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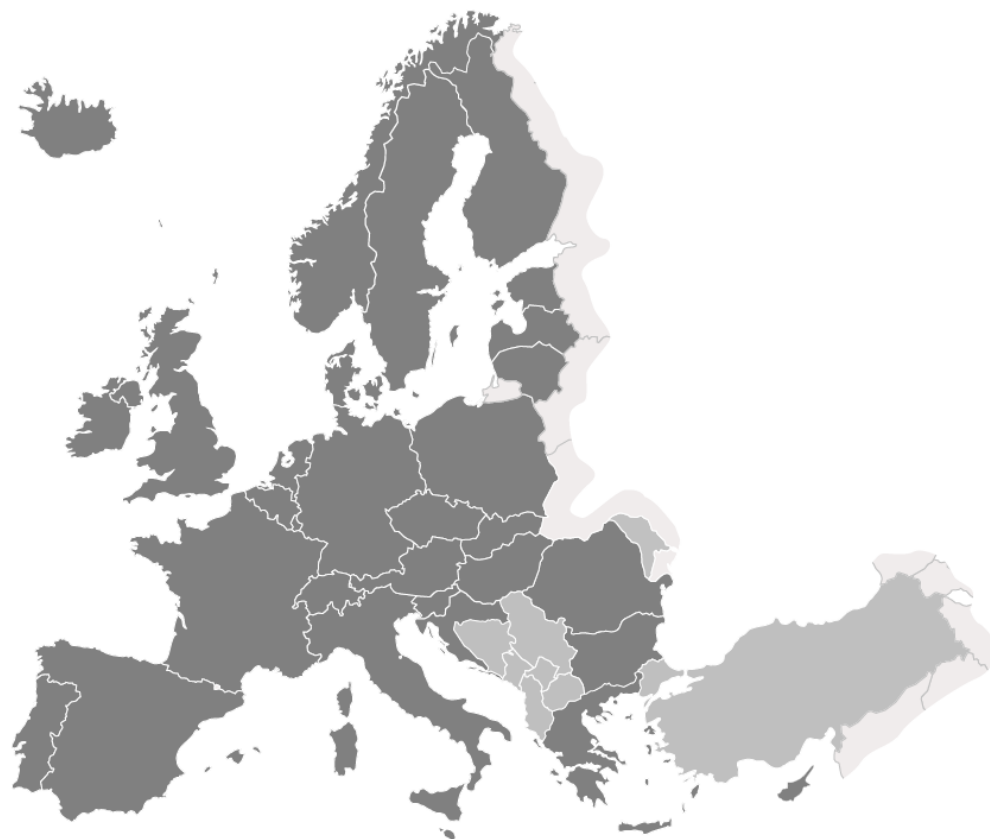
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WELMEC

European Cooperation in Legal Metrology

Measuring Instruments Directive Water Meters Corresponding Tables

OIML R 49 2013 – MID Annex I and III (MI-001)



WELMEC

European Cooperation in Legal Metrology

WELMEC is a 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.

Published by:
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E-mail: secretary@welmec.org
Website: <http://www.welmec.org>

Foreword

1. The column “Comments” indicates when necessary the relevant text of OIML R 49 and related explanations concerning the compliance with the relevant requirements in Directive 2014/32/EU.
2. The column “Conclusion” gives the conclusion on the compliance between MID and OIML R 49 for the relevant requirement.

The indication “Covered” means that:

- the requirement of OIML R 49 is identical to the one of Directive 2014/32/EU; or
- the requirement of OIML R 49 is more severe than the one of Directive 2014/32/EU; or
- all the requirements of OIML R 49 fulfil requirements in Directive 2014/32/EU (even when Directive 2014/32/EU allows other alternatives),
- in case the requirement is not fully covered, a short statement explains what is covered.

The indication “Partially covered” means that the requirement is not fully covered or OIML R 49 allows possibilities which are not foreseen in MID.

The indication “Not Covered” means that the MID requirement is either not compatible with the relevant OIML R 49 requirement or not included in OIML R 49.

The indication “Not relevant” means that the MID Annex I requirement is not relevant for water meters.

