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Compressed gaseous fuel measuring systems for vehicles

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OIML R 139-3

Compressed gaseous fuel measuring systems for vehicles

Part 3: OIML Report format for type evaluation

TITRE DU CD (French):

OIML R 139-3

Ensembles de mesurage de gaz comprimé pour véhicules

Partie 3 : OIML format du rapport pour l'évaluation de type

Original version in English

Version originale en anglais

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Foreword

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States.

The main categories of OIML publications are:

- **International Recommendations (OIML R)**, which are model regulations that establish the metrological characteristics required of certain measuring instruments and which specify methods and equipment for checking their conformity. OIML Member States shall implement these Recommendations to the greatest possible extent;
- **International Documents (OIML D)**, which are informative in nature and which are intended to harmonize and improve work in the field of legal metrology;
- **International Guides (OIML G)**, which are also informative in nature and which are intended to give guidelines for the application of certain requirements to legal metrology; and
- **International Basic Publications (OIML B)**, which define the operating rules of the various OIML structures and systems.

OIML Draft Recommendations, Documents and Guides are developed by Project Groups linked to Technical Committees or Subcommittees which comprise representatives from the Member States. Certain international and regional institutions also participate on a consultation basis. Cooperative agreements have been established between the OIML and certain institutions, such as ISO and the IEC, with the objective of avoiding contradictory requirements. Consequently, manufacturers and users of measuring instruments, test laboratories, etc. may simultaneously apply OIML publications and those of other institutions.

International Recommendations, Documents, Guides and Basic Publications are published in English (E) and translated into French (F) and are subject to periodic revision.

Additionally, the OIML publishes or participates in the publication of **Vocabularies (OIML V)** and periodically commissions legal metrology experts to write **Expert Reports (OIML E)**. Expert Reports are intended to provide information and advice, and are written solely from the viewpoint of their author, without the involvement of a Technical Committee or Subcommittee, nor that of the CIML. Thus, they do not necessarily represent the views of the OIML.

This publication – reference OIML R 139-3, Edition 201~~x~~ – was developed by Project Group 7 of OIML TC 8/SC 7 *Gas metering*. It was approved for final publication by the International Committee of Legal Metrology in 201~~x~~ and will be submitted to the International Conference on Legal Metrology in 2020 for formal sanction.

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Compressed gaseous fuel measuring systems for vehicles

Part 3 – Test report format

1 Introduction

Implementation of this report format is informative with regard to the implementation of OIML R 139-1 and -2 in national regulations. However, its implementation is mandatory within the framework of the *OIML Certificate System for Measuring Instruments*.

Note concerning the references: All references are to the combined publication OIML R 139-1 and -2:201x. In this report format this publication is referred to as “R 139”.

This report format applies for any kind of compressed gaseous fuel measuring system for vehicles (independent of its technology). It presents a standardized format for recording the results of the various tests and examinations, described in R 139-2:201x, to which a type of a compressed gaseous fuel measuring system for vehicles shall be submitted with a view to its approval based on this OIML Recommendation.

The use of this report format as is, or translated into a different language, is recommended to all metrology services or laboratories evaluating and/or testing types of compressed gaseous fuel measuring systems for vehicles according to OIML R 139, or according to national or regional regulations based on this Recommendation. If a translation is used, it is highly recommended to leave the structure and the clause numbers unchanged, in order to facilitate the interpretation of the contents by those readers who are not familiar with this other language.

The size of the fields should be adjusted as required to accommodate each specific record. Completely deleting an entry field should be avoided.

The report format, in its practical application, shall as a minimum contain clauses A–F (where applicable) in addition to a cover page issued by the Issuing Authority.

2 Applicability of this report format

In the framework of the *OIML Certificate System for Measuring Instruments* applicable to compressed gaseous fuel measuring systems for vehicles in conformity with R 139:201x, the use of this report format is mandatory. It shall be made available in English and/or in French and include copies translated into the national languages of the countries issuing such certificates, when appropriate. Concerning the implementation of OIML R 139:201x in national regulations, this report format is informative.

3 Guidance for the application of this report format

Key to the symbols and expressions used on the following pages:

The “summary of the results” and the “results of the tests” shall be completed according to the following example:

Clause	Requirement or test	Yes	No	N.A.	Meaning
#	<name>	X			Passed
#	<name>		X		Failed
#	<name>			X	Requirement or test is not applicable to this instrument

- Notes:*
- (1) Unless prescribed otherwise, “Date” in the report refers to the date of testing.
 - (2) The name(s) or symbol(s) of the unit(s) used to express the test results shall be specified in each form.
 - (3) Where in a table one or several choices can be made, checkboxes are applied.
In such a case, some or all of the columns Y, N, N/A are not applicable and are thus presented grayed out or crosshatched (see the example below).

Clause	Description	Yes	No	Not applicable	Observations
		<input type="checkbox"/>			
		<input type="checkbox"/>			

If a prescribed test is not relevant for the type of instrument to be tested, the reason why the test is omitted shall be clearly stated in the field “Observations” (for instance surge tests on signal lines shorter than 30 m, tests related to AC mains supply in the case of an instrument only powered by DC mains supply, or partial testing after modification of a previously tested type).

The number of the report and the page numbers shall be completed in the heading.

Pages 1–5 of this test report format may be replaced by a cover page by the Issuing authority.

4 The evaluation report

The format for the report is presented on the following pages, starting with space for the cover page.

Cover page
by the
Issuing Authority

in accordance with national custom or legislation

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C Summary of the results of the evaluation (examination and tests)*(To be completed by the Issuing Authority)***C.1 Examinations**

For details of the evaluation results refer to the corresponding records in clause E of this report.

OIML R 139-1 (Sub-)clause	General requirements	Specimen(s) comply with referred clause			Details in
		Yes	No	N.A.	
5.1, 6.2	Presentation of the measurement result				E.1
5.3	Measuring range				E.2
6.1	Construction				E.3
6.2.8	Printing device				E.4
6.3	Storing of measurement results (memory device; hardware)				E.5
6.4	Data transmission				E.6
6.5	Zero-setting device				E.7
6.6	Presetting device				E.8
6.7	Calculator				E.9
6.8	Emergency power supply device				E.10
6.9	Protection against fraud				E.11
6.10	Checking facilities				E.12
6.11	Software				E.13
6.12	Self-service arrangement				E.14
6.14	Installation of the measuring system				E.15
7	Markings				D.4
8	Instruction manual				E.16
9	Sealing				E.17
10	Stamping plate				E.18
11	Suitability for testing				E.19
13	Ancillary devices				E.20
14	Transfer point				E.21
15	Additional requirements for specific modules				E.22
15.1	The meter				E.22
15.2	External printers and memory devices				E.22
R 139-2, 3.2	Documentation for type evaluation				E.23

C.2 Performance tests

For details of the test results refer to the corresponding records in clause F of this report

OIML R 139-2 Subclause	Performance tests	Specimen(s) comply with referred clause			Details in
		Yes	No	N.A.	
2.2.7.1	At variable flow rate				F.1
2.2.7.2	Tests with sequential control				F.2
2.2.7.3	Tests without sequential control				F.3
2.2.7.5	Durability				F.4
2.2.7.6	Gas influence factors				F.5
2.2.7.7a	Zero stability				F.6
2.2.7.7b	Flow disturbances				F.7
3.5.43	Preset function				F.7.1
3.6.a	Use of alternative fluid				D.11
3.6.b	Use of only one gas				D.11
3.7.1	Initial test				F.8
3.8.2	Influence of static (ambient) temperature				F.8.1
3.8.3	Influence of vibration (random)				F.9
3.8.4	Influence of mains power supply variation				F.10
3.8.5	Influence of battery power supply variation				F.11
3.9.4.1	Immunity to atmospheric disturbances				F.12
3.9.4.2	Immunity to radio frequency EM fields				F.13
3.9.4.3	Immunity to electrostatic discharges				F.14
3.9.4.4	Immunity to surges				F.15
3.9.4.5	Immunity to power source disturbances:				
→	AC mains voltage dips, short interruptions				F.16
→	DC mains voltage dips, short interruptions and voltage variations				F.17
→	Bursts (transients) on AC and DC mains and signal lines				F.18
→	Ripple on DC mains power				F.19

D General information**D.1 Manufacturer**

Company	
Address	

D.2 Applicant

Company		
Representative		
Address		
Reference		
Date of application		
Applicant is authorized by the manufacturer (documented)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
It is verified that no application for OIML type evaluation for the same type has been made to any other OIML Issuing Authority (see OIML B 3, 5.1.2)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Observations:		

D.3 Testing laboratories involved in the tests*(This table to be completed for each test laboratory)*

