

# WELMEC

European Cooperation in Legal Metrology

## Corresponding Tables Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water

OIML R 117: 2019

—

MID 2014/32/EU Annex I and VII (MI-005)



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 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:

WELMEC Secretariat

E-mail: [secretary@welmec.org](mailto:secretary@welmec.org)

Website: [www.welmec.org](http://www.welmec.org)

## Foreword

1. The column “Comments” indicates when necessary the relevant text of OIML R 117 and related explanations concerning the compliance with relevant MID requirement.
2. The column “Conclusion” gives the conclusion on the compliance between MID and OIML R 117 for the relevant requirement.

The indication “Covered” means that:

- the requirement of OIML R 117 is identical to the one of MID; or
- the requirement of OIML R 117 is more severe than the one of MID; or
- all the requirement of OIML R 117 fulfils MID requirements (even when MID allows other alternatives),
- In case the requirement is not fully covered, a short statement explains what is covered.

The indication “Not Covered” means that the MID requirement is either not compatible with the relevant OIML R 117 requirement or not included in OIML R 117.

The indication “Not relevant” means that the MID Annex I requirement is not applicable for measuring systems for the continuous and dynamic measurement of quantities of liquids other than water.

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 VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
ANNEX I				
1.1	<p>Allowable Errors</p> <p>Under rated operation conditions and in absence of a disturbance, the error of measurement shall not exceed the maximum permissible error (MPE) value as laid down in the appropriate instrument-specific requirements.</p> <p>Unless stated otherwise in the instrument-specific annexes, MPE is expressed as a bilateral value of the deviation from the true measurement value.</p>	2.3 2.4 2.5 2.6		Covered
1.2	<p>Under rated operating conditions and in presence of a disturbance, the performance requirement shall be as laid down in the appropriate instrument-specific requirements.</p> <p>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.</p>	2.3 4.1		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019 (R 117-2: 2019, if mentioned)	Comments	Conclusion
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.	2.3.1 3.1.1.1 3.1.6.2 4.1.1.2 6.1.2.2		Covered
1.3.1	<p>Climatic environments</p> <p>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.</p> <p>Temperature limits:</p> <p>Upper temperature limit 30 °C / 40 °C / 55 °C / 70 °C</p> <p>Lower temperature limit 5 °C / -10 °C / -25 °C / -40 °C</p>	6.1.2.2 R 117-2: 4.8.2 R 117-2: Table 4.8.5 R 117-2: Table 4.8.6		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019 (R 117-2: 2019, if mentioned)	Comments	Conclusion
1.3.2	<p>(a) Mechanical environments are classified into classes M1 to M3 as described below.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>(b) The following influence quantities shall be considered in relation with mechanical environments:                      - Vibration                      - Mechanical shock</p>	6.1.2.2 R 117-2: 4.8.4 R 117-2: Table 4.8.8	<p>No mechanical shock test is specified considering the conditions of installation and use of such measuring systems. This test is seen as not relevant for these kind of measuring instruments.</p>	Covered for vibrations Not relevant for mechanical shock

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019 (R 117-2: 2019, if mentioned)	Comments	Conclusion
1.3.3	<p>(a) Electromagnetic environments are classified into E1, E2 or E3 as described below, unless otherwise laid down in the appropriate instrument-specific annexes.</p> <p>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.</p> <p>E2: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in other industrial buildings.</p> <p>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.</p>	6.1.2.2 R 117-2: 4.9 R 117-2: 4.10		Covered
	<p>(b) The following influence quantities shall be considered in relation with electromagnetic environments:                      - voltage interruptions;                      - short voltage reductions;</p>	6.1.2.2 R 117-2: 4.9 R 117-2: 4.10		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
	<ul style="list-style-type: none"> <li>- voltage transients on supply lines and/or signal lines;</li> <li>- electrostatic discharges;</li> <li>- radio frequency electromagnetic fields;</li> <li>- conducted radio frequency; electromagnetic fields on supply lines and/or signal lines;</li> <li>- surges on supply lines and/or signal lines.</li> </ul>			
1.3.4	Other influence quantities to be considered, where appropriate, are: <ul style="list-style-type: none"> <li>- voltage variation;</li> <li>- mains frequency variation;</li> <li>- power frequency magnetic fields;</li> <li>- any other quantity likely to influence in a significant way the accuracy of the instrument.</li> </ul>	6.1.2.2 R 117-2: 4.9 R 117-2: 4.10	Not covered: <ul style="list-style-type: none"> <li>- mains frequency variation;</li> <li>- power frequency magnetic fields;</li> <li>- any other quantity likely to influence in a significant way the accuracy of the instrument.</li> </ul>	Partially covered
1.4	When carrying out the tests as envisaged in this Directive, the following paragraphs apply:			
1.4.1	Basic rules for testing and the determination of errors	6.1.2.2 6.1.11.2 R 117-2: 4.1 R 117-2: 4.8 R 117-2: 4.9 R 117-2: 4.10		Covered



