for conformity assessment of their products.

The Guides are purely advisory and do not themselves impose any restrictions or additional technical requirements beyond those contained in relevant EU Directives.

Alternative approaches may be acceptable, but the guidance provided in this document represents the considered view of WELMEC as to the best practice to be followed.

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1 Foreword

This document is intended to provide guidance to all those concerned with the application of Measuring Instruments Directive 2014/32/EU (MID) on utility meters (water meters and thermal energy meters).

This document provides a record of the continuing work of WELMEC Working Group 13 in the area of the common application of the Directive itself.

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This document refers to and explains some of the requirements of the normative document OIML R-49:2013. When relevant part of normative document OIML R 49 is mentioned in this document, it means that the version OIML R 49:2013 applies. Moreover, it may be understood to apply also to relevant part of European Standard EN ISO 4064: 2017, because both specifications are the same with respect to their content.

1.1 Overview

The list of decisions concerning common application of the Directive is following:

Scope and exclusions of the Directive

Clause No.	Issue
2.1.1	Maximum size of a meter assessable under MID
2.1.2	Scope of MID concerning “additional/ associated functions” of measuring instruments

Interpretation of the essential requirements in respect to utility meters for water meters - Annex III (MI 001) and thermal energy meters - Annex VI (MI 004).

Clause No.	Issue
2.2.1	Acceptance criteria for accuracy measurements during market surveillance and conformity assessment
2.2.2	Explanation of the term “supplier” regarding MID, Annex I, Introduction
2.2.3	Indication of results
2.2.4	Indication of low flows

Interpretation of the special requirements on water meters - Annex III (MI 001)

Clause No.	Issue
2.3.1	Clean water
2.3.2	Connection interface of axial or coaxial cartridge water meters and its CE marking
2.3.3	Interpretation of requirements for conformity assessment of water meters according to OIML R 49

Interpretation of the special requirements on thermal energy metres - Annex VI (MI 004)

Clause No.	Issue
2.4.1	Application of thermal energy meters in systems for cooling (additional function)
2.4.2	Bifunctional thermal energy meters
2.4.3	Other special requirements

Sub-assemblies

Clause No.	Issue
2.5	Combining sub-assemblies of the thermal energy meters during putting into use

Evaluation of conformity assessment procedures

Clause No.	Issue
2.6.1	Adjustment of meters in order to avoid an exploitation of MPE
2.6.2	Metrological surveillance

Miscellaneous

Clause No.	Issue
2.7.1	MPEs applicable to a repaired meter that was originally conformity assessed according to MID
2.7.2	Determination of “period of time estimated by the manufacturer” in respect to the meter durability (MID, Annex 1, clause 5) and consequences for manufacturer following from this statement
2.7.3	Documentation of seals used for security measures

Protection against reset of meters, checking of meters placed on the market

Clause No.	Issue
2.8.1	Resetting of registers
2.8.2	Additional tools/equipment

Meter families in respect to conformity assessment

Clause No.	Issue
2.9.1	Definition of a family of meters

2 Decisions**2.1 Scope and exclusions of the Directive****2.1.1 Maximum size of a meter possible to be assessed under MID**

There is no limit on size of the water meter/thermal energy meter that can be assessed under MID.

Reason:

There are no limits concerning the size stated in the MID. It is the choice of the manufacturer which meter sizes are in the scope of an assessment.

2.1.2 Scope of MID concerning “additional/ associated functions” of measuring instruments

Functions of the water meter/thermal energy meter which are not specified in the instrument specific Annex shall be considered as “additional/associated functions” (see also clauses 2.3 and 2.4). They shall be examined in order to ensure that they do not affect the conformity of the measuring instrument to the essential requirements of MID.

The “additional/associated functions” including the concerned hardware and software respectively shall be examined in respect to the appropriate clauses of Annex I of MID, in particular the clauses

7.1, 7.6, 8.1, 10.2 and 10.5. The EU-type examination certificate or EU design examination certificate shall include a list of the “additional/associated functions” with a clear description of the functions and the additional information that these functions do not influence the metrological characteristics of the measuring instrument and essential requirements.