Name		
Address		
Application number		
Tests by this laboratory		
Date/period of tests		
Name(s) of test engineer(s)		
Statement of compliance with the requirement of proven competence for performing the tests referred to above within the scope of OIML R 139-1 &-2:2014 (OIML B 3, 5.3.1)		
Where applicable accredited for	QA standard	
	Accreditation number:	Expires (date):
Details of relevant peer assessment or assessment by other means where applicable		
Entry area for detailed information if tests have not been performed on the premises of this laboratory but at a different location		
Name of the responsible person		
Date of signature		
Stamp (where applicable) and signature of the responsible person		
Observations:		

D.4 General information concerning the type and the specimen(s) supplied for the tests

(as stated on the instrument / provided by the manufacturer)

OIML R 139-1 Subclause	Information presented on the instrument		Yes	No	Not applicable	Comments/observations	
7.1	Manufacturer's trade mark						
	Type/model designation/number						
	Presented or space for:	Approval marking					
		Year of manufacture					
		Serial number					
7.2	Minimum measured quantity	$MMQ =$ g; kg					
7.3.a	Flow rate range	$Q_{\min} =$ kg/min					
		$Q_{\max} =$ kg/min					
	Minimum pressure of the gas	$P_{\min} =$ MPa					
	Maximum pressure of the gas	$P_{\max} =$ MPa					
	Maximum storage pressure	$P_{st} =$ MPa					
	Maximum fast-fill pressure	$P_v =$ MPa					
	Types of gas or mixtures of gas						
	Temperature range of the gas	$T_{\min} =$ °C					
		$T_{\max} =$ °C					
	Ambient temperature range	Ambient high (T_{ah}) = °C					
		Ambient low (T_{al}) = °C					
	Environmental classification	Exclusively non industrial					
		Generic (includes industrial)					
	7.3.b	Electrical power supply	Mains AC voltage V				
			Mains DC voltage V				
Battery voltage V							
7.3.c	Identification of software						
7.3.d	Speed of switching between banks					ms	
	Length of the hose					m	
7.1.e	Modules :name	:type	:serial number				
	Further observations:						

D.5 Accessories, supplied by the applicant (if applicable)

Operating instructions	
.....	
.....	
.....	
.....	
Examples are: Data printer (if applicable); ancillary devices, cabling and other accessories:	

D.6 Selection of specimens tested

If the tests and examinations are valid for more versions, present full details of these versions, according to the listing of parameters and type designation in the way presented in D.4:
Justification of the selection of the specimens:

The following specimens have taken part in the examination:

Specimen no.	Model	Serial no.	Year of manufacture	Q_{\max} [kg/min]	Q_{\min} [kg/min]
1					
2					
3					
4					
5					
...					

D.7 Adjustments and modifications

Adjustments, modifications, and repairs made to the specimens during the testing:

D.8 Additional information concerning the type

Additional observations and/or information (connection equipment, interfaces, etc.):

D.9 Documentation supplied by the applicant

Observations:

D.10 Results of previous tests that were taken into account

Details:

D.11 Information concerning the test equipment used for the type evaluation
(including details of simulations)

*If applicable, the laboratory is free to provide this information, instead of a complete overview here, in the appropriate chapter F.x in an extra field below the first table (with "Date & Time" etc.).
In that case a statement shall be made in this field.*

E Examinations

(To be completed by the Evaluating Authority)

Where specified “not applicable” in Table C.1, the related tables below may be omitted from this report.

For each of the applicable requirements an explanation of the manner in which the requirement is met is presented in the column ‘observations’.

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

5.1	E.1 Presentation of the measurement result				Applied units:
5.1.1	Units of measurement				
	All applied quantity values are expressed in	SI units: <input type="checkbox"/>			
		other legal units conforming OIML D 2:2007: <input type="checkbox"/>			
5.1.2	Scale interval				
5.1.2.1	- agrees 1×10^0 , 2×10^0 or 5×10^0 , ($n = \text{integer}$)				
5.1.2.2	- is equal to or smaller than MMQ				
5.1.2.3	Non-significant figures avoided				
5.1.3	Same scale intervals multiple indications (displays and printers)				
6.2.1.1	Size of figures on digital display ≥ 10 mm				
6.2.1.2	No dots or commas applied when grouping numbers in groups of 3 digits				
6.2.5	Presentation of decimal fraction at least one figure to the left of the separator and all figures to the right				

5.3	E.2 Measuring ranges				
5.3.1.1	Q_{\min} specified limited				
5.3.1.2	Q_{\max} specified limited				
	Flow rate below Q_{\min} prevented				
5.3.1.3	All elements of the system range within Q_{\min} and Q_{\max}				
5.3.2	MMQ specified:				
<u>5.2.1</u>	<u>Accuracy class</u>	<u>2</u> <input type="checkbox"/>	<u>3</u> <input type="checkbox"/> ¹⁾	<u>5</u> <input type="checkbox"/> ¹⁾	
5.2.34	R_{MPE}				
5.2.34	$E_{\min} = 2 \times \text{MMQ} \times R_{\text{MPE}}$				
5.3.1.4	Applied ratio(s):				
	Q_{\max}/Q_{\min}		$Q_{\max}/Q_{\min} \geq 10$?		
5.3.2	$Q_{\max} \leq 4$ <input type="checkbox"/>	MMQ =	MMQ ≤ 0.5 ?		
	$4 < Q_{\max} \leq 12$ <input type="checkbox"/>	MMQ =	MMQ ≤ 1 ?		
	$12 < Q_{\max} \leq 30$ <input type="checkbox"/>	MMQ =	MMQ ≤ 2 ?		
	$30 < Q_{\max} \leq 70$ <input type="checkbox"/>	MMQ =	MMQ ≤ 5 ?		
	$Q_{\max} > 70$ <input type="checkbox"/>	MMQ =	MMQ ≤ 10 ?		
	<u>Hydrogen</u> <input type="checkbox"/>	MMQ = 1			
	MMQ agrees 1×10^0 , 2×10^0 or 5×10^0 , ($n = \text{integer}$)				
5.6.1	$E_{\min} < 0.1 \cdot R_{\text{MPE}}$ <input type="checkbox"/>	Fault limit =	$0.1 \cdot R_{\text{MPE}}$ %		
	<u>5</u> %				
	$E_{\min} \geq 0.1 \cdot R_{\text{MPE}}$ <input type="checkbox"/>	Fault limit = $E_{\min} =$	%		

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¹ Applicable to hydrogen only

	0.15 %						
--	--------	--	--	--	--	--	--

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6	E.3	Technical requirements for the measuring system					
6.1	Construction						
6.1.1	The measuring system and, if applicable, its modules are designed for the intended purpose						
	The measuring system is solidly and carefully constructed in order to ensure that it maintains its metrological qualities during a reasonable period of use.						Explain how.
6.1.2	The measuring system comprises more than 1 bank Number of banks :...						
6.1.3	The measuring system is constructed such that the opportunity for unintentional, accidental, or intentional misuse is minimized						Explain how.
6.2	Presentation of measured value						
6.2.1	Digital indicating device displays mass of the gas						
	Where a secondary (informative) indication is available the status of this informative indication is clear and unambiguous and is not misleading with respect to the actual amount						If yes, explain how.
	Secondary indication in quantity values of	volume <input type="checkbox"/>					
		conversion factor displayed on front face					
		energy <input type="checkbox"/>					
		conversion factor displayed on front face					
		other <input type="checkbox"/>					
	conversion factor displayed on front face						Which quantity:
	Meter is fitted with a price indicating device	unit price and price to pay are only related to mass					
		indications are displayed only when displaying mass					
6.2.2	Common simultaneous use of the same indicating device for several measuring systems possible	Measuring system identified in the indication?					
		Identification of indicated quantity value is unchallengeable and clearly indicated					
6.2.3	Price indications fulfill the provisions applicable to mass indications						
	Other quantity indications on secondary indicating devices fulfill the provisions applicable to mass indications						
6.2.4	Totalized mass is continuously displayed during the measurement						
6.2.5	Digital indication or print consists of at least one figure						
6.2.6	Falsification of results is not possible when applying an external printing device or data storage						
	Printing or storing of data is prevented if a significant fault occurs						
	Loss of previous measurement data is prevented if a significant fault occurs						
6.2.7	Price indicating device						
6.2.7.1	Mass indicating device contains a price indicating device which displays unit price and price to be paid including the applicable monetary unit						
6.2.7.2	Unit price is displayed before the start of the measurement and remains valid for the whole transaction						
	After being changed, the unit price is only effective from the moment that a new transaction may start and is adjustable	direct on the measuring system <input type="checkbox"/>					
		through peripheral equipment allowing at least 5 s to elapse between indicating the new unit price and the start of the measurement <input type="checkbox"/>					

6.2.7.3	Errors due to rounding only influence the least significant digit of the price to be paid				
OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name: Date(s): Specimen: Observations:

6.2	E.4 Printing device				
6.2.8	Printing device	Internal <input type="checkbox"/>			
		External <input type="checkbox"/>			
6.2.8.1	Printing of the current transaction is inhibited during a measurement				
	No change in indicated quantity during printing				
6.2.8.2	Prints identification of applicable system when more than one measuring system is, or can be connected				
6.2.8.3	Marks duplicates when copies can be produced				
6.2.8.6, a	Print permanency: readable for at least 3 months				
6.2.8.6, b	Height of digits.... mm	≥ 2 mm			
6.2.8.4	Prints	Price <input type="checkbox"/>			
		Price and unit price <input type="checkbox"/>			
6.2.8.6, c		Name/symbol of units to the right of the value <input type="checkbox"/>			
		Name/symbol of units above column <input type="checkbox"/>			
6.2.8.6, d	A print failure results in	a warning <input type="checkbox"/>			
		inhibiting the measurement <input type="checkbox"/>			
6.2.8.5	Checking facilities of printer				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.3	E.5	Storing of measurement results				
6.3.1	Hardware memory device	Internal <input type="checkbox"/>				
		External <input type="checkbox"/>				
6.3.1	Means available to read stored data					
	Sufficient storage capacity					
6.3.2	Permanency of stored data					
6.3.3	Modification of stored data inhibited					
6.3.3	Deletion of data					
6.3.4	Checking facilities of memory device					

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.4	E.6 Data transmission interface				
	Equipped with data transmission interface				
	No possibility to inadmissibly influence metrological functions				
	No possibility to falsify measurement results				

6.5	E.7 Zero-setting device				
6.5.1	Measuring system is equipped with required zero-setting device				
6.5.1.1	Only acts on indicated measurement result				
6.5.1.2	Next delivery only possible after finish of and reset to zero of previous delivery				
6.5.1.3	Measurement result during zero-setting inhibited				
6.5.1.3	During zero-setting no diverging indication of measured value				
6.5.1.4	Zero-setting during measurement inhibited				
6.5.2	Equipped with required zero-setting of price indication				
6.5.3	Corrects for false recorded mass flow in case of no flow				

6.6	E.8 Presetting device				
6.6.1	Presetting device	Available <input type="checkbox"/>			
6.6.2	Indication of preset before start of measurement				
6.6.3	Indication between actual measured and preset is distinguishable				How?
6.6.4	Indication of preset value	remains unaltered <input type="checkbox"/>			
		returns progressively to zero <input type="checkbox"/>			
6.6.6		units according to 5.1.1			
6.6.7		scale interval same as 5.1.2			
6.6.4	Presetting device	special operation involving the preset value to change to zero before the measurement <input type="checkbox"/>			
6.6.8		Emergency flow stop incorporated <input type="checkbox"/>			
6.6.9		Price presetting device available <input type="checkbox"/>			

6.7	E.9 Calculator				
6.7.2	All necessary parameter values are available at the start of the measurement				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.8	E.10	Emergency power supply device						
6.8.1	Emergency power supply allows	a) all measuring functions are safeguarded during a failure of the principal power supply	<input type="checkbox"/>					
		b) data contained at the moment of a failure leading to stopping the flow are saved and displayable on an indicating device subject to legal metrology control for sufficient time to permit the conclusion of the current transaction	<input type="checkbox"/>					
6.8.2	A failure leading to stopping the flow causes the operation of the display	a) to automatically continue for at least 15 min immediately following the failure of the principal electrical supply	<input type="checkbox"/>					
		b) for a total time of at least 5 minutes in one or several periods to be controlled manually during one hour immediately following the failure	<input type="checkbox"/>					
	More than 15 s power failure leads to finishing the delivery when the power supply is re-established							

6.9	E.11	Protection against fraud						
6.9.1a	Adjustment without breaking seals inhibited							
6.9.1d	Risk on successful deliberate influence is minimized							

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.10	E.12	Checking facilities				
6.10.2	Checking facilities for the measurement transducer					
	Type	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
	Function check	a) by disconnecting the transducer, or <input type="checkbox"/>				
		b) by interrupting one of the sensor's pulse generators, or <input type="checkbox"/>				
		c) by interrupting the electrical supply of the transducer <input type="checkbox"/>				
6.10.2.3	Time-out after 120 s					
6.10.3	Checking facilities for the calculator					
	Type	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
6.10.3.2	If of type I: Function check	Operates at least every 5 min in the course of a delivery and at least once during a delivery				
6.10.3.3	Validity check	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
6.10.4	Checking facilities for the indicating device					
	Type	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
6.10.4	If of type I: Function check	A primary indication is provided by some other device of the measuring system, or the indication can be easily determined from other primary indications				Details
6.10.4.2	Function check	Automatic verification of the complete indicating device <input type="checkbox"/>				
6.10.4.5		Or both: <input type="checkbox"/>				
6.10.4.6		- automatic check of the data transmitted to the indicating device and the electronic circuits used for the indicating device, excluding those to the driving circuits of the display itself, - visual check of the display itself which is of type I (each step to be at least 0.75 s)				
6.10.5	Checking facilities for ancillary devices					
	Type	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
6.10.6	Checking facilities for the associated measuring instruments					
	Type	<input type="checkbox"/> N / <input type="checkbox"/> I / <input type="checkbox"/> P				
6.10.7	Zero flow response					
	Time-out device incorporated that terminates a single batch delivery should a period of inactivity (no flow) of more than 2 min occur during the transaction					

Applicable software evaluation procedures:

Requirement		Evaluation procedure
A.1.1	Software identification	AD + VFTSw
A.1.2	Correctness of algorithms	AD + VFTSw
A.1.3	Fraud protection	AD + VFTSw + DFA/CIWT/SMT
	Parameter protection	AD + VFTSw + DFA/CIWT/SMT
A.2.1	Separation of electronic devices and sub-assemblies	AD
A.2.2	Separation of software parts	AD
A.2.3	Storage of data, transmission via communication systems	AD + VFTSw + CIWT/SMT
A.2.3.2	Data protection with respect to time of measurement	AD + VFTSw + SMT
A.2.4	Transmission delay	AD + VFTSw
A.2.5	Transmission interruption	AD + VFTSw
A.2.6	Automatic storing	AD + VFTSw
	Time stamp	AD + VFTSw

Abbreviation	Description	Not applicable	Related OIML R 139-1 Clause in OIML D 31:2008
AD	Analysis of the documentation and validation of the design		6.3.2.1
VFTM	Validation by functional testing of metrological functions		6.3.2.2
VFTSw	Validation by functional testing of software functions		6.3.2.3
DFA ²⁾	Metrological data flow analysis		6.3.2.4
CIWT ¹⁾	Code inspection and walkthrough		6.3.2.5
SMT ¹⁾	Software module testing		6.3.2.6

² The software validation methods DFA, CIWT and SMT in general are not applicable and may only be applicable if the measuring system is designed to allow software downloading as stated in OIML R 139-2.

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s): Specimen:
					Observations
A.1	E.13 Software				
A.1.1	Software identification				
	The legally relevant parts are clearly identified				
	The identification number is:				
	The identification is presented by means of:				
	The identification is inextricably linked to the software				
A.1.2	Correctness of algorithms and functions				
	The measuring algorithms and functions are appropriate and functionally correct				
A.1.3	Software protection (against fraud)				
	The legally relevant software is protected against unauthorized modification, loading or changes by swapping the memory device				
	Only clearly documented functions can be activated by the user interface, which do not facilitate fraudulent use				
	Parameters that fix the legally relevant characteristics are secured against unauthorized modification				
	Displaying the current parameter settings is possible				
	Protection/sealing makes unauthorized access impossible or evident				
A.1.4	Detection by checking facilities of significant faults is performed by the software and in the legally relevant software part				
	A list is available of anomalies which result in a significant fault and which are detected by the software				
A.2.1	Separation of electronic devices and sub-assemblies				
	Constituents of a measuring system that perform functions which are legally relevant are identified, clearly defined, and documented				
	Those functions cannot be inadmissibly influenced by commands received via an interface				
	All legally relevant software parts are clearly described				
	An interface is available between the legally relevant software and the other software parts, and is clearly documented. All communication is performed exclusively via this interface				
	The interface commands are documented with a statement of completeness				
	The legally relevant software has priority using the resources over non-relevant software. The measurement task is not delayed or blocked by other tasks				
A.2.2	Shared indications				
	The same display is used for presenting information both from the legally relevant part and the non-legally relevant part				
	Software for the indication of measurement results belongs to the legally relevant part				
A.2.3	Storage of data, transmission via communication system				
	The measurement value stored or transmitted is accompanied by all relevant information for future legally relevant use				
	The data is protected to guarantee the authenticity, integrity and correctness concerning the time of measurement				
	The memory device is fitted with a checking facility, which guarantees that irregular data is discarded or marked unusable				
	The software module that prepares the data for storing, sending and checking after reading or receiving is part of the legally relevant software				