	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
	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.			
1.4.2	Ambient humidity (a) 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. (b) 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.	6.1.2.2  R 117-2: Table 4.8.7		Covered
2	Reproducibility	6.1.2.3		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
	The application of the same measurand in a different location or by different user, all other conditions being the same, shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.	6.2.1 2.12 – 2.18		
3	Repeatability The application of the same measurand under the same conditions of measurement shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.	3.1.2.2	In OIML R 117 the requirement for repeatability is only stated for the meter and not for the complete measuring system (MI-005). This article is therefore partially covered by OIML R 117.	Partially covered
4	Discrimination and Sensitivity A measuring instrument shall be sufficiently sensitive and the discrimination threshold shall be sufficiently low for the intended measurement task.	2.3.2 2.5.3 3.1.2.4 3.1.3 3.1.5.4 3.1.6.1 3.1.7.1 3.1.8.1 3.1.9.1 3.2.1.4 3.3.3 3.4.1 3.4.8 3.6.8 3.9.1.3 5.1.8 5.5.1		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
		5.9.1 5.11.3		
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.	3.1.2.3  R 117-2: 5.4  4.1.3  A.1.5	Two different aspects have been considered: mechanical durability and electronic durability.  <b>“Endurance</b>  Capability of the measuring system to keep its performance characteristics over a period of use.”  <b>“Durability for electronic devices</b>  Capability of the electronic devices of a measuring system to keep their performance characteristics over a period of use.”  “The requirements in 4.1.1 shall be met durably. For this purpose, electronic measuring systems shall be provided with the checking facilities specified in 4.3.”	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.	4  A.1.5	“Electronic measuring systems shall be designed and manufactured such that their metrological functions are safeguarded and their errors do not exceed the maximum permissible errors as defined in 2.5 under rated operating conditions.” (4.1.1)  Not covered for non-electronic devices (mechanical devices). The MID requires in that case that the manufacturer covers this in his risk analysis.	Partially covered
7	Suitability			
7.1	A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.	2.9 – 2.18  2.20  5  Annex A	No requirement is stated regarding the suitable timing of installation of downloaded software.  Section 5 gives additional requirements for certain types of measuring systems and therefore takes into account relevant practical working conditions.	Partially covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019 (R 117-2: 2019, if mentioned)	Comments	Conclusion
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.	2 3 5 Annex A	Section 5 gives additional requirements for certain types of measuring systems and therefore takes into account relevant practical working conditions.	Covered
7.3	The errors of a utility measuring instrument at flows or currents outside the controlled range shall not be unduly biased.		These measuring systems are not utility measuring instruments.	Not relevant
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 relevant
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.	R 117-1 R 117-2	This is indirectly covered when all requirements are fulfilled, and tests are performed in accordance with R 117 edition 2019.	Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
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.	3.1.4 3.1.10.1 3.7.4 3.7.5 3.7.6 4.3.4 4.3.5 5.4.3 5.4.4 5.5.3 5.5.9 5.9.5 6.2.2.3	R 117-1 does not require that test procedures be included in the operating manual.  R 117-1 does not require that special equipment or software needed for control is part of the instrument.	Partially covered
	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.	6.1.2.1 6.1.3 A.1.1 A.1.3 A.1.4 A.2.1 A.2.2		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.	2.2.3 2.20.2.2 2.20.2.3 3.8 A.1.3 A.1.4 A.2.1.1 A.2.3 A.2.4		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, 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.	2.20.1 3.1.3	Only covered if protected by hardware seals.	Partially 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.	6.1.3 2.20.2.1.5 A.1.1 A.1.3 A.1.4 A.3	Evidence of an intervention is covered only for parameter and not covered for other items such as software.	Partially 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.	2.20.1 3.5 4.3.2 4.3.3.1 A.1.3 A.1.4 A.2.3 A.2.4 A.3	The protection against accidental or intentional corruption for measurement data is only covered for the primary indication.  The protection against accidental or intentional corruption for parameters is only covered if protected by hardware seals.	Partially 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.		These measuring systems are not utility measuring instruments.	Not relevant