Note: The guideline shall be applied to “additional /associated functions besides the measuring function” referred to as “additional /associated functions” in this guideline.

2.2 Interpretation of the essential requirements in respect to water meters - Annex III (MI 001) and thermal energy meters - Annex VI (MI 004)

2.2.1 Acceptance criteria for accuracy measurements during market surveillance and conformity assessment

In order to obtain reliable results, the traceability and the Best Measurement Capability (BMC) of the test equipment used during market surveillance and conformity assessments shall be known. The Best Measurement Capability is the uncertainty ($k=2$) of the measurand without the uncertainty contribution of the measuring instrument under the test.

a) Market surveillance applications

It is recommended that the following equation is fulfilled:

$$\text{BMC} < 1/3 \text{ MPE}$$

Meters (or sub-assemblies) can be declared to be non-conforming if at any point of the operating range of the measuring instrument, the average $\bar{e}$ (average of repetitions for one measuring value) of the observed errors exceeds the sum of MPE and U :

$$\bar{e} > \text{MPE} + U$$

where U is the uncertainty (the coverage factor $k=2$) of the measurement result.

b) Conformity assessment applications

If nothing else is stated in harmonised standards or normative documents, the following approach applies:

– Conformity assessment according module B or module H1

For test equipment, it is recommended that the following equation is fulfilled:

$$\text{BMC} < 1/5 \text{ MPE.}$$

The observed errors e during a meter test meet the requirements if, for all repetitions the following equation is fulfilled:

$$e < \text{MPE}$$

– Conformity assessment according module D and module F

For test equipment, it is recommended that the following equation is fulfilled:

for water meters: $\text{BMC} < 1/3 \text{ MPE}$

for thermal energy meters and its subassemblies: $\text{BMC} < 1/5 \text{ MPE}$

The observed errors e during a meter test meet the requirements if, for all repetitions the following equation is fulfilled:

$$e < \text{MPE}$$

Note on the evaluation of test results:

The minimum measuring time or the minimum number of pulses taken into account during an accuracy test of a meter shall be specified by the manufacturer. The results of repeatability tests in respect to Annex 1 clause 3 of MID shall be inside the MPE.

2.2.2 Explanation of the term “supplier” regarding MID, Annex I, Introduction

In Annex 1 the term supplier is used in the definition of ‘utility’. In this context the term “supplier” means an entity which supplies, heat or water to the end users. Where heat or water is resold, the reseller takes on the responsibility of the supplier.

2.2.3 Indication of results

Related to: MID, Annex 1, clause 10.5

10.5. Whether or not a measuring instrument intended for utility measurement purposes can be remotely read it shall in any case be fitted with a metrological controlled display accessible without tools to the consumer. The reading of this display is the measurement result that serves as the basis for the price to pay.

If a meter is designed to count the quantities defined in Annex III (MI 001) and Annex VI (MI 004) in different registers, the meter shall be able to display the total quantities of each register on the display by means of the user interface (see WELMEC guide 7.2, for instance buttons on the measuring instrument) as well as the currently active rate register. It is possible to show the results on different displays, periodically or on request via user interface.

If a meter is designed to count the quantities consumed in time intervals, the display shall show the results on request via user interface (see WELMEC guide 7.2, for instance buttons on the measuring instrument). In addition to the value itself, the corresponding date and time shall be identifiable. The memorised values shall be available over a reasonable period time in order to check of the bill.

Reasons:

- The price to pay for a measured quantity may depend mainly from the rates (price/quantity).
- In order to control the consumption behaviour individually the end user needs the information, as to which rate is currently active.
- If only the total quantity supplied is displayed on the metrological controlled display, then distribution of the quantities in different rates registers will not be obtainable for checking.

2.2.4 Indication of flows outside measuring range

Related to: MID, Annex 1, clause 7, suitability

7.2. A measuring instrument shall be suitable for its intended use taking account of the practical working conditions and shall not require unreasonable demands of the user in order to obtain a correct measurement result.

A meter shall allow to check whether there is also a registration outside the measuring range or not.

