INTERNATIONAL RECOMMENDATION

OIML R 117-3

Edition 2014 (E)

Dynamic measuring systems for liquids other than water.

Part 3: Test report format

Ensembles de mesurage dynamique de liquides autres que l'eau.

Partie 3: Format du rapport d'essai

OIML R 117-3 Edition 2014 (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 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 117-3, Edition 2014 (E) - was developed by OIML Project Group 3 of OIML TC 8/SC 3 *Dynamic measuring systems for liquids other than water*. It was approved for final publication by the International Committee of Legal Metrology in 2014 and will be submitted to the International Conference of Legal Metrology in 2014 for formal sanction.

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Bureau International de Métrologie Légale
11, rue Turgot - 75009 Paris - France
Telephone: 33 (0)1 48 78 12 82
Fax: 33 (0)1 42 82 17 27
E-mail: biml@oiml.org
Internet: www.oiml.org

Dynamic measuring systems for liquids other than water
Part 3: Test report format

1 Introduction

This report format applies to any kind of dynamic measuring systems for liquids other than water independent of its technology. It presents a standardized format for the results of the various tests and examinations, described in OIML R 117-2, to which a type of a measuring system or a sub-assembly shall be submitted with a view to its approval based on this OIML Recommendation.

It is recommended that all metrology services or laboratories evaluating and/or testing types of measuring systems or sub-assemblies according to OIML R 117-1:2007 & -2:2014, or to national or regional regulations based on this Recommendation, use this report format directly, or after translation into a language other than English or French. If this Recommendation needs to be translated, it is highly recommended to leave the structure and the numbering of the clauses unchanged, thus facilitating the interpretation of most of the contents even for those readers that are not able to easily interpret the applied language.

2 Applicability of this test report format

In the framework of the *OIML Certificate System for Measuring Instruments*, and the OIML *Mutual Acceptance Arrangement* (MAA) applicable to measuring systems or sub-assemblies in conformity with OIML R 117-1:2007 & -2:2014, the use of this report format in French and/or in English is mandatory, including its translation into the national languages of the countries issuing such certificates, where appropriate.

Concerning the implementation of OIML R 117-1:2007 & -2:2014 in national regulations this report format is informative.

3 Guidance for the application of this test report format

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

- The “summary of the results” and the “results of the tests” shall be completed in agreement with the following examples:

	Class 0.3	Class 0.5	Class 1	Class 1.5	No	Meaning
Passed for	X					passed for class 0.3
Passed for		X	X	X		passed for class 0.5, 1 and 1.5
Passed for					X	failed for all classes
Passed for	/	/	/	/	/	test is not applicable for this instrument

- Unless prescribed otherwise, “Date” in the test report refers to the date of testing.
- 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 Pass, Fail, N/A are generally not applicable and thus presented crosshatched (see the example below).

Clause	Requirement		Pass	Fail	N/A	Remarks

If a prescribed test is not relevant for the type of instrument to be tested, the reason why the test is omitted shall be clearly stated in the field “Remarks” (for instance tests related to AC mains supply in the case of an instrument only powered by batteries, or partial testing after modification of a previously approved type).

The testing and report formats described in this Recommendation are generally via the volumetric method. However, testing using the gravimetric method is also acceptable.

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

Pages 1–5 of this report format shall be replaced by a cover page added by the Issuing Authority.

4 The report format

The following pages concern the format for the individual report, starting with space for the cover page.

**<Cover page
to be added by the
Issuing Authority>**

Test report format
Contents of the report

A References of the authority responsible for this report

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

B Synopsis of the results of the examination and tests

(To be completed by the Issuing Authority)

The tested specimen fulfils ALL applicable requirements in OIML R 117-1:2007 for: ☐ Class 0.3 ☐ Class 0.5 ☐ Class 1.0 ☐ Class 1.5
☐ Yes ☐ No
Observations:

C Summary of the results of the examination and tests

(To be completed by the Issuing Authority)

C.1 Examinations

Details of the evaluation results are available in the corresponding referenced rows in clause E.

Clause(s) in R 117-1		Compliance with OIML R 117-1		
		Pass	Fail	N/A
2	General requirements			
2.1	Constituens of a measuring system			
2.2	Ancillary devices			
2.3	Rated operating conditions			
2.4	Accuracy classes			
2.5	Maximum permissible errors and significant faults			
2.6	Conditions for applying maximum permissible errors			
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2.17	Control and closing mechanisms			
2.18	Various provisions			
2.19	Markings			
2.20	Sealing devices and stamping plate			
3	Requirements for meters and ancillary devices of a measuring system			
3.1	Meter			
3.2	Indicating device			
3.3	Price indicating device			
3.4	Printing device			
3.5	Memory device			
3.6	Pre-setting device			
3.7	Conversion device			
3.8	Calculator			
4	Measuring systems equipped with electronic devices			
4.1	General requirements			
4.2	Power supply device			
4.3	Checking facilities			
5	Requirements specific to certain types of measuring systems			
5.1	Fuel dispensers			
5.2	Measuring systems on road tankers			
5.3	Measuring systems for the unloading of ships' tanks and of rail and road tankers using an intermediate tank			
5.4	Measuring systems for liquefied gases under pressure (other then LPG dispensers)			
5.5	Fuel dispensers for liquefied gases under pressure (LPG dispensers)			
5.6	Measuring systems for milk, beer and other foaming potable liquids			
5.7	Measuring systems on pipelines and systems for loading ships			
5.8	Measuring systems intended for the refuelling of aircraft			
5.9	Blend dispensers			
5.10	Self-service arrangements with fuel dispensers			
5.11	Other self-service arrangements			
5.12	Unattended delivery			

C.2 Performance tests

Details of the test results are available in the referenced sub-clauses of clause F of this report.

Clause R 117-3	Clause R 117-2	Performance tests	Clause R 117-1	Complies with R 117-1		
				Pass	Fail	N/A
F.1	**4**	**Type evaluation performance tests**	**2.3**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.2	**5**	**Meter sensors and measuring devices**	**3**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.3, F4, F5	**6**	**Electronic calculators, indicating devices and associated devices**	**3**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.6	**7**	**Gas elimination devices**	**2.10**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.7	**8**	**Ancillary devices**				
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.1	**A**	**Fuel dispensers**	**5.1**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.2	**A-LPG**	**LPG dispensers**	**5.5**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.3	**B**	**Measuring systems on road tankers**	**5.2**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.4	**E**	**Measuring systems for milk, beer and other foaming potable liquids**	**5.6**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.5	**F**	**Measuring systems on pipelines and systems for loading ships**	**5.7**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			
F.8.6	**G**	**Measuring systems intended for the refuelling of aircraft**	**5.8**			
yy	xx	Xx	XX			
yy	xx	Xx	XX			

***Note*: yy, xx, Xx and XX are completed by the issuing authority**

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
No application for OIML type evaluation has been made to any other OIML Issuing Authority (see OIML B 3, 3.1.2)	☐ 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)			
Accredited by		Number:	Expires (date):
Accreditation includes OIML R 117	☐ Yes Edition: ☐		☐ No
Details of relevant peer assessment or assessment by other means			
In case tests have been performed on another location than the premises of this laboratory, give details here			
Name of the responsible person			
Date of signature			
Stamp (if applicable) and signature of the responsible person			
Observations:			

D.4 General information concerning the type and the specimen(s) supplied for the tests
(as stated on the instrument / provided by the manufacturer)

Information, indicated on the instrument	
Manufacturer's trade mark	
Type designation	
Accuracy class	
Size of the meter	
Cyclic volume (if applicable)	
Minimum pressure p_{min} (if applicable)	
Maximum pressure p_{max} (if applicable)	
Ambient temperature range (if applicable)	
Liquid temperature range (if applicable)	
Base pressure (if applicable)	
Base temperature (if applicable)	
t_{sp} (if applicable)	
Electrical power (if applicable)	
Identification of software (if applicable)	

The following specimens are used during the examination:

Specimen no.	Model	Size [inch or mm]	Serial no.	Year of fabrication
1				
2				
3				
4				
5				
…				

The following meter sizes are approved with the parameters as indicated in the table (if applicable).

Type				
Diameter in- / outlet [mm]				
Q_{min} [m^3/h]				
Q_{max} [m^3/h]				
Reynolds num. [-]				
Density [kg/m^3]				
Viscosity [cSt]				
MMQ [m^3]				
Temperature range liquid [°C]				
Temperature range ambient [°C]				
Maximum pressure [kPa]				

If the family of meter approach is used, the sizes which are approved but not tested will also be added to the table. The sizes that are tested are in bold.