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
9	Information to be borne by and to accompany the instrument			
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 (c) information in respect of the conditions of use (d) measuring capacity (e) measuring range (f) identity marking (g) number of EU-type examination certificate or the EU design examination certificate (h) information whether or not additional devices providing metrological results comply with the provisions of this Directive on legal metrological control.	2.2.3 2.19	In the Directive 2014/32/EU article 8.6 and 10.3 shall be taken into account.	Covered
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.			Not relevant
9.3	The instrument shall be accompanied by information on its operation, unless the simplicity of the measuring instrument	2.16 2.19.1	Some of the information is indicated on the identification plate, except for information on its operation, installation, maintenance, repairs, permissible adjustments, instructions for correct operation and	Partially covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
	makes this unnecessary. Information shall be easily understandable and shall include where relevant: (a) rated operating conditions (b) mechanical and electromagnetic environment classes (c) the upper and lower temperature limit, whether condensation is possible or not, open or closed location (d) instructions for installation, maintenance, repairs, permissible adjustments (e) instructions for correct operation and any special conditions use (f) conditions for compatibility with interfaces, sub-assemblies or measuring instruments.		conditions for compatibility with interfaces, sub-assemblies or measuring instruments.	
9.4	Groups of identical measuring instruments used in the same location or used for utility measurements do not necessarily require individual instruction manuals.		OIML R 117:2019 does not require that an instruction manual shall be on location of the measuring instrument.	Not covered
9.5	Unless specified otherwise in an instrument-specific annex, the scale interval for a measured value shall be in the form $1 \times 10^n$ , $2 \times 10^n$ , or $5 \times 10^n$ , where $n$ is any integer or zero. The unit of measurement or its symbol shall be shown close to the numerical value.	3.2.1.2 3.2.2.1 3.3.3 2.9.1	<i>“The scale interval shall be in the form <math>1 \times 10^n</math>, <math>2 \times 10^n</math> or <math>5 \times 10^n</math> authorized units of quantity, where <math>n</math> is a positive or negative whole number, or zero.”</i>  <i>“The name of the unit or its symbol shall appear in the immediate vicinity of the indication. For mass, according to the case, the name of the unit or its symbol shall be accompanied by the term “mass” (actual mass) or “conventional mass” (comparison to weights).”</i>	Covered



CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019 (R 117-2: 2019, if mentioned)	Comments	Conclusion
9.6	A material measure shall be marked with a nominal value or a scale, accompanied by the unit of measurement used.		Measuring systems are not material measure.	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.	2.9.1	Note: The unit "cubic decimetre" is not allowed according to MI-005, art. 8.	Covered
9.8	All marks and inscriptions required under any requirement shall be clear, non-erasable, unambiguous and non-transferable.	2.19.1	Only covered for non-transferable of marks and inscriptions.	Partially covered
10	Indication of result			
10.1	Indication of the result shall be by means of a display or a hard copy.	T.m.2 T.m.3 2.1 2.9.2 3.2 3.4 3.5	Note: Indication of result by means of only a hard copy is not allowed according to definitions of a meter in Annex VII (MI-005) and OIML R 117-1 paragraph 2.1 and definitions T.m.2 (Measuring system) and T.m.3 (Meter).	Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, 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 presented result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrologically controlled indications.	2.2.3 2.9 2.19.4 3.2.1.1 3.2.1.3 3.3 3.4 5.1.6 5.1.12 5.5.1 5.9.1 5.11.3 A.2.2		Covered
10.3	In the case of hard copy the print or record shall also be easily legible and non-erasable.	3.4.2 3.4.3 3.5.2 3.5.3 3.5.4 3.5.5 A.2.3 A.2.4 A.2.5 A.2.6	A non-erasable printout is not covered.	Partially covered
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 appropriate restrictive information.	2.2.3 3.9 2.21	The presentation to both parties involved is only covered for measuring systems with a self-service device.	Partially covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
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 metrologically 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.			Not relevant
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: (a) the measurement is non-repeatable (b) the measuring instrument is normally intended for use in the absence of one of the trading parties.	2.21 3.4 3.5 3.9		Covered
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.	2.21 3.4 3.5 3.9		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	R 117-1: 2019  (R 117-2: 2019, if mentioned)	Comments	Conclusion
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.	6.1 6.2 A.1 A.3 A.4		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019  (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
--	---	--	----------	------------

ANNEX VII (MI-005)

