Australian Government
Department of Industry, Science and Resources

National Measurement Institute

NMI R 139-3 Compressed gaseous fuel measuring systems for vehicles

Part 3: Test report format

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Amendments

No.	Clause(s)	Change	Details	Date
1	NA	NA	NA	NA

1. Scope

NMI R 139-3 specifies the test reports format for the pattern approval of compressed gaseous fuel measuring systems for vehicles for use for trade.

2. Contents

NMI R 139-3:2023 is considered **identical** to OIML R 139-3:2018, *Compressed gaseous fuel measuring systems for vehicles. Part 3: Test report format* published by the International Organisation of Legal Metrology (OIML).

OIML Recommendations are published in three parts and the first and second parts have been adopted as the identical national standards NMI R 139-1 *Compressed gaseous fuel measuring systems for vehicles. Part 1: Metrological and technical requirements* and NMI R 139-2 *Compressed gaseous fuel measuring systems for vehicles. Part 2: Metrological controls and performance tests* respectively.

3. Variations and Interpretations

Minor variations and interpretations have been made to the 2018 version of OIML R 139-3 such that deletions are indicated with a '~~red strikethrough~~' and additions are indicated in 'blue text'. These variations and interpretations are also reproduced in full below:

Clause	Details
General	All references in this document to 'this Recommendation' shall be taken to refer to NMI R 139-3.
General	All references in this document to the 'national authorities' shall be taken to refer to the Chief Metrologist.
General	In Australia, 'type' approval (or examination) is referred to as 'pattern' approval (or examination). The two terms refer to the same concept. All relevant instances of 'type' have been changed to 'pattern' through the document, however this has not been marked as a change.
General	The requirements for the acceptance of test results for pattern approval are specified in NMI P 106 *Procedures for the Approval and Certification of Patterns of Measuring Instruments*.

INTERNATIONAL RECOMMENDATION

OIML R 139-3

Edition 2018 (E)

Compressed gaseous fuel measuring systems for vehicles

Part 3: Test report format

Ensembles de mesurage de gaz compressé pour véhicules

Partie 3 : Format du rapport d'essais

OIML R 139-3 Edition 2018 (E)

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

Cover page

OIML R 139-3

Compressed gaseous fuel measuring systems for vehicles
Part 3: Test report format

Contents

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 2018 (E) – was developed by the Project Group p7 of Technical Subcommittee TC 8/SC 7 *Gas metering*. It was approved for final publication by the International Committee of Legal Metrology in 2018 and will be submitted to the International Conference on Legal Metrology in 2020 for formal sanction. It supersedes the previous edition of R 139 dated 2014.

OIML Publications may be downloaded from the OIML website in the form of PDF files. Additional information on OIML Publications may be obtained from the Organization’s headquarters:

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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 Certification System*.

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 139-2:2018, 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 Certification System* (OIML-CS) applicable to compressed gaseous fuel measuring systems for vehicles in conformity with R 139:2018, 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 139:2018 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**
		☐				
		☐				

If a prescribed test is not relevant for the pattern 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 pattern).

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

Contents of the evaluation report

A References of the authority responsible for this report

Name	
Address	
Report number	
Application number	
Period of execution of the tests	
Date of issuing this report	
Name and signature of the person responsible for the report and stamp(s) (if applicable)	

B Synopsis of the results of the evaluation

(To be completed by the Issuing Authority)

The evaluated specimen (or specimens) fulfils all the applicable and required criteria stated in OIML R 139-1:2018 ☐ Yes ☐ No
Observations:

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 pattern 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
3.5.4	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)		☐ Yes ☐ No
It is verified that no application for OIML pattern evaluation for the same pattern has been made to any other OIML Issuing Authority (see OIML-CS procedure PD-05, 4.1.2.b)		☐ Yes ☐ 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 &-2:201 (see OIML-CS procedure PD-05, 4.3.1)		
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 pattern 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 Low vibrations [M1]					
		Generic (includes industrial) [M2]					
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	:pattern	: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 pattern