Relevant external/internal photographs taken during the examination and tests:

D.5 Adjustments and modifications

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

D.6 Additional information concerning the type

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

D.7 Results of previous tests that were taken into account

D.8 Information concerning the test equipment used for the type evaluation

(including details of simulations and the way uncertainties are taken into account)

E Check list for type evaluation and performance test

E.1 Check list for type evaluation

Note: Item numbering refers to International Recommendation OIML R 117-1:2007
"Dynamic measuring systems for liquid other than water"
Part 1: Metrological and technical requirements

For each test, the check list has been completed according to this example:

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2	**General requirements**				
2.7	**Provisions for converted indications**				
	There are two approaches to verify a conversion device:				
	The first approach verifies the conversion device with the associated measuring devices, the calculator, and the indicating device (together). This approach applies to mechanical conversion devices and may apply to electronic conversion devices.				
	The second approach allows for separate verification of the individual components of a conversion device. This approach allows the **separate** verification of associated measuring sensors, associated measuring devices (made up of an associated measuring sensor plus an associated measuring transducer), and the conversion function.				
	In both of these approaches, for the purpose of the verification, the indication of the quantity at metering conditions is assumed to be without any error.				
	The approach to be applied shall be specified by the applicant for type approval.				
2.7.1	**First approach:** Verification of a conversion device with the associated measuring devices, the calculator, and the indicating device (together)				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.7.1.1	It is not mandatory that a conversion device indicates the quantities measured by the associated measuring devices (such as temperature, pressure, and density).				
2.7.1.2	When a conversion device is verified using the first approach, the MPE allowable on the converted indication due to the conversion device (positive or negative), is the greater of: • the value specified in line C of Table 2, or • one half of the minimum specified quantity deviation (E_{min}).				
2.7.1.3	The value of a significant fault on converted indications (from 2.5.4) is the greater of: • one fifth of the absolute value of the MPE for the measured quantity, or • the minimum specified quantity deviation (E_{min}).				
2.7.2	**Second approach:** Verification of the individual components of the conversion device				
2.7.2.1	Verification of a conversion device (as part of the calculator with its indicating device), using simulated inputs				
2.7.2.1.1	Using digital input signals: when a calculator with its indicating device is verified separately, using known "digital input signals" to simulate inputs from associated measuring devices, the MPE and the significant fault for the indication of the temperature or pressure or density are restricted to rounding errors.				
2.7.2.1.2	Using analog input signals: when a calculator with its indicating device is verified separately, using known "analog input signals" to simulate inputs from associated measuring devices, the MPE and the significant fault for the indication of the temperature or pressure or density are those specified in Table 4.1.				
2.7.2.1.3	Verification of indications of converted quantities using simulated inputs The indication of the converted quantity shall agree with the "true value", within one tenth of the MPE stated in line A of Table 2 for the applicable accuracy class. The "true value" is calculated based on the quantities indicated for the simulated inputs for the following: • the unconverted quantity, • the temperature or pressure or density as determined by associated measuring devices, • as well as: • any characteristic quantities entered into the calculator (typically density), and • appropriate values from applicable International Recommendations and Standards.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.7.2.2	Verification of associated measuring devices or associated measuring sensors				
2.7.2.2.1	The MPE and significant fault for indications of temperature or pressure or density measured by an associated measuring device (which is made up of an associated measuring sensor and an associated measuring transducer) when it is subjected to a known temperature or pressure or density, are those specified in Table 4.2. If the indication is provided by the conversion device (as part of the calculator with its indicating device), this MPE includes the MPE of the corresponding calculator as specified in 2.7.2.1.1.				
2.7.2.2.2	When an associated measuring device, which provides a digital signal output is verified by subjecting it to a known temperature or pressure or density, the MPE and significant fault are those specified in Table 4.2. The rounding errors of the calculator or other indicting device are assumed to be negligible.				
2.7.2.2.3	When an associated measuring sensor (which provides an analog output) is verified separately by subjecting it to a known temperature or pressure or density, the MPE and significant fault are those specified in Table 4.3.				
2.8	**Maximum permissible errors and significant faults on calculators**				
	Maximum permissible errors and significant faults on quantities of liquid indications applicable to calculators, positive or negative, when they are tested separately, are equal to one-tenth of the maximum permissible error defined in line A of Table 2.				
	However, the magnitude of the maximum permissible error, respectively significant fault, shall not be less than one half of the scale interval of the measuring system in which the calculator is intended to be included.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.9	**Indications**				
2.9.1	The volume shall be indicated in cubic centimetres or millilitres, in cubic decimetres or litres, or in cubic metres. The mass shall be indicated in grams, kilograms, or metric tons (tonnes). The name of the unit or its symbol shall appear in the immediate vicinity of the indication. For mass, according to the case, the name of the unit or its symbol shall be accompanied by the term "mass" (actual mass) or "conventional mass" (comparison to weights). Where units of quantity are delivered by associated measuring instruments: temperature shall be indicated in degrees Celsius or in degrees Kelvin, density shall be indicated in kilograms per cubic meter, and pressure shall be indicated in bars or Pascals (Pa, kPa, MPa).				
	If units of measurement outside the SI are required by a country's national regulations, these units of measurement shall be considered acceptable for indications in that country. In international trade, the officially agreed equivalents between these units of measurement and those of the SI shall be applied.				
2.9.2	Measuring systems shall be provided with an indicating device giving the quantity of liquid measured at metering conditions. When a measuring system is fitted with a conversion device, it shall be possible to indicate the quantity at metering conditions and the converted quantity. In case of systems used for direct selling to the public, only the quantity used in the transaction shall be indicated in normal operation. The use of the same display for the indications of quantities at metering conditions and converted indications is permitted provided that the nature of the displayed quantity is clear and that these indications are available on request. Provisions applicable to devices which indicate the quantity at metering conditions apply to devices which indicate the converted quantities by analogy.				
2.9.3	A measuring system may have several devices indicating the same quantity. Each shall meet the requirements of this Recommendation. Scale intervals of the various indications may be different.				
2.9.4	For any measured quantity relating to the same measurement, the indications provided by various devices shall not deviate one from another by more than one scale interval or the greatest of the two scale intervals if they differ, except otherwise provided in clause 5 (see 5.10.1.3).				
	For totalizers this requirement applies to the difference in indication before and after the measurement.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.9.5	Subject to specific provisions for certain types of measuring systems, use of the same indicating device for the indications of several measuring systems (which then have a common indicating device) is permitted provided that one of the following conditions is met: • it is impossible to use any two of these measuring systems simultaneously, • the indications relating to a given measuring system are accompanied by a clear identification of that measuring system, and the user may obtain the indication corresponding to any of the measuring systems concerned, using a simple command.		/	/	