	Cryptographic methods are applied. Confidentiality key-codes are kept secret and secured				
A.2.4	The measurement is not inadmissibly influenced by a transmission delay				
A.2.5	No measurement data is lost if the network services become unavailable				
A.2.6	Data storage is performed automatically				
	The storage device has sufficient permanency to ensure that the data is not corrupted under normal storage conditions				
	There is sufficient memory storage				
	All data necessary for the calculation is stored with the final calculated value				
A.2.7	Stored data is deleted when the transaction is settled under the following conditions: <ul style="list-style-type: none">• deletion is performed in the same order as the recording order;• deletion is started automatically or after a specific manual operation				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.12	E.14 Self-service arrangement				
6.12.1	GENERAL				
6.12.1.2	Individual identification of measuring systems in the case of multi-measuring systems				
6.12.1.3	No indications potentially introduce confusion				
6.12.1.4	Indication of status of measuring system				
6.12.1.5	Changing type of payment and/or mode of operation inhibited before end of operation				
6.12.1.6	Indication available for consumer up to end of transaction				
6.12.2	ATTENDED SERVICE MODE				
	Information to customer				
6.12.2.1.1	Attended post payment additional indicating device consists of	a) a printing device for the issue of a receipt to the customer, or <input type="checkbox"/>			
		b) an indicating device for the benefit of the supplier together with a display for the benefit of the customer <input type="checkbox"/>			
6.12.2.1.2	Temporary storage incorporates	a) association of the data with the measurement is unambiguous for each measuring system when the results are recalled			
		b) the customer is informed about the identification of his measurement in the sequence of storage of measurements			
6.12.2.1.3	Temporary storage mode is inhibited and the measuring system indicating device remains the primary indication	c) when a primary indication is out of service			
		when an external device providing a mandatory primary indication for the benefit of the customer is disconnected, or when a faulty operation is automatically detected.			
6.12.3	UNATTENDED SERVICE MODE				
6.12.3.1	General				
6.12.3.1.1	Recording by additional primary indication by means of	a) a printer receipt issued for the customer, and			
		b) measurement data recorded for the benefit of the supplier by a printing or memory device <input type="checkbox"/>			
6.12.3.1.2	Warning to customer before operation if 6.12.3.1.1 a) or b) out of service				
6.12.3.1.3	Individual volume totalizers for each registered customer; visible to the customer (in which case 6.12.3.1.1 and 6.12.3.1.2 do not apply) <input type="checkbox"/>				
6.12.3.1.4	Inhibiting of the process in the case of an interference or disturbance				
6.12.3.1.5	Conservation of delivery data during power supply failure (6.8.2 applies)				
6.12.3.2	Delayed payment				
	Printed and/or memorized indications contain sufficient information for providing proof and include the measured quantity, the price to pay and information to identify the particular transaction (e.g. the measuring system number, location, date, time)				
6.12.3.3	Pre-payment in unattended service mode				
6.12.3.3.1	Pre-paid amount and actual price of the gas delivered is printed and memorized	Printed/memorized indications are divided into two parts indicated to be related and to contain pre and post delivery information respectively <input type="checkbox"/>			
6.12.3.3.1	Fulfills preset requirements (6.6)				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

6.14	E.15 Installation of the measuring system				
6.14.1	No corruption of metrological behavior by installing additional device				
6.14.2	No means provided for diversion downstream of the meter during filling				
6.14.3	Design is such that delivered mass is always within $\frac{1}{2} E_{\min}$				
6.14.4	Flow limiting device is installed (applies only when there is a risk of exceeding Q_{\max})				
6.14.5	Provision available for fitting and removing a pressure gauge				

8	E.16 Instruction manual				
8.2.a	Operating instructions				
8.2.b	Rated operating conditions				
8.2.c	Warm-up time				
8.2.d	Other relevant conditions				
8.2.e	Specifications of power converter				
8.2.f	Compatibility of ancillary equipment				
8.2.g	Any specific installation conditions such as for instance a limitation of the length of signal, data, and control lines				
8.2.h	Instructions for installation, maintenance, repair, permissible adjustments (this can be in a separate document, not intended for the user/owner)				
8.2.i	Conditions for compatibility with interfaces, sub-assemblies (modules) or other measuring instruments				
8.2.j	Minimum measured quantity, MMQ				
8.2.k	Minimum flowrate, Q_{\min}				
8.2.k	Maximum flowrate, Q_{\max}				
8.2.l	Maximum pressure of the gas in the refueling station gas storage, P_{st}				
8.2.m	Maximum fast fill pressure of the gas-fueled vehicle, P_v				
8.2.n	Minimum pressure of the gas, P_{\min}				
8.2.o	Nature and characteristics of the gases to be measured				
8.2.p	Maximum temperature of the gas, T_{\max}				
8.2.q	Minimum temperature of the gas, T_{\min}				
8.2.r	Restricted environment (not to be used in an industrial environment – see 5.7.1 and 5.7.2)				
8.2.s	Maximum length of the hose				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

9	E.17	Sealing				
9.1	General					
9.1.1	Sealing/ sealing provisions available for:					
9.1.2	Adjustment of essential metrological parameters is inhibited by means of seals					
9.1.3	Hardware seals <input type="checkbox"/>					
	Electronic seals <input type="checkbox"/> (if so, subclause 9.2 applies)					
9.1.4	Seals are easily accessible					
9.2	Electronic sealing					
9.2.1.1	a) Access is allowed only to authorized persons by using a "password" and, after changing parameters, the measuring system can be put into use "in sealed condition" again without any restriction; or <input type="checkbox"/>					
	b) Access is allowed without restrictions (similar to classical sealing) but, after changing parameters, the measuring system can only be put into use "in sealed condition" again by authorized persons using a password <input type="checkbox"/>					
9.2.1.2	Password is changeable					
9.2.1.3	Mechanical sealing in the case of direct sale to the public					
9.2.1.4	Device does not operate or indicates so when in configuration mode until put in sealed condition again					
9.2.1.5.a	Event logger record contains: 1) an event counter, 2) the date the parameter was changed, 3) the new value of the parameter, and 4) an identification of the person that implemented the intervention					
9.2.1.5.b	The traceability of the last intervention is assured					
9.2.1.5.c	The event logger is capable of storing at least 999 interventions					
9.2.1.5.d	The event logger applies the first-in first-out (FIFO) principle if insufficient memory capacity remains to store a new record					
	Measuring system contains parts which may be disconnected by the user and are					
9.2.2	interchangeable <input type="checkbox"/>	Access to parameters that contribute to the determination of the results of measurements is not possible through disconnected points (unless the provisions in 9.2.1 are fulfilled)				
		The insertion of any device which may influence the accuracy is prevented by means of electronic and data processing securities or by mechanical means				
9.2.3	not interchangeable <input type="checkbox"/>	Access to parameters that contribute to the determination of the results of measurements is not possible through disconnected points (unless the provisions in 9.2.1 are fulfilled)				
		The insertion of any device which may influence the accuracy is prevented by means of electronic and data processing securities or by mechanical means				
		Measuring system is provided with devices which do not allow the system to operate if the various parts are not associated according to the manufacturer's configuration				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

10	E.18	Stamping plate				
		(Provisions for installing) available				
		(Provisions for installing) sealing available <input type="checkbox"/>				
		Permanently attached on a support of the measuring system <input type="checkbox"/>				
		Combined with identification plate <input type="checkbox"/>				

11	E.19	Suitability for testing				
11.1		Design permits testing according to OIML R 139-2				
11.2		Identification is possible of modules having been subjected to separate type evaluation				
11.3		Design allows for initial and subsequent verification without unreasonably severe efforts				

12	E.20	Specific requirements for ancillary devices				
13.3	Optional ancillary device(s) which is (are) not subject to legal control	do(es) not affect the correct operation of the measuring system and in particular the measuring system when connected or disconnected				
		show(s) the user a statement stating that the applicable device or devices are not under legal control when displaying or printing a measurement result which is made available to the customer				

14	E.21	Transfer point				
		Maximum number of transfer points foreseen:				
14.1		Transfer points are all downstream				
14.2	Any diversion of gas to other than the intended receiving receptacle(s)	cannot be readily accomplished, or				
		is readily apparent				
14.3		Next delivery is inhibited until the indication is reset to zero				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

