Australian Government
Department of Industry, Science, Energy and Resources

National Measurement Institute

NMI R 80-3 Road and rail tankers with level gauging

Part 3: Report Format for type evaluation

May 2021

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1. Scope

NMI R 80-3 specifies the test report format for the pattern approval of road and rail tankers with level gauging.

2. Contents

NMI R 80-3:2021 is considered **identical** to OIML R 80-3:2017 *Road and rail tankers with level gauging. Part 3: Report Format for type evaluation* published by the International Organisation of Legal Metrology (OIML).

OIML's international recommendation is published in three parts and the first and second parts have been adopted as the **modified** national standards NMI R 80-1 *Road and rail tankers with level gauging. Part 1: Metrological and technical requirements* and NMI R 80-2 *Road and rail tankers with level gauging. Part 2: Metrological controls and tests* respectively.

3. Variations and Interpretations

Minor variations and interpretations have been made to the 2017 version of OIML R 80-3. These variations and interpretations are described below:

Clause	Details
General	All references in this document to 'this Recommendation' shall be taken to refer to NMI R 80-3.
General	In Australia 'type' approval (or examination) is referred to as 'pattern' approval (or examination. The two terms refer to the same concept. This has not been marked as a change throughout the document.
General	All references in this document to the 'issuing authority' or 'the evaluating authority' shall be taken to refer to the Chief Metrologist.
General	Date references have been changed throughout the document as relevant. This has not been marked as a change throughout the document.

INTERNATIONAL RECOMMENDATION

OIML R 80-3

Edition 2017 (E)

Road and rail tankers with level gauging

Part 3: Report Format for type evaluation

Camions et wagons citernes avec mesurage de niveau

Partie 3: Format de Rapport pour l'examen de type

OIML R 80-3 Edition 2017 (E)

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

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 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 80-3, edition 2017 – was developed by Project Group 6 in OIML TC 8/SC 1 *Static volume and mass measurement*. It was approved for final publication by the CIML in 2017 and will be submitted to the International Conference on Legal Metrology in 2020 for formal sanction.

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

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Road and rail tankers with level gauging
Part 3: Report Format for pattern evaluation

1 Introduction

This Report Format applies for static volume measuring systems being part of tankers for the transport of liquid products by road or rail and being used as transportable measuring tanks and equipped with level gauging systems. It presents a standardized format for the results of the various tests and examinations, described in Part 2 of this Recommendation, to which a pattern of road or rails tankers shall be submitted with a view to its approval based on International Recommendation OIML R 80 (201x).

It is recommended that all metrology services or laboratories evaluating and/or testing patterns of road and rail tankers with level gauging to OIML R 80 or to national or regional regulations based on OIML R 80 use this Report Format, directly or after translation into a language other than English or French. In case of a translation, it is highly recommended to leave the structure and the numbers of the clauses unchanged: in this case most of the contents is also understandable for those who cannot read the language of the translation.

It is also recommended that this Report Format in English or in French (or in both languages) be transmitted by the country performing the tests to the relevant authorities of another country, under bi- or multi-lateral cooperation agreements.

In the practical application of the Report Format, in addition to a cover page by the Issuing Authority, as a minimum clauses A–F (as necessary) shall be included.

2 Applicability of this Report Format

In the framework of the OIML Certificate System for Measuring Instruments, and the OIML Mutual Acceptance Arrangement (MAA) applicable to automatic level gauges in conformity with OIML R 80, the use of this Report Format is mandatory.

Implementation of this Report Format is informative with regard to the implementation of OIML R 80-1 and -2 in national regulations.

3 Guidance for the application of this Test Report Format

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

- *The name(s) or symbol(s) of the unit(s) used to express the test results shall be specified where applied.*
- *Where in a table one or several choices can be made, checkboxes are applied. In such case the columns it may be that Y, N, N/A are not applicable and thus presented crosshatched (see the example below)*

Clause	Description		Yes	No	Not applicable	Observations
		☐				

In case 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 tests related to AC mains supply in case of an instrument only powered by batteries, or partial testing after modification of a previously approved pattern).

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

The user is free to change the length of the cells (for instance “Observations”) as required in a specific case.

The clauses 1 to and including 4 of this Report Format are meant to be replaced by a cover page issued by the Issuing Authority.

4 Evaluation Report

The format for the Evaluation Report is given on the following pages.

Cover page by the Issuing Authority

Contents of the Evaluation Report

A References to the authority responsible for this report

Name	
Address	
Report number	
Application number	
Date/period of the execution of the tests	
Date of issuing this Report	
Name and signature of the person responsible for reporting and, if applicable stamp(s)	

B Synopsis of the results of the examinations and tests

(To be completed by the Issuing Authority)

The evaluated specimen (or specimens) fulfils all the applicable and required criteria stated in OIML R 80-1 (2009) ☐ Yes ☐ No
Observations:

C Summary of the results of the 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 80-1 (Sub-)clause	**General requirements**	Specimen(-s) comply with referred clause			details in
		Yes	No	N.A.	
3.1	Constituents and measuring methods				E.1
3.2	Construction of tanks				E.2
4	Units of Measurement				E.3
5.1.1	Rated operating conditions				E.4
5.1.2	Accuracy classification				E.5
5.1.5	Temperature dependency				E.6
5.1.6	Nominal capacity				E.7
5.1.7	Minimum measured quantity				E.8
5.2	Container of a measuring tank				E.9
5.3	Additional devices				E.10
5.4	Level gauging system				E.11
5.5	Tank capacity table				E.12
5.6	Indicating and ancillary devices				E.13
5.7	Susceptibility for influence quantities on electronics				E.14
5.7.1.2.4	Sustainability (Durability)				E.15
5.7.2	Power supply failure consequences				E.16
5.7.3	Checking facilities				E.17
6.1	Identification plate				E.18
6.2	Measuring system document (upon initial ver.)				E.19
6.3	Tank capacity plate				E.20
6.5	Seals				E.21

C.2 Performance tests

For details, of the test results refer to the corresponding records in clause F of this Report.

OIML R 80-2 Subclause	**Performance tests**	Specimen(-s) comply with referred clause			**Details in**
		Yes	**No**	**N.A.**	
4.2.2	Volume conversion and temperature measuring devices				F.1
4.2.2 and 4.2.6	Volume conversion software				F.2
4.2.3	Inclination sensor				F.3
4.2.4.1	Floats				F.4
4.2.5	Dipsticks for ultrasonic systems				F.5
5.4.1	Influence of dry heath				F.6.1
5.4.2	Influence of cold				F.6.2
5.4.3	Influence of damp heat, cyclic (condensing)				F.6.3
5.4.4	Influence of vibration (random)				F.6.4
5.4.5	Immunity to radiated radio frequency EM fields				F.7.1
5.4.6	Conducted common mode currents generated by radio frequency EM fields				F.7.2
5.4.7	Immunity to electrostatic discharges				F.7.3
5.4.8	Power frequency magnetic field				F.7.4
5.4.9	Burst (transients) on signal, data and control lines				F.7.5
5.4.10	Influence of mains power supply voltage variation				F.7.6
5.4.11	Surges on AC and DC mains power lines				F.7.7
5.4.12	AC mains voltage dips, short interruptions				F.7.8
5.4.13	Bursts (transients) on AC and DC mains and signal lines				F.7.9
5.4.14	Low voltage of internal battery				F.7.10
5.4.15.1	Influence of vehicle battery supply voltage variation				F.7.11
5.4.15.2	Electrical transients conduction along supply lines				F.7.12
5.4.15.3	Electrical transient conduction via lines other than supply lines				F.7.13

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 Procedural Document PD-05, 4.1.2.b)	☐ Yes ☐ No
Observations:	