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.10	**Elimination of air or gases**				
2.10.1	General requirements				
	Measuring systems shall incorporate a gas elimination device for the proper elimination of any air or undissolved gases which may be contained in the liquid before it enters the meter. In the case that neither air intake nor gas release will occur in the liquid upstream of the meter, a gas elimination device is not required.				
2.10.1	The gas elimination device shall be suitable for the supply conditions and be arranged in such a way that the effect due to the influence of the air or gases on the measuring result does not exceed: • 1 % of the quantity measured for milk, beer, other foaming potable liquids, and for liquids of a viscosity exceeding 1 mPa·s (at 20 °C); or • 0.5 % of the quantity measured for all other liquids. However, it is not necessary for this effect to be less than 1 % of the minimum measured quantity. The values specified in this section apply to the difference between: • the meter errors with air intake or with gas, and • the meter errors without air intake or gas. Gas elimination devices shall be installed in accordance with the manufacturer's instructions.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.10.2	Pumped flow				
	A gas separator shall be provided when, without prejudice of requirements in 2.10.4, the pressure at the pump inlet may, even momentarily, fall below either the atmospheric pressure or the saturated vapor pressure of the liquid, which can result in mixed air or gas. If gaseous formations such as pockets liable to have a specific effect greater than 1 % of the minimum measured quantity can occur as well, this gas separator shall also be approved as a gas extractor. Depending on the supply conditions, a special gas extractor can be used for that purpose if the risk of mixed air or gas is smaller than 5 % of the volume delivered at the maximum flowrate. When applying this provision concerning gaseous formations, it is important to consider that: • gaseous formations are likely to occur because of thermal contraction during shutdown periods, and • air pockets are likely to be introduced into the pipework when the supply tank becomes empty. A gas extractor is required when the pressure at the pump inlet is always greater than the atmospheric pressure and the saturated vapor pressure of the liquid, but gaseous formations liable to have a specific effect greater than 1 % of the minimum measured quantity can occur. When applying this provision, it is necessary to consider the situations concerning gaseous formations that were mentioned above. No gas elimination device is required if the pressure at the pump inlet is always greater than the atmospheric pressure and the saturated vapor pressure of the liquid, and if any gaseous formation liable to have a specific effect greater than 1 % of the minimum measured quantity cannot form or enter the inlet pipework of the meter, whatever the conditions of use.				
	If the gas elimination device is installed below the level of the meter, a non-return valve shall be incorporated to prevent the pipework between the two components from emptying. The loss of pressure caused by the flow of liquid between the gas elimination device and the meter shall be as small as possible. If the pipework upstream of the meter incorporates several high points, it may be necessary to provide one or more automatic or manual evacuation devices				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.10.3	Non-pumped flow				
	When a meter is supplied by gravity without use of a pump, and if the pressure of the liquid in all parts of the pipework upstream of the meter and in the meter itself is greater than the saturated vapor pressure of the liquid and the atmospheric pressure at metering conditions, a gas elimination device is not necessary. If the pressure of the liquid is likely to be lower than the atmospheric pressure while remaining greater than the saturated vapor pressure, an appropriate automatic device shall prevent entry of air into the meter. In other cases, an appropriate gas elimination device shall be provided. If a meter is supplied under gas pressure, the measuring system shall be so constructed that release of gas dissolved in the liquid is avoided. An appropriate device shall prevent entry of gas into the meter. In all circumstances, the pressure of the liquid between the meter and the transfer point shall be greater than the saturated vapor pressure of the liquid.				
2.10.4	Viscous liquids				
	Since the effectiveness of gas elimination devices decreases as the viscosity of the liquids increases, these devices are not required for measuring liquids with a dynamic viscosity of more than 20 mPa·s at 20 °C. In this case, it is necessary to make provisions to prevent entry of air. The pump shall be so arranged that the inlet pressure is always greater than the atmospheric pressure. If it is not always possible to meet this condition, a device shall be provided to stop the flow of liquid automatically as soon as the inlet pressure falls below the atmospheric pressure. A pressure gauge shall be used to monitor this pressure. These provisions are not necessary if devices are provided which ensure that no air can enter through the joints in the sections of the pipework under reduced pressure and if the measuring system is so arranged that no air or dissolved gases will be released.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.10.5	Gas removal pipe				
	The gas removal pipe of a gas elimination device shall not include a manually-controlled valve. However, if such a closing element is required for safety reasons, it shall be possible to ensure that the valve remains in the open position during operation by means of a sealing device or by means of a system interlock that would prevent further measurement upon valve closure.				
2.10.6	Anti-swirl device				
	If the supply tank of a measuring system is normally to be completely emptied, the outlet of the tank shall be fitted with an anti-swirl device, unless the measuring system incorporates a gas separator.				
2.10.7	General provisions for gas elimination devices				
2.10.7.1	The gas separated in a gas elimination device shall be evacuated automatically unless a device is provided which automatically either stops or sufficiently reduces the flow of liquid when there is a risk of air or gases entering the meter. In the case of shutdown, no measurement shall be possible unless the air or gases are automatically or manually eliminated.				
2.10.7.2	The operational limits of a gas elimination device are as follows: • the maximum flowrate(s) for one or more specified liquids, • the maximum pressure (with no flow running) and minimum pressure (with liquid and without air intake while the pump is running at maximum flowrate) compatible with the correct operation of the gas elimination device, and • the minimum measured quantity for which it is designed.				
2.10.8	Special provisions applicable to gas separators				
	Within the error limits specified in 2.10.1, a gas separator shall ensure the elimination of air or gases mixed with the liquid. A gas separator designed for a maximum flowrate lower than or equal to 20 m^3/h shall ensure the elimination of any proportion by volume of air or gases relative to the measured liquid. A gas separator designed for a maximum flowrate higher than 20 m^3 /h shall ensure the elimination of 30 % air or gases relative to the measured liquid (the volumes of air or gases are measured at atmospheric pressure in determining their percentages). The percentage is considered only when the meter is running at flow rates higher than the minimum flow rate (mean value during one minute). Furthermore, when provided, the automatic gas elimination device must continue to operate at the maximum pressure fixed for the gas separator.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.10.9	Special provisions applicable to gas extractors				
	A gas extractor shall, at the maximum flowrate of the measuring system, ensure the elimination of an air or gas pocket of a volume (measured at atmospheric pressure) at least equal to the minimum measured quantity with no resulting additional effect greater than 1 % of the minimum measured quantity. A special gas extractor (capable of eliminating mixed gas and gas pockets), shall also be capable, at the system's maximum flowrate, of continuously separating a volume of air or gas mixed with the liquid equal to 5 % of the volume of liquid delivered (at the maximum flowrate) without the resulting additional effect exceeding the limits fixed in 2.10.1.				
2.11	**Gas indicator**				
	For certain types of measuring systems a gas indicator may be required. The gas indicator shall be designed so as to provide a satisfactory indication of the presence of air or gases in the liquid. The gas indicator shall be downstream of the meter. In empty hose measuring systems, the gas indicator may be in the form of a weir-type sight glass and may also be used as the transfer point. The gas indicator may be fitted with a bleed screw or with any other venting device when it forms a high point of the pipework. No pipe shall be connected to the venting device. Flow indicating devices (e.g. spinners) may be incorporated in gas indicators provided that such devices do not prevent observation of any gaseous formations which could be present in the liquid.				
2.12	**Transfer point**				
2.12.1	Measuring systems shall incorporate a minimum of one transfer point. This transfer point is located downstream of the meter in delivery systems and upstream of the meter in receiving systems.				
2.12.2	Measuring systems may be of two types: "empty hose" systems and "full hose" systems. The term "hose" includes rigid pipework.				
2.12.2.1	In case of an empty hose system the transfer point may be in the form of either a weir-type sight glass, or a closing device combined, in each case, with a system which ensures the emptying of the delivery hose after each measuring operation.				
2.12.2.2	When, in case of full hose systems, the delivery line has a free end, the closing device must be installed as close as possible to this end.				
2.12.2.3	In the case of receiving equipment, the same provisions apply by analogy to the reception pipework upstream of the meter.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.13	**Complete filling of the measuring system**				
2.13.1	The meter and the pipework between the meter and the transfer point shall be kept full of liquid during measurement and during shutdown periods. When this condition is not met, especially in the case of fixed installations, the complete filling of the measuring system up to the transfer point shall be effected manually or automatically and shall be monitored during measurement and shutdowns. To ensure complete elimination of air and gases from the measuring system, a venting device (with means for visual or automatic detection of the complete filling) shall be placed in appropriate positions.				
2.13.2	The effect of contraction due to temperature change on the liquid in the pipework between the meter and the transfer point shall not be greater than 1 % of the minimum measured quantity due to variations in temperature, equal to: • 10 °C for exposed pipes, • 2 °C for insulated or underground pipes. To calculate this additional effect the coefficient of thermal expansion for the liquid shall be rounded to 1×10^{-3} per degree Celsius.				
2.13.3	Following the provisions in 2.10.3, a pressure maintaining device shall, if necessary, be installed downstream of the meter to ensure that the pressure in the gas elimination device and in the meter is always greater than both the atmospheric pressure and the saturated vapor pressure of the liquid.				
2.13.4	When reversal of the flow could result in errors greater than the minimum specified quantity deviation, a measuring system (in which the liquid could flow in the opposite direction when the pump is stopped) shall be provided with a non-return valve. If necessary, the system shall also be fitted with a pressure limiting device				
2.13.5	In empty hose measuring systems, the pipework downstream of the meter and, if necessary, the pipework upstream of the meter shall have a high point so that all parts of the measuring system except the hose, always remain full.				
2.13.6	In full hose measuring systems which are used for measuring liquids other than liquefied gases, the free end of the hose shall incorporate a device which prevents the draining of the hose during shutdown periods. When a closing device is installed downstream of this device, the volume of the space between them shall be as small as possible and, in all cases, be less than the minimum specified quantity deviation.				
2.13.7	If the hose comprises several components, these shall be assembled either by means of a special connector which keeps the hose full, or by a connection system which is either sealed or requires the use of a special tool to be disconnected.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.14	**Emptying of the delivery hose**				
	In empty hose measuring systems, emptying of the delivery hose referred to in 2.12.2.1 is ensured by a venting valve. In some cases, this valve may be replaced by an active means, such as an auxiliary pump or compressed gas injector. This active device shall operate automatically. However, when it is not possible, for duly established technical or safety reasons, to deliver (or to receive) the measured quantity contained in hoses of an empty hose measuring system (for example when measuring liquefied carbon dioxide), this quantity shall be smaller than or equal to half the minimum specified quantity deviation.				
2.15	**Variations in the internal volume of full hoses**				