	The relevant essential requirements of Annex I, the specific requirements of this Annex and the conformity assessment procedures listed in this Annex, apply to measuring systems intended for the continuous and dynamic measurement of quantities (volumes or masses) of liquids other than water. If appropriate, the terms "volume, and L" in this Annex can be read as: "mass and kg".	1 2.9.1		Covered
1	Rated operating conditions  The manufacturer shall specify the rated operating conditions for the instrument, in particular;	2.3 6.1.2.2 B.2.3.1		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019  (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion																	
1.1	<p>The flowrate range</p> <p>The flowrate range is subject to the following conditions:</p> <p>(i) the flowrate range of a measuring system shall be within the flowrate range of each of its elements, in particular the meter.</p> <p>(ii) meter and measuring system:</p> <p style="text-align: center;">Table 1</p> <table border="1" data-bbox="248 740 736 903"> <thead> <tr> <th>Specific measuring system</th> <th>Characteristic of liquid</th> <th>Minimum ratio of <math>Q_{max}</math> / <math>Q_{min}</math></th> </tr> </thead> <tbody> <tr> <td rowspan="2">Fuel dispensers</td> <td>Not Liquefied gases</td> <td>10: 1</td> </tr> <tr> <td>Liquefied gases</td> <td>5: 1</td> </tr> <tr> <td>Measuring system</td> <td>Cryogenic liquids</td> <td>5: 1</td> </tr> <tr> <td>Measuring systems on pipeline and systems for loading ships</td> <td>All liquids</td> <td>Suitable for use</td> </tr> <tr> <td>All other measuring systems</td> <td>All liquids</td> <td>4: 1</td> </tr> </tbody> </table>	Specific measuring system	Characteristic of liquid	Minimum ratio of $Q_{max}$ / $Q_{min}$	Fuel dispensers	Not Liquefied gases	10: 1	Liquefied gases	5: 1	Measuring system	Cryogenic liquids	5: 1	Measuring systems on pipeline and systems for loading ships	All liquids	Suitable for use	All other measuring systems	All liquids	4: 1	2.3.3.1 2.3.3.3 5.1.1 5.5.1 5.7.1 5.9.1 5.10.3	<p>OIML R 117-1 allows smaller ratios for blend dispensers (5.9.1) and for measuring systems other than fuel dispensers (for liquefied gases or not liquefied gases).</p> <p>LNG is considered as a cryogenic fluid and therefore the accuracy class for cryogenic fluids given in the MID could also be valid for LNG (accuracy class 2,5). Where OIML R 117 does not recognize accuracy class 2,5 and only accuracy class 1,5 is stated for LNG.</p> <p>Other cryogenic liquids are not addressed in OIML R 117-1.</p>	Partially covered
Specific measuring system	Characteristic of liquid	Minimum ratio of $Q_{max}$ / $Q_{min}$																			
Fuel dispensers	Not Liquefied gases	10: 1																			
	Liquefied gases	5: 1																			
Measuring system	Cryogenic liquids	5: 1																			
Measuring systems on pipeline and systems for loading ships	All liquids	Suitable for use																			
All other measuring systems	All liquids	4: 1																			
1.2	<p>The properties of the liquid to be measured by the instrument by specifying the name or type of the liquid or its relevant characteristics, for example:</p> <ul style="list-style-type: none"> <li>— Temperature range;</li> <li>— Pressure range;</li> <li>— Density range;</li> <li>— Viscosity range.</li> </ul>	1.2 2.3.1 3.1.1.1		Covered																	
1.3	The nominal value of the AC voltage supply and/or limits of the DC voltage supply.	2.3.1		Covered																	