It is up to the manufacturer to declare how this functionality is implemented.

An acceptable solution is for the meter to display a special sign. In the case where the display is switched off (for saving energy) this sign may also be switched off.

A further acceptable solution for checking the registration outside the measuring range is that the design includes a sufficiently low value of the last digit of the display, or a special test mode.

2.3 Interpretation of the special requirements on water meters - Annex III (MI 001)

2.3.1 Clean water

Related to: MID, Annex III, water meters (MI 001), Scope

Clean water is potable water which may contain solid additives (particles) or additives in solution only.

2.3.2 Connection interface of axial or coaxial cartridge water meters and its CE marking

A connection interface is not a sub-assembly of a meter in the sense of MID. It shall be considered as part of the installation piping, provided that it is described in the OIML R 49 and that the meter is assessed to fulfil the requirements of the Directive with one or more of the types of the defined connection interfaces. Axial and co-axial cartridge meters and the standardised connection interfaces shall be clearly marked for their intended combined fit for the use under MID requirements.

The manufacturer has to specify which connection interface is used on the application for the conformity assessment. Connection interface and cartridge meter have to carry the identical externally visible identification mark. Furthermore it is not allowed to use any adaptor devices, to make it possible to mount a meter into a connection interface of a type where it is not intentionally designed for and approved for. This information must be part of the installation instructions.

The CE and M marking has to be applied to the measuring instrument only.

The above mentioned does not apply to concentric meters as defined in OIML R 49.

Reason:

According to MID, article 4 (2), sub-assemblies have to be mentioned in the instrument specific annexes. This is the reason for not considering the connection interface as a sub-assembly in view of the Directive.

It is the current experience of experts, that the metrological performance of a meter may be influenced if the meter is not used with the prescribed connection interface. In accordance with article 8 of the Directive the measuring instrument is to be put into use together with a connection interface of a type accepted under the conformity assessment of the cartridge meter. Attention should be given to the prohibition of use of adaptors in practice.

2.3.3 Interpretation of requirements for conformity assessment of water meters according to OIML R 49

a) Related to: testing of water meters intended to operate only in horizontal position (H)

If the water meter is marked “H”, the connecting pipework shall be mounted with the flow axis in the horizontal plane during the tests and the horizontally mounted meters are oriented with indicating device positioned only on the top.

Reason:

According to OIML R 49-2, clause 7.4.2.2.7.5 where the meters have an indicating device which is integral with the body of the meter, at least one of the horizontally mounted meters shall be oriented with the indicating device positioned at the side. However, the horizontal orientation of the water meter with indicating device positioned at the side is comparable with vertical position. It may lead to bigger error for some kind of water meters (e.g. single-jet meters, multi-jet meters) due to higher loading of measuring parts.

b) Related to: selection of samples concerning performance tests No.3 - No.9 and No. 14 (Table 6) according to OIML R 49-2.

It is not required to submit the same meter sample for tests No.3 - No.9 and No. 14 (Table 6) according to OIML R 49-2.

Reason:

The performance tests No.3 - No.9 and No. 14 (Table 6) according to OIML R 49-2 are not technically or metrological interdependent.

However always in advance of performing these above tests, test no. 2 (Error of indication) shall be performed.

c) Related to: installation/operated positions of the meters in relation to performance tests No.3 - No.9 and No. 14 (Table 6) and performance tests for electronic water meters, mechanical water meters fitted with electronic devices, and their separable parts (clause 9.3) according to OIML R 49-2.

If the water meter is not marked “H” or “V”, performance tests No.3 - No.9 and No. 14 (Table 6) and performance tests applicable to electronic water meters, mechanical water meters fitted with electronic devices, and their separable parts (clause 9.3) according to OIML R 49-2 may be performed only in the horizontal position “H” with indicating device positioned on the top.

If the water meter is marked at once “H” and “V” with the same or different ration R for “H” and “V”, performance tests No.3 - No.9 and No. 14 (Table 6) and performance tests applicable to electronic water meters, mechanical water meters fitted with electronic devices, and their separable parts (clause 9.3) according to OIML R 49-2 may be performed only in the horizontal position “H” with indicating device positioned on the top.