	For full hoses in a measuring system provided with a hose reel, the increase in internal volume due to the change from the coiled hose position when not under pressure to the uncoiled hose position when under pressure without any flow of liquid, shall not exceed twice the minimum specified quantity deviation. If the measuring system is not provided with a hose reel, the increase in internal volume shall not exceed the minimum specified quantity deviation.				
2.16	**Branches and bypasses**				
2.16.1	In measuring systems intended to deliver liquids, no means shall be provided by which any measured liquid can be diverted downstream of the meter. However, two or more delivery outlets may be permanently installed and operated simultaneously or alternately provided so that any diversion of flow to other than the intended receiving receptacle(s) cannot be readily accomplished or is readily apparent. Such means include, for example, physical barriers, visible valves or indications that make it clear which outlets are in operation, and explanatory signs, if necessary. For measuring systems intended to receive liquids, such provisions apply by analogy. A manually controlled outlet may be available for purging or draining the measuring system. Effective means shall be provided to prevent the passage of liquid through any such outlet during normal operation of the measuring system.				
2.16.2	In measuring systems which may operate either with an empty hose or with a full hose and which are equipped with flexible pipes, a non-return valve shall be incorporated in the rigid pipework leading to the full hose immediately downstream from the selector valve. In addition, the selector valve shall not, in any position, permit connection of the discharge hose, operating as an empty hose to the pipework leading to the full hose.				
2.16.3	It shall not be possible to bypass the meter in normal conditions of use.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.17	**Control and closing mechanisms**				
2.17.1	If there is a risk that the supply conditions can overload the meter, a flow limiting device shall be provided. This device shall be installed downstream of the meter. It shall be possible to seal it.				
2.17.2	The various positions of the controls of multi-way valves shall be easily visible and located by notches, stops or other fixing devices. Deviations from this requirement are permissible when the adjacent positions of the controls form an angle of 90º or more.				
2.18	**Various provisions**				
2.18.1	If provided, filters shall not disturb the accuracy or operation of the measuring system or its components				
2.18.2	In the case of measuring liquid petroleum products, means for vapor recovery shall not influence the accuracy of measurements such that the maximum permissible error is exceeded.				
2.18.3	It may be possible in meters for liquid food (for example, milk) to dismount and disassemble the measuring device to the extent necessary for cleaning. The measuring device must be designed such that improper assembly of the components of the measuring device is not possible. Instead, the meters may be provided with assembly instructions or marks that will ensure correct measurements.				
2.19	**Markings**				
2.19.1	Each measuring system, component or sub-system for which pattern approval has been granted shall bear, placed together legibly and indelibly either on the dial of the indicating device or on a special data plate, the following information: • type approval number, • manufacturer's identification mark, trademark or name, • designation selected by the manufacturer, if appropriate, • year of manufacture, • serial number, • characteristics as defined in 2.3.1 (measuring system), 3.1.1.1 (meter), or 2.10.7.2 (gas elimination device), • accuracy class, and • verification marks. This information shall be put on one or several data plates on a part not likely to be removed in normal conditions of use. At least the information related to the minimum measured quantity and the verification marks shall be visible in normal conditions of use. The information marked on the measuring system shall be the information based on the type approval, including the temperature range, and should not be confused with descriptions affixed for safety reasons, in particular the pressure limits.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.19.2	Each component or sub-system for which type approval has been granted shall bear the following information: • serial number, • type approval number. This information shall be part of the component or sub-system itself or shall be put on a data plate not likely to be removed from the component or sub-system under normal conditions of use.				
2.19.3	If several components operate in a single measurement system, the markings required for each part of the system may be combined on a single plate. If several separate measuring systems operate in a common housing, only one data plate is required. When a measuring system can be transported without being dismantled, the markings required for each component may also be combined on a single plate.				
2.19.4	When volume at base conditions is indicated, the result of measurement shall be accompanied with information with respect to the base conditions, for example: "at 15 °C" or "at 15 °C and 1013.25 hPa".				
2.20	**Sealing devices and stamping plate**				
2.20.1	General				
	Sealing may be carried out with metal, plastic or other suitable means as long as it is sufficiently durable and provides evidence of tampering. The seals shall, in all cases, be easily accessible. Sealing should be provided on all parts of the measuring system which cannot be materially protected in any other way against operations liable to affect the measurement accuracy. Without prejudice to the provisions in 3.1.4 and 3.7.5, it must be prohibited to change parameters which participate in the determination of the results of measurement (parameters for correction and conversion in particular) by means of sealing devices. A plate, referred to as the stamping plate, aimed at receiving the verification marks, shall be sealed or permanently attached on a support of the measuring system. lt may be combined with the data plate of the measuring system referred to in 2.19. In the case of a measuring system used for potable liquids, sealing shall be applied such that the equipment may be dismantled for cleaning purposes.				
2.20.2	Electronic sealing devices				
2.20.2.1	When access to parameters that participate in the determination of results of measurement is not protected by mechanical sealing devices, the protection shall fulfil the provisions of 2.20.2.1.1 through 2.20.2.1.5.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.20.2.1.1	Either: • access shall only be allowed to authorized persons, e.g. by using a "password" and, after changing parameters, the measuring system may be put into use "in sealed condition" again without any restriction; or • access is allowed without restrictions (similar with the classical sealing) but, after changing parameters, the measuring system shall only be put into use'in sealed condition" again by authorized persons, e.g. by using a "password".				
2.20.2.1.2	The "password" must be changeable.				
2.20.2.1.3	In case of direct selling to the public the use of only a "password" is not allowed and the measuring system shall be provided with a mechanical sealing device, e.g. access cover protected switch or key switch.				
2.20.2.1.4	The device shall either clearly indicate when it is in the configuration mode (that is changes not implemented), or it shall not operate while in this mode. This status shall remain until the measuring system has been put into use "in sealed condition" in accordance with 2.20.2.1.1.				
2.20.2.1.5	For identification, data concerning the latest intervention shall be automatically recorded into an event logger. The record shall include at least: • an event counter, • the date the parameter was changed (this is allowed to be entered manually), • the new value of the parameter, and • an identification of the person that implemented the intervention The traceability of the last intervention shall be assured for at least two years, if it is not over-written on the occasion of a further intervention. If it is possible to store more than one intervention, and if deletion of a previous intervention must occur to permit a new record, the oldest record shall be deleted.				
2.20.2.2	For measuring systems with parts which may be disconnected one from another by the user and which are interchangeable, the following provisions shall be fulfilled: • it shall not be possible to access parameters that participate in the determination of results of measurements through disconnected points unless the provisions in 2.20.2.1 are fulfilled; • interposing any device which may influence the accuracy shall be prevented by means of electronic and data processing securities or, if not possible, by mechanical means.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
2.20.2.3	For measuring systems with parts which may be disconnected one from another by the user and which are not interchangeable, the provisions in 2.20.2.2 apply. Moreover, these measuring systems shall be provided with devices which do not allow them to operate if the various parts are not associated according to the manufacturer's configuration. *Note:* Disconnections which are not allowed to the user may be prevented, for example by means of a device that prevents any measurement after disconnecting and reconnecting.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3	**Requirements for meters and ancillary devices of a measuring system**				
3.1	**Meter**				
3.1.1	Rated operating conditions				
3.1.1.1	The rated operating conditions of a meter are determined at least by the following characteristics: • minimum measured quantity, MMQ; • flowrate range limited by the minimum flowrate, Q_{min}, and the maximum flowrate, Q_{max}, (or by the Reynolds number range, if applicable); • name or type of the liquid or its relevant characteristics, for example the viscosity range limited by the minimum viscosity of the liquid and the maximum viscosity of the liquid and/or the density range limited by the minimum density of the liquid ρ_{min} and the maximum density of the liquid ρ_{max}; • the pressure range limited by the minimum pressure of the liquid, P_{min} and the maximum pressure of the liquid, P_{max}; • the temperature range limited by the minimum temperature of the liquid, T_{min} and the maximum temperature of the liquid, T_{max}; • climatic and mechanical environmental class (see Annex A); • nominal value of the AC voltage supply and/or limits of DC voltage supply.				
3.1.1.2	The value of the minimum measured quantity shall be in the form 1×10^n, 2×10^n or 5×10^n authorized units of volume or mass, n being a positive or negative whole number, or zero.				
3.1.2	Metrological requirements In this section, the requirements for a meter also apply to measuring devices.				
3.1.2.1	The maximum permissible errors for a meter, under rated operating conditions, are equal to those specified in line B of Table 2.				
3.1.2.2	For any quantity equal to or greater than five times the minimum measured quantity, the repeatability error of the meter shall not be higher than two-fifths of the value specified in line A of Table 2.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.1.2.3	Under rated operating conditions for a given liquid, meters shall present a magnitude of the difference between the initial intrinsic error and the error after the endurance test equal to or less than the value specified in line B in Table 2.				
3.1.2.4	The minimum specified quantity deviation (E_{min}) for the meter is given by the second formula in 2.5.3.				
3.1.3	Adjustment device				
	A meter may have a sealable means of adjustment which permits modification of the ratio between the indicated quantity and the actual quantity to be within: • 0.05 % for meters intended for measuring systems with accuracy class 0.3; • 0.1 % for meters intended for measuring systems with all other accuracy classes. An adjustment device shall only be used to reduce the errors to as close to zero as possible. Adjustment by means of a bypass of the meter is prohibited.				
3.1.4	Correction device				
3.1.4.1	Meters may be fitted with correction devices; such devices are always considered as an integral part of the meter. The whole of the requirements which apply to the meter, in particular the maximum permissible errors specified in 3.1.2.1, are therefore applicable to the corrected quantity (at metering conditions).				
3.1.4.2	In normal operation, the non-corrected quantity shall not be displayed. The non-corrected quantity shall, however, be available for test purposes.				
3.1.4.3	The correction device shall only be used to reduce the errors to as close to zero as possible.				
3.1.4.4	All the parameters which are not measured and which are necessary for correcting shall be contained in the calculator at the beginning of the measurement operation. The type approval certificate may prescribe the possibility of checking parameters that are necessary for correctness at the time of verification of the correction device.				