15	E.22 Additional requirements for specific modules				
15.1	The meter				
15.1.1	Metrological specifications of the meter				
15.1.1.1	Metrological characteristics of the meter: Q_{\min} , Q_{\max} , P_{\max} , P_{\min} , T_{\max} and T_{\min} are specified				
15.1.1.2	The temperature range of the gas covers at least + 10 °C to + 40 °C				
	The rated operating conditions of the meter are the same as those for the complete measurement system				
	The ranges shall suit the conditions of use				
15.1.2	Additional technical requirements for meters				
15.1.2.1	Reliable connections between the flow sensor and the indicating device				
	Durable connections between the flow sensor and the indicating device				
15.1.2.2	Adjustment device provided permitting modification of the ratio between the indicated mass and the actual mass of gas passing through the meter	by a simple command			
		in a discontinuous manner, whereby the consecutive values of the ratio do not differ by more than 0.001			
	Adjustment by means of a bypass of the meter is inhibited				
15.1.2.3	a) The meter is equipped with a correction device and b) only the corrected mass values are displayed during normal operation				
	c) Correction device cannot be applied for creating an offset to zero or d) correcting for a theoretical pre-established value				
	e) Correction device applies checking facilities				
15.2	Additional technical requirements for external printers and memory devices				
	(Space provided for) Permanent, non-transferable, and easily readable identification plate or label specifying	a) manufacturer's trade mark/corporate name			
		b) type designation / model number			
		c) type approval number			
		d) serial number			
		e) identification of the measuring instrument(s), using which the measurement results can be printed			
		f) details of the electrical power supply: (AC/DC voltage; frequency)			
		g) specific conditions for use (for instance specific ambient conditions)			
		h) identification of the software (see 6.11)			
R 139-2 2.2.7.7.	Is any flow disturbance expected to be critical for the measurement result?	<input type="checkbox"/> Yes <input type="checkbox"/> No			

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

3.2	E.23 Documentation for type evaluation				
3.2.1	General documentation				
a	description of its general principle of measurement				
b	(mechanical) drawings and/or photographs				
c	electric/electronic diagrams				
d	lists of the essential sub-assemblies/modules, components with their essential characteristics				
e	functional description of the various electronic devices				
f	flow diagram of the logic, showing the functions of the electronic devices				
g	for measuring systems and meters fitted with correction devices: a description of how the correction parameters are determined				
h	assembly drawing identifying the various components				
i	drawing(s) presenting the security sealing plan and the provisions and location for verification marks				
j	drawing of regulatory markings				
k	general information on the software required for the measuring instrument				
l	test inputs or outputs, their use, and their relationships to the parameters being measured				
m	installation requirements				
n	operating instructions that shall be provided to the user				
o	references to the approval certificates of the constituent elements				
p	overview of any purely digital elements that are considered to be replaceable (in accordance with 1.2.3.4)				
q	documents or other evidence that support the assumption that the design and characteristics of the instrument comply with the requirements of this Recommendation				

OIML R 139-1 Subclause	Description	Yes	No	Not applicable	Observer's name:
					Date(s):
					Specimen:
					Observations:

3.2.2	Software documentation				
a	description of the legally relevant software and how the requirements are met: - list of software modules that belong to the legally relevant part including a declaration that all legally relevant functions are included in the description - description of the software interfaces of the legally relevant software part and of the commands and data flows via this interface including a statement of completeness - description of the generation of the software identification - list of parameters to be protected and description of protection means				
b	description of the security means of the operating system (password, etc. if applicable)				
c	description of the (software) sealing method(s)				
d	overview of the system hardware, e.g. topology block diagram, type of computer(s), type of network, etc. Where a hardware component is deemed legally relevant or where it performs legally relevant functions, this should also be identified				
e	description of the accuracy of the algorithms (e.g. filtering of A/D conversion results, price calculation, rounding algorithms, etc.)				
f	description of the user interface, menus and dialogues				
g	software identification and instructions for obtaining it from an instrument in use				
h	list of commands of each hardware interface of the measuring instrument / electronic device / sub-assembly including a statement of completeness				
i	list of potential durability errors that are detected by the software is able to detect and, if necessary for understanding, a description of the detecting algorithms				
j	description of data sets stored or transmitted				
k	if fault detection is carried out within the software, a list of potential faults that the software is able to are detected and a description of the detecting algorithm				
l	operating manual				
3.2.3	Specific documentation concerning execution of performance tests				
	Validation documentation concerning the use of air instead of gas during tests				
3.2.4	Specific documentation on durability				
	The type of meter has previously proven conformity to the durability requirement <input type="checkbox"/> Yes <input type="checkbox"/> No				
	Life time estimate containing a guarantee				
3.2.5	Additional documentation				
	Specify if applicable				

F Performance tests**F.1 Variable flowrate (not applicable to hydrogen systems)**

OIML R 139-2, 2.2.7.1 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]		Test conditions			Observer's name:		
		Test fluid (gas, air, water, ...)	start	stop	Date(s):	Specimen:	
Time:					Specimen:		
Ambient temperature		°C	°C		Q_{\min} [unit/min]		
Fluid temperature		°C	°C		Q_{\max} [unit/min]		
Test 0	Fill (<i>t</i>)	I			Repeatability		
	Phase (<i>p</i>)	1	2	3	1	2	3
Initial pressure	receiver						
	low bank P_{stl}						
Quantity [unit]	reference						
	indicated						
Error [unit]							
relative error [%]	phase1 (E_{11})						
	phase2 (E_{12})						
	phase3 (E_{13})						
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Test 0	Fill	II					
Initial pressure	Receiver						
	mid. bank P_{stm}						
Quantity [unit]	Reference						
	Indicated						
Error [unit]							
relative error [%]	phase1 (E_{21})						
	phase2 (E_{22})						
	phase3 (E_{23})						
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Test 0	Fill	III					
Initial pressure	Receiver						
	high bank P_{st}						
Quantity [unit]	Reference						
	Indicated						
Error [unit]							
relative error [%]	phase1 (E_{31})						
	phase2 (E_{32})						
	phase3 (E_{33})						
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
	pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Repeatability [%]							
Repeatability	MPE [%]				For meter $\leq 0.6 \cdot \frac{2}{3}$ For system $\leq +\text{MPE}$		
	pass				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	fail				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Notes: Reference = Indicated quantity value on reference weighing instrument at end of the filling phase – Indicated quantity value on reference weighing instrument at start of the filling phase. Indicated = Indicated quantity value on EUT at end of the filling phase – Indicated quantity value on EUT at start of the filling phase.							

Sequence of the test

Considering test numbering $[x, t, p]$ where x = Test #, and t = testcycle #, p = phase # the test sequence is $[0, 1, 1]; [0, 1, 2]; [0, 1, 3]; [0, 2, 1]; [0, 2, 2]; [0, 2, 3]; [0, 3, 1]; [0, 3, 2]; [0, 3, 3]$.

Observations

Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>
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F.2 Tests with sequential control (involving 3 banks) (not applicable to hydrogen systems)

OIML R 139-2, 2.2.7.2 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:
	Test fluid (gas, air, water, ..)				
		Start	Stop	Date(s):	
	Time:				Specimen:
	Ambient temperature		°C	°C	Q_{\min} [unit/min]
Fluid temperature		°C	°C	Q_{\max} [unit/min]	
Test 1	Fill	1	2	3	Nominal pressure value
Initial pressure in kPa	Receiver				0
	low bank P_l				P_{st}
	mid. bank P_m				P_{st}
	high bank P_{sth}				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized:
Average flow rate [unit]/min					
Quantity [unit]	Reference				(2 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} \text{MPE}$ Meter ≤ 0.6; System ≤ 1
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test 2	Fill	1	2	3	Nominal pressure value
Initial pressure	Receiver				0.5 P_v
	low bank P_{stl}				0.75 P_v
	mid. bank P_{stm}				P_v
	high bank P_{sth}				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized
Average flow rate [unit]/min					
Quantity [unit]	Reference				(2 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} \text{MPE}$ Meter ≤ 0.6; System ≤ 1
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test 3	Fill	1	2	3	Nominal pressure value
Initial pressure	Receiver				0.75 P_v
	low bank P_{stl}				0.75 P_v
	mid. bank P_{stm}				P_v
	high bank P_{sth}				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized
Average flow rate [unit]/min					
Quantity [unit]	Reference				(1 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} \text{MPE}$ Meter ≤ 0.6; System ≤ 1
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations					

Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.3 Tests without sequential control (involving only one bank)