3. The text in italic is an extract from the relevant clause of the OIML Recommendation.

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
1.2 Under rated operating conditions and in presence of a disturbance, the performance requirement shall be as laid down in the appropriate instrument-specific requirements. Where the instrument is intended to be used in a specified permanent continuous electromagnetic field the permitted performance during the radiated electromagnetic field-amplitude modulated test shall be within MPE.	4.2.2 6.4 R 49-2 4	Reference conditions	Covered
1.3 The manufacturer shall specify the climatic, mechanical and electromagnetic environments in which the instrument is intended to be used, power supply and other influence quantities likely to affect its accuracy, taking into account of the requirements laid down in the appropriate instrument-specific annexes.	Annex A.2 Annex A.3 Annex A.5 7.2.9 R 49-2 8.2, 8.3, 8.4		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
1.3.1 Climatic environments The manufacturer shall specify the upper temperature limit and the lower temperature limit from any of the values in Table 1 unless otherwise specified in the Annexes MI-III to MI-IX and indicate whether the instrument is designed for condensing or non-condensing humidity as well as the intended location for the instrument, i.e. open or closed. <u>Temperature limits:</u> Upper temperature limit 30 °C / 40 °C / 55 °C / 70 °C Lower temperature limit 5 °C / -10 °C / -25 °C / -40 °C	Annex A.2 6.4 R 49-2 8.6, 8.7	MID allows manufacturer to apply for other ambient temperature ranges	Covered
1.3.2 (a) Mechanical environments are classified into classes M1 to M3 as described below M1: This class applies to instruments used in locations with vibration and shocks of low significance, e.g. for instruments fastened to light structures subject to negligible vibrations and shocks transmitted from local blasting or pile-driving activities, slamming doors, etc.	Annex A.2	B and O is applicable. <i>Also relevant Document D11 OIML</i>	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
M2: This class applies to instruments used in locations with significant or high levels of vibration and shock, e.g. transmitted from machines and passing vehicles in the vicinity or adjacent to heavy machines, conveyor belts, etc.	Annex A.2	M is applicable. <i>Also relevant Document D11 OIML</i>	Covered
M3: This class applies to instruments used in locations where the level of vibration and shock is high and very high, e.g. for instruments mounted directly on machines, conveyor belts, etc.	Annex A.2	M is applicable. <i>Also relevant Document D11 OIML</i>	Covered
(b) The following influence quantities shall be considered in relation with mechanical environments: - Vibration - Mechanical shock	Annex A.2	Vibration and mechanical shock are considered in the case of environmental class M (mobile meters)	Covered
1.3.3 (a) Electromagnetic environments are classified into E1, E2 or E3 as described below, unless otherwise laid down in the appropriate instrument-specific annexes.	Annex A.3 Annex A.5 R 49-2 7.12, 8.5, 8.8, 8.9, 8.10, 8.11, 8.12, 8.13, 8.14, 8.15, 8.16	In detail, table A.1 Classes E1 or E2 Appropriate test procedures are defined in R49-2 Points 7.12, 8.16 - static magnetic field	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
E1: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in residential, commercial and light industrial buildings.	Annex A.3	See 1.3.3 Appropriate test procedures are defined in R49-2	Covered
E2: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in other industrial buildings.	Annex A.3	See 1.3.3 Appropriate test procedures are defined in R49-2	Covered
E3: This class applies to instruments supplied by the battery of a vehicle. Such instruments shall comply with the requirements of E2 and the following additional requirements - voltage reductions caused by energizing the starter-motor circuits of internal combustion engines, - load dump transients occurring in the event of a discharged battery being disconnected while the engine is running.	-	Not relevant for water meters defined in MI-001	Not relevant

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
(b) The following influence quantities shall be considered in relation with electromagnetic environments: - voltage interruptions - short voltage reductions - voltage transients on supply lines and/or signal lines - electrostatic discharges - radio frequency electromagnetic fields - conducted radio frequency electromagnetic fields on supply lines and/or signal lines - surges on supply lines and/or signal lines	Annex A.3 Annex A.5 R49-2 8.8, 8.9, 8.10, 8.11, 8.12, 8.13, 8.14, 8.15	See 1.3.3 Appropriate test procedures are defined in R49-2	Covered
1.3.4 Other influence quantities to be considered, where appropriate, are: - voltage variation - mains frequency variation - power frequency magnetic fields - any other quantity likely to influence in a significant way the accuracy of the instrument.	7.2.12.2.2 Annex A table A.1, R49-2 8.5.2, 8.5.3, 8.5.4	Appropriate test procedures are defined in R49-2 <i>Power frequency magnetic fields test is not covered.</i>	Partly covered
1.4 When carrying out the tests as envisaged in this Directive, the following paragraphs apply:		7.	