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019  (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion																							
1.4	The base conditions for converted values.  Note: Point 1.4 is without prejudice to the Member States' obligations to require use of a temperature of either 15 °C in accordance with Article 12(2) of Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (OJ L 283, 31.10.2003, p. 51.).	2.19.4		Covered																							
2	Accuracy classification and maximum permissible errors (MPEs)																										
2.1	For quantities equal to or greater than 2 litres the MPE on indications is:  <table border="1" data-bbox="248 911 739 1029"> <caption>Table 2</caption> <thead> <tr> <th rowspan="2"></th> <th colspan="5">Accuracy Class</th> </tr> <tr> <th>0,3</th> <th>0,5</th> <th>1,0</th> <th>1,5</th> <th>2,5</th> </tr> </thead> <tbody> <tr> <td>Measuring systems (A)</td> <td>0,3 %</td> <td>0,5 %</td> <td>1,0 %</td> <td>1,5 %</td> <td>2,5 %</td> </tr> <tr> <td>Meters (B)</td> <td>0,2 %</td> <td>0,3 %</td> <td>0,6 %</td> <td>1,0 %</td> <td>1,5 %</td> </tr> </tbody> </table>		Accuracy Class					0,3	0,5	1,0	1,5	2,5	Measuring systems (A)	0,3 %	0,5 %	1,0 %	1,5 %	2,5 %	Meters (B)	0,2 %	0,3 %	0,6 %	1,0 %	1,5 %	2.5.1 6.1.1	OIML R 117-1 does not specify an accuracy class 2,5.  LNG is considered as a cryogenic fluid and therefore the accuracy class for cryogenic fluids given in the MID could also be valid for LNG (accuracy class 2,5). Where OIML R 117 does not recognize accuracy class 2,5 and only accuracy class 1,5 is stated for LNG.	Partially covered
	Accuracy Class																										
	0,3	0,5	1,0	1,5	2,5																						
Measuring systems (A)	0,3 %	0,5 %	1,0 %	1,5 %	2,5 %																						
Meters (B)	0,2 %	0,3 %	0,6 %	1,0 %	1,5 %																						
2.2	For quantities less than two litres the MPE on indications is:  <table border="1" data-bbox="248 1161 739 1329"> <caption>Table 3</caption> <thead> <tr> <th>Measured volume V</th> <th>MPE</th> </tr> </thead> <tbody> <tr> <td><math>V &lt; 0,11</math></td> <td><math>4 \times</math> value in Table 2, applied to 0,1 L</td> </tr> <tr> <td><math>0,11 \leq V &lt; 0,21</math></td> <td><math>4 \times</math> value in Table 2</td> </tr> <tr> <td><math>0,21 \leq V &lt; 0,41</math></td> <td><math>2 \times</math> value in Table 2, applied to 0,4 L</td> </tr> <tr> <td><math>0,41 \leq V &lt; 1,1</math></td> <td><math>2 \times</math> value in Table 2</td> </tr> <tr> <td><math>1,1 \leq V &lt; 2,1</math></td> <td>Value in Table 2, applied to 2 L</td> </tr> </tbody> </table>	Measured volume V	MPE	$V < 0,11$	$4 \times$ value in Table 2, applied to 0,1 L	$0,11 \leq V < 0,21$	$4 \times$ value in Table 2	$0,21 \leq V < 0,41$	$2 \times$ value in Table 2, applied to 0,4 L	$0,41 \leq V < 1,1$	$2 \times$ value in Table 2	$1,1 \leq V < 2,1$	Value in Table 2, applied to 2 L	2.5.2		Covered											
Measured volume V	MPE																										
$V < 0,11$	$4 \times$ value in Table 2, applied to 0,1 L																										
$0,11 \leq V < 0,21$	$4 \times$ value in Table 2																										
$0,21 \leq V < 0,41$	$2 \times$ value in Table 2, applied to 0,4 L																										
$0,41 \leq V < 1,1$	$2 \times$ value in Table 2																										
$1,1 \leq V < 2,1$	Value in Table 2, applied to 2 L																										

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
2.3	<p>However, no matter what the measured quantity may be, the magnitude of the MPE is given by the greater of the following two values:</p> <ul style="list-style-type: none"> <li>— the absolute value of the MPE given in Table 2 or Table 3,</li> <li>— the absolute value of the MPE for the minimum measured quantity (<math>E_{min}</math>).</li> </ul>	2.5.3		Covered
2.4.1	<p>For minimum measured quantities greater than or equal to 2 litres the following conditions apply:</p> <p>Condition 1</p> <p><math>E_{min}</math> shall fulfil the condition: <math>E_{min} \geq 2 R</math>, where R is the smallest scale interval of the indication device.</p> <p>Condition 2</p> <p><math>E_{min}</math> is given by the formula: <math>E_{min} = (2MMQ) \times (A/100)</math>, where:</p> <ul style="list-style-type: none"> <li>— MMQ is the minimum measured quantity,</li> <li>— A is the numerical value specified in line A of Table 2.</li> </ul>	2.5.3 3.2.1.4		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
2.4.2	For minimum measured quantities of less than two litres, the above mentioned condition 1 applies and $E_{min}$ is twice the value specified in Table 3, and related to line A of Table 2.	2.5.3 3.2.1.4		Covered
2.5	Converted indication In the case of a converted indication the MPEs are as in line A of Table 2.	2.5.1		Covered
2.6	<p>Conversion devices</p> <p>MPEs on converted indications due to a conversion device are equal to <math>\pm (A - B)</math>, A and B being the values specified in Table 2.</p> <p>Parts of conversion devices that can be tested separately</p> <hr/> <p>(a) Calculator</p> <p>MPEs on quantities of liquid indications applicable to calculation, positive or negative, are equal to one-tenth of the MPEs as defined in line A of Table 2.</p>	2.5.1 2.7.1 2.7.2.2 2.8	<p>OIML R 117-1 does not specify an accuracy class 2,5.</p> <p>LNG is considered as a cryogenic fluid and therefore the accuracy class for cryogenic fluids given in the MID could also be valid for LNG (accuracy class 2,5). Where OIML R 117 does not recognize accuracy class 2,5 and only accuracy class 1,5 is stated for LNG.</p>	Partially covered