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 pattern 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: ☐				
		other legal units conforming OIML D 2:2007: ☐				
5.1.2	**Scale interval**					
5.1.2.1	- agrees 1×10^n, 2×10^n or 5×10^n, (n = 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**							Applied units:
5.3.1.1	Q_{min} specified limited							Q_{min} ; Q_{max} in kg/min
5.3.1.2	Q_{max} specified limited							*MMQ;* E_{min} in kg
	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:							
5.2.1	Accuracy class	1.5 ☐	2 ☐ [1]	4 ☐ [1]				
5.2.3	R_{MPE}							
5.2.3	$E_{min} = 2 \times MMQ \times R_{MPE}$							
5.3.1.4	Applied ratio(s): Q_{max}/Q_{min}			$Q_{max}/Q_{min} \geq 10$?				
5.3.2	$Q_{max} \leq 4$ ☐	MMQ =		MMQ ≤ 0.5 ?				
	$4 < Q_{max} \leq 12$ ☐	MMQ =		MMQ ≤ 1 ?				
	$12 < Q_{max} \leq 30$ ☐	MMQ =		MMQ ≤ 2 ?				
	$30 < Q_{max} \leq 70$ ☐	MMQ =		MMQ ≤ 5 ?				
	$Q_{max} > 70$ ☐	MMQ =		MMQ ≤ 10 ?				
	Hydrogen ☐	MMQ = 1						
	MMQ agrees 1×10^n, 2×10^n or 5×10^n, (n = integer)							
5.6.1	$E_{min} < 0.1 * R_{MPE}$ % ☐	Fault limit =		0.1 $*R_{MPE}$ %				
	$E_{min} \geq 0.1 * R_{MPE}$ % ☐	Fault limit = E_{min} =		%				

[1] Applicable to hydrogen only

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 ☐				
		conversion factor displayed on front face				
		energy ☐				
		conversion factor displayed on front face				
		other ☐				Which quantity:
		conversion factor displayed on front face				
	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 ☐				
		through peripheral equipment allowing at least 5 s to elapse between indicating the new unit price and the start of the measurement ☐				
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 ☐					
		External ☐					
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 ☐					
		Price and unit price ☐					
6.2.8.6, c		Name/symbol of units to the right of the value ☐					
		Name/symbol of units above column ☐					
6.2.8.6, d	A print failure results in	a warning ☐					
		inhibiting the measurement ☐					
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 ☐				
		External ☐				
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 ☐				
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 ☐				
		returns progressively to zero ☐				
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 ☐				
6.6.8		Emergency flow stop incorporated ☐				
6.6.9		Price presetting device available ☐				

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 ☐					
		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 ☐					
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 ☐					
		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 ☐					
	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	☐ N / ☐ I / ☐ P					
	Function check	a) by disconnecting the transducer, or	☐				
		b) by interrupting one of the sensor's pulse generators, or	☐				
		c) by interrupting the electrical supply of the transducer	☐				
6.10.2.3	Time-out after 120 s						
6.10.3	**Checking facilities for the calculator**						
	Type	☐ N / ☐ I / ☐ 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	☐ N / ☐ I / ☐ P					
6.10.4	**Checking facilities for the indicating device**						
	Type	☐ N / ☐ I / ☐ 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 6.10.4.5	Function check	Automatic verification of the complete indicating device	☐				
6.10.4.6		Or both: - 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	☐ N / ☐ I / ☐ P					
6.10.6	**Checking facilities for the associated measuring instruments**						
	Type	☐ N / ☐ I / ☐ 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: • 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 ☐				
		b) an indicating device for the benefit of the supplier together with a display for the benefit of the customer ☐				
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 ☐				
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) ☐					
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 ☐					
6.12.3.3.1	Fulfils 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	Not designed for measuring hydrogen though and such that delivered mass is always within ½ E_{min}				
	Designed for measuring hydrogen without correction for depressurization and such that the residual mass measured though not delivered is within $^1/_3$ 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				
6.14.6	Isolation of flowmeter from becoming influenced by compressor vibrations				
6.14.7 6.14.8	Information documented on prevention measures of correlation of Coriolis meter frequency and compressor vibration				