OIML R 139-2, 2.2.7.3 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:
	Test fluid (gas, air, water, ...)				
	Pressure in kPa units	Start	Stop		
	Date(s):				
	Time:				
	Ambient temperature	°C	°C	Specimen: Q_{min} [unit/min]	
Fluid temperature	°C	°C	Q_{max} [unit/min]		
Test 4	Fill	1	2	3	Nominal pressure value
Initial pressure	Receiver				0
	high bank				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized:
Average flow rate [unit]/min					
Quantity [unit]	Reference				(2 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} MPE_{Meter} \leq 0.6;$ $System \leq 1$
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test 5	Fill	1	2	3	Nominal pressure value
Initial pressure	Receiver				$0.5 P_v$
	high bank				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized
Average flow rate [unit]/min					
Quantity [unit]	Reference				(2 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} MPE_{Meter} \leq 0.6;$ $System \leq 1$
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test 6³⁾	Fill	1	2	3	Nominal pressure value
Initial pressure	Receiver				$0.75 P_v$
	high bank				P_{st}
Timing	start / stop	/	/	/	
	time period	s	s	s	Minimum quantity to be totalized
Average flow rate [unit]/min					
Quantity [unit]	Reference				(1 × MMQ [unit])
	Indicated				
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			$\leq \frac{2}{3} MPE_{Meter} \leq 0.6;$ $System \leq 1$
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

³⁾ not applicable to hydrogen systems

Observations					
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

OIML R 139-2, 2.2.7.3 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions			Observer's name:
	Test fluid (gas, air, water, ..)			
	Pressure in kPa units	Start	Stop	
	Date(s):			
	Time:			Specimen:
	Ambient temperature	°C	°C	Q_{min} [unit/min]
	Fluid temperature	°C	°C	Q_{max} [unit/min]
Test 7	Fill	1	2	Nominal pressure value
Initial pressure	Receiver			$0.75 P_v$
	high bank			P_{st}
Timing	start / stop	/	/	
	time period	s	s	Minimum quantity to be totalized
Average flow rate [unit]/min				
Quantity [unit]	Reference			
	Indicated			$(1 \times MMQ \text{ [unit]})$
Error [unit]				Repeatability
relative error [%]				
MPE [%]		For meter ≤ 1 ; For system ≤ 1.5		$\leq \frac{2}{3} MPE_{Meter} \leq 0.6$; $System \leq 1$
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations				
Result		Pass	<input type="checkbox"/>	Fail <input type="checkbox"/>

F.4 Durability test

OIML R 139-2, 2.2.7.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Test fluid (gas, air, water, ...)		Start	Stop		
	Date(s):					
	Time:				Specimen:	
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]
	Fluid temperature		°C	°C	Q_{\max}	[unit/min]
Test # <input type="checkbox"/> 1 / <input type="checkbox"/> 4	Fill	1	2	3	Nominal pressure value	
Initial pressure in kPa	receiver				0	
	low bank P_l				<input type="checkbox"/> P_{st} / <input type="checkbox"/> Not applicable	
	mid. bank P_m				<input type="checkbox"/> P_{st} / <input type="checkbox"/> Not applicable	
	high bank P_h				P_{st}	
Timing	start / stop	/	/	/		
	time period	s	s	s	Minimum quantity to be totalized:	
Average flow rate [unit]/min						
Quantity [unit]	reference					
	indicated				(2 × MMQ [unit])	
Error [unit]						
initial intrinsic error (% E_{ii})						
repeatability (%rep.)					==>	
% E_{ii} average					==>	
MPE		% $E_{ii} \leq 1$			%rep. ≤	
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Date(s):		Start	Stop	Observer:	
	Time:					
	Ambient temperature		°C	°C		
	Fluid temperature		°C	°C		
Initial pressure in kPa	receiver					
	low bank P_l					
	mid. bank P_m					
	high bank P_h					
Timing	start / stop	/	/	/		
	time period	s	s	s		
Average flow rate [unit]/min						
Quantity [unit]	reference					
	indicated					
Error [unit]						
intrinsic error (% E_i)						
repeatability (%rep.)					==>	
% E_i average					==>	
% E_{ii} average - % E_i average					==>	
MPE		% $E_i \leq 1$			%rep. ≤	≤ 1
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations						
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

F.5 Gas influence factors

OIML R 139-2, 2.2.7.6 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Test fluid (gas, air, water, ...)				Date(s):	
		Min	Max			
	Fluid density specified					
	Fluid temperature specified				°C °C	
	Ambient temperature				Start	Stop
	Time:					
	Ambient temperature				°C	°C
Fluid density				±		
Fluid temperature				°C ± °C		
Test # <input type="checkbox"/> 1 / <input type="checkbox"/> 4	Fill	1	2	3	Nominal pressure value	
Initial pressure in kPa	receiver				0	
	low bank P_l				<input type="checkbox"/> P_{st} / <input type="checkbox"/> Not applicable	
	mid. bank P_m				<input type="checkbox"/> P_{st} / <input type="checkbox"/> Not applicable	
	high bank P_h				P_{st}	
Timing	start / stop	/	/	/		
	time period	s	s	s	Minimum quantity to be totalized:	
Average flow rate [unit]/min						
Quantity [unit]	reference					
	indicated				(2 × MMQ [unit])	
Error [unit]						
initial intrinsic error (% E_{ii})						
repeatability (%rep.)		==>				
% E_{ii} average		==>				
MPE		% $E_{ii} \leq 1$			%rep. ≤	
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2/3 0.6	
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Initial pressure in kPa	receiver					
	low bank P_l					
	mid. bank P_m					
	high bank P_h					
Timing	start / stop	/	/	/		
	time period	s	s	s		
Average flow rate [unit]/min						
Quantity [unit]	reference					
	indicated					
Error [unit]						
intrinsic error (% E_i)						
repeatability (%rep.)		==>				
% E_i average		==>				
% E_{ii} average - % E_i average		==>				
MPE		% $E_i \leq 1$			%rep. ≤	≤ 1
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2/3 0.6	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations						

Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>
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F.6 Zero stability test (if applicable)

OIML R 139-2, 2.2.7.7a [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Date:		Start	Stop	Specimen:		
	Time:						
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]	
					Q_{\max}	[unit/min]	
	Measurements	1	2	3	4	5	6
	Flowrate $Q <$						
Temperature	start [°C]						
	stop [°C]						
Relative humidity [%]							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ri}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.7 Flow disturbances (if applicable)⁴

OIML R 139-2, 2.2.7.7b [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Using actual test fluid				Type of fluid:		
	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]	
Fluid temperature		°C	°C	Q_{\max}	[unit/min]		
Measurements		1	2	3	4	5	6
Flowrate Q							
Type of disturbance							
Temperature	start [°C]						
	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity	reference						
[unit]	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]		For system ≤ 1.5					
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result					Pass	<input type="checkbox"/>	Fail <input type="checkbox"/>

⁴ At least not applicable to hydrogen systems

F 7.1 Preset function (if applicable)

OIML R 139-2, 3.5.3 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid				
			Type of fluid:				
		<input type="checkbox"/>	Simulating flow				
			using:				
	Date:		Start	Stop	$E_{min} =$ [unit]		
	Time:				Specimen:		
	Ambient temperature		°C	°C	Q_{min} [unit/min]		
	Fluid temperature		°C	°C	Q_{max} [unit/min]		
	Measurements		1	2	3	4	5
Flowrate Q							
Type of disturbance							
Temperature	start [°C]						
	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	preset						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
E_{min} [unit]							
Error $\leq E_{min}$	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Error $> E_{min}$	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>		

F.8 Initial test

OIML R 139-2, 3.7 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid				
			Type of fluid:				
		<input type="checkbox"/>	Simulating flow				
			using:				
	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]	
	Fluid temperature		°C	°C	Q_{\max}	[unit/min]	
	Measurements	1	2	3	4	5	6
Flowrate Q							
Temperature	start [°C]						
	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity	reference						
[unit]	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ri}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Observations							
Result				Pass	<input type="checkbox"/>	Fail	
					<input type="checkbox"/>		

F.8.1 Static temperature tests**Reference temperature**

OIML R 139-2, 3.8.2 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid				
			Type of fluid:				
		<input type="checkbox"/>	Simulating flow				
			using:				
	Date:		Start	Stop			
	Time:					Specimen:	
	Ambient temperature	°C	°C	Q_{min}		[unit/min]	
	Fluid temperature	°C	°C	Q_{max}		[unit/min]	
	Nom. 20 °C = Reference:	Flowrate #	1	2	3	4	5
Environment	Flowrate Q =						
temperature	start [°C]						
	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ji}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
Functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T_{ah} =	Flowrate #	1	2	3	4	5	6
High limit	Flowrate Q						
Environment	start [°C]						
temperature	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ji}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
Functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

Static temperature (continued)

OIML R 139-2, 3.8.2 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid				
			Type of fluid:				
		<input type="checkbox"/>	Simulating flow using:				
	Date:		Start	Stop			
Time:					Specimen:		
Ambient temperature		°C	°C	Q_{min}		[unit/min]	
Fluid temperature		°C	°C	Q_{max}		[unit/min]	
$T_{al} =$	Flowrate #	1	2	3	4	5	6
= Low limit	Flowrate Q						
Environment temperature	start [°C]						
	stop [°C]						
Relative humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]	For meter ≤ 1 For system ≤ 1.5						
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nom. 20 °C	Flowrate #	1	2	3	4	5	6
= Reference:	Flowrate $Q =$						
Environment temperature	start [°C]						
	stop [°C]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]	For meter ≤ 1 For system ≤ 1.5						
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.9 Vibration (random)