If the water meter is marked only “V”, performance tests No.3 - No.9 and No. 14 (Table 6) and performance tests applicable to electronic water meters, mechanical water meters fitted with electronic devices, and their separable parts (clause 9.3) according to OIML R 49-2 may be performed only in one vertical position “V” (up or down).

If the water meter is marked only “H”, performance tests No.3 - No.9 and No. 14 (Table 6) and performance tests applicable to electronic water meters, mechanical water meters fitted with electronic devices, and their separable parts (clause 9.3) according to OIML R 49-2 may be performed only in the horizontal position “H” with indicating device positioned on the top.

Reason:

Establishment of orientation requirements does not improve the outcome of the test program.

d) Related to: temperature classes according to OIML R 49-2

The meter temperature class T30/70 specified in OIML R 49-2, Table 1 is not covered by MID.

Reason:

According to MID, Annex III, clause 2 „*The values for the temperature range shall fulfil the following conditions: 0,1 °C to at least 30 °C, or 30 °C to at least 90 °C. The meter may be designed to operate over both ranges.*”

e) Related to: water meters intended to be used in specific installation/operated positions

Other installation/operated positions of the water meter beside the main positions: horizontal (H), vertical (V) and any position (not marked H or V) according to OIML R 49-2 are allowed under the condition that the operated position is clearly and understandably marked on the water meter. Such operated position shall be clear described in the EU-type examination certificate or EU design examination certificate and in the documentation referred to in certificate which accompany a measuring instrument.

Reason:

The operated positions as are defined in OIML R 49-2 are not strictly prescribed in MID. According to MID, Annex III, clause 8.1 “*The meter shall be able to be installed to operate in any position unless clearly marked otherwise.*”

f) Related to: calculation of the standard deviation used for the evaluation of the test results according to OIML R 49-2.

Acceptance criteria for the evaluation of intrinsic errors according to OIML R 49-2, clause 7.4.5 includes, inter alia, the evaluation of the standard deviation of measurement results. Following equation for the calculation of the (population) standard deviation that is stated in OIML R 49-2 clause 7.4.5 c) shall be used:

$$s = \sqrt{\frac{1}{n} \sum_{i=1}^n (E_{m(i)} - \bar{E}_m)^2}$$

Where

s – population standard deviation

$E_{m(i)}$ - relative error (of indication) at a flow rate i

$\bar{E}_m$ – average relative error (of indication) at a flow rate i

n - number of tests

g) Related to: test procedure concerning the evaluation of discontinuous flow test and continuous flow test of the water meter according to OIML R 49-2

The test procedure for the evaluation of discontinuous flow test (7.11.2.3.1) and continuous flow test (7.11.3.3.1) of OIML R 49-2 shall be considered.

Reason:

The clarification of the test procedure concerning the evaluation of discontinuous flow test and continuous flow test according to OIML R 49-2 is necessary because the test procedure for the evaluation of discontinuous flow test and continuous flow test was different according to previously harmonised standard EN 14154-3:2005+A2:2011 and normative document OIML R 49-2: 2006.

- h) Related to:** Static pressure test in relation to water meters with different temperature classes according to OIML R 49-2.

The static pressure test may be carried out only at the reference temperature $50\text{ °C} \pm 5\text{ °C}$ for the water meters with temperature class equal to or greater than T70.

Reason:

The negative effects on static pressure performance of the water meters become more apparent at higher temperatures (e.g. due to higher temperature expansion of the body material). The static pressure test at the reference temperature $50\text{ °C} \pm 5\text{ °C}$ is harder than at the reference temperature $20\text{ °C} \pm 5\text{ °C}$ and therefore covers the effect the lower reference temperature.

- i) Related to:** testing the water meters with different DN sizes within the family of water meters according to OIML R 49-2.

Rules for type evaluation of a family of water meters are stated in OIML R 49-2, Annex D. In the case where the family of water meters includes only water meters with two DN sizes, all tests stated in the OIML R 49-2, Annex D i) may be carried out only on smaller DN size and apply only the static pressure test for bigger DN size. It is applicable provided that all other requirements of OIML R 49-2, Annex D are fulfilled.