3.1.4.5	For transactions that involve direct selling to the public, applying a correction is allowed only by selecting the name or the type of the liquid at the beginning of the measurement operation. For transactions that do not involve direct selling to the public, it is allowed to select or enter the name or type of the liquid or any other data, when this data participates in the correction of the quantity. This other allowed data is that which characterizes the name or type of the measured liquid without any ambiguity.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.1.4.5	All cases are subject to the following conditions: • A printing device subject to legal metrological control is mandatory; • This data and a note explaining that this data has been entered manually shall be printed at the same time as the measuring results; • The name or type of the liquid shall be known and printed without any ambiguity. For transactions that do not involve direct selling to the public (especially transactions governed by specific contracts), a printing device is not required when the following conditions exist: • when the correction is stored by a memory device accessible to all parties involved; or • when both parties have the possibility to be present to conclude the transaction, by any appropriate means, and the two parties are informed of the conditions of the correction. The type approval certificate may indicate how to gain access to the memorized data.				
3.1.4.6	The correction device shall not allow the correction of a pre-estimated drift (such as in relation to time or total quantity).				
3.1.4.7	The associated measuring devices, if any, shall comply with the applicable International Standards or Recommendations. Their accuracy shall be good enough to permit that the requirements on the meter be met, as specified in 3.1.2.1.				
3.1.4.8	Associated measuring devices shall be fitted with checking facilities, as specified in 4.3.6.				
3.1.5.1	Measuring systems equipped with turbine meters				
3.1.5.1	The pressure downstream of the meter shall be such that cavitation is avoided.				
3.1.5.2	If the accuracy of the meter is affected by disturbances in the upstream or downstream pipeline, the meter shall be provided with a sufficient number of straight pipe lengths, with or without flow straightening devices, as specified by the manufacturer, so that the indications of the installed measuring system including the meter meet the requirements of 2.4 to 2.6 with respect to the maximum permissible errors and according to the accuracy class of the measuring system.				
3.1.5.3	The characteristics of the flow straightening devices, and/or straight pipe lengths, if required, shall be specified in the type approval certificate.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.1.5.4	If the system is provided with a programmable or adjustable "low-flow cut-off" feature, a "zero-offset adjustment" feature, or any other adjustable feature relied upon to comply with a test requirement throughout the rated operating conditions, the feature(s) shall be sealable. Clear instructions for the proper setting of the feature(s) shall be provided by the manufacturer. The limitations and setting of the feature(s) shall be detailed in the type approval certificate. "Low-flow cut-off" features shall not be set at flow rates higher than 20 % of the application-defined minimum flow rate. The error caused by the zero-offset of the meter, related to the minimum flowrate, shall not exceed the value specified in line C of Table 2.				
3.1.6	Measuring systems equipped with electromagnetic meters				
3.1.6.1	The requirements in 3.1.5.1 to 3.1.5.4 apply.				
3.1.6.2	The rated operating conditions with respect to the conductivity of the liquid and the cable characteristics shall be specified by the manufacturer and shall be documented in the type approval certificate.				
3.1.7	Measuring systems equipped with ultrasonic meters				
3.1.7.1	The requirements in 3.1.5.1 to 3.1.5.4 apply.				
3.1.7.2	The minimum Reynolds number of the liquid to be measured shall be specified by the manufacturer.				
3.1.8	Measuring systems equipped with vortex meters				
3.1.8.1	The requirements in 3.1.5.1 to 3.1.5.4 and the requirement in 3.1.7.2 apply.				
3.1.9	Measuring systems equipped with mass flow meters				
3.1.9.1	The requirements in 3.1.5.1 to 3.1.5.4 apply.				
3.1.9.2	The mass flowmeter shall be installed in the measuring system in accordance with the system manufacturer's recommendations and with any conditions or limitations set out in the type approval certificate.				
3.1.10	Measuring systems equipped with drum meters for alcohol				
3.1.10.1	The volume of the individual measuring chambers of the drum meter shall be 1×10^n, 2×10^n, or 5×10^n litres, where n is a positive or negative whole number, or zero. The chambers of the drum shall be of equal size. The drum axis shall be horizontal. In order to be able to ensure that it is correctly installed, the meter shall be equipped with a level indicating device if, when the drum axis is inclined up to 3º to the horizontal, the indication of the meter varies by more than half the maximum permissible error on verification.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.1.10.2	The volumes of the individual measuring chambers of a drum meter may be adjusted by means of displacement bodies. The associated conversion device which measures the density and the temperature of the measured liquid shall be adjustable.				
3.1.10.3	The conversion device to determine the volume of ethanol belonging to a drum meter shall function in accordance with the International Recommendation OIML R 22 “International alcoholometric tables” (1975). The reference temperature for the alcohol measurement is 20 ºC. The conversion may be applied mechanically or electronically. These requirements also apply to other measuring principles.				
3.1.10.4	The sampler of a drum meter shall automatically separate and collect a representative sample of the liquid to be measured in order to permit the separate determination of the average alcohol content of liquid which has passed through the measuring device, for example, by separating an equal volume each time the measuring chambers are filled. If the test volume withdrawn is subject to special or separate treatment, the measuring device shall be so adjusted that the volume withdrawn is not included in the indication of the drum meter.				
3.1.10.5	The elimination of air intake or gas release will be performed by the drum meter itself. So no additional gas elimination device is required.				
3.1.10.6	The following inadmissible operating conditions and failures of a drum meter shall either be prevented by special devices incorporated in the meter, or their occurrences shall be indicated by warning devices: • excessive flowrate; • obstruction of free flow; • overfilling of the drum due to obstruction of the rotating elements; • temperature outside the permissible range; and • inadmissible heating of the separated sample.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.2	**Indicating device**				
3.2.1	General provisions				
3.2.1.1	Reading of the indications shall be precise, easy and non-ambiguous whatever position the indicating device comes to rest; if the devices comprises several elements, it shall be arranged in such a way that the reading of the measured quantity can be made by simple juxtaposition of the indications of the different elements. The decimal sign shall appear distinctly.				
3.2.1.2	The scale interval of indication shall be in the form 1×10^n, 2×10^n or 5×10^n authorised units of quantity, where n is a positive or negative whole number, or zero.				
3.2.1.3	Non-significant minimum increments of registration should be avoided. This does not apply to price indications.				
3.2.1.4	The scale interval shall satisfy the following requirements: • for analog indicating devices, the quantity corresponding to 2 mm on the scale or to one-fifth of the scale interval (of the first element for mechanical indicating devices), whichever is greater, shall be less than or equal to the minimum specified quantity deviation; • for digital indicating devices, the quantity corresponding to two minimum increments of registration shall be less than or equal to the minimum specified quantity deviation.				
3.2.2	Mechanical indicating device				
3.2.2.1	When the graduation of an element is entirely visible, the value of one revolution of that element shall be in the form 10^n authorized units of quantity, where n is a whole number. This rule however, does not apply to the element corresponding to the maximum range of the indicating device.				
3.2.2.2	On an indicating device having several elements, the value of each revolution of an element whose graduation is entirely visible must correspond to the scale interval of the following element.				
3.2.2.3	An element of the indicating device may have continuous or discontinuous movement, but when elements other than the first have only part of their scales visible through the windows, these elements shall have discontinuous movement.				
3.2.2.4	The advance by one figure of any element having discontinuous movement shall occur and be completed when the preceding element passes from 9 to 0.				
3.2.2.5	When the first element has only a part of its scale visible through a window and has a continuous movement, the dimension of that window shall be at least equal to 1.5 times the distance between two consecutive graduated scale marks.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.2.2.6	All scale marks shall have the same width, constant along the line and not exceeding one quarter of the scale spacing. The apparent scale spacing shall be equal to or greater than 2 mm. The apparent height of the figures shall be equal to or greater than 4 mm, unless otherwise specified in the requirements for particular measuring systems.				
3.2.3	Electronic indicating device				
	The continuous display of quantity during the period of measurement is only mandatory in the case of direct selling to the public. However, if interrupting the display of quantity interrupts the action of some checking facilities that are mandatory or necessary to ensure correct measurement, the quantity passing through the meter during each interruption shall be smaller than or equal to the minimum measured quantity.				
3.2.4	Zero setting device for quantity indicating device				
3.2.4.1	A quantity indicating device may be provided with an ancillary device for setting the indication to zero either by manual operation or by means of an automatic system.				
3.2.4.2	Once the zeroing operation has begun it shall be impossible for the quantity indication to show a result different from that of the measurement, which has just been made, until the zeroing operation has completed. Indicating devices on fuel dispensers and electronic measuring systems shall not be capable of being reset to zero during measurement. On other measuring systems, either this provision shall be fulfilled or a clearly visible notice shall be provided on the indicating device stating that this operation is prohibited.				
3.2.4.3	On analog indicating devices, the residual indication after return to zero shall not be more than half the minimum specified quantity deviation.				
3.2.4.4	On digital indicating devices, the quantity indication after return to zero shall be zero without any ambiguity.				
3.2.4.5	In the case of direct selling to the public, and except for fuel dispensers, the following provisions apply: • the next delivery shall be inhibited until the indicating device has been reset to zero; or • when the zeroing operation is not automatic, the measuring system shall bear legible and indelible information inviting the customer to reset the indication before the delivery.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.3	**Price indicating device**				
3.3.1	A quantity indicating device with aligned figures and zero-setting may be complemented with a price indicating device, also with aligned figures and zero-setting.				
3.3.2	The unit price may be displayed before the delivery (3.3.2.1) or the unit price may be keyed in after the delivery (3.3.2.2).				
3.3.2.1	The selected unit price shall be displayed by an indicating device before the start of the measurement (unless the option in 3.3.2.2 is used). The unit price shall be adjustable; changing the unit price may be carried out either directly on the measuring system or through ancillary devices. The indicated unit price at the start of the measurement operation shall be valid for the whole transaction. A new unit price shall only be effective at the moment of a new measurement operation. A time of at least 5 seconds shall elapse between indicating a new unit price and before the next measurement operation can start, if the unit price is set from ancillary devices.				
3.3.2.2	(This section is a different option from 3.3.2.1 and is not applicable to fuel dispensers.) In the case of price indicating devices for measuring systems other than fuel dispensers, it is permitted to display only the quantity before and during the delivery. Neither unit price nor total price is displayed before and during the delivery. After the measurement operation is complete, the unit price is selected (or keyed in) to process the total price calculation to conclude the transaction; this unit price shall be valid for the whole transaction. In the case of direct selling to the public, the unit price shall be displayed or printed.				
3.3.3	The provisions in 3.2 relating to quantity indicating devices apply also, by analogy, to the price indicating devices.				
3.3.4	The monetary unit used, or its symbol, shall appear in the immediate vicinity of the indication.				
3.3.5	The zero-setting devices of the price indicating device and of the quantity indicating device shall be designed in such a way that zeroing either indicating device automatically involves zeroing the other.				