OIML R 139-2, 3.8.3 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions					Observer's name:			
	Flow	<input type="checkbox"/>	Using actual test fluid						
			Type of fluid:						
	Flow	<input type="checkbox"/>	Simulating flow using:						
	Date:			Start	Stop				
	Time:						Specimen:		
	Ambient temperature			°C	°C		Q_{\min}	[unit/min]	
	Fluid temperature			°C	°C		Q_{\max}	[unit/min]	
	Relative humidity			%	%				
Vector		Before test	During test	After test	During test	After test	During test	After test	
X-axis	Flowrate		0			0		0	
Time	start								
	stop								
Quantity [unit]	reference								
	indicated								
Error [unit]									
relative error [%] E_{ii}			E_i		E_i		E_i		
MPE [%]		For meter ≤ 1 For system ≤ 1.5							
functional performance									
	Pass	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
	Fail	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Y-axis	Flowrate		0			0		0	
Time	start								
	stop								
Quantity [unit]	reference								
	indicated								
Error [unit]									
relative error [%] E_{ii}			E_i		E_i		E_i		
MPE [%]		For meter ≤ 1 For system ≤ 1.5							
functional performance									
	Pass	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
	Fail	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Z-axis	Flowrate		0			0		0	
Time	start								
	stop								
Quantity [unit]	reference								
	indicated								
Error [unit]									
relative error [%] E_{ii}			E_i		E_i		E_i		
MPE [%]		For meter ≤ 1 For system ≤ 1.5							
functional performance									
	Pass	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
	Fail	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Observations									
Result					Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

F.10 AC/DC mains voltage variations

OIML R 139-2, 3.8.4 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid				
			Type of fluid:				
		<input type="checkbox"/>	Simulating flow				
			using:				
	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]	
	Fluid temperature		°C	°C	Q_{\max}	[unit/min]	
	Relative humidity		%	%			
Reference:	Voltage	Nominal	High	Nominal	Low	Nominal	
	Flowrate $Q =$						
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
Error [unit]							
relative error [%]							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.11 Low voltage of internal battery

OIML R 139-2, 3.8.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:		
	Flow	<input type="checkbox"/>	Using actual test fluid		Nominal battery voltage:		
		<input type="checkbox"/>	Type of fluid:				
		<input type="checkbox"/>	Simulating flow				
			using:				
	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		°C	°C	Q_{\min}	[unit/min]	
	Fluid temperature		°C	°C	Q_{\max}	[unit/min]	
	Relative humidity		%	%			
Reference:	Voltage	Nominal	U_{bmin}	$0.9 U_{\text{bmin}}$	Nominal	U_{bmin}	$0.9 U_{\text{bmin}}$
	Flowrate $Q =$						
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
Error [unit]							
relative error [%]							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
functional performance							
	Pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.12 Damp heat, cyclic (condensing)

OIML R 139-2, 3.9.4.1 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid			
			Type of fluid:			Reference 25 °C
		<input type="checkbox"/>	Simulating flow using:			$T_{ah} =$ °C $T_{al} =$ °C
			Start	Stop	Specimen:	
	Date:				Q_{min}	[unit/min]
	Time:				Q_{max}	[unit/min]
	First cycle	Cycle phase	initial	rise to T_{ah}	stabilize	
	Flowrate $Q =$					
	Test temperature	start [°C]				
	stop [°C]					
Relative humidity	start [%]					
	stop [%]					
Fluid temperature	start [°C]					
	stop [°C]					
Time	Start	h	$t_b =$ h	h		
	Stop (t_s)	h	$= t_b$ h	h		
	Required: $t_s =$		$t_b + 3$ h	$t_b + 12$ h		
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
	Pass	<input type="checkbox"/>				
	Fail	<input type="checkbox"/>				
	Cycle phase	Lowering to T_{al}	stabilize	after		
Flowrate $Q =$						
Test temperature	start [°C]					
	stop [°C]					
Relative humidity	start [%]					
	stop [%]					
Fluid temperature	start [°C]					
	stop [°C]					
Time	Start	h	h	h		
	Stop (t_s)	h	h	h		
	Required: $t_s =$	$t_b + (15 \div 18)$ h	$t_b + 24$ h			
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
Fault limit [%]		0.15 or $0.1 * R_{MPE}$ or E_{min} (whichever is the largest)				
Acts on fault	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Significant fault	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Observations						
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

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OIML R 139-2, 3.9.4.1 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid			
		<input type="checkbox"/>	Type of fluid:			Reference 25 °C
			Simulating flow			$T_{ah} =$ °C
			using:			$T_{al} =$ °C
			Start	Stop		Specimen:
	Date:				Q_{min} [unit/min]	
	Time:				Q_{max} [unit/min]	
Second cycle	Cycle phase	initial	rise to T_{ah}		Stabilize	
	Flowrate $Q =$					
Test temperature	start [°C]					
	stop [°C]					
Relative humidity	start [%]					
	stop [%]					
Fluid temperature	start [°C]					
	stop [°C]					
Time	Start	h	$t_b =$ h	h		
	Stop (t_s)	h	$= t_b$ h	h		
	Required: $t_s =$		$t_b + 3$ h	$t_b + 12$ h		
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
	Pass	<input type="checkbox"/>				
	Fail	<input type="checkbox"/>				
	Cycle phase	Lowering to T_{al}	stabilize		after	
	Flowrate $Q =$					
Test temperature	start [°C]					
	stop [°C]					
Relative humidity	start [%]					
	stop [%]					
Fluid temperature	start [°C]					
	stop [°C]					
Time	Start	h	h	h		
	Stop (t_s)	h	h	h		
	Required: $t_s =$	$t_b + (15 \div 18)$ h	$t_b + 24$ h			
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
Fault limit [%]		0.15 or $0.1 * R_{MPE}$ or E_{min} (whichever is the largest)				
Acts on fault	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Significant fault	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Observations						
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

F.13 Immunity to radio frequency EM fields

OIML R 139-2, 3.9.4.2 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions RF field exposure				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid		$f_i =$ MHz	
		<input type="checkbox"/>	Type of fluid:		$f_h =$ MHz	
			Simulating flow using:		Field strength V/m	
	Date:		Start	Stop	Modulation % AM	
	Time:				Dwell time s	
	Ambient temperature		°C	°C	Specimen:	
	Fluid temperature		°C	°C	Q_{min} [unit/min]	
	Relative humidity		%	%	Q_{max} [unit/min]	
	Frequency cycle	Cycle phase	Initial	During exposure		After
	Flowrate $Q =$					
Time	Start					
	Stop					
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
	Pass	<input type="checkbox"/>			<input type="checkbox"/>	
	Fail	<input type="checkbox"/>			<input type="checkbox"/>	
Observed faults during exposure						
Fault limit [%]		0.15 or $0.1 * R_{MPE, or} E_{min}$ (whichever is the largest)				
Frequency		Fault/Deviation	Significant		Acts on fault	
MHz			Yes	No	Yes	No
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations						
Result			Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.14 Immunity to electrostatic discharges

OIML R 139-2, 3.9.4.3 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:			
	Flow	<input type="checkbox"/>	Using actual test fluid			contact 6 kV		
		<input type="checkbox"/>	Type of fluid:			air 8 kV		
		<input type="checkbox"/>	Simulating flow using:			# discharges		
			Note:			at least 10		
	Date:		Start		Stop	Specimen:		
	Time:					Q_{\min}	[unit/min]	
	Ambient temperature		°C		°C	Q_{\max}	[unit/min]	
	Fluid temperature		°C		°C			
	Relative humidity		%		%			
	Cycle phase	Initial		During exposure		After		
	Flowrate $Q =$							
Time	Start							
	Stop							
Quantity [unit]	reference							
	indicated							
2 nd indication (if applicable)								
3 rd indication (if applicable)								
Error [unit]								
relative error [%] E_{ii}								
MPE [%]				For meter ≤ 1 For system ≤ 1.5				
Pass		<input type="checkbox"/>				<input type="checkbox"/>		
Fail		<input type="checkbox"/>				<input type="checkbox"/>		
Observed faults during exposure								
Fault limit [%]		$0.15 \text{ or } 0.1 * R_{MPE} \text{ or } E_{\min}$ (whichever is the largest)						
Exposed surface	Discharge type			Fault/ Deviation	Significant		Acts on fault	
	Air	Contact	Level		Yes	No	Yes	No
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			