Reason:

It is not expected that different results will be obtained from the tests of “one other size”. The example for testing of meter family members is given in OIML R 49-2, Annex D j).

- j) Related to:** Type evaluation of the water meter with various ratios Q_3/Q_1 (R) according to OIML R 49-2.

In many cases the manufacturers declare for the water meter more than one ratio Q_3/Q_1 (R) provided that the Q_3 is the same for all declared ratios (e.g. R160, R100, R 80). In such a case only the largest ratio Q_3/Q_1 (R) may be tested within type tests. On the basis of the shape of the error curve obtained from the tests at the largest ratio Q_3/Q_1 (R), notified body may decide to carry out the tests at additional flowrates.

Reason:

In the case where the water meter has various ratios Q_3/Q_1 (R) provided that Q_3 is the same for all declared ratios, the flowrates Q_3 and Q_4 are the same and Q_1 and Q_2 are different for all declared ratios. When the largest ratio Q_3/Q_1 (R) is tested, all flowrates concerning the smaller ratios Q_3/Q_1 (R) are inside the range of flowrates for the largest ratio and MPes for smaller ratios Q_3/Q_1 (R) shift towards flowrate Q_3 (for example see Figure 1).

The errors (of indication) at the flow rate range resulting from the ratio (R) marked on the water meter shall be evaluated during conformity assessment procedures F, D and H1 (final product inspection and testing).

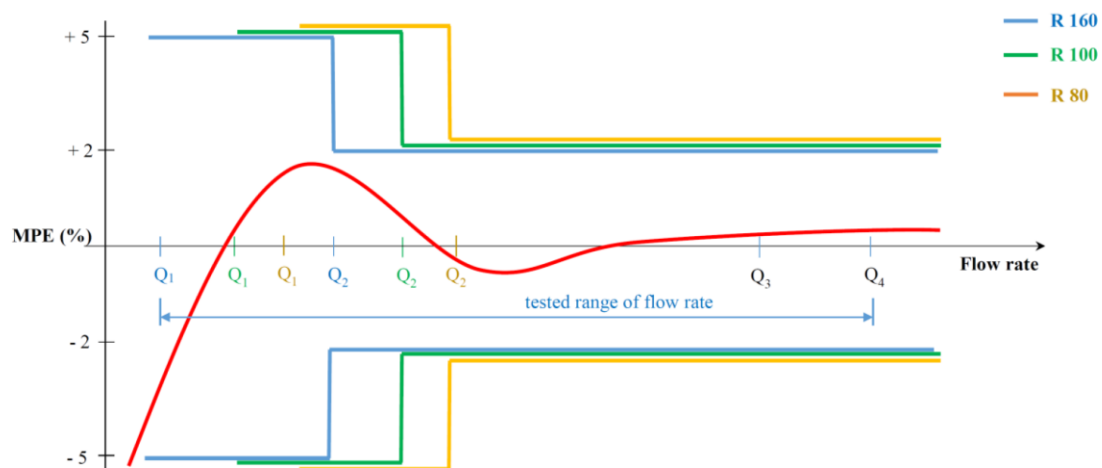


Figure 1: Example of the flowrates and MPEs for various ratios Q_3/Q_1 (R) provided that Q_3 is the same for all ratios

2.4 Interpretation of the special requirements on thermal energy meters - Annex VI (MI 004)

2.4.1 Application of thermal energy meters in systems for cooling (additional function)

The Directive 2014/32/EU does not regulate the thermal energy meters for cooling applications. The thermal energy meters for cooling applications are regulated by the national legislation of the member states.

The tests and conditions of the tests for cooling application are defined in the relevant standards EN 1434. Substances for cooling (air condition) systems are mixtures of the water and other liquids (mostly on basis of glycol, etc.). These substances have different thermodynamic parameters than the water, defined mostly by polynomials or by tables.

Applications of thermal energy meters using mixtures shall be only realized by precisely defined characteristics (by means of its thermodynamic parameters). If not, errors over MPE can arise during measurements (sometimes very large).