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
1.4.1 <i>Basic rules for testing and the determination of errors</i> Essential requirements specified in 1.1 and 1.2 shall be verified for each relevant influence quantity. Unless otherwise specified in the appropriate instrument-specific annex, these essential requirements apply when each influence quantity is applied and its effect evaluated separately, all other influence quantities being kept relatively constant at their reference value. Metrological tests shall be carried out during or after the application of the influence quantity, whichever condition corresponds to the normal operational status of the instrument when that influence quantity is likely to occur.	7.1 Annex A.1 R49-2 7.2.2, 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6 8.1		Covered
1.4.2 <i>Ambient humidity</i> - According to the climatic operating environment in which the instrument is intended to be used either the damp heat-steady state (non-condensing) or damp heat cyclic (condensing) test may be appropriate. - The damp heat cyclic test is appropriate where condensation is important or when penetration of vapour will be accelerated by the effect of breathing. In conditions where non-condensing humidity is a factor the damp-heat steady state is appropriate.	Annex A.5 table A.1, 8.4 R 49-2 6.4, 8.4	Table A.1 prescribes the damp heat cyclic test for electronic meters Point 8.4 R 49-2 for damp heat cyclic only.	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
5 Durability A measuring instrument shall be designed to maintain an adequate stability of its metrological characteristics over a period of time estimated by the manufacturer's instruction when in the environmental conditions for which it is intended.	4.2 5.1.1 7.2.6 R 49-2 7.11		Covered
6 Reliability A measuring instrument shall be designed to reduce as far as possible the effect of a defect that would lead to an inaccurate measurement result, unless the presence of such a defect is obvious.	6.1		Covered
7 Suitability			

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
7.1 A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.	6.1.7 6.8		Covered
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.	6.1.8 6.7.1.1 6.7.1.3 6.7.1.4		Covered
7.3 The errors of a utility measuring instrument at flows or currents outside the controlled range shall not be unduly biased.	3.3 6.1.9 6.2.1 6.2.2		Covered
7.4 Where a measuring instrument is designed for the measurement of values of the measurand that are constant over time, the measuring instrument shall be insensitive to small fluctuations of the value of the measurand, or shall take appropriate action.	Not applicable	A water meter is an instrument designed to measure, memorise and display the volume at metering conditions of water passing through the measurement transducer. Volume means in sense of accumulated amounts of volume over a time period. Thus, this requirement is not applicable.	Not relevant

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
7.5 A measuring instrument shall be robust and its materials of construction shall be suitable for the conditions in which it is intended to be used.	6.1.1		Covered
7.6 A measuring instrument shall be designed so as to allow the control of the measuring tasks after the instrument has been placed on the market and put into use. If necessary, special equipment or software for this control shall be part of the instrument. The test procedure shall be described in the operation manual. When a measuring instrument has associated software which provides other functions besides the measuring function, the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software.	4.3.4 6.7.3 Annex B		Covered
8 Protection against corruption			
8.1 The metrological characteristics of a measuring instrument shall not be influenced in any inadmissible way by the connection to it of another device, by any feature of the connected device itself or by any remote device that communicates with the measuring instrument.	4.3.4 6.8.2.2 6.8.2.3		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
8.2 A hardware component that is critical for metrological characteristics shall be designed so that it can be secured. Security measures foreseen shall provide for evidence of an intervention.	6.8.1		Covered
8.3 Software that is critical for metrological characteristics shall be identified as such and shall be secured. Software identification shall be easily provided by the measuring instrument. Evidence of an intervention shall be available for a reasonable period of time.			Not covered
8.4 Measurement data, software that is critical for measurement characteristics and metrological important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption.			Not covered
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.	6.8.1		Covered
9 Information to be borne by and to accompany the instrument			