	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion																													
	<p>(b) Associated measuring instruments</p> <p>Associated measuring instruments shall have an accuracy at least as good as the values in Table 4:</p> <table border="1" data-bbox="248 564 739 772"> <caption>Table 4</caption> <thead> <tr> <th rowspan="2">MPE on Measurements</th> <th colspan="5">Accuracy classes of the measuring system</th> </tr> <tr> <th>0,3</th> <th>0,5</th> <th>1,0</th> <th>1,5</th> <th>2,5</th> </tr> </thead> <tbody> <tr> <td>Temperature</td> <td colspan="2">± 0,3 °C</td> <td colspan="2">± 0,5 °C</td> <td>± 1,0 °C</td> </tr> <tr> <td>Pressure</td> <td colspan="5">                     Less than 1 MPa: ± 50 kPa                      From 1 to 4 MPa: ± 5 %                      Over 4 MPa: ± 200 kPa                 </td> </tr> <tr> <td>Density</td> <td colspan="2">± 1 kg/m<sup>3</sup></td> <td colspan="2">± 2 kg/m<sup>3</sup></td> <td>± 5 kg/m<sup>3</sup></td> </tr> </tbody> </table> <p>these values apply to the indication of the characteristic quantities of the liquid displayed by the conversion device.</p>	MPE on Measurements	Accuracy classes of the measuring system					0,3	0,5	1,0	1,5	2,5	Temperature	± 0,3 °C		± 0,5 °C		± 1,0 °C	Pressure	Less than 1 MPa: ± 50 kPa From 1 to 4 MPa: ± 5 % Over 4 MPa: ± 200 kPa					Density	± 1 kg/m <sup>3</sup>		± 2 kg/m <sup>3</sup>		± 5 kg/m <sup>3</sup>			
MPE on Measurements	Accuracy classes of the measuring system																																
	0,3	0,5	1,0	1,5	2,5																												
Temperature	± 0,3 °C		± 0,5 °C		± 1,0 °C																												
Pressure	Less than 1 MPa: ± 50 kPa From 1 to 4 MPa: ± 5 % Over 4 MPa: ± 200 kPa																																
Density	± 1 kg/m <sup>3</sup>		± 2 kg/m <sup>3</sup>		± 5 kg/m <sup>3</sup>																												
	<p>(c) Accuracy for calculating function</p> <p>The MPE for the calculation of each characteristic quantity of the liquid, positive or negative, is equal to two fifths of the value fixed in (b).</p>	2.7.2	<p>Values defined in OIML R 117-1 Table 5.1 are greater than those specified in the MID since a quadratic sum has been considered to define the relevant MPEs.</p> <p>OIML R 117-1 does not specify an accuracy class 2,5.</p>	Partially covered																													
2.7	The requirement (a) in point 2.6 applies to any calculation, not only conversion.	2.8		Covered																													
2.8	The measuring system shall not exploit the MPEs or systematically favour any party.			Not covered.																													
3	Maximum permissible effect of disturbances																																

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
3.1	<p>The effect of an electromagnetic disturbance on a measuring system shall be one of the following:</p> <ul style="list-style-type: none"> <li>— the change in the measurement result is not greater than the critical change value as defined in point 3.2, or</li> <li>— the indication of the measurement result shows a momentary variation that cannot be interpreted, memorised or transmitted as a measuring result. Furthermore, in the case of an interruptible system, this can also mean the impossibility to perform any measurement, or</li> <li>— the change in the measurement result is greater than the critical change value, in which case the measuring system shall permit the retrieval of the measuring result just before the critical change value occurred and cut off the flow.</li> </ul>	4.1.1 4.1.5 4.3.1		Covered
3.2	The critical change value is the greater of MPE/5 for a particular measured quantity or $E_{min}$ .	2.5.4		Covered