D.3 Testing laboratories involved in the tests

(This table to be completed for each testing 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 above referred tests within the scope of OIML R 80-1:2009 and R 80-2:2017 (see OIML-CS Procedural Document 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 in case tests have not been performed on the premises of this laboratory but on a different location.		
Name of the responsible person		
Date of signature		
Stamp (if applicable) and signature of the responsible person		
Observations:		

D.4 General information concerning the pattern and the sample(s) submitted for the tests

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

OIML R 80-1 Subclause	Information presented on the instrument			Yes	No	Not applicable	Comments/ observations
6.1.2	Manufacturer's trade mark						
	Pattern/model designation/number						
	Presented or space for:	Approval marking					
		Year of manufacture					
		Serial number of tank					
		Base temperature					
		Serial number of level gauging system					
		Accuracy class if <> 0.5					**Acc. Class =**
		Range of inclination if <> 2 %					**Inclination range =**
6.1.3		Verification marks					
6.1.2	Presented or space on tank or of each compartment:						
Comp. nr	Nominal capacity		Minimum measured quantity				
			MMQ = L ; m^3				
			MMQ = L ; m^3				
			MMQ = L ; m^3				
6.2.1	Draft measuring system document available						
5.1.1	Ambient temperature range		Ambient high (T_{ah}) = °C				
			Ambient low (T_{al}) = °C				
	Environmental classification		Exclusively non industrial				
			Generic (includes industrial)				
	Electrical power supply		mains AC voltage V				
			mains DC voltage V				
			Battery voltage V				
6.2.1	Identification of software						
	Modules :name	:pattern	:serial number				
	Further observations:						

D.5 Accessories supplied by the applicant

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

D.6 Selection of specimens tested

In case the tests and examination are valid for more versions, present full details of these versions, according to the listing of parameters and pattern designation in the way presented in D4:
Justification for the selection of the specimens:

The following specimens/compartments have taken part in the examination:

Specimen/compartment no.	Model	Serial no.	Year of manufacture	*Nominal capacity*	*MMQ*
1					
2					
3					
4					
5					
…					

D.7 Adjustments and modifications

Adjustments, modifications, and repairs made to the samples 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 1st table (with "Date & Time" etc.). *In that case a statement shall be made in this field.*

D.12 Choices of the manufacturer concerning operation conditions

Influence	

E Examinations

(To be completed by the Evaluating Authority)
Where specified not applicable in table C.1 the underneath related tables may be removed from this report.

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

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:
3.1	**E.1 Constituents and measurement methods**				
3.1.2	**Methods for measurement of**				
	level by a) manual/visual gauging based on:				
	- single or more volumetric mark ☐				
	- a graduated window in the dome ☐				
	- another measuring device with a graduated scale ☐				
	- a dipstick or a dip tape ☐				
	b) electronic level gauging based on: ☐				
	- floats/displacers with electronic detection (magnetic or magneto-strictive); ☐				
	- ultrasonic level gauge; ☐				
	- radar (microwave) level gauge; ☐				
	- other non-contact level gauges such as electrical capacitance ☐				
	temperature a) in case transferred (delivered/received) volume ☐				
	by electrical temperature sensor located on the discharge/inlet line (pipe)				
	b) in case : inventory measurement, ☐				
	by one or more temperature sensors/thermometers located in such a way that they allow the mean temperature of the liquid volume in the tank or in each compartment to be determined,				
	volume at working base conditions by a) an electronic computing device or controller ☐				
	b) manual calculation using data from the tank calibration table and the volume correction table ☐				
3.1.3	**Tank designed for** - delivery/receipt of full compartment only; ☐				
	- delivery/receipt of partial volume of a compartment; ☐				
	- automatic measurement of the average temperature of the delivered/received volume; ☐				
	- automatic volume conversion. ☐				
3.1.4	**Tanks fitted with ancillary devices** - installations for measuring partial volumes received or delivered; ☐				
	- internal pumps; ☐				
	- collectors; ☐				
	- full hose installations ☐				

3.1.5	**Tank**	- at atmospheric pressure - under pressure ☐ - with means for heating ☐ - with thermal insulation of containment ☐				
3.1.7	**Tank mounting**	- directly and permanently on the chassis of ☐ o a vehicle, trailer o a semi-articulated trailer - self-propelled ☐ - temporarily on the vehicle ☐ position of the tank ensured to remain unchanged.				

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

3.2	**E.2 Construction of tanks**				
3.2.1	Tank with compartments				
3.2.2	Tank comprised a shell and ends and discharge devices				
3.2.3	Tank constructed such that it drains completely				See 5.2.2.9
3.2.4	Tank discharge device comprises one or two discharge pipe(s) (allowing offloading on either side of the tanker), each equipped with a stop valve.				*The flow of liquid between the tank and the discharge pipe(s) may be stopped by a foot valve.*
	Suitable interlock to prevent the use of both discharge pipes at the same time				
	Devices are incorporated in the tank for water separation. ☐				
3.2.5	**Tank fitted with level gauges**				
3.2.5.1	Incorporates an adequate dome located on top				Location of level index:
	Devices incorporated in the dome: - a filling aperture, fitted with a leak-proof cover;				
	- an orifice to observe the filling;				
	- a venting device or double-acting safety valve.				
3.2.5.2	**With mechanical level gauges**				
	Ladder installed allowing access and performance of measurements				
3.2.5.3	**With electronic level gauging:**				
	Sealing or other means prevents access				
	Visual checking of the interior is easily possible according to 3.2.5.2				
3.2.6	No dome installed in case of tankers for liquefied gasses				
3.2.7	Breather valves and flame arresters fitted where appropriate				

4	**E.3 Units of measurement**					
	All applied quantity values are expressed in:	SI units: ☐				Applied units: ....
		other legal units conforming OIML D 2 [2007]: ☐				

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.1.1.	**E.4 Rated operating conditions**								
5.1.2	**E.5 Accuracy classification**								
	Static measuring system			(A) ☐					
	Transportable measuring tank			(B) ☐					
	For			(A)	(B)				
	- liquids of which the viscosity does not exceed 20 mPa·s at working temperature			☐	☐				
	- milk, beer, and other foaming liquids;			☐	☐				
	- refuelling aircrafts			☐	☐				
	Class 0.5	MPE		0.5 %	0.3 %				
	- liquefied gases under pressure measured at a temperature equal or above –10 °C.			☐	☐				
	Class 1.0	MPE		1.0 %	0.5 %				
	- liquefied carbon dioxide;			☐	☐				
	- liquefied gases under pressure measured at a temperature below –10 °C			☐	☐				
	Class 1.5	MPE		1.5 %	1.0 %				
	- cryogenic liquids.			☐	☐				
	Class 2.5	MPE		2.5 %	1.5 %				
5.1.5	**E.6 Temperature measurement**								
5.1.5.1	MPE on temperature measurement	Class 0.5; 1.0; 1.5			☐ MPE_{temp} ±0.5 %				*Note:* The maximum permissible errors apply to the indication by the corresponding calculator with its indicating device and include the errors due to rounding if using digital inputs.
		Class 2.5			☐ MPE_{temp} ±1.0 %				
5.1.5.2	Location of temperature sensor for the measurement of a volume transferred (received or discharged)								Location
	The temperature element (sensor) shall be installed in the inlet/discharge line beneath the tank at a location where under all discharge or loading modes the liquid flow passes by the sensor. In the case of separate liquid paths, additional sensor(s) shall be installed								
5.1.5.4	Read out of actual temperature available								
5.1.6	**E.7 Nominal capacity**								
	Nominal capacity of a measuring tank or of its compartment is at least 500 L unless stated otherwise.								
5.1.7	**E.8 Minimum measured quantity**								
5.1.7.1	The minimum measured quantity is specified for each compartment of a tank and does not exceed a quarter (1/4) of its nominal capacity.								
5.1.7.2	The MMQ is equal to or greater than the volume corresponding to the level difference given below according to the accuracy class and with the smallest sensitivity or the volume which corresponds to the manufacturing tolerance on the volume and which does not exceed three-fifths of MPE_A for each inclination whichever is the largest.								MMQ =
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	Level difference	200	171	190	200				
	3/5 MPE_A	0.3 %	0.6 %	0.9 %	1.5 %				
5.1.7.3	MMQ agrees $n \times 10^2$, 1×10^n, 2×10^n, 5×10^n L ,(n = integer)								