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
9.1 A measuring instrument shall bear the following inscriptions: (a) manufacturer's name, registered trade name or registered trade mark (b) information in respect of its accuracy, and, where applicable - information in respect of the conditions of use - measuring capacity - measuring range - identity marking - number of EU-type examination certificate or the EU design examination certificate - information whether or not additional devices providing metrological results comply with the provisions of this Directive on legal metrological control.	6.6.2		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
9.2 An instrument of dimensions too small or of too sensitive a composition to allow it to bear the relevant information shall have its packaging, if any, and the accompanying documents required by the provisions of this Directive suitably marked.	6.6		Covered
9.3 The instrument shall be accompanied by information on its operation, unless the simplicity of the measuring instrument makes this unnecessary. Information shall be easily understandable and shall include where relevant: - rated operating conditions - mechanical and electromagnetic environment classes - the upper and lower temperature limit, whether condensation is possible or not, open or closed location - instructions for installation, maintenance, repairs, permissible adjustments - instructions for correct operation and any special conditions use - conditions for compatibility with interfaces, sub-assemblies or measuring instruments.	6.3 6.6.2		Covered
9.4 Groups of identical measuring instruments used in the same location or used for utility measurements do not necessarily require individual instruction manuals.			Not covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)		OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
9.5	Unless specified otherwise in an instrument-specific annex, the scale interval for a measured value shall be in the form 1×10^n , 2×10^n , or 5×10^n , where n is any integer or zero. The unit of measurement or its symbol shall be shown close to the numerical value.	6.7.3.2.1		Covered
9.6	A material measure shall be marked with a nominal value or a scale, accompanied by the unit of measurement used.	Not applicable	Water meters are not material measures.	Not relevant
9.7	The units of measurement used and their symbols shall be in accordance with the provisions of Community legislation on units of measurement and their symbols.	6.7.1.2		Covered
9.8	All marks and inscriptions required under any requirement shall be clear, non-erasable, unambiguous and non-transferable.	6.6.1 6.6.2		Covered
10	Indication of result			
10.1	Indication of the result shall be by means of a display or a hard copy.	3.1.1	Hard copy is not applicable because MID under article 10.5 of Annex I always requires a display for a water meter.	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
10.2 The indication of any result shall be clear and unambiguous and accompanied by such marks and inscriptions necessary to inform the user of the significance of the result. Easy reading of the present result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrological controlled indications.	6.7.1.1	.	Covered
10.3 In the case of hard copy the print or record shall also be easily legible and non-erasable.	Not applicable	Hard copy is not applicable because MID under article 10.5 of Annex I always requires a display for a water meter.	Not relevant
10.4 A measuring instrument for direct sales trading transactions shall be designed to present the measurement result to both parties in the transaction when installed as intended. When critical in case of direct sales, any ticket provided to the consumer by an ancillary device not complying with the appropriate requirements of this Directive shall bear an appropriate restrictive information.	Not applicable	Not for direct sales trading.	Not relevant
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 customer. The reading of this display is the measurement result that serves as the basis for the price to pay.	3.1.8 6.7 6.1.8		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)		OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
11	Further processing of data to conclude the trading transaction			
11.1	A measuring instrument other than a utility measuring instrument shall record by a durable means the measurement result accompanied by information to identify the particular transaction, when: - the measurement is non-repeatable - the measuring instrument is normally intended for use in the absence of one of the trading parties.	Not applicable	Water meters addressed by MID are utility meters.	Not relevant
11.2	Additionally, a durable proof of the measurement result and the information to identify the transaction shall be available on request at the time the measurement is concluded.	Not applicable	Water meters addressed by MID are utility meters.	Not relevant
12	Conformity evaluation A measuring instrument shall be designed so as to allow ready evaluation of its conformity with the appropriate requirements of this Directive.	3.6 7.2 7.3 R 49-2, clauses 9, 10		Covered
ANNEX III (MI-001)				