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 ☐					
	Electronic seals ☐ (if so, 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					
	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					
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	Inter-changeable ☐	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 inter-changeable ☐	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 ☐					
	Permanently attached on a support of the measuring system ☐					
	Combined with identification plate ☐					

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 pattern 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) pattern 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? ☐Yes ☐No					

OIML R 139-2 Subclause	Description	Yes	No	Not applicable	Observer's name: Date(s): Specimen: Observations:

3.2	**E.23 Documentation for pattern 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: a description of all legally relevant parameters and their corresponding ranges if applicable and in case of correction devices the information on 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 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 detect 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 ☐ Yes ☐ No				
3.2.5	Additional documentation				
	Specify if applicable				

F Performance tests

F.1 Variable flowrate

OIML R 139-2, 2.2.7.1 **[unit]** ☐[g]; ☐[kg]; ☐[t]	Test conditions			Observer's name:		
	Test fluid (gas, air, water, ..)					
		start	stop	Date(s):		
	Time:			Specimen:		
	Ambient temperature	ºC	ºC	Q_{min} [unit/min]		
	Fluid temperature	ºC	ºC	Q_{max} [unit/min]		
Test 0	**Fill** (*t*)	**I**		Repeatability		
	Phase (*p*)	**1**	**2**	**3**	**1**	**2**	**3**
Initial pressure	receiver						
	low bank P_{stl}						
Quantity [unit]	reference						
	indicated						
Error [unit]							
relative error [%] ($E_{1,p}$)	phase1 (E_{11})						
	phase2 (E_{12})						
	phase3 (E_{13})						
MPE [%]		For meter ≤ 1					
($E_{1,p}$)	Pass	☐	☐	☐			
	Fail	☐	☐	☐			
Test 0	**Fill**	**II**					
Initial pressure	Receiver						
	mid. bank P_{stm}						
Quantity [unit]	Reference						
	Indicated						
Error [unit]							
relative error [%] ($E_{2,p}$)	phase1 (E_{21})						
	phase2 (E_{22})						
	phase3 (E_{23})						
MPE [%]		For meter ≤ 1					
($E_{2,p}$)	Pass	☐	☐	☐			
	Fail	☐	☐	☐			
Test 0	**Fill**	**III**					
Initial pressure	Receiver						
	high bank P_{st}						
Quantity [unit]	Reference						
	Indicated						
Error [unit]							
relative error [%] ($E_{3,p}$)	phase1 (E_{31})						
	phase2 (E_{32})						
	phase3 (E_{33})						
MPE [%]		For meter ≤ 1					
($E_{3,p}$)	pass	☐	☐	☐			
	fail	☐	☐	☐			
Repeatability [%]							
Repeatability	MPE [%]				≤ $^2/_3$ MPE		
	pass				☐	☐	☐
	fail				☐	☐	☐

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* = test cycle #, *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	☐	Fail	☐

F.2 Tests on systems with sequential control (involving 3 banks)

OIML R 139-2, 2.2.7.2 **[unit]** ☐[g]; ☐[kg]; ☐[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				
	Indicated				(2 × MMQ [unit])
Error [unit]					Repeatability
relative error [%]					
MPE [%]		; For system ≤ 1.5			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

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				
	Indicated				(2 × MMQ [unit])
Error [unit]					Repeatability
relative error [%]					
MPE [%]		For meter ≤ 1; For system ≤ 1.5			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

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				
	Indicated				(1 × MMQ [unit])
Error [unit]					Repeatability
relative error [%]					
MPE [%]		; For system ≤ 1.5			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

Applied sequence of the test

Observations					
Result		Pass	☐	Fail	☐

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

OIML R 139-2, 2.2.7.3 **[unit]** ☐[g]; ☐[kg]; ☐[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 4 [3]	**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			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

Test 5 [3]	**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			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

Test 6 [4]	**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			≤ $^2/_3$ MPE
	Pass	☐	☐	☐	☐
	Fail	☐	☐	☐	☐

Applied sequence of the test

[3] for hydrogen only applicable to the system, not to the meter
[4] not applicable to hydrogen systems