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.2	**E.9 Container of measuring tank**								
5.2.1	Safety and non-metrological requirements								
5.2.2	General requirements on the construction of the container								
5.2.2.1	Construction is sufficiently unaffected by atmospheric agents and the liquids								
5.2.2.2	Container is proven tight								
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
5.2.2.3	Maximum permissible variation of the reference height *H* (mm) does not vary more than the greater of the two values:	2 mm or *H*/1000 *Value: .....mm*	4 mm or *H*/500	4 mm or *H*/500	4 mm or *H*/500				
Table 2	MPE_B	0.3 %	0.5 %	1.0 %	1.5 %				
5.2.2.4	Maximum change in capacity of compartment between neighbouring compartments full or empty (1/3 MPE_B)	0.10 %	0.17 %	0.3 %	0.5 %				
5.2.2.5	Maximum change in capacity when the temperature of the tank changes ± 10 °C from the reference temperature (1/3 MPE_B)	0.10 %	0.17 %	0.3 %	0.5 %				*Note:* In any case fulfilled when the lin. expansion coefficient of the tank material < $33 \cdot 10^{-6}$ K^{-1}.
5.2.2.6	If not for liquids measured at atmospheric pressure: maximum change in capacity in the whole admissible pressure range (1/5 MPE_B)	0.06 %	0.1%	0.2 %	0.3 %				
5.2.2.7	Tank or compartment is such shaped that no air is trapped during the filling and no liquid is retained during the emptying in any admissible position of use of the equipment								
5.2.2.8	Spouts, mouldings or vent pipes and valves are utilized in order to comply with the requirements.								
5.2.2.9	Complete drainage ensured through: adequate shape of the tank ☐								
	Complete drainage ensured through: a slope of at least 2 % (1.2°) of the tank bottom with the vehicle on horizontal ground ☐								
	Complete drainage ensured through: other means : (specify how in observation column) ☐								
	Monitoring/indicating facilities provided where complete drainage cannot be fully guaranteed through construction (specify how) ☐								
Table 2	MPE_B	0.3 %	0.5 %	1.0 %	1.5 %				
5.2.2.10	Maximum remaining volume when completely drained as part of tank capacity (1/10 MPE_B)	0.03 %	0.05 %	0.1 %	0.15 %				
5.2.2.11	Baffles and reinforcing elements fitted in the tank have a shape and are provided with appropriate orifices such that filling, draining and checking the emptiness of the tank is not impeded.								
5.2.2.12	No objects are likely to become introduced in the tank for the purpose of adjusting the capacity to a given value, which when removed or changed and could modify the capacity of the tank								
5.2.2.13	Fixed internal elements in the measuring compartments (e.g. heating coils) have been present during the calibration and cannot be modified or dismounted.								

5.2.2.14	The tank or compartment geometry is such constructed that waves at the liquid surface are adequately damped						
5.2.2.15	Correct measurement is possible under all expected inclinations	The measuring tank is symmetrical in both the longitudinal as well as in the transverse direction and the level sensors is installed centrally in order to minimize inclination effects ☐					
		Other construction is applied to ensure the correct volume measurement ☐					
5.2.2.16	Correct measurement is not possible under all expected inclinations, which may be during use, however the tank is equipped with a device that indicates the actual inclination with respect to the range of inclinations ☐						
5.2.2.17	The interior of the measuring tank is accessible for inspection purposes via a manhole where not excluded through safety or other regulations						
5.2.2.18	The capacity of the measuring tank does not deviate by more than 10 % from that specified in the design documents						
5.2.2.19	The dome, when fitted, is on the upper part of the body and is welded to the latter.						
5.2.2.20	The dome has a cylinder or parallelepiped shaped geometry with vertical side-walls and the same length as the tank in case of a parallelepiped shaped dome.						Dome shape:
5.2.2.21	Orifices or cut-outs of appropriate dimensions and at high enough positions are mounted to avoid air pockets to form when filling at the maximum permitted filling level, in case the sidewalls of the dome are mounted so that they penetrate the tank shell.						
5.2.2.22	The vertical cross section of the shell and dome are of symmetrical. ☐						
	A different construction is applied still ensuring the correct volume measurement ☐						
5.2.2.23	The dimensions of the horizontal section of the dome is such that it allows inspection of the interior of the tank.						diameter :.... mm (at least 500 mm is recommended)

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	**Observer name:** **Date(s):** **Specimen:** **Observations:**
5.3	**E.10 Additional devices**				
5.3.1	Discharge device				
5.3.1.1	The discharge device ensures complete and rapid discharge of the liquid contained in the tank. The discharge device is connected to the lowest part of the tank shell.				
5.3.1.2	The tank is a special construction dedicated to airports and fitted with a device to collect water and impurities precipitated by a liquid contained in the tank. When the normal discharge pipe is not connected to the lowest part of the tank this device has a separate drain pipe, of small diameter and ☐				
	the collective device is mounted: over the whole of the lower part of the tank ☐				
	the collective device is mounted: over a reduced area of the lower part of the tank. ☐				
5.3.1.3	The discharge pipe is as short as possible and has an adequate slope towards the stop valve.				*Note:* A resulting slope of at least 2° is recommended
5.3.1.4	Means are available for each compartment being discharged independently.				
	A discharge manifold is available and has suitable control facilities that prevent the flowing back from one compartment to another or provide evidence of such a situation ☐				
	A discharge manifold is available and non-secured manifolds are accepted because the appropriate information is easily legible and readable available close to the delivering points, which information in case where the collector is easily removable reads: *"The presence of the collector is not allowed during the delivery from the measuring tank"* and if the collector is not easily removable reads *"Check the liquid level before and after each delivery from a compartment"* ☐				
5.3.1.5	The existence of a manifold is indicated in the verification certificate.				
5.3.1.6	Stop valves are readily accessible and at the rear or on the appropriate side of the tank.				
5.3.1.7	The tank consists of more than one measuring compartment and each compartment is provided with a separate (manual or automatic) shutoff device in each delivery line.				
	Unwanted mixtures of the products from different compartments is prevented by construction or control devices.				
5.3.1.8	Where necessary, for checking emptiness in the vicinity of the lowest point of each delivery line, liquid detectors or sight glasses are installed.				
5.3.1.9	Pipework, of which the filling quantity has an effect on the measurement result, is not flexible and rigidly supported.				
5.3.1.10	It is ensured by a separate gas separator, or an equivalent function of existing parts, in case of full hose delivery, that the full hose is completely filled at the time of level gauging.				
5.3.1.11	Control lines and control devices whose manipulation might falsify the measurement result are protected against tampering.				
5.3.1.12	Filling levels are monitored in all measuring compartments if during a transaction there is a change from full to empty hose and vice versa as well as the change between the full hose systems so that manipulations are made evident.				
5.3.1.13	Venting devices on the measuring system are protected against dismounting and removal as well as against manipulations from the outside.				
5.3.1.14	The measuring tank has supports in the longitudinal and in the transverse directions the length of which is be greater than 500 mm in order to accommodate an electronic (spirit) level detector to mark the reference plane for the normal position of the measuring tank.				