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
1 The flowrate range of the water. The values for the flowrate range shall fulfil the following conditions: $Q_3 / Q_1 \geq 40$ $Q_2 / Q_1 = 1,6$ $Q_4 / Q_3 = 1,25$ <i>Note:</i> <i>Amendment of Directive 2015/13/EU</i> <i>In Annex III to Directive 2014/32/EU, point 1 is replaced by the following: '1. The flowrate range of the water. The values for the flowrate range shall fulfil the following conditions: $Q_3/Q_1 \geq 40$ $Q_2/Q_1 = 1,6$ $Q_4/Q_3 = 1,25$'</i>	4.1.3 4.1.4 4.1.5 4.1.6 R49-2 7.4		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
2 The temperature range of the water 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.	4.2.4 R49-2 7.5, 7.6	MID does not rate temperatures into classes but it does give limits though Temperature class T30/T70 does not fulfil the second condition (30 °C to at least 90 °C) and that temperature class T30/T70 is not covered by MID.	Covered
3 The relative pressure range of the water, the range being 0,3 bar to at least 10 bar at Q₃.	4.2.8 and 6.4 R-49-2 7.3, 7.7	Rated operating conditions Working pressure range: 0.03 MPa (0.3 bar) to at least 1 MPa (10 bar), except for meters of DN ≥ 500, where the maximum admissible pressure (MAP) shall be at least 0.6 MPa (6 bar). Meters rated with a relative pressure of the water below 10bar are not within the scope of the MID	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)		OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
4	For the power supply: the nominal value of the AC voltage supply and/or the limits of DC supply.	5.2		Covered
MPE				
5				Partly covered
The MPE, positive or negative, on volumes deliver at flowrates between the transitional flowrate (Q_2) (included) and the overload flowrate (Q_4) is: 2 % for water having a temperature ≤ 30 °C 3 % for water having a temperature > 30 °C		4.2.3	MID provides only for meters equivalent to accuracy class 2. The MID does not recognize classification.	Covered
The meter shall not exploit the MPE or systematically favour any party.		7.2.3 6.1.9 R49-2 10.1.4 R49-2 7.4.5		Not covered
6				Partly covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
The MPE, positive or negative, on volumes delivered at flowrates between the minimum flowrate (Q_1) and the transitional flowrate (Q_2) (excluded) is 5 % for water having any temperature.	4.2.3	MID provides only for meters equivalent to accuracy class 2. The MID does not recognize classification. The MPE for the lower flow rate zone ($Q_1 \leq Q < Q_2$) is ± 5 % regardless of the temperature range.	Covered
The meter shall not exploit the MPE or systematically favour any party.	7.2.3 6.1.9 R49-2 10.1.4 R49-2 7.4.5		Not covered
Permissible effect of disturbances 7.1 Electromagnetic immunity			
7.1.1 The effect of an electromagnetic disturbance on a water meter shall be such that: — the change in the measurement result is no greater than the critical change value as defined in point 7.1.3, or — the indication of the measurement result is such that it cannot be interpreted as a valid result, such as a momentary variation that cannot be interpreted, memorised or transmitted as a measuring result.	Annex A.3 R49-2 8.1.3, 8.12, 8.13		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
7.1.2 After undergoing an electromagnetic disturbance the water meter shall: — recover to operate within MPE, and — have all measurement functions safeguarded, and — allow recovery of all measurement data present just before the disturbance	5.1.1 Annex A.3, A5 R-49-2 8.1.3, 8.12		Covered
7.1.3 The critical change value is the smaller of the two following values: — the volume corresponding to half of the magnitude of the MPE in the upper zone on the measured volume; — the volume corresponding to the MPE on the volume corresponding to one minute at flowrate Q 3	5.1.2		Covered
7.2 Durability After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criteria shall be satisfied	7.2.6.1 R-49.2 7.11		Covered
7.2.1 The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed: — 3 % of the metered volume between Q 1 included and Q 2 excluded; — 1,5 % of the metered volume between Q 2 included and Q 4 included	7.2.6.3	MID provides only for meters equivalent to accuracy class 2.The MID does not recognize classification.	Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
7.2.2 The error of indication for the volume metered after the durability test shall not exceed: — $\pm 6\%$ of the metered volume between Q 1 included and Q 2 excluded; — $\pm 2,5\%$ of the metered volume between Q 2 included and Q 4 included for water meters intended to meter water with a temperature between 0,1 °C and 30 °C, — $\pm 3,5\%$ of the metered volume between Q 2 included and Q 4 included for water meters intended to meter water with a temperature between 30 °C and 90 °C	7.2.6.3	MID provides only for meters equivalent to accuracy class 2. The MID does not recognize classification.	Covered
8.1 Suitability The meter shall be able to be installed to operate in any position unless clearly marked otherwise	7.2.3 R 49-2 7.4.2.2.7.5		Covered

Directive 2014/32/EU Essential requirements of Annex I and Annex III (MI-001)	OIML R49-1 (2013) (OIML R49-2 (2013) if mentioned)	Comments	Conclusion
8.2 The manufacturer shall specify whether the meter is designed to measure reverse flow. In such a case, the reverse flow volume shall either be subtracted from the cumulated volume or shall be separately recorded. The same MPE shall apply to both forward and reverse flow. EN 29.3.2014 Official Journal of the European Union L 96/203 Water meters not designed to measure reverse flow shall either prevent reverse flow or shall withstand an accidental reverse flow without any deterioration or change in metrological properties.	4.2.7 R49-2 7.8		Covered
9 Units of Measurement Metered volume shall be displayed in cubic metres.	6.7.1.2 R49-2 6.4.3.2		Covered
10 Putting into Use The Member State shall ensure that the requirements under points 1, 2 and 3 are determined by the utility or the person legally designated for installing the meter, so that the meter is appropriate for the accurate measurement of consumption that is foreseen or foreseeable	-	-	Not covered