3.3.6	The scale interval shall satisfy the following requirements • for analog indicating devices, the price corresponding to 2 mm on the scale or to one-fifth of the scale interval (of the first element for mechanical indicating devices), whichever is greater, shall be less than or equal to the minimum specified price deviation; • for digital indicating devices, the price corresponding to two minimum increments of registration, shall be less than or equal to the minimum specified price deviation. However, the interval of one-fifth of the scale interval or of 2 mm in the case of the first bullet or the scale interval in the case of the second bullet needs not correspond to a value less than that of the smallest coin in circulation in the country in which the equipment is used.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.3.7	The difference between the indicated price and the price calculated from the unit price and the indicated quantity shall not exceed the minimum specified price deviation. However this difference need not be less than the smallest coin in circulation in the country in which the equipment is used. Moreover this requirement does not apply when the unit price has been changed between two measurements.				
3.3.8	The significant fault on price indication (the difference in 3.3.7) is the price corresponding to the significant fault for the quantity as specified in 2.5.4.				
3.3.9	On analog indicating devices, the residual indication after zeroing shall not exceed half the minimum specified price deviation. However, this indication need not be less than the smallest coin in circulation in the country in which the equipment is used.				
3.3.10	On digital indicating devices, the price indication after zeroing shall be zero without any ambiguity.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.4	**Printing device**				
3.4.1	The printed scale interval shall be in the form of 1×10^n, 2×10^n or 5×10^n authorized units of quantity, n being a positive or negative whole number, or zero, and shall not be greater than the minimum specified quantity deviation. The printed scale interval shall not be less than the smallest scale interval of the indicating devices.				
3.4.2	The quantity printed shall be expressed in one of the units authorized for the indication of quantity and expressed in the same units as the indicating device. The figures, the unit used or its symbol and the decimal sign, if any, shall be printed unambiguously on the ticket.				
3.4.3	The printing device may also print information identifying the measurement such as: sequence number, date, identification of the dispenser, type or name of liquid, etc. If the printing device is connected to more than one measuring system, it shall print the identification of the relevant system.				
3.4.4	If a printing device allows repetition of the printing before a new delivery has started, copies shall be clearly marked as such, for example by printing "duplicate".				
3.4.5	If the quantity is determined by the difference between two printed values, even if one is expressed in zeros, it shall be impossible to withdraw the ticket from the printing device during measurement.				
3.4.6	Where the printing device and quantity indicating device each have a zeroing device, these devices shall be designed so that resetting one of them to zero also resets the other.				
3.4.7	The printing device may print, in addition to the measured quantity, the corresponding transaction price, or this price accompanied by the unit price. Any value shall be printed as a repeated value from the measuring system. The figures, the monetary unit used or its symbol, and the decimal sign, if any, shall be printed unambiguously on the ticket.				
3.4.8	The printed price scale interval shall be in the form 1×10^n, 2×10^n or 5×10^n monetary units, n being a positive or negative whole number, or zero; it shall not exceed the minimum specified price deviation. However, it need not be less than the smallest coin in circulation in the country in which the equipment is used.				
3.4.9	If the quantity indicating device is not fitted with a price indicating device, the difference between the printed price and the price calculated on the basis of the indicated quantity and the printed unit price shall comply with the requirements in 3.3.7.				
3.4.10	Electronic printing devices are also subject to the requirements in 4.3.5.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.5	**Memory device**				
3.5.1	Measuring systems may be fitted with a memory device to store measurement results until their use or to keep a record of commercial transactions, providing proof in the event of a dispute. Devices used to read stored information are considered as included in the memory devices. It is not required that the parties interested in a transaction shall be provided continuously with the results of measurement, but only that they shall have access to these results (for example, in the event of a dispute). In addition, in the case of self-service (filling station, truck filling station) the owner of the measuring system is considered to have access to the indications of the measuring system even when he does not use this possibility in practice.				
3.5.2	The medium on which data are stored must have sufficient permanency to ensure that the data are not corrupted under normal storage conditions. There shall be sufficient memory storage for any particular application.				
3.5.3	Stored data may be deleted if either: • the transaction is settled; or • these data are printed by a printing device subject to legal control.				
3.5.4	After the requirements in 3.5.3 are fulfilled and when the storage is full, it is permitted to delete memorized data when both the following conditions are met: • data are deleted in the same order as the recording order and the rules established for the particular application are respected; • deletion is carried out either automatically or after a special manual operation.				
3.5.5	Memorization shall be such that it is impossible in normal use to modify stored values. The data memorized must be protected against unintentional and intentional changes with common software tools.				
3.5.6	Memory devices shall be fitted with checking facilities according to 4.3.5. The aim of the checking facility is to ensure that stored data correspond to the data provided by the calculator and that restored data correspond to stored data.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.6	**Pre-setting device**				
3.6.1	The preset quantity shall be indicated before the start of the measurement.				
3.6.2	Where pre-setting is effected by means of several controls which are independent of each other, the scale interval corresponding to one control shall be equal to the pre-setting range of the control of the next lower order. Pre-setting devices with push-buttons or similar means to pre-set fixed quantities are allowed, provided that these fixed quantities are equal to a whole number of units of volume or mass.				
3.6.3	Pre-setting devices may be so arranged that the repetition of a selected quantity does not require a new setting of the controls.				
3.6.4	Where it is possible to view simultaneously the figures of the display device of the pre-setting device and those of the quantity indicating device, the former shall be clearly distinguishable from the latter.				
3.6.5	Indication of the selected quantity may, during measurement, either remain unaltered or return progressively to zero. However, for an electronic pre-setting device it is acceptable to indicate the preset value on the indicating device for quantity or price by means of a special operation with the restriction that this value shall be replaced by the zero indication for quantity or price before the measurement operation can start.				
3.6.6	In the case of a prepaid or pre-ordered delivery: • the difference found under normal operating conditions between the pre-set quantity and the quantity shown by the quantity indicating device at the end of the measurement operation shall not exceed the minimum specified quantity deviation; • the difference found under normal operating conditions between the prepaid amount and the price shown by the price indicating device at the end of the measurement operation shall not exceed the minimum specified price deviation.				
3.6.7	The pre-set quantities and the quantities shown by the quantity indicating device shall be expressed in the same unit. This unit (or its symbol) shall be marked on the pre-setting mechanism.				
3.6.8	The scale interval of the pre-setting device shall not be less than the scale interval of the indicating device.				
3.6.9	Pre-setting devices may incorporate a device to permit the flow of liquid to be stopped quickly when necessary.				
3.6.10	Measuring systems with a price indicating device may also be fitted with a price pre-setting device which stops the flow of the liquid when the quantity delivered corresponds to the pre-set price. The requirements in 3.6.1 to 3.6.9 apply by analogy.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.7	**Conversion device**				
3.7.1	Measuring systems may be fitted with a conversion device as defined in T.c.4. The provisions of 3.7 apply to electronic conversion devices and, by analogy, to mechanical conversion devices.				
3.7.2	The calculation of the converted quantity shall be made according to the applicable International Recommendations or Standards, or other acceptable methods.				
3.7.3	The parameters which characterize the measured liquid and which are employed in the conversion formula shall be measured using associated measuring devices subject to control when the parameters vary during the measurement process. However, some of these parameters may be not measured, or associated measuring devices may be not subject to control if these parameters do not vary substantially. In any case, the maximum permissible errors an converted indications due to the conversion device, shall not exceed the values specified in 2.7.1.2.				
3.7.4	Associated measuring sensors and suitable provisions for testing shall be installed within a distance of one metre (1 m) of the meter wherever possible. Where this is not possible, it shall be possible to verify that the associated measuring devices are able to determine (within the maximum permissible errors as defined in Table 4.2) the relevant characteristic quantities of the liquid, as they exist in the measuring device (See also Annex B). The associated measuring devices shall not affect the correct functioning of the meter(s).				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.7.5	All the parameters which are not measured and which are necessary for the conversion shall be present in the calculator at the beginning of the measurement operation. lt must be possible to print or to indicate them from the calculator. The device(s) used exclusively to print or indicate these non measured parameters are considered to be non-critical and are only subject to tests showing their capability to correctly indicate or print these values. For a mechanical conversion device that cannot print or indicate these values, a seal must be broken to change any setting. For direct selling to the public, it is allowed to enter the name or type of the liquid into the calculator at the beginning of the measurement Operation; it is not permitted to change any other parameter participating in conversion unless a seal is broken. In other cases, it is allowed to select or enter the name or type of the liquid or any other data, when this data participates in the conversion of the quantity, subject to the following conditions: • a printing device subject to legal metrological control is mandatory; • this data and a note explaining that this data has been entered manually shall be printed at the same time as the measurement results; • the name or type of the liquid shall be known and printed without any ambiguity; • where the transaction does not involve direct selling to the public, the other allowed data are those which characterize the name or type of the measured liquid without any ambiguity. Except in the case of direct selling to the public it is allowed to replace the printing device under the following conditions: • in case of conversion by a memory device; or • when both parties have the possibility to be present to conclude the transaction, by any appropriate means to inform the two parties of the conditions of conversion. The type approval certificate may indicate how to gain access to the memorized data.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
3.7.6	In addition to the quantity at metering conditions and the volume at base conditions or the mass, which shall be displayed according to 2.9.2, the values of other measured quantities (density, pressure, temperature) shall be accessible for testing purposes. When only used for testing or inspection purposes, the device(s) used to access and indicate these values is(are) considered to be non-critical, and is(are) only subject to tests showing its(their) capability to correctly indicate or print these values. Scale intervals for indication of density, pressure and temperature shall be smaller than or equal to one fifth of the maximum permissible errors fixed in Table 4.2 in 2.7.2.2 for associated measuring devices.				
3.7.7	The temperature sensor shall respond rapidly to temperature changes in order to measure the temperature of the liquid passing through the meter in a sufficiently accurate way.				
3.8	**Calculator**				
	All parameters necessary for the elaboration of indications that are subject to legal metrology control, such as unit price, calculation table, correction polynomial, etc. shall be present in the calculator at the beginning of the measurement operation. The calculator may be provided with interfaces permitting the coupling of other devices. When these Interfaces are used, the Instrument shall continue to function correctly and its metrological functions shall not be influenced or affected.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4	**Measuring systems equipped with electronic devices**				