OIML R 80-1 Sub clause	**Description**	**Yes**	**No**	**Not applicable**	**Observer name:** **Date(s):** **Specimen:** **Observations:**
5.3.2	Installations for external measurement and pumping				
5.3.2.1	It is intended to connect the tank to separate pumping or measuring device, and it therefore is provided with an appropriate detachable coupling device that is as short as possible and can easily be connected and disconnected.				
5.3.2.2	In addition to the pump itself the pumping installations comprises no more than one filter and very short pipes (no valves or branch connections) and the installation is such constructed that it can be drained completely without the need for any special measures, each time the tank is emptied.				
5.3.2.3	The tank is equipped with a built-in manifold for measuring the partial volumes delivered and where a diverting valve is fitted on any discharge pipe any leakage of liquid through the diverting valve can be detected[1] and the installation and the control of the diverting valves is such that the product cannot flow back from one compartment to another. *Note:*[1)] for example: the built-in manifold ensures the complete and rapid discharge of the liquid it contains. An inspection window or monitoring device at its bottom allows for the checking of its emptiness				
5.3.2.4	Sampling devices				
	The measuring system includes a sampling device intended to determine the properties of the liquid to be measured. Quantity taken from the tank by the sampling device:				
	- Smaller than 1/3 MPE_B ☐				
	- Larger than 1/3 MPE_B and taken into account ☐				
	Class: 0.5 ☐ 1.0 ☐ 1.5 ☐ 2.5 ☐				
	1/3 MPE_B: 0.10 % 0.17 % 0.3 % 0.5 %				
5.3.2.5	Additivation systems				
	The measuring system includes an injection device that injects additives to the delivered product. The additivation ratio is:				
	- not larger than 1:500				
	- larger than 1:500 and the additive quantity is measured				
5.3.3	Other devices				
5.3.3.1	Tank is fitted with				
	- level switch;				
	- level detectors;				
	- high level shutoff devices;				
	- etc. :specify:				
5.3.3.2	Devices are provided to facilitate reading of the index, or to stop the flow automatically when the level of the liquid reaches the index not causing any additional measurement errors				

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.4	**E.11 Level gauging system**								
5.4.1	General requirements								
5.4.1.1	The level gauging device ensures a safe, easy and unambiguous readout, practically independent of tank tilt under rated operating conditions								
5.4.1.2	The index (e.g. volumetric marks, scales), or the vertical measurement axis, are as near as possible to the center of the horizontal sections of the tank								
5.4.1.3	The level gauging system will only perform and declare a height measurement valid when the liquid surface has calmed down so that the result is reproducible.								
5.4.1.4	When the measuring range of the level sensor is reached, a visual and/or audible indication automatically occurs.								
5.4.2	Requirements on level gauging for full compartment delivery								
5.4.2.1	The shape of the tank is such that, in the zone where the levels are being gauged, a sensitivity equal to or greater than the underneath values is attained.								Sensitivity: $\Delta h / \Delta V/V$:
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	Minim. sensitivity $\Delta h / \Delta V/V$ [mm/ (1/1000)]	1.5	1.0	0.5	0.3				
5.4.2.2	It is possible to gauge the level of the contained liquid manually in case of a non-pressurized tank. The gauging device is positioned as close as possible to the curve connecting the centers of gravity of the horizontal cross sections of the compartment in the level measuring range.								
	- The axis of the lower end of the gauging device when close to the bottom of the tank intersects the lower tank bottom at a point having no orifice or obstacle within a radius of 100 mm. ☐								
	- The axis of the lower end of the gauging device when close to the bottom of the tank **does not** intersect the lower tank bottom at a point having no orifice or obstacle within a radius of 100 mm but a horizontal and non-removable plate of 100 mm × 100 mm is positioned in order to ensure repeatability of measurements ☐								
5.4.2.3	The reference points RPB and RPT are clearly defined and realized.								
5.4.2.4	The joint between the shell and the dome are such that the gauging device can be held in a vertical position during measurement.								
5.4.3	Requirements on level gauging for partial delivery								
5.4.3.1	The expanded uncertainty of the level measurement does not exceed the underneath values								Maximum U_x =
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	Level measurement uncertainty Ux in mm	0.7	1.2	2	3.5				
	The permissible ranges of product parameters will be/is specified in the pattern approval certificate								
5.4.3.2	The resolution of the level indication is in accordance with the underneath values								Level indication resolution:
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	Maximum level indication resolution [mm]	0.1	0.2	0.5	1.0				
5.4.3.3	The level sensor is fitted in a damping tube to dampen the surface waves. ☐ In the area of the tank bottom, of the tank roof and in-between, this tube is provided with openings for liquid exchange. The tube is not affect the								

	measurement (e.g. dirt or sedimentation occurring underregular operation).								
5.4.4	Specific requirements for level gauging systems with float								
5.4.4.1	The float does not change in mass or volume due to the influence of the product measured or pressure exposed to.								
5.4.4.2	The cross-section of float in the range of immersion depth change is well known.								
5.4.4.3	The shape of the float is such designed that it does not retain liquid except the liquid layer caused by capillary effects and no gas or air cushion is formed under the float.								
5.4.4.4	Within the permissible density range of the measured liquid at base conditions, the immersion depth of the float does not change by more than the underneath given values								
	Class / Max. change of immersion depth in mm for:	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				Maximum change:
	- partial deliveries	0.5	0.8	1.6	2.5				
	- full compartment deliveries	1.5	2.4	4.8	7.5				
	The permissible density range is specified and is or will be registered in the pattern approval certificate								
	For measuring systems not fitted with the corresponding correction, the influence on the immersion depth that results from variation in the liquid density is included in the uncertainty evaluation of the level measurement.								
5.4.5	Specific requirements for level gauging systems based on the ultrasound transit time measurements								
5.4.5.1	Within the permissible product parameters range the measured height does not change by more than the underneath values								Maximum change:
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	[mm]	0.7	1.2	2	3.5				
	The permissible ranges of product parameters will be/is specified in the pattern approval certificate								
5.4.5.2	The effects of the product parameters on the transit time of the ultrasound signal are compensated by suitable methods (e.g. by reference marks).								

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.5	**E.12 Tank capacity table**								
5.5.1	For the conversion of the result of the level gauging into volume, the electronic data processing system stores a tank capacity table with pairs of level/volume values for each measuring compartment.								
	The number and distance of these value pairs are selected according to the real tank geometry								
	Intermediate values are calculated by suitable interpolation no extrapolation is applied								
5.5.2	The tank capacity table is determined for each compartment of the measuring tank using volumetric, gravimetric or geometric methods and not merely calculated on the construction documents								
5.5.3	The level range of the tank capacity table encompasses all filling states occurring in practical operation.								
	Filling of a measuring compartment to a level beyond the maximum permissible point of the tank capacity table is prevented for or will be detected by the occurrence of a visual and/or audible indication.								
5.5.4	Volume effects of the inclination in the range specified for a given system (pitch and roll angles) does not exceed the minimum specified volume deviation for partial delivery or the value given in the beneath table of nominal compartment volume for full compartment delivery.								Maximum volume effects of the inclination:
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐				
	MPE_B	0.3 %	0.5 %	1.0 %	1.5 %				
5.5.5	A correction for inclination should be made								*Note: R 80-1 has a mistake in this clause 5.5.5 referring to 5.1.5.2 and 5.1.5.3. The right references are 5.2.2.15 and 5.2.2.16*
	The inclined position of the measuring tank is measured during level detection using inclination sensors rigidly fixed to the tank.								
	The inclination data are utilized to correct the measurement using a suitable algorithm								
5.5.6	The tank capacity table compiled during the calibration as well as the inclination correction data, when relevant, is stored in the system to prevent for manipulation.								