Note: The thermodynamic parameters of the mixtures (water with glycol), as well as test descriptions and requirements on utilization, are intended to be defined in prEN 1434:2020.

2.4.2 Bifunctional thermal energy meters

Bifunctional thermal energy meters are equipped with automatic switch on/off between heating and cooling application of thermal energy in the circuit. It is based on Θ_{hc} temperature and temperature difference and defined in standard EN 1434-4:2015+A1:2018. Tests for the switching over from heating to cooling register and reversed shall be performed during conformity assessment according to MID.

2.4.3 Other special requirements

Concerning clauses 2.2.3 "Indication of results", 2.8.1 "Resetting of registers", 2.8.2 "Additional tools/equipment" of this document and utilization of thermal energy meters in smart metering,

remote reading, data transmission, etc., following points should be taken in account as additional intelligent functionalities of the thermal energy meters:

- interval metering and tariff values
- thermal power (in defined time interval)
- internal time of meter (real time clock)
- suitable legal relevant software
- reliable communication ability of the meter

Specifications are given in standard EN 1434 and WELMEC Guide 7.2 and WELMEC Guide 11.2.

2.5 Sub-assemblies

2.5.1 Combining sub-assemblies of the thermal energy meters during putting into use

The national legislation has to provide regulations concerning the responsibility for a correct combination of sub-assemblies of the thermal energy meters (flow sensor, temperature sensor pair and calculator or a combination thereof) during putting into use. This includes the responsibilities concerning the correct programming of parameters e.g. pulse factors. All information shall be easily available in the documentation for sub-assemblies to set up the combination correctly. The notified body has to ensure that during the conformity assessment the documentation is complete and comprehensive.

Before CE-marking the manufacturer has to set the parameters in such a way, that the sub-assembly works with default parameters.

The EU type examination certificate (TEC) or EU design examination certificate and documentation referred to in certificate which accompany a measuring instrument shall specify detail information necessary to ensure correct functioning of the combined instrument when built and installed according to this information.

The sealing of the connection of the subassemblies shall be ensured by the person legally designated for installing the meter.

Reason:

According to MID, article 5 sub-assemblies can have separate EU type examination certificates. According to MID, article 18, clause 5 the manufacturer shall indicate the conditions for compatibility with interfaces and sub-assemblies.

2.6 Evaluation of conformity assessment procedures

2.6.1 Adjustment of meters in order to avoid an exploitation of MPE or systematically favour any party

Related to:

Annex III, water meters (MI 001)

Annex VI, thermal energy meters (MI 004)

The Annex III, water meters (MI 001) and Annex VI, thermal energy meters (MI 004) includes a following requirement which restrict the MPE additionally in order to avoid an undue biasing of meters during the production: *“The meter shall not exploit the MPEs or systematically favour any party”*.

This requirement (further called as Adjustment Rule, abbreviation AR) shall be applied during the production process, where the adjustment of a meter takes place or during the final tests of the meter. The manufacturer is responsible for the correct adjustment of the meter and shall establish

appropriate measures in his quality system to follow the adjustment rules or implement other means during production process.

The adjustment shall lead to meter errors curves which are as close as possible near to zero level, taking into account the technical opportunities of a meter/or sub-assembly design.

The manufacturer's quality system of the production process (Module D, H1) shall describe how a duly adjustment of the meter is implemented. If a manufacturer applies module F he shall inform the responsible notified body about the applied methods of the adjustment.

In order to allow a check of the correct application of the AR by the Notified Body, the manufacturer shall file the results of the relevant tests over an appropriate time.

Concerning the adjustment of the meter following rules shall be applied:

a) For water meters:

- All meters must be designed and adjusted as close as possible to the zero error limits.
- Water meters and flow sensors with abilities for adjustment of the error curves, where the errors are aligned into the same sign (+/-) within the complete measuring range, shall only pass the verification if all errors do not exceed a half of the MPE. In cases where no adjustment is possible, special measures have to be included into the manufacturer's quality system of the production process.