Observations					
Result		Pass	☐	Fail	☐

F.4 Tests on minimum measured quantity on all systems (with and without sequential control)

OIML R 139-2, 2.2.7.3 **[unit]** ☐[g]; ☐[kg]; ☐[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			(1 × MMQ [unit])
	Indicated			
Error [unit]				Repeatability
relative error [%]				
MPE [%]		For system ≤ 1.5		≤ $^2/_3$ MPE
	Pass	☐	☐	☐
	Fail	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.5 Durability test

OIML R 139-2, 2.2.7.5 **[unit]** ☐[g]; ☐[kg]; ☐[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 / ☐ 4	**Fill**		**1**	**2**	**3**	Nominal pressure value
Initial pressure in kPa	receiver					0
	low bank P_l					☐ P_{st} / ☐ Not applicable
	mid. bank P_m					☐ P_{st} / ☐ 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.≤ 2/3
	Pass		☐	☐	☐	☐
	Fail		☐	☐	☐	☐
	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.≤ 2/3 ≤ 1
	Pass		☐	☐	☐	☐ ☐
	Fail		☐	☐	☐	☐ ☐
Observations						
Result				Pass	☐	Fail ☐

F.6 Gas influence factors

OIML R 139-2, 2.2.7.6	Test conditions			Observer's name:
	Test fluid (gas, air, water, ..)			
		Min	Max	Date(s):
	Fluid density specified			
	Fluid temperature specified	°C	°C	Specimen:
[unit] ☐[g]; ☐[kg]; ☐[t]	Ambient temperature	Start	Stop	Q_{min} [unit/min]
	Time:			
	Ambient temperature	°C	°C	Q_{max} [unit/min]
	Fluid density		±	
	Fluid temperature		°C ± °C	

Test # ☐ **1** / ☐ **4**	**Fill**	**1**	**2**	**3**	Nominal pressure value	
Initial pressure in kPa	receiver				0	
	low bank P_l				☐ P_{st} / ☐ Not applicable	
	mid. bank P_m				☐ P_{st} / ☐ 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.≤ 2/3	
	Pass	☐	☐	☐	☐	
	Fail	☐	☐	☐	☐	
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.≤ 2/3	≤ 1
	Pass	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.7 Zero stability test (if applicable)

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

Result		Pass	☐	Fail	☐

F.8 Flow disturbances (if applicable)[5]

OIML R 139-2, 2.2.7.7b **[unit]** ☐[g]; ☐[kg]; ☐[t]	Test conditions			Observer's name:	
	Using actual test fluid			Type of fluid:	
	Date:	Start	Stop		
	Time:			Specimen:	
	Ambient temperature	ºC	ºC	Q_{min}	[unit/min]
	Fluid temperature	ºC	ºC	Q_{max}	[unit/min]

Measurements		**1**	**2**	**3**	**4**	**5**	**6**
Flowrate Q							
Type of disturbance							
Temperature	start [ºC]						
	stop [ºC]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2nd indication (if applicable)							
3rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]		For system ≤ 1.5					
functional performance							
	Pass	☐	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

[5] At least not applicable to hydrogen systems

F 8.1 Preset function (if applicable)

OIML R 139-2, 3.5.3	Test conditions				Observer's name:	
	Flow	☐	Using actual test fluid			
			Type of fluid:			
		☐	Simulating flow using:			
[unit] ☐[g]; ☐[kg]; ☐[t]	Date:		Start	Stop	E_{min} =	[unit]
	Time:				Specimen:	
	Ambient temperature		ºC	ºC	Q_{min}	[unit/min]
	Fluid temperature		ºC	ºC	Q_{max}	[unit/min]

Measurements		**1**	**2**	**3**	**4**	**5**	**6**
Flowrate Q							
Type of disturbance							
Temperature	start [ºC]						
	stop [ºC]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	preset						
	indicated						
2nd indication (if applicable)							
3rd indication (if applicable)							
Error [unit]							
E_{min} [unit]							
Error ≤ E_{min}	Pass	☐	☐	☐	☐	☐	☐
Error > E_{min}	Fail	☐	☐	☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.9 Initial test