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
4	<p>Durability</p> <p>After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criterion shall be satisfied:</p> <p>The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed the value for meters specified in line B of table 2.</p>	<p>3.1.2.3 R 117-2: 5.4</p>		Covered
5	Suitability			
5.1	<p>For any measured quantity relating to the same measurement, the indications provided by various devices shall not deviate one from another by more than one scale interval where devices have the same scale interval. In the case where the devices have different scale intervals, the deviation shall not be more than that of the greatest scale interval.</p> <p>However, in the case of a self-service arrangement the scale intervals of the main indicating device on the measuring system and the scale intervals of the self-service device shall be the same and results of measurement shall not deviate one from another.</p>	<p>2.9.4  3.9.1.3</p>		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
5.2	It shall not be possible to divert the measured quantity in normal conditions of use unless it is readily apparent.	2.16 2.17.2 5.1.7 5.5.5 5.9.2 5.11.3		Covered
5.3	Any percentage of air or gas not easily detectable in the liquid shall not lead to a variation of error greater than: — 0,5 % for liquids other than potable liquids and for liquids of a viscosity not exceeding 1 mPa.s, or — 1 % for potable liquids and for liquids of a viscosity exceeding 1 mPa.s.  However, the allowed variation shall never be smaller than 1 % of MMQ. This value applies in the case of air or gas pockets.	2.10		Covered
5.4	Instruments for direct sales			

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
5.4.1	A measuring system for direct sales shall be provided with means for resetting the display to zero.  It shall not be possible to divert the measured quantity.	2.16.1 2.16.2 3.2.4.4 5.1.5 5.1.7 5.1.9 5.2.7 5.5.1 5.5.5 5.9.1 5.9.2 5.11.3 5.11.5 5.11.7 5.11.8	OIML R 117-1 allows diversion of flow if readily apparent even in case of measuring systems for direct sales.	Partially covered
5.4.2	The display of the quantity on which the transaction is based shall be permanent until all parties in the transaction have accepted the measurement result.	2.21 3.9.1.7 3.9.2.1.1 3.9.2.1.3 3.9.3.1.1	The presentation to both parties involved is only covered for measuring systems with a self-service device.	Partially covered
5.4.3	Measuring systems for direct sales shall be interruptible.	4.1.2 5.1.10 5.5.1 5.9.1 5.11.3		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
5.4.4	Any percentage of air or gas in the liquid shall not lead to a variation of error greater than the values specified in point 5.3.	2.10 5.1.2 5.1.3 5.1.4 5.2.3 5.2.8 5.8.2.1 5.9.1 5.11.5		Covered
5.5	Fuel Dispensers			
5.5.1	Displays on fuel dispensers shall not be capable of being reset to zero during a measurement.	3.2.4.1 3.3.3		Covered
5.5.2	The start of a new measurement shall be inhibited until the display has been reset to zero.	5.1.7 5.5.5 5.9.1 5.11.3		Covered
5.5.3	Where a measuring system is fitted with a price display, the difference between the indicated price and the price calculated from the unit price and the indicated quantity shall not exceed the price corresponding to $E_{min}$ . However this difference need not be less than the smallest monetary value.	3.3.7		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion
6	<p>Power supply failure</p> <p>A measuring system shall either be provided with an emergency power supply device that will safeguard all measuring functions during the failure of the main power supply device or be equipped with means to save and display the data present in order to permit the conclusion of the transaction in progress and with means to stop the flow at the moment of the failure of the main power supply device.</p>	4.2		Covered

CT-005, 2020 Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water, OIML R 117: 2019 – MID Annex I and VII (MI-005)