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.6	**E.13 Metrological requirements for indicating and ancillary devices**									
5.6.1	Volume conversion									
5.6.1.1	MPE for conversion = MPE_{A-B} or (Scale interval of conversion device)/2 or $E_{min}/2$ whichever is the largest for the specific accuracy class									
	Class	0.5 ☐	1.0 ☐	1.5 ☐	2.5 ☐					
	MPE_{A-B} = ±	0.2 %	0.5 %	0.5 %	1.0 %					
	(Scale interval of conversion device)/2									
	$E_{min}/2$									
	MPE for conversion =									
5.6.1.2	Determining the total volume at base conditions									
Method A	Partial volume #	Volume at t_i $\Delta V_{t,i}$ =	Temperature t_i =	Temperature t_0 =	Volume at t_0 $\Delta V_{0,i}$					
	1									
	2									
	3									
	4									
	Total volume at base conditions $V_0 = \Sigma \Delta V_{0,i}$ =									
Method B	Partial volume #	Volume at t_i $\Delta V_{t,i}$ =	Temperature t_i =	Product of $\Delta V_{t,i} \cdot t_i$ =	Total volume at base conditions $V_0 = \varphi (V_t \cdot t)$					
	1				$V_0 = (\Sigma \Delta V_{t,i} \cdot t)/V_t$					
	2									
	3									
	4									
	$V_t = \Sigma \Delta V_{t,i}$ =									
5.6.1.3	The utilized conversion function $\varphi(V_t,t)$ is in accordance with the applicable standards (in particular, OIML R 63) , or other methods accepted for national use.									See Annexes C and D of R 80-1
5.6.1.4	The temperatures of the liquid flowing through the particular delivery line during a transaction is measured in proportion to: - the volume ☐ - the time. ☐									
5.6.1.5	Volume proportional average applied and $\Delta V_{t,i} \leq V_{min}/5$									
5.6.1.6	Time proportional average applied and the time intervals are smaller or equal to the time needed to measure one fifth of the smallest measured quantity at maximum flow									
5.6.1.7	$V_t = \Sigma \Delta V_{t,i}$ =									

OIML R 80-1 Sub clause	**Description**	**Yes**	**No**	**Not applicable**	**Observer name:** **Date(s):** **Specimen:** **Observations:**
5.6.1.9	The data underlying the conversion (for instance the density ρ_0 at base conditions or the thermal expansion coefficient α_0 are protected against manipulations and - firmly set ☐				
5.6.1.10	- adjustable and value used or liquid is unambiguously indicated ☐				
5.6.1.11	No change in measuring method at verification				
	Only one set of conversion data is entered				
5.6.2	Indicating device				
5.6.2.1	The reading of the indication is precise, easy and non-ambiguous. The customer is able to inspect it without particular measures.				
5.6.2.2	The resolution of the indication is in the form 1×10^n, 2×10^n , 5×10^n (n= integer or 0)				
	The indication is in the applicable measurement units				
	The resolution of the indication is smaller or equal to $0.1 \cdot E_{min}$				
5.6.2.3	Continuous display of the quantity in case of sale direct to the public				
5.6.2.4	All measured and calculated values are available at an output				
	When the volume of a product at base conditions is indicated, it is possible to access all the values underlying the conversion.				
5.6.2.5	The nature of the indicated quantity (metering or base condition) is unequivocal				
5.6.2.6	The measuring system has several units for indicating the same measuring quantity each of which satisfying all the specified requirements.				
5.6.2.7	Some information, not subject to legal metrological control, is additionally indicated but clearly identified thus giving no rise to any misinterpretation				Additional information:
5.6.2.8	Where correction of a quantity value is applied the non-corrected quantity value is only available for test purposes and not displayed during normal operation				
5.6.3	Price calculation is applied and a unit price can be entered.				
5.6.4	Printing device				
5.6.4.1	The measuring systems is applied for direct sales to the public and therefore comprises the mandatory printing device and checks that a printer is connected (even temporarily) and ready for transactions before the delivery or receipt starts,				
5.6.4.2	Data to be printed the delivery/receipt document is generated, it contains at least the following data: - an identifier for the measuring system (e.g. serial number, number plate of the semi-trailer, or number of the compartment); - the product name or product group name; - a unique number, which increments for each transaction; - the volume V_t at working conditions with the remark “at delivery/receipt temperature” and/or ☐				
	- the volume V_0 with the remark “at base conditions”. ☐				
5.6.4.3	Printing of multiple results				
	More than one compartment is used for delivery/receipt and				
	all the results are printed on the same delivery/receipt document				
	More than one result is available for the same product and				
	the results for the same product are summed up				

OIML R 80-1 Sub clause	**Description**	**Yes**	**No**	**Not applicable**	**Observer name:** **Date(s):** **Specimen:** **Observations:**
5.6.4.4	Marking of data				
	Verified data is enclosed by special characters (e.g. an asterisk "*").				Special Character: <SCHAR>=
	No non-verified data is enclosed by these special characters				
	The delivery document contains the explanatory note: "Data from verified devices are enclosed in <SCHAR> ..... <SCHAR>				
	The remark is - printed at the time the document is generated ☐				
	- pre-printed on the paper being used for the printout or ☐				
	- on the rear side of the paper being used for the printout ☐				
5.6.5	Memory device				
5.6.5.1	The measuring systems is fitted with a memory device to keep record of commercial transactions and providing proof in the event of a dispute.				
5.6.5.2	The measuring systems is not used for direct sales to the public and all data necessary for a printout is stored and not printed				
5.6.5.3	The quality of the data storage means are sufficient to ensure that the stored data is not corrupted under normal storage conditions.				
5.6.5.4	The data storage capability is sufficient for any particular application for which the measuring system is expected to be applied				
5.6.5.5	The measured data is stored for at least the period until after finishing a transaction including the period for handling a dispute or request for reversal. If the data storage capacity is exhausted and if stored data cannot be erased because the periods specified have not yet elapsed, it is not be possible to start a new measurement.				
5.6.5.6	Erasing of measured data is only possible after at least one transfer or print out of the measured data				
5.6.6	Automatic stop				
	The system allows for automatically termination of the delivery or the loading after a set quantity value has been reached.				

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:
5.7	**E.14 Susceptibility for influence quantities on electronics**				See performance tests (F)
5.7.1.2.4	**E.15 Durability**				
	The provisions in 5.1.3 and 5.7.1.2 are met durably.				
	No durability errors of any significance do occur, or ☐				
	Means assure that durability errors of any significance are acted upon ☐				
5.7.2	**E.16 Power supply device**				
5.7.2.1	The transaction is not interrupted in case the power supply fails and the measuring system is provided with an emergency power supply device to safeguard all measuring and control functions during the failure. ☐				
5.7.2.2	The transaction is interrupted in case the power supply fails, and - the requirements of 5.7.2.1 are met, or ☐				*Note*: The absolute value of the maximum permissible error for the indicated volume in this case is increased to 5 % of the MMQ
	- the data contained at the time of the failure is saved and remains displayable on an indicating device subject to legal control for a sufficiently long time so that the current transaction can be completed ☐				
5.7.2.3	- the result of the measurement after re-establishing the power supply is indicated ☐				
5.7.2.4	- the transaction is terminated properly after re-establishing the power supply. ☐				

OIML R 80-1 Sub clause	Description	Yes	No	Not applicable	Observer name: Date(s): Specimen: Observations:

5.7.3	**E.17 Checking facilities**					
5.7.3.1	**General**					
5.7.3.1	A significant fault causes - an automatic correction of the change in volume ☐ - to stop only the faulty device when the measuring system continues to comply with the regulations without this device being in operation ☐ - the stopping of the transaction. ☐					
5.7.3.2	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 ☐				
5.7.3.3	**Checking facilities for the calculator**					
	Type	☐ I / ☐ P				
	It checks the values of all permanently stored instructions and data as well as all procedures for the internal transmission and storage of the data relevant to the measurement result					
5.7.3.4	**Checking facilities for the correctness of the calculations**					
	Type	☐ P				
	Function check	For example, with the aid of a parity bit, a checksum or double storage.				
5.7.3.5	**Checking facilities for the indicating device**					The visual check can, for example, be carried out by redundant LC segments (graphics LCD) or a black-and white test. The automatic detection can, for example, take place by monitoring the current between the segments of LED displays or by measuring the grid voltage of fluorescent displays
	Type	☐ N / ☐ I / ☐ P				
	Function check	a failure or mal-operation of individual elements is detected - visually and/or ☐				
		automatically or ☐				
		cannot lead to erroneous interpretation ☐				
5.7.3.6	It is possible to check the checking facility of the indicating device during initial verification					
5.7.3.7	**Checking facilities for ancillary devices**					*Note:* References 5.6.2 to 5.6.5 are unclear; this requirement concerns all ancillary devices of clause 5.6
	Type	☐ N / ☐ I / ☐ P				
	Ensures that the particular ancillary device is available, if necessary, and that the transmission of the data is valid.					
5.7.3.8	**Checking facilities for printing devices**					
	Type	☐ N / ☐ I / ☐ P				
	Monitors the presence of paper					

OIML R 80-1 Sub clause	**Description**	**Yes**	**No**	**Not applicable**	**Observer name:** **Date(s):** **Specimen:** **Observations:**
6.1	**E.18 Identification plate**				
6.1.1	Plate available				
	Clearly visible, easily legible				
	Made of material that does not deteriorate under the rated operating conditions of the tank and allows the data to be easily inscribed.				
	(Provisions for installing) available				
	(Provisions for installing) sealing available ☐				
	Permanently attached on a support of the measuring system ☐				
6.1.2	**Inscriptions**				
	- name or trademark of the manufacturer;				
	- type and year of manufacture				(year may be given as part of a serial number)
	- serial number of the tank; ☐				
	- serial number of the level gauging system, if appropriate; ☐				
	- pattern approval number, if appropriate; ☐				
	- nominal capacity of the tank or of each compartment;				
	- accuracy class if different from 0.5; ☐				
	- minimum measured quantity of the tank or of each compartment;				
	- base temperature;				
	- range of specified inclination, if it differs from 2 %. ☐				
	Free area for verification marks				

OIML R 80-1 Sub clause	**Description**	**Yes**	**No**	**Not applicable**	**Observer name:** **Date(s):** **Specimen:** **Observations:**

6.2	**E.19 Measuring system document (upon initial verification)**				
6.2.1	Contains:				
	- sealing plan;				
	- pipework diagram;				
	- pneumatics diagram with the metrologically significant control lines marked;				
	- calibration parameter printout and calibration tables, if applicable;				
	- extra sheets with descriptions of changes to the measuring system, repairs as well as any breaking of official seals including their confirmations;				
	- signatures for the software relevant to verification and its parameters, if applicable.				
6.2.2	Is kept on the tanker				

6.3	**E.20 Tank capacity plate (on tanks with dipsticks scaled in non-volumetric units)**				
	Plate Available fixed on the tank or each compartment				
	Inscriptions				
	institution which calibrated the tank and prepared the tank capacity table;				
	calibration certificate number;				
	base temperature;				
	number of heating coils, if appropriate;				
	tank capacity table (as a function of V(*h*) or V(*C*)).				

6.5	**E.21 Seals**				
6.5.1	Manipulations can be prevented and/or detected for				
	- indicating devices of the level gauging system;				
	- controller and interface units;				
	- terminal boxes with cables relevant to the measurements (e.g. for temperature and liquid detector);				
	- inclination sensors;				
	- temperature sensors;				
	- liquid detectors, except those requiring removal for cleaning;				
	- dipsticks on the upper and lower fastenings, where relevant;				
	- identification plate of the measuring system, operating instructions and pneumatic and pipework diagram, if applicable;				
	- dome cover and man holes of tank compartments in measuring systems which can be filled from the bottom only.				
6.5.2	Heating coils, if provided, are sealed at their points of junction with the tank body.				
6.5.3	The locations for seals are arranged such that the sealing and the external administrative examination is possible without hindrance. They are fixed individually for each pattern of measuring system within the pattern approval certificate.				

F Performance tests

F.1 Testing of volume conversion and temperature measuring devices

OIML R 80-2 Sub. 4.2.2 **[unit]** ☐[°C]; ☐[K]	Test conditions					Observer name:
	Analogue temperature sensor	☐ Sensor separate				
		☐ Sensor including conversion device				
	Date:		Start	Stop		
	Time:					Specimen:
	Ambient temperature		°C	°C		
	Ambient humidity		%	%		
Temperature	Nominal	T_{min} (or near 0 °C) =		T_{ref} =		T_{max}=
Relative humidity [%]						
Quantity [unit]	reference					
	indicated					
2nd indication (if applicable)						
Error [unit]						
Relative error [%] E_{ii}						
MPE [%]		☐ 0.3 ; ☐ 0.6 % (3/5 of requirements of R 80-1 : 5.1.5)				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
OIML R 80-2 Sub. 4.2.2 **[unit]** ☐[°C]; ☐[K]	**Volume conversion device**	☐ Actual sensor				Observer name:
		☐ Simulating sensor				
	Date:		Start	Stop		
	Time:					Specimen:
	Ambient temperature		°C	°C		
	Ambient humidity		%	%		
Temperature	Nominal	T_{min} (or near 0 °C) =		T_{ref} =		T_{max}=
Relative humidity [%]						
Quantity [unit]	reference					
	indicated					
2nd indication (if applicable)						
Error [unit]						
Relative error [%] E_{ii}						
MPE [%]		☐ 0,2 ; ☐ 0,4 % (2/5 of requirements of R 80-1 : 5.1.5)				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
Observations						
Result			Pass	☐	Fail	☐

F.2 Test of volume conversion software

OIML R 80-2 Sub. 4.2.2 and sub. 4.2.6	Test conditions				Observer name:
	Volume conversion				
		☐ Simulated temperatures			Specimen:
	Date:	Start	Stop		
[unit] ☐[m^3]; ☐[L]	Time:				Quantity ≥ 10 000 L

Product name:	Temperature	T_{min} (or near 0 °C) =	T_{ref} =	T_{max}=
Quantity [unit]	calculated			
	indicated			
Error [unit]				
Relative error [%]				
MPE [%]		☐ 0,05 ; ☐ 0,1 ; ☐ 0,15 ; ☐ 0,25 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐
Product name:	Temperature	T_{min} (or near 0 °C) =	T_{ref} =	T_{max}=
Quantity [unit]	calculated			
	indicated			
Error [unit]				
Relative error [%]				
MPE [%]		☐ 0,05 ; ☐ 0,1 ; ☐ 0,15 ; ☐ 0,25 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐
Product name:	Temperature	T_{min} (or near 0 °C) =	T_{ref} =	T_{max}=
Quantity [unit]	calculated			
	indicated			
Error [unit]				
Relative error [%]				
MPE [%]		☐ 0,05 ; ☐ 0,1 ; ☐ 0,15 ; ☐ 0,25 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐
Observations				

Result		Pass	☐	Fail	☐

F.3 Test on inclination sensor

OIML R 80-2 Sub. 4.2.3 **[unit]** ☐[°]; ☐[%]	Test conditions				Observer name:
	Inclination	☐ Sensor separate			
		☐ Sensor including correction device			
	Date:	Start	Stop		
	Time:				Specimen:
	Ambient temperature	°C	°C		
	Ambient humidity	%	%		

Vector	inclination	**levelled**	I_1		I_2		I_{max}	
X-axis		**0**	-	+	-	+	-	+
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%]								
MPE [%]		☐ 0.3 ; ☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 % (See OIML R 80-1 : 5.5.4)						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
Y-axis	level	**0**	-	+	-	+	-	+
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%]								
MPE [%]		☐ 0.3 ; ☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 % (See OIML R 80-1 : 5.5.4)						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
Z-axis	level	**0**	-	+	-	+	-	+
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%]								
MPE [%]		☐ 0.3 ; ☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 % (See OIML R 80-1 : 5.5.4)						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐

Observations

Result		Pass	☐	Fail	☐

F.4 Test on floats (general)

OIML R 80-2 Sub. 4.2.4.1 **[unit]** ☐[mm]; ☐[cm]; ☐[m];	Test conditions					Observer name:
	(separate table for each type of float)					
	Date:	Start	Stop			Specimen:
	Time:					
	Ambient temperature	°C	°C			Mass of float: g
	Ambient humidity	%	%			Volume: cm^3
		No	Yes			Min. perm ρ
	Reference Float	☐	☐			Max. perm ρ
	Float marked	☐	☐			

Float type:	Liquid Type	**Close to min. density**	**Close to max. density**	**deviation**	
	Liquid density				
Immersion depth [unit] (=Quantity)	reference				
	calculated				
	indicated				
Error [unit]				Difference:	
Documentation reference					
Spec's		Min. permissible ρ	Max. permissible ρ		
Specified					
Calculated (using error)					
Relative error [%]					
MPE [%]		Table 8 of R 80-1			
Documentation		Adequate		Pass	☐
		Inadequate		Fail	☐
Resistance **R 80-2**	Chemical Sub. 4.2.4.2.1	Previously proven adequate		Pass	☐
		Proven adequate through testing		Pass	☐
		Not proven adequate		Fail	☐
	Pressure Sub. 4.2.4.2.2	Proven to withstand 1.5 times overpressure		Pass	☐
		Not proven to withstand 1.5 times overpressure		Fail	☐
Adaption of float to rod **R 80-2** Sub. 4.2.4.2.3		Adequate (does not become stuck on the rod)		Pass	☐
		Inadequate		Fail	☐
Temperature influence on immersion depth		The change in immersion depth of the float is not more than the values given in Table 8 of R 80-1		Pass	☐
				Fail	☐
	Pass	☐	☐	☐	
	Fail	☐	☐	☐	
Observations					

Result		Pass	☐	Fail	☐

F.5 Testing of dipstick pipes for ultrasonic systems

OIML R 80-2 Sub. 4.2.5 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	(separate table for each type ultrasound level)					
	Date:	Start	Stop			Specimen:
	Time:					
	Ambient temperature	°C	°C			
	Ambient humidity	%	%			
Float type:	Level #	**1**		**2**		**3**
	Level =					
T_{ref} = + .. °C	Liquid Type: Water					
Quantity [unit]	reference					
	indicated					
Error [unit]						
Relative error [%] *E*						
MPE [%]		Permissible deviations do not exceed the values given in Table 4 of R 80-1				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
Observations						
Result		Pass	☐	Fail	☐	

F.6 Disturbance and influence factor tests - Climatic and mechanical environmental conditions

F.6.1 Static temperature tests (influence of dry heat)

OIML R 80-2 Sub. 5.4.1 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐ Actual level				
		☐ Simulating level				
	Date:		Start	Stop		
	Time:					Specimen:
	Ambient temperature		ºC	ºC		
	Ambient humidity		%	%		

T_{nom} = +20 °C = Reference:	Level #	**1**	**2**	**3**
	Level =			
Absolute humidity [g/m³]				
Relative humidity [%]				
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐

T_{ah} = +55 ºC High limit	Level #	**1**	**2**	**3**
	Level =			
Absolute humidity [g/m³]				
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_i				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐

T_{nom} = +20 °C = Reference:	Level #	**1**	**2**	**3**
	Level =			
Absolute humidity [g/m³]				
Relative humidity [%]				
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_i				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
Functional performance				
	Pass	☐	☐	☐
	Fail	☐	☐	☐

Observations					
Result		Pass	☐	Fail	☐

F.6.2 Static temperature test (influence of cold)

OIML R 80-2 Sub. 5.4.2 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐ Actual level				
		☐ Simulating level				
	Date:		Start	Stop		
	Time:					Specimen:
	Ambient temperature		ºC	ºC		
	Initial pressure					
T_{nom} = +20 °C = Reference:	Level #	**1**		**2**		**3**
	Level =					
Absolute humidity [g/m³]						
Quantity [unit]	reference					
	indicated					
2nd indication (if applicable)						
Error [unit]						
Relative error [%] E_{ii}						
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
T_{al} = -25 ºC Low limit	Level #	**1**		**2**		**3**
	Level =					
Quantity [unit]	reference					
	indicated					
2nd indication (if applicable)						
Error [unit]						
Relative error [%] E_i						
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
T_{nom} = +20 °C = Reference:	Level #	**1**		**2**		**3**
	Level =					
Absolute humidity [g/m³]						
Quantity [unit]	reference					
	indicated					
2nd indication (if applicable)						
Error [unit]						
Relative error [%] E_i						
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %				
Functional performance						
	Pass	☐		☐		☐
	Fail	☐		☐		☐
Observations						
Result				Pass	☐	Fail ☐

F.6.3 Damp heat, cyclic (condensing)

OIML R 80-2 Sub.5.4.3 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions				Observer name:	
	Level	☐	Actual level			
		☐	Simulating level			
			Start	Stop	Specimen:	
	Date:				T_{ah} =	55 °C
	Time:				T_{al} =	25 °C

First cycle	Cycle phase	**initial**	**rise to T_{ah}**	**stabilize**
	Level =			
Test temperature	start [°C]			
	stop [°C]			
Relative humidity	start [%]			
	stop [%]			
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)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		
	Fail	☐		

	Cycle phase	**Lowering to T_{al}**	**stabilize**	**after**
	Level =			
Test temperature	start [°C]			
	stop [°C]			
Relative humidity	start [%]			
	stop [%]			
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)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
Fault limit [%]		0.2·*MPE* or E_{min} (whichever is the largest		
Acts on fault		Yes ☐	No ☐	
Significant fault		Yes ☐	No ☐	
Observations				

Result		Pass	☐	Fail	☐

F.6.4 Vibration (random)

R 80-2 Sub.5.4.4 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions				Observer name:	
	Level	☐	Actual level			
		☐	Simulating level			
	Date:		Start	Stop		
	Time:				Specimen:	
	Ambient temperature		ºC	ºC	Frequency	10-150 Hz
	Relative humidity		%	%	Total RMS level	7 m/s^2

Vector		**Before test**	**During test**	**After test**	**During test**	**After test**	**During test**	**After test**
X-axis	level							
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%] E_{ii}			E_i		E_i		E_i	
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
Y-axis	level							
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%] E_{ii}			E_i		E_i		E_i	
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐
Z-axis	level							
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%] E_{ii}			E_i		E_i		E_i	
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %						
Functional performance								
	Pass	☐		☐		☐		☐
	Fail	☐		☐		☐		☐

Observations

Result		Pass	☐	Fail	☐

F.7 Disturbance and influence factor tests - Electrical tests

F.7.1 RF immunity (radiated electromagnetic fields)

OIML R 80-2 Sub.5.4.5 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐	Actual level			
		☐	Simulating level			Specimen:
						Field strength 10 V/m
	Date:			Start	Stop	Dwell time s
	Time:					
	Ambient temperature			ºC	ºC	f_l = MHz
	Fluid temperature			ºC	ºC	f_h = MHz
	Relative humidity			%	%	

	Phase	Initial	During exposure	After
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*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.7.2 RF immunity (common mode currents generated by radio frequency electromagnetic fields)

OIML R 80-2 Sub.5.4.6	Test conditions RF current injection				Observer name:
	Level ☐	Actual level			
	Level ☐	Simulating level			Specimen:
					RF voltage 10 $V_{e.m.f.}$
[unit]	Date:		Start	Stop	Dwell time s
☐[mm];	Time:				
☐[cm];	Ambient temperature		ºC	ºC	f_l = MHz
☐[m]	Relative humidity		%	%	f_h = MHz