4.1	General requirements				
4.1.1	Electronic measuring systems shall be designed and manufactured such that their metrological functions are safeguarded and their errors do not exceed the maximum permissible errors as defined in 2.5 under rated operating conditions.				
4.1.1.1	Interruptible electronic measuring systems shall be designed and manufactured such that, when they are exposed to the disturbances specified in A.4, either: a) significant faults do not occur, or b) checking facilities detect a malfunction and act upon it in accordance with 4.3 when significant faults occur.				
4.1.1.2	Non-interruptible measuring systems shall be designed and manufactured in such a way that no significant faults occur when they are exposed to the disturbances specified in A.4.				
4.1.2	lt is the responsibility of the manufacturer to decide whether a given type of measuring system is interruptible or not, taking into account the applicable rules of security and type of application. However, measuring systems for direct selling to the public shall be interruptible. When, at the time of type approval, it is not possible to specify the future utilization of the instrument the requirements in 4.1.1.2 apply.				
4.1.3	The requirements in 4.1.1 shall be met durably. For this purpose electronic measuring systems shall be provided with the checking facilities specified in 4.3.				
4.1.5	Measuring systems shall permit the retrieval of the measurement result just before a malfunction, in particular significant faults and/or power supply failure, occurred and was detected by checking facilities.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4.2	**Power supply device**				
4.2.1	When the flow is not interrupted during the failure of the principal power supply device, the measuring system shall be provided with a means to safeguard all measuring functions during that failure.				
4.2.2	When the flow is interrupted during the failure of the principal power supply device, the provisions in 4.2.1 shall be met, or data contained at the moment of the failure shall be saved and displayable an an indicating device subject to legal metrology control during a period of at least 15 minutes, to permit the conclusion of the current transaction.				
4.2.2.1	If a provision for the manual activation of the display is present, the display shall be available for a minimum of two minutes.				
4.2.2.2	As an alternative, except for direct selling to the public, the last transaction may be memorized and displayable upon the restoration of power.				
4.3	Checking facilities				
4.3.1	Action of checking facilities The detection by the checking facilities of incorrectness in generation, transmission, processing and/or indication of measurement data shall result in the following actions, according to the type.				
4.3.1.1	Type N (Non-automatic): a visible or audible alarm for the attention of the operator.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4.3.1.2	Type I or P				
	a) for non-interruptible measuring systems:				
	• automatic correction of the fault				
	• stopping only the faulty device when the measuring system without that device continues to comply with the regulations				
	• a visible or audible alarm for the Operator; this alarm shall continue until the cause of the alarm is suppressed. In addition, when the measuring system transmits data to ancillary devices, the transmission shall be accompanied by a message indicating the presence of a fault. This bullet is not applicable for the disturbances specifies in A.11.				
	Where an instrument is equipped with facilities to estimate the quantity of liquid having passed through the system during a fault, all indications of such values shall be clearly identifies as estimates.				
	b) for interruptible measuring systems, in particular for fuel dispensers:				
	• automatic correction of the fault				
	• stopping only the faulty device, when the measuring system without that device continues to comply with the regulations				
	• stopping the flow.				
4.3.2	Checking facilities for the measuring device Checking facilities shall be designed and manufactured such that they can verify the presence of the measuring device, its correct operation, and the correctness of the data transmission.				
4.3.2.1	When the signals generated by the measuring device are in the form of pulses, each pulse representing an elementary quantity, significant faults shall be detected by checking facilities and acted upon. These checking facilities shall be of type P and the checking shall occur at time intervals not exceeding the duration of the measurement of an amount of liquid equal to the minimum specified quantity deviation. While not an requirement for initial and subsequent verification, it shall be possible during type approval to ensure that these checking facilities function correctly: • by disconnecting the transducer, or • by interrupting one of the sensor's pulse generators, or • by interrupting the electrical supply of the transducer.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4.3.2.2	For electromagnetic meters only, where the amplitude of the Signals generated by the measuring device is proportional to the flowrate, the following procedure may be used:				
	A simulated signal with a shape similar to that of the measurement signal is fed into the Input of the secondary device, representing a flowrate between the minimum and maximum flowrate of the meter. The checking facility shall check the primary and the secondary device. The equivalent digital value is checked to verify that it is within predetermined limits given by the manufacturer and consistent with the maximum permissible errors.				
	This checking facility shall be of type P or I. In the latter case, the checking shall occur at least every five minutes.				
	Note: Following this procedure, additional checking facilities (more than two electrodes, double signal transmission etc.) are not required.				
4.3.2.3	For other technologies checking facilities providing equivalent levels of security remain to be developed.				
4.3.3	Checking facilities for the calculator These checking facilities shall verify that the calculator system functions correctly and ensure the validity of the calculations made. There are no special means required for indicating that these checking facilities function correctly.				
4.3.3.1	The checking of the functioning of the calculation system shall be of types P or I. In the latter case, the checking shall occur at least every five minutes, except in the case of fuel dispensers, for which it shall occur at each delivery. The objective of the checking is to verify that: • the values of all permanently memorized instructions and data are correct; and • all procedures of internal transfer and storage of data relevant to the measurement result are performed correctly.				
4.3.3.2	The checking of the validity of calculations shall be of type P. This consists of checking the correct value of all data related to the measurement whenever these data are internally stored or transmitted to an ancillary device through an interface.				
	In addition, the calculation system shall be provided with a means of controlling the continuity of the calculation program.				
4.3.4	Checking facilities for the indicating device This checking facility shall verify that the primary indications are displayed and that they correspond to the data provided by the calculator.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4.3.4	In addition, the checking facility shall verify the presence of the indicating devices, if they are removable.				
	These verifications may be performed in one of two possible ways; they may be performed either according to first possibility which is presented in 4.3.4.2 or they may be performed according to the second possibility which is presented in 4.3.4.3.				
4.3.4.1	While not a requirement for initial and subsequent verification, it shall be possible during type approval to ensure that the checking facility of the indicating device is working properly.				
4.3.4.2	The first possibility is to automatically control the complete indicating device. The checking facility of the indicating device is of type P. However, it may be of type I if a primary indication is provided by another device of the measuring system or if the indication may be easily determined from other primary indications (for example, in the case of a fuel dispenser, it is possible to determine the price to pay from the quantity and the unit price).				
4.3.4.3	The second possibility is to automatically check the data transmitted to the indicating device and the electronic circuits used for the indicating device, except the driving circuits of the display itself, and to also check the display.				
	The automatic checking facility of the transmitted data and of the electronic circuits used for the indicating device is of type P. However, it may be of type I if a primary indication is provided by another device of the measuring system, or if the indication may be easily determined from other primary indications (for example, in the case of the presence of a price indicating device, it is possible to determine the price to pay from the quantity and the unit price).				
	The checking facility of the display shall provide the ability to visually check the entire display which shall meet the following description:				
	a) For fuel dispensers: • displaying all the elements (“eights” test if appropriate); • blanking all the elements (“blank” test), and displaying “zeros” for quantity and, if applicable, displaying the valid unit price and “zeros” for price, just before a new delivery starts.				
	b) For all other interruptible and non-interruptible measuring systems, the test sequence shall be as described under a) (above) or any other automatic test cycle which indicates all possible states for each element of the display.				
	This ability to visually check the display shall be of type I for fuel dispensers and of type N for other interruptible and non-interruptible measuring systems, but it is not mandatory for a malfunction to result in the actions described in 4.3.1.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
4.3.5	Checking facilities for ancillary devices An ancillary device (repeating device, printing device, seif-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device, when it is a necessary device, and to verify the correct transmission of data from the calculator to the ancillary device.				
	In particular, the checking of a printing device aims at ensuring that the data received and processed by the printing device correspond to the data transmitted by the calculator. At least the following shall be checked: • presence of paper, • transmission of data, • the electronic control circuits (except the driving circuits of the printing mechanism itself). While not a requirement for initial and subsequent verification, it shall be possible during type approval to ensure that the checking facility of the printing device is functioning by an action that forces a printing malfunction. This action should be a simulated incorrectness in the generation, transmission (taking into account 4.3.2.1), processing, or indication of measurement data.				
	Where the action of the checking facility is a warning, this shall be given on or by the ancillary device concerned.				
4.3.6	Checking facilities for the associated measuring devices Associated measuring devices shall include a checking facility of type P. The aim of this checking facility is to ensure that the Signal given by these associated devices is inside a pre-determined measuring range. Data from associated measuring devices shall be read at least 5 times during a quantity equal to the minimum measured quantity. Each time the data is read there shall be a check.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5	**Requirements specific to certain types of measuring systems**				
5.1	**Fuel dispensers**				
	Except where otherwise specified, the requirements in this section do not apply to LPG dispensers.				
5.1.1	Where installed, the ratio between the maximum and the minimum flowrate may be smaller than 10 provided that it is not less than five. *Note*: this (as installed) requirement is different than the requirement in 2.3.3.3.				
5.1.2	When the measuring system includes its own pump, a gas elimination device shall be installed immediately upstream of the meter inlet.				
5.1.3	When the measuring system is intended for installation in a centrally pumped system, or for a remote pump, the general provisions in 2.10 shall be applied. If it is not intended to install a gas elimination device, there shall be no risk of air intake or gas release. In this case, an automatic facility (such as a storage tank level detector) shall automatically prevent further deliveries when the storage tank minimum level is reached (see also 2.10.2).				
5.1.4	Where a gas indicator is fitted, it shall not have a venting device as mentioned in 2.11.				
5.1.5	Fuel dispensers shall be equipped with a device for resetting the quantity indicating device to zero. If these systems also include a price indicating device, this indicating device shall be fitted with a zero-setting device.				
5.1.6	The minimum height for the figures of the resettable quantity indicator is 10 mm. The minimum height for the resettable price indicator is 10 mm. The minimum height for the unit price is 4 mm.				
5.1.7	When only one nozzle can be used during a delivery, and after the nozzle has been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. When two or more nozzles can be used simultaneously or alternately, and after the utilized nozzles have been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. Moreover, by design, the provisions in the first paragraph of 2.16.1 shall be fulfilled. The above requirements do not apply when an auxiliary hand pump is used.				