Note: Measures mean e.g. to detect the batch of statistics coming from test results of water meters which shall show at Q_3 or Q_2 that the maximum of the error distribution is below half of the permitted errors."

b) For thermal energy meters (flow sensors):

- Each individual meter with electronic abilities for adjustment of their error curves, where errors are aligned into same sign (+/-) in the complete measuring range, shall only pass the verification assessment if any of the errors does not exceed half of MPE. Mechanical meters (e.g. Woltman Turbine Meters) with no abilities by electronic adjustment shall be produced as close as possible to zero error.
- In a case of statistical method it is not permitted to select special meters from produced batch. A batch is a deliverable of the same type and range. WELMEC guide 8.10 provides information about the acceptable size of a batch (lot size).

2.6.2 Metrological surveillance

The metrological surveillance of water meters and thermal energy meters in respect to the AR may be based on statistical methods applied on a sufficient number of meters.

Taking into account the typical values of uncertainties of the test rigs used by the manufacturer and surveillance authorities the uncertainties may be not negligible in respect to the MPE. The uncertainty of the used test rig shall be taken into account as described in this document, clause 2.2.1 a).

2.7 Miscellaneous

2.7.1 MPEs applicable to a repaired meter that was originally conformity assessed according to MID

If a measuring instrument was repaired before putting into use, the MPEs stated in the corresponding specific annex shall apply.

For measuring instruments that are in-service the national regulations apply.

Reason:

MID is applicable to measuring instruments being made available on the market and/or put into use for the measuring tasks.

2.8 Protection against reset of meters, checking of meters placed on the market

2.8.1 Resetting of registers

Related to: MID, Annex I, clause 8.5:

“For utility measuring instruments the display of the total quantity supplied or the displays from which the total quantity supplied can be derived, whole or partial reference to which is the basis for payment, shall not be able to be reset during use.”

If tariff registers are used for billing purposes then they have to be treated as legally relevant parameters. The registers need to be protected against changes and resetting in the same way as legally relevant parameters (see WELMEC 7.2 requirement P5 and P7). For different tariff registers a software seal is allowed, as described in P7.

The overall cumulative register needs to be protected by means of a hardware seal. If no overall cumulative register is available, the displays from which the total quantity supplied can be derived (all tariff registers) need to be protected also by means of a hardware seal.

Reasons:

Lots of utility meters have more than one tariff register. One of the simplest version is a meter with a day and a night tariff register. The day or night tariff register may be reset under a software seal in the case a total (overall cumulative) register is available which is protected by means of a hardware seal.

2.9 Meter families in respect to conformity assessment

The aim of definition of meter families is to reduce the necessary tests and documents to a minimum in respect to conformity assessment.

The manufacturer should make suggestions for grouping measuring instruments to a family. The Notified Body assesses the suggestion and can accept, refuse or modify the manufacturer's proposal.

2.9.1 Definition of a family of meters

a) Water meters

The criteria to be applied in deciding whether a group of water meters can be considered to be from the same family for conformity assessment procedures are given in Annex D, Annex D, OIML R 49-2.

The water meters within a family may have different display device versions as long as it is demonstrated by design argumentations or tests that they have the same influence on the metrological performances.

b) Thermal energy meters or sub-assemblies

A family of thermal energy meters is a group of meters of different sizes having a family similarity in the principles of operation, construction and materials (EN 1434-1:2015+A1:2018, cl. 3.3).

Other criteria to be applied in deciding whether a group of thermal energy meters can be considered to be from the same family for conformity assessment procedures are following:

- the same manufacturer
- the same measuring principle
- the same accuracy class
- roughly the same ratios q_s/q_p and q_p/q_i
- roughly the same $\Delta\theta$ range
- the same temperature pairs
- the same electronic devices for each meter size
- geometric similarity of the wetted parts with scalable measures thereof
- a similar construction and component assembly
- the same materials for those components that are critical to the metrological performance of the meter
- the same rated operating conditions

The thermal energy meters within a family may have different display device versions as long as it is demonstrated by design argumentations or tests that they have the same influence on the metrological performances.