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*MPE* or E_{min} (whichever is the largest)				
Frequency	Cable exposed	Fault/Deviation	Significant		Acts on fault	
MHz			Yes	No	Yes	No
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
Observations						

Result		Pass	☐	Fail	☐

F.7.3 Immunity to electrostatic discharges

OIML R 80-2 Sub.5.4.7	Test conditions					Observer name:
	Level	☐	Actual level			
		☐	Simulating level			Specimen:
	Date:			Start	Stop	# discharges :
[unit]	Time:					*Note:* at least 10
☐[mm];	Ambient temperature			ºC	ºC	contact 6 kV
☐[cm];	Relative humidity			%	%	air 8 kV
☐[m]						

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]			0.2·*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.7.4 Immunity to power frequency magnetic fields

OIML R 80-2 Sub.5.4.8 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions						Observer name:
	Level	☐	Actual level				
		☐	Simulating level				Specimen:
							Fieldstrength A/m
	Date:			Start	Stop		Dwell time s
	Time:						
	Ambient temperature			ºC	ºC		f_l = 50/60 Hz
	Relative humidity			%	%		

	Phase	Initial	During exposure	After
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*MPE* or E_{min} (whichever is the largest)				
		Fault/Deviation	Significant		Acts on fault	
Exposure	Fieldstrength		Yes	No	Yes	No
Continuous	30 A/m		☐	☐	☐	☐
Short (1-3 s)	300 A/m		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.7.5 Bursts on signal data and control lines

OIML R 80-2 Sub.5.4.9 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐	Actual level			
		☐	Simulating level			Specimen:
	Date:		Start	Stop		Level 1 kV
	Time:					
	Ambient temperature		ºC	ºC		Repetition: 5 kHz
	Relative humidity		%	%		

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*MPE* or E_{min} (whichever is the largest)				
		Fault/Deviation	Significant		Acts on fault	
Line	Pol.		Yes	No	Yes	No
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.7.6 Influence of AC mains voltage variations

OIML R 80-2 Sub.5.4.10 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:		
	Level	☐	Actual level					
		☐	Simulating level			Specimen:		
	Date:			Start	Stop			
	Time:					Nominal = $U_{nom} = (U_{nom1} + U_{nom2})/2$		
	Ambient temperature			ºC	ºC	High = U_{nom1} + 10 %		
	Relative humidity			%	%	Low = U_{nom2} - 15 %		
Reference:	Voltage		**Nominal**	**High**	**Nominal**	**Low**	**Nominal**	
	Level =							
Quantity [unit]	Reference							
	Indicated							
Error [unit]								
Relative error [%]								
MPE [%]			☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %					
Functional performance								
	Pass		☐	☐	☐	☐	☐	☐
	Fail		☐	☐	☐	☐	☐	☐
Observations								
Result						Pass	☐	Fail ☐

F.7.7 Immunity to surges on AC mains power lines

OIML R 80-2 Sub.5.4.11 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions							Observer name:	
	Level	☐	Actual level						
		☐	Simulating level						
	Date:			Start		Stop		Specimen:	
	Time:								
	Ambient temperature			ºC		ºC		Line to line	1 kV
	Relative humidity			%		%		Line to earth	2 kV

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	Reference			
	Indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults after exposure

Fault limit [%]				0.2·*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	☐

F.7.8 Immunity to AC mains voltage dips and short interruptions

OIML R 80-2 Sub.5.4.12	Test conditions				Observer name:
	Level ☐	Actual level			
	Level ☐	Simulating level			
	Date:		Start	Stop	Specimen:
[unit]	Time:				Repetition: 10 times
☐[mm];	Ambient temperature		ºC	ºC	Intervals: 10 s
☐[cm];	Fluid temperature		ºC	ºC	
☐[m]	Relative humidity		%	%	

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	Reference			
	Indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*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		☐	☐	☐	☐
0	250 / 300		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.7.9 Immunity to bursts on AC mains power lines

OIML R 80-2 Sub.5.4.13 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐				
		☐	Simulating Level			Specimen:
	Cable:					
	Date:		Start	Stop		
	Time:					Level 2 kV
	Ambient temperature		ºC	ºC		Repetition: 5 kHz
	Relative humidity		%	%		

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]		0.2·*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.7.10 Influence of low voltage of internal battery

OIML R 80-2 Sub.5.4.14 [unit] ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:		
	Level	☐	Actual level					
		☐	Simulating level					
	Date:			Start	Stop			
	Time:					Specimen:		
	Ambient temperature			°C	°C			
	Relative humidity			%	%			
Reference:	Voltage		Nominal	U_{bmin}	$0.9U_{bmin}$	Nominal	U_{bmin}	$0.9U_{bmin}$
	Level							
Quantity [unit]	Reference							
	Indicated							
Error [unit]								
Relative error [%]								
MPE [%]			☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %					
Functional performance								
	Pass		☐	☐	☐	☐	☐	☐
	Fail		☐	☐	☐	☐	☐	☐
Observations								
Result						Pass	☐	Fail ☐

F.7.11 Influence of vehicle battery voltage variations

OIML R 80-2 Sub.5.4.15.1 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:		
	Level	☐	Actual level					
		☐	Simulating level			Specimen:		
	Date:			Start	Stop	Battery voltage	☐	☐
	Time:					Nominal	12 V	24 V
	Ambient temperature			ºC	ºC	High	16 V	32 V
	Relative humidity			%	%	Low	9 V	16 V
Reference:	Voltage		**Nominal**	**High**	**Nominal**	**Low**	**Nominal**	
	Level							
Quantity [unit]	reference							
	indicated							
Error [unit]								
Relative error [%]								
MPE [%]			☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %					
Functional performance								
	Pass		☐	☐	☐	☐	☐	☐
	Fail		☐	☐	☐	☐	☐	☐
Observations								
Result						Pass	☐	Fail ☐

F.7.12 Immunity to electrical transients along supply lines

OIML R 80-2 Sub.5.4.15.2 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐	Actual level			
		☐	Simulating level			Repetition: times
	Date:			Start	Stop	Specimen:
	Time:					Nom. battery ☐ 12 V
	Ambient temperature			°C	°C	voltage ☐ 24 V
	Relative humidity			%	%	

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]			0.2·*MPE* or E_{min} (whichever is the largest)				
Nominal	12 V	24 V	Fault/Deviation	Significant		Acts on fault	
Test pulse	Pulse voltage U_s [V]			Yes	No	Yes	No
2a	+50	+50		☐	☐	☐	☐
2b	+10	+20		☐	☐	☐	☐
3a	-150	-200		☐	☐	☐	☐
3b	+100	+200		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐

F.7.13 Immunity to electrical transients along other than supply lines

OIML R 80-2 Sub.5.4.15.3 **[unit]** ☐[mm]; ☐[cm]; ☐[m]	Test conditions					Observer name:
	Level	☐	Actual level			
		☐	Simulating level			Repetition: times
	Date:			Start	Stop	Specimen:
	Time:					Nom. battery ☐ 12 V
	Ambient temperature			°C	°C	voltage ☐ 24 V
	Relative humidity			%	%	

	Phase	**Initial**	**During exposure**	**After**
	Level =			
Quantity [unit]	reference			
	indicated			
2nd indication (if applicable)				
Error [unit]				
Relative error [%] E_{ii}				
MPE [%]		☐ 0.5 ; ☐ 1.0 ; ☐ 1.5 ; ☐ 2.5 %		
	Pass	☐		☐
	Fail	☐		☐

Observed faults during exposure

Fault limit [%]			0.2·*MPE* or E_{min} (whichever is the largest)				
Nominal	12 V	24 V	Fault/Deviation	Significant		Acts on fault	
Test pulse	Pulse voltage U_s [V]			Yes	No	Yes	No
a	-60	-80		☐	☐	☐	☐
b	+40	+80		☐	☐	☐	☐

Observations

Result		Pass	☐	Fail	☐