OIML R 139-2, 3.9.4.4 [unit] □[g]; □[kg]; □[t]	Test conditions surges on mains power lines					Observer's name:			
	Flow	□	Using actual test fluid			Line to line 1 kV			
		□	Simulating flow using:			Line to earth 2 kV			
	Date:			Start	Stop	Specimen:			
	Time:					Q_{\min} [unit/min]			
	Ambient temperature			°C	°C	Q_{\max} [unit/min]			
	Fluid temperature			°C	°C				
	Relative humidity			%	%				
	Cycle phase		Initial		During exposure		After		
	Flowrate $Q =$								
Time	Start								
	Stop								
Quantity [unit]	reference								
	indicated								
2 nd indication (if applicable)									
3 rd indication (if applicable)									
Error [unit]									
relative error [%] E_{fi}									
MPE [%]					For meter ≤ 1 For system ≤ 1.5				
Pass			□				□		
Fail			□				□		
Observed faults after exposure									
Fault limit [%]				0.15 or $0.1 * R_{MPE}$ or E_{\min} (whichever is the largest)					
Phase angle				Fault/Deviation		Significant		Acts on fault	
0°	90°	180°	270°			Yes	No	Yes	No
Line to line									
3x ↑ ■						□	□	□	□
	3x ↑ ■					□	□	□	□
		3x ↑ ■				□	□	□	□
			3x ↑ ■			□	□	□	□
3x ↓ ■						□	□	□	□
	3x ↓ ■					□	□	□	□
		3x ↓ ■				□	□	□	□
			3x ↓ ■			□	□	□	□
Line to earth									
3x ↑ ■						□	□	□	□
	3x ↑ ■					□	□	□	□
		3x ↑ ■				□	□	□	□
			3x ↑ ■			□	□	□	□
3x ↓ ■						□	□	□	□
	3x ↓ ■					□	□	□	□
		3x ↓ ■				□	□	□	□
			3x ↓ ■			□	□	□	□
Observations									
Result					Pass	□	Fail	□	

OIML R 139-2, 3.9.4.4 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions Surges on signal, data and control lines				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid			Line to line 1 kV
		<input type="checkbox"/>	Type of fluid:			Line to earth 2 kV
			Simulating flow using:			
	Cable:					<input type="checkbox"/> Balanced line
	Date:		Start	Stop	<input type="checkbox"/> Unbalanced line	
	Time:					
	Ambient temperature		°C	°C	Specimen:	
	Fluid temperature		°C	°C	Q_{min}	[unit/min]
	Relative humidity		%	%	Q_{max}	[unit/min]
	Cycle phase	Initial	During exposure		After	
	Flowrate $Q =$					
Time	Start					
	Stop					
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
	Pass	<input type="checkbox"/>			<input type="checkbox"/>	
	Fail	<input type="checkbox"/>			<input type="checkbox"/>	
Observed faults after exposure						
Fault limit [%]		0.15 or 0.1 * R_{MPE} or E_{min} (whichever is the largest)				
Line to line (N/A for balanced)		Fault/Deviation		Significant		Acts on fault
$\uparrow \blacksquare$	$\downarrow \blacksquare$			Yes	No	Yes No
3x				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
	3x			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Line to earth						
3x				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
	3x			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Observations						
Result		Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

F.16 AC mains voltage dips and short interruptions

OIML R 139-2, 3.9.4.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions					Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid			Repetition: 10 times	
		<input type="checkbox"/>	Type of fluid:				
			Simulating flow using:				
	Date:			Start	Stop	Specimen:	
	Time:					Q_{\min}	[unit/min]
	Ambient temperature			°C	°C	Q_{\max}	[unit/min]
	Fluid temperature			°C	°C		
	Relative humidity			%	%		
	Frequency cycle	Cycle phase	Initial		During exposure		After
Flowrate $Q =$							
Time	Start						
	Stop						
Quantity [unit]	reference						
	indicated						
2 nd indication (if applicable)							
3 rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]	For meter ≤ 1 For system ≤ 1.5						
	Pass	<input type="checkbox"/>				<input type="checkbox"/>	
	Fail	<input type="checkbox"/>				<input type="checkbox"/>	
Observed faults during exposure							
Fault limit [%]		$0.15 \text{ or } 0.1 * R_{MPE} \text{ or } E_{\min}$ (whichever is the largest)					
Reduction to [% U_{nom}]	Duration [cycles]	Fault/Deviation		Significant		Acts on fault	
				Yes	No	Yes	No
0	0.5			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	10 / 12			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70	25 / 30			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80	250 / 300			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations							
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.17 DC mains voltage dips, short interruptions and voltage variations

OIML R 139-2, 3.9.4.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid		Repetition: times	
		<input type="checkbox"/>	Type of fluid:		Note: at least 3 times	
	Date:			Start	Stop	Specimen:
	Time:					Q_{min} [unit/min]
	Ambient temperature			°C	°C	Q_{max} [unit/min]
	Fluid temperature			°C	°C	
	Relative humidity			%	%	
Frequency cycle	Cycle phase	Initial		During exposure		After
	Flowrate $Q =$					
Time	Start					
	Stop					
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ii}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
Pass		<input type="checkbox"/>				<input type="checkbox"/>
Fail		<input type="checkbox"/>				<input type="checkbox"/>
Observed faults during exposure						
Fault limit [%]		0.15 or $0.1 * R_{MPE, OF} E_{min}$ (whichever is the largest)				
Reduction to [% U_{nom}]	Duration [s]	Fault/Deviation	Significant		Acts on fault	
			Yes	No	Yes	No
0 (high imp)	0.01		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 (low imp)	0.01		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	0.1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70	0.1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
85	10		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
120	10		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations						
Result			Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>

F.18 Bursts on AC and DC mains and signal lines

OIML R 139-2, 3.9.4.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:			
	Flow	<input type="checkbox"/>	Using actual test fluid					
		<input type="checkbox"/>	Type of fluid:					
		<input type="checkbox"/>	Simulating flow using:			Line index	Level [kV]	
	Cable:				mains	1	2	
	Date:		Start	Stop	signal	0.5	1	
	Time:				Repetition:	5 kHz		
	Ambient temperature		°C	°C	Specimen:			
	Fluid temperature		°C	°C	Q_{min}	[unit/min]		
	Relative humidity		%	%	Q_{max}	[unit/min]		
	Cycle phase	Initial		During exposure		After		
	Flowrate $Q =$							
Time	Start							
	Stop							
Quantity [unit]	reference							
	indicated							
2 nd indication (if applicable)								
3 rd indication (if applicable)								
Error [unit]								
relative error [%] E_{ji}								
MPE [%]		For meter ≤ 1 For system ≤ 1.5						
Pass		<input type="checkbox"/>				<input type="checkbox"/>		
Fail		<input type="checkbox"/>				<input type="checkbox"/>		
Observed faults during exposure								
Fault limit [%]		± 1.5 or $0.1 * R_{MPE}$ or E_{min} (whichever is the largest)						
		Fault/Deviation		Significant		Acts on fault		
Line	Pol.			Yes	No	Yes	No	
phase	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
neutral	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Protective earth	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Port 1 ^(*)	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Port 2 ^(*)	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Port 3 ^(*)	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Port 4 ^(*)	\uparrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	\downarrow <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(*) Description of the ports: Port 1: Port 2: Port 3: Port 4:		Observations						
Result				Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	

F.19 Ripple on DC mains power

OIML R 139-2, 3.9.4.5 [unit] <input type="checkbox"/> [g]; <input type="checkbox"/> [kg]; <input type="checkbox"/> [t]	Test conditions				Observer's name:	
	Flow	<input type="checkbox"/>	Using actual test fluid		DC voltage V	
		<input type="checkbox"/>	Type of fluid:		Ripple 2 % (peak peak)	
			Simulating flow using:			
	Date:		Start	Stop	Specimen:	
	Time:				Q_{min} [unit/min]	
	Ambient temperature		°C	°C	Q_{max} [unit/min]	
	Fluid temperature		°C	°C		
Relative humidity		%	%			
Frequency cycle	Cycle phase	Initial	During exposure	After		
	Flowrate $Q =$					
Time	Start					
	Stop					
Quantity [unit]	reference					
	indicated					
2 nd indication (if applicable)						
3 rd indication (if applicable)						
Error [unit]						
relative error [%] E_{ri}						
MPE [%]		For meter ≤ 1 For system ≤ 1.5				
Pass		<input type="checkbox"/>		<input type="checkbox"/>		
Fail		<input type="checkbox"/>		<input type="checkbox"/>		
Observed faults during exposure						
Fault limit [%]		0.15 or $0.1 * R_{MPE}$ or E_{min} (whichever is the largest)				
Test	Duration	Fault/Deviation	Significant		Acts on fault	
			Yes	No	Yes	No
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observations						
Result			Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>