	Directive 2014/32/EU Essential requirements of Annex I and Annex VII (MI-005)	OIML R 117-1: 2019 (OIML R 117- 2: 2019, if mentioned)	Comments	Conclusion														
7	<p>Putting into use</p> <table border="1" data-bbox="246 454 741 901"> <thead> <tr> <th colspan="2" data-bbox="246 454 741 470">Table 5</th> </tr> <tr> <th data-bbox="246 470 324 494">Accuracy Class</th> <th data-bbox="324 470 741 494">Types of Measuring system</th> </tr> </thead> <tbody> <tr> <td data-bbox="246 494 324 518">0,3</td> <td data-bbox="324 494 741 518">Measuring systems on pipeline</td> </tr> <tr> <td data-bbox="246 518 324 646">0,5</td> <td data-bbox="324 518 741 646">All measuring systems if not differently stated elsewhere in this Table, in particular: — fuel dispensers (not for liquefied gases), — measuring systems on road tankers for liquids of low viscosity (&lt; 20 mPa.s) — measuring systems for (un)loading ships and rail and road tankers <sup>(1)</sup> — measuring systems for milk — measuring systems for refuelling aircraft</td> </tr> <tr> <td data-bbox="246 646 324 774">1,0</td> <td data-bbox="324 646 741 774">Measuring systems for liquefied gases under pressure measured at a temperature equal to or above - 10 °C  Measuring systems normally in class 0,3 or 0,5 but used for liquids — whose temperature is less than - 10 °C or greater than 50 °C — whose dynamic viscosity is higher than 1 000 mPa.s — whose maximum volumetric flowrate is not higher than 20 L/h</td> </tr> <tr> <td data-bbox="246 774 324 837">1,5</td> <td data-bbox="324 774 741 837">Measuring systems for liquefied carbon dioxide  Measuring systems for liquefied gases under pressure measured at a temperature below - 10 °C (other than cryogenic liquids)</td> </tr> <tr> <td data-bbox="246 837 324 901">2,5</td> <td data-bbox="324 837 741 901">measuring systems for cryogenic liquids (temperature below - 153 °C)</td> </tr> </tbody> </table> <p data-bbox="246 861 741 901"><sup>(1)</sup> However, Member States may require measuring systems of accuracy class 0,3 or 0,5 when used for the levying of duties on mineral oils when (un)loading ships and rail and road tankers. Note: However, the manufacturer may specify a better accuracy for a certain type of measuring system.</p> <p data-bbox="246 925 741 1189">(1) However, Member States may require measuring systems of accuracy class 0,3 or 0,5 when used for the levying of duties on mineral oils when (un)loading ships and rail and road tankers.  Note: However, the manufacturer may specify a better accuracy for a certain type of measuring system</p>	Table 5		Accuracy Class	Types of Measuring system	0,3	Measuring systems on pipeline	0,5	All measuring systems if not differently stated elsewhere in this Table, in particular: — fuel dispensers (not for liquefied gases), — measuring systems on road tankers for liquids of low viscosity (< 20 mPa.s) — measuring systems for (un)loading ships and rail and road tankers <sup>(1)</sup> — measuring systems for milk — measuring systems for refuelling aircraft	1,0	Measuring systems for liquefied gases under pressure measured at a temperature equal to or above - 10 °C  Measuring systems normally in class 0,3 or 0,5 but used for liquids — whose temperature is less than - 10 °C or greater than 50 °C — whose dynamic viscosity is higher than 1 000 mPa.s — whose maximum volumetric flowrate is not higher than 20 L/h	1,5	Measuring systems for liquefied carbon dioxide  Measuring systems for liquefied gases under pressure measured at a temperature below - 10 °C (other than cryogenic liquids)	2,5	measuring systems for cryogenic liquids (temperature below - 153 °C)	2.4  6.2	OIML R 117-1 does not specify an accuracy class 2,5.  LNG is considered as a cryogenic fluid and therefore the accuracy class for cryogenic fluids given in the MID could also be valid for LNG (accuracy class 2,5). Where OIML R 117 does not recognize accuracy class 2,5 and only accuracy class 1,5 is stated for LNG.	Partially covered
Table 5																		
Accuracy Class	Types of Measuring system																	
0,3	Measuring systems on pipeline																	
0,5	All measuring systems if not differently stated elsewhere in this Table, in particular: — fuel dispensers (not for liquefied gases), — measuring systems on road tankers for liquids of low viscosity (< 20 mPa.s) — measuring systems for (un)loading ships and rail and road tankers <sup>(1)</sup> — measuring systems for milk — measuring systems for refuelling aircraft																	
1,0	Measuring systems for liquefied gases under pressure measured at a temperature equal to or above - 10 °C  Measuring systems normally in class 0,3 or 0,5 but used for liquids — whose temperature is less than - 10 °C or greater than 50 °C — whose dynamic viscosity is higher than 1 000 mPa.s — whose maximum volumetric flowrate is not higher than 20 L/h																	
1,5	Measuring systems for liquefied carbon dioxide  Measuring systems for liquefied gases under pressure measured at a temperature below - 10 °C (other than cryogenic liquids)																	
2,5	measuring systems for cryogenic liquids (temperature below - 153 °C)																	
8	Units of measurement  The metered quantity shall be displayed in millilitres, cubic centimetres, litres, cubic metres, grams, kilograms or tonnes.	2.9.1	Note: The unit "cubic decimetre" is also allowed in OIML R 117-1.	Covered														