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

F.9.1 Static temperature tests

Reference temperature

OIML R 139-2, 3.8.2	Test conditions				Observer's name:		
	Flow	☐	Using actual test fluid				
			Type of fluid:				
		☐	Simulating flow				
			using:				
[unit] ☐[g]; ☐[kg]; ☐[t]	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		ºC	ºC	Q_{min}		[unit/min]
	Fluid temperature		ºC	ºC	Q_{max}		[unit/min]

Nom. **20 °C** = Reference:	Flowrate #	**1**	**2**	**3**	**4**	**5**	**6**
	Flowrate Q =						
Environment temperature	start [ºC]						
	stop [ºC]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2nd indication (if applicable)							
3rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
Functional performance							
	Pass	☐	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐	☐

T_{ah} = High limit	Flowrate #	**1**	**2**	**3**	**4**	**5**	**6**
	Flowrate Q						
Environment temperature	start [ºC]						
	stop [ºC]						
Relative Humidity [%]							
Initial pressure							
Time	start						
	stop						
Quantity [unit]	reference						
	indicated						
2nd indication (if applicable)							
3rd indication (if applicable)							
Error [unit]							
relative error [%] E_{ii}							
MPE [%]		For meter ≤ 1 For system ≤ 1.5					
Functional performance							
	Pass	☐	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

Static temperature (continued)

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

F.10 Vibration (random)[6)]

OIML R 139-2, 3.8.3	Test conditions					Observer's name:		
	Flow	☐	Using actual test fluid					
			Type of fluid:					
		☐	Simulating flow					
			using:					
[unit] ☐[g]; ☐[kg]; ☐[t]	Date:			Start	Stop			
	Time:					Specimen:		
	Ambient temperature			ºC	ºC	Q_{min}		[unit/min]
	Fluid temperature			ºC	ºC	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	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
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	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
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	☐		☐		☐		☐
	Fail	☐		☐		☐		☐

Observations					
Result		Pass	☐	Fail	☐

[6] Test may be omitted when the instrument is marked class M1

F.11 AC/DC mains voltage variations

OIML R 139-2, 3.8.4	Test conditions				Observer's name:		
	Flow	☐	Using actual test fluid				
			Type of fluid:				
		☐	Simulating flow				
			using:				
[unit] ☐[g]; ☐[kg]; ☐[t]	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		ºC	ºC	Q_{min}		[unit/min]
	Fluid temperature		ºC	ºC	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	☐	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.12 Low voltage of internal battery

OIML R 139-2, 3.8.5	Test conditions				Observer's name:		
	Flow	☐	Using actual test fluid				
			Type of fluid:		Nominal battery voltage:		
		☐	Simulating flow using:				
[unit] ☐[g]; ☐[kg]; ☐[t]	Date:		Start	Stop			
	Time:				Specimen:		
	Ambient temperature		ºC	ºC	Q_{min} [unit/min]		
	Fluid temperature		ºC	ºC	Q_{max} [unit/min]		
	Relative humidity		%	%			
Reference:	Voltage	Nominal	U_{bmin}	0.9 U_{bmin}	Nominal	U_{bmin}	0.9 U_{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	☐	☐	☐	☐	☐	☐
	Fail	☐	☐	☐	☐	☐	☐
Observations							
Result					Pass	☐	Fail ☐

F.13 Damp heat, cyclic (condensing)

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

OIML R 139-2, 3.9.4.1 **[unit]** ☐[g]; ☐[kg]; ☐[t]	Test conditions				Observer's name:	
	Flow	☐	Using actual test fluid			
			Type of fluid:		Reference	25 ºC
		☐	Simulating flow		T_{ah} =	ºC
			using:		T_{al} =	ºC
			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 [ºC]			
	stop [ºC]			
Relative humidity	start [%]			
	stop [%]			
Fluid temperature	start [ºC]			
	stop [ºC]			
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			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		
	Fail	☐		

	Cycle phase	**Lowering to T_{al}**	**stabilize**	**after**
	Flowrate Q =			
Test temperature	start [ºC]			
	stop [ºC]			
Relative humidity	start [%]			
	stop [%]			
Fluid temperature	start [ºC]			
	stop [ºC]			
Time	Start	h	h	h
	Stop (t_s)	h	h	h
	Required: t_s =	t_b + (15 ÷18 h)	t_b + 24 h	
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		

Fault limit [%]	0.1 * R_{MPE} or E_{min} (whichever is the largest)					
Acts on fault	Yes	☐	No	☐		
Significant fault	Yes	☐	No	☐		

Observations

Result		Pass	☐	Fail	☐

F.14 Immunity to radio frequency EM fields

OIML R 139-2, 3.9.4.2	Test conditions RF field exposure					Observer's name:	
	Flow	☐	Using actual test fluid				
			Type of fluid:			f_l =	MHz
		☐	Simulating flow			f_h =	MHz
			using:			Field strength	V/m
						Modulation	% AM
	Date:			Start	Stop	Dwell time	s
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:					Specimen:	
	Ambient temperature			ºC	ºC		
	Fluid temperature			ºC	ºC	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			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} or E_{min} (whichever is the largest)				
Frequency		Fault/Deviation	Significant		Acts on fault	
MHz			Yes	No	Yes	No
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

OIML R 139-2, 3.9.4.2	Test conditions RF current injection					Observer's name:	
	Flow	☐	Using actual test fluid				
			Type of fluid:			f_l =	MHz
		☐	Simulating flow			f_h =	MHz
			using:			RF voltage	$V_{e.m.f.}$
	Cable exposed					Modulation	% AM
	Date:			Start	Stop	Dwell time	s
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:					Specimen:	
	Ambient temperature			ºC	ºC		
	Fluid temperature			ºC	ºC	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			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} or E_{min} (whichever is the largest)				
Frequency		Fault/Deviation	Significant		Acts on fault	
MHz			Yes	No	Yes	No
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.15 Immunity to electrostatic discharges

OIML R 139-2, 3.9.4.3	Test conditions				Observer's name:
	Flow	☐	Using actual test fluid		
			Type of fluid:		contact 6 kV
		☐	Simulating flow		air 8 kV
			using:		# discharges
			Note:		at least 10
	Date:		Start	Stop	Specimen:
[unit]	Time:				Q_{min} [unit/min]
☐[g];	Ambient temperature		ºC	ºC	Q_{max} [unit/min]
☐[kg];	Fluid temperature		ºC	ºC	
☐[t]	Relative humidity		%	%	

	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]			0.1 * R_{MPE} or E_{min} (whichever is the largest)					
Exposed surface	Discharge type			Fault/ Deviation	Significant		Acts on fault	
	Air	Contact	Level		Yes	No	Yes	No
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐
	☐	☐	☐		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.16 Immunity to surges

OIML R 139-2, 3.9.4.4	Test conditions surges on mains power lines						Observer's name:	
	Flow	☐	Using actual test fluid					
			Type of fluid:				Line to line	1 kV
		☐	Simulating flow				Line to earth	2 kV
			using:					
	Date:			Start		Stop	Specimen:	
[unit]	Time:						Q_{min}	[unit/min]
☐[g];	Ambient temperature			ºC		ºC	Q_{max}	[unit/min]
☐[kg];	Fluid temperature			ºC		ºC		
☐[t]	Relative humidity			%		%		

	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults after exposure								
Fault limit [%]				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	Test conditions Surges on signal, data and control lines				Observer's name:
	Flow ☐	Using actual test fluid			
		Type of fluid:			Line to line 1 kV
	Flow ☐	Simulating flow			Line to earth 2 kV
		using:			
	Cable:				☐ Balanced line
	Date:		Start	Stop	☐ Unbalanced line
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:				
	Ambient temperature		ºC	ºC	Specimen:
	Fluid temperature		ºC	ºC	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			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults after exposure

Fault limit [%]		0.1 * R_{MPE} or E_{min} (whichever is the largest)				
Line to line (N/A for balanced)		Fault/Deviation	Significant		Acts on fault	
↑■	↓■		Yes	No	Yes	No
3x			☐	☐	☐	☐
	3x		☐	☐	☐	☐
Line to earth						
3x			☐	☐	☐	☐
	3x		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.17 AC mains voltage dips and short interruptions

OIML R 139-2, 3.9.4.5	Test conditions					Observer's name:
	Flow	☐	Using actual test fluid			
			Type of fluid:			Repetition: 10 times
		☐	Simulating flow using:			
	Date:			Start	Stop	Specimen:
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:					Q_{min} [unit/min]
	Ambient temperature			ºC	ºC	Q_{max} [unit/min]
	Fluid temperature			ºC	ºC	
	Relative humidity			%	%	

Frequency cycle	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} 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		☐	☐	☐	☐
0	1		☐	☐	☐	☐
40	10 / 12		☐	☐	☐	☐
70	25 / 30		☐	☐	☐	☐
80	250 / 300		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.18 DC mains voltage dips, short interruptions and voltage variations

OIML R 139-2, 3.9.4.5	Test conditions				Observer's name:
	Flow ☐	Using actual test fluid			
		Type of fluid:			Repetition: times
	Flow ☐	Simulating flow			*Note:* at least 3 times
		using:			
	Date:		Start	Stop	Specimen:
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:				Q_{min} [unit/min]
	Ambient temperature		ºC	ºC	Q_{max} [unit/min]
	Fluid temperature		ºC	ºC	
	Relative humidity		%	%	

Frequency cycle	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} or 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		☐	☐	☐	☐
0 (low imp)	0.01		☐	☐	☐	☐
40	0.1		☐	☐	☐	☐
70	0.1		☐	☐	☐	☐
85	10		☐	☐	☐	☐
120	10		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.19 Bursts on AC and DC mains and signal lines

OIML R 139-2, 3.9.4.5	Test conditions				Observer's name:		
	Flow	☐	Using actual test fluid				
			Type of fluid:				
		☐	Simulating flow		Line	Level [kV]	
			using:		index	☐ (2)	☐ (3)
	Cable:				mains	1	2
	Date:		Start	Stop	signal	0.5	1
[unit]	Time:				Repetition:		5 kHz
☐[g];	Ambient temperature		ºC	ºC	Specimen:		
☐[kg];	Fluid temperature		ºC	ºC	Q_{min}		[unit/min]
☐[t]	Relative humidity		%	%	Q_{max}		[unit/min]

	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} or E_{min} (whichever is the largest)				
		Fault/Deviation	Significant		Acts on fault	
Line	Pol.		Yes	No	Yes	No
phase	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
neutral	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
Protective earth	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
Port 1(*)	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
Port 2(*)	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
Port 3(*)	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
Port 4(*)	↑☐		☐	☐	☐	☐
	↓☐		☐	☐	☐	☐
(*) Description of the ports: Port 1: Port 2: Port 3: Port 4:		Observations				
Result			Pass	☐	Fail	☐

F.20 Ripple on DC mains power

OIML R 139-2, 3.9.4.5	Test conditions					Observer's name:
	Flow	☐	Using actual test fluid			
			Type of fluid:			DC voltage V
		☐	Simulating flow			Ripple 2 % (peak peak)
			using:			
	Date:			Start	Stop	Specimen:
[unit] ☐[g]; ☐[kg]; ☐[t]	Time:					Q_{min} [unit/min]
	Ambient temperature			ºC	ºC	Q_{max} [unit/min]
	Fluid temperature			ºC	ºC	
	Relative humidity			%	%	

Frequency cycle	Cycle phase	**Initial**	**During exposure**	**After**
	Flowrate Q =			
Time	Start			
	Stop			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
3rd indication (if applicable)				
Error [unit]				
relative error [%] E_{ii}				
MPE [%]		For meter ≤ 1 For system ≤ 1.5		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.1 * R_{MPE} or E_{min} (whichever is the largest)				
Test	Duration	Fault/Deviation	Significant		Acts on fault	
			Yes	No	Yes	No
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