5.1.8	Measuring systems having a maximum flowrate not greater than 3.6 m^3/h, shall have a minimum measured quantity not exceeding 5 L.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.1.9	When the measuring system is fitted with a ticket printing device which is subject to control, this printing device shall comply with the relevant requirements in 3.4. In addition, any printing operation shall prevent the continuation of the delivery until a reset to zero as been performed. However, the printing operation shall not change the quantity indicated on the indicating device.				
5.1.10	Fuel dispensers shall be interruptible.				
5.1.11	In addition to the requirements in 4.2.2, electronic fuel dispensers shall be such that the minimum duration of operation of the display shall be either: • at least 15 min continuously and automatically after the failure of the principal electrical supply; or • a total of at least 5 min in one or several periods controlled manually during one hour after the failure.				
5.1.11	The instrument shall be supplied with electric power for the 12 hours preceding a test of this requirement. In addition, electronic fuel dispensers shall be designed so that an interrupted delivery cannot be continued after the power supply has been re-established if the power failure has lasted more than 15 seconds.				
5.1.12	When several fuel dispensers have a common indicating device it shall be impossible to use any of these measuring systems simultaneously.				
5.1.13	The checking of the operation of the calculator, as described in 4.3.3.1, shall be performed at least once for each delivery.				
5.1.14	It is not required to display quantities, and prices if applicable, that correspond to a small number of “minimum increments of registration” at the beginning of the delivery. The display of quantity or price may start after the hidden quantity has been reached.				
5.1.15	All dispensers with electronic indicators shall be fitted with a time-out device that terminates a transaction (i.e. the dispenser is reset to zero before delivery starts), should a period of inactivity (no flow) of more than 120 seconds occur during the transaction.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.2	**Measuring system on road tankers**				
5.2.1	The provisions hereafter apply to measuring systems mounted on road tankers or on transportable tanks for the transport and delivery of liquids of low viscosity ($\leq$ 20 mPa·s) and stored at atmospheric pressure with the exception of foaming potable liquids (see 5.6 for these requirements).				
5.2.2	Tanks equipped with measuring systems may comprise one or more compartments.				
5.2.3	The compartments of road tankers shall be fitted with an anti-swirl device, except when the measuring system is fitted with a gas separator which complies with 2.10.8.				
5.2.4	When a tank comprises more than one compartment, each compartment shall be provided with an individual (manual or automatic) closing device in each outlet line.				
5.2.5	In conformity with national regulations on their use, each measuring system shall be allocated to a specific product or to a range of products for which the meter has been approved.				
5.2.6	Subject to the requirements in 2.16.2, a measuring system mounted on a road tanker may include empty or full hoses or both.				
5.2.7	The quantity indicating device shall include a zero-setting device complying with 3.2.4. When the measuring system is fitted with a ticket printing device, any printing operation shall prevent the continuation of the delivery until a reset to zero has been performed.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.2.8	Measuring systems mounted on road tankers may be designed to operate by pump only, or by gravity only, or with the choice of either pump or gravity, or by gas pressure.				
5.2.8.1	Measuring systems fed by pump only may operate either empty hose or full hose and shall comply with the requirements in 5.2.8.1.1 and 5.2.8.1.2.				
5.2.8.1.1	As there is a risk that the requirements in 2.10.2 related to the absence of air or gas cannot be met, the measuring system shall have a suitable gas elimination device upstream of the meter (see 2.10.7, 2.10.8 and 2.10.9).				
5.2.8.1.2	When, in a measuring system, the pressure at the outlet of the meter can be lower than atmospheric pressure, but still higher than the saturated vapor pressure, an automatic means to prevent any air from entering the meter shall be installed. When the pressure at the outlet of the meter cannot be lower than atmospheric pressure (this is especially the case for systems operating solely full hose), the use of automatic devices for slowing down and stopping the flow is not required.				
5.2.8.2	Measuring systems operating solely by gravity shall comply with the following requirements.				
5.2.8.2.1	The equipment shall be so constructed that the total contents of the compartment(s) can be measured at a flowrate greater than or equal to the minimum flowrate of the measuring system.				
5.2.8.2.2	If there are connections with the gas phase in the tank of the road tanker, appropriate devices shall prevent any gas from entering the meter.				
5.2.8.2.3	The requirements in 2.10.3 concerning non-pumped flow shall apply. A pump downstream of the transfer point for increasing the flowrate may be authorized if the foregoing provisions are complied with. This pump shall not cause a fall in pressure in the meter.				
5.2.8.2.4	Where an air release to atmosphere is required to ensure the complete emptying of all piping downstream of the transfer point, it shall be automatic in operation. Means for visual or automatic detection of the complete emptying are mandatory in this case.				
5.2.8.3	Measuring systems capable of being operated either by gravity or by pump shall comply with the requirements in 5.2.8.1 and 5.2.8.2.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.2.8.4	Measuring systems operated by means of gas pressure may operate empty hose or full hose. The pipework which links the meter to the device intended to prevent any gas from entering the meter as specified in 2.10.3 shall have no constriction or component likely to cause a pressure loss which could generate gas pockets by releasing the gas dissolved in the liquid. These systems shall include a pressure gauge which indicates the pressure in the tank. The dial of this gauge shall indicate the range of permissible pressures.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.3	**Measuring systems for the unloading of ships' tanks and of rail and road tankers using an intermediate tank**				
5.3.1	Measuring systems designed to measure quantities of liquids during the unloading of ships' tanks and of rail and road tankers may include an intermediate tank in which the liquid level determines the transfer point. This intermediate tank may be designed to ensure the elimination of gas. The cross section of the intermediate tank shall be such that a quantity equal to the minimum specified quantity deviation corresponds to a difference in level of at least 2 mm.				
5.3.2	In the case of road and rail tankers, the intermediate tank shall automatically ensure a constant level, visible or detectable, at the beginning and at the end of the measurement operation. The level is considered to be constant when it settles within a range corresponding to a quantity of no more than the minimum specified quantity deviation.				
5.3.3	In the case of ships' tanks, it is not necessary to provide for the automatic maintenance of a constant level. Where such a provision is not made, it shall be possible to measure the contents in the intermediate tank. If the ships' tank is unloaded by means of pumps located in the bottom of the ship, the intermediate tank may be used only at the beginning and at the end of the measurement operation.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.4	**Measuring systems for liquefied gases under pressure (other than LPG dispensers)**				
5.4.1	Only full hose measuring systems are authorized (unless 5.4.9 is applicable).				
5.4.2	The design of the measuring system shall ensure that the product in the meter remains in a liquid state during the measurement.				
5.4.3	A thermometer well shall be provided close to the meter for verification purposes.				
5.4.4	Provisions shall be made for fitting a pressure measuring device downstream and close to the meter. This measuring device shall be available for verification. If necessary, provisions for sealing shall be made.				
5.4.5	When the quantity is measured using a system mounted on a road tanker, any connection between the gaseous phases of the vehicle's tank and of the receiving tank is prohibited. For other measuring systems for liquefied gas, such connections are permitted when the quantities of gas transferred via these connections are measured by means of suitable measuring instruments and subtracted from the delivered quantity.				
5.4.6	Safety valves may be incorporated in measuring systems in order to prevent abnormally high pressures. If they are located downstream of the meter, they shall open to the atmosphere or be connected to the receiving tank. In no case shall the safety valves located upstream of the meter be connected to the valves located downstream by pipes which bypass the meter.				
5.4.7	When the conditions of operation require the use of detachable hoses, these hoses shall remain full if their quantities are greater than the minimum specified quantity deviation. Detachable full hoses shall be fitted with special connections for full hoses, so-called couplers or self-sealing valves. Manually operated blow-off devices shall be provided at the ends of these hoses, if necessary.				
5.4.8	For measuring systems mounted on road tankers the quantity indicating device and its printing device, if provided, shall comply with the requirements in 5.2.7.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.4.9	The provisions in 5.4 also apply for measuring systems for liquefied carbon dioxide with the following exceptions: • only empty hose measuring systems are authorized (see 5.4.1); • the connection between the gaseous phases of the vehicle's tank and of the receiving tank is permitted if (i) a device is installed to allow compensation of the delivered quantity by an amount relating to the quantity of vapor returned in the gas line, or (ii) compensation is made by automatic calculation. However, in both cases, flow from the delivery tank to the receiving tank by means of the gas return line shall be securely prevented; • the requirements in 5.4.7 are not mandatory for these systems.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.5	**Fuel dispensers for liquefied gases under pressure (LPG dispensers)**				
5.5.1	Requirements in 5.1.1, 5.1.5, 5.1.6, 5.1.8 to 5.1.15, 5.4.1, and 5.4.2 are applicable to LPG dispensers for motor vehicles. Where installed, the ratio between the maximum flowrate and the minimum flowrate may be smaller than five provided that it is not less than 2.5.				
5.5.2	Provisions shall be made to ensure that the LPG in the measuring system remains in the liquid state. Often, this is accomplished through a pressure-maintaining device.				
5.5.3	A thermometer well may be provided close to the meter. When it is not provided, the legal metrology authority may require that the manufacturer or the owner of the measuring system provide an equivalent means for measuring temperature. When a pressure-maintaining device is used, provision shall be made for fitting a pressure-measuring device close to the meter and upstream of the pressure-maintaining device. This measuring device shall be available for verification. If necessary, provision for sealing shall be made.				
5.5.4	Connection between the gas phase of the feed tank and the gas phase of the vehicle's tank, a vapor return line, is prohibited.				
5.5.5	When only one nozzle can be used during a delivery, and after the nozzle has been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. When two or more nozzles can be used simultaneously or alternately, and after the utilized nozzles have been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. Moreover, by design, the provisions in the first paragraph of 2.16.1 shall be fulfilled. Moreover, in both cases, when the flow is stopped by emergency means and a predetermined delay is exceeded, the current delivery shall be stopped and the next delivery shall be preceded by a reset to zero.				
5.5.6	A non-return valve, downstream of the meter, is mandatory. The pressure loss caused by it shall be sufficiently low to be considered negligible.				
5.5.7	Hoses shall be fitted with special connections for full hoses, so-called couplers or self-sealing valves.				
5.5.8	Safety features shall not affect the metrological performance.				
5.5.9	When the measuring system is provided with a conversion device, it shall be possible to verify separately the indications of quantity at measuring conditions and associated measuring devices.				
5.5.10	Construction of the nozzle shall be such that, at the moment of coupling or uncoupling, the loss of liquid does not exceed the minimum specified quantity deviation.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.6	**Measuring systems for milk, beer, and other foaming potable liquids**				
5.6.1	The following requirements apply to transportable measuring systems for foaming potable liquids which are mounted on road tankers and also to fixed measuring systems used for the reception or delivery of these liquids.				
5.6.2	The transfer point in reception installations is defined by a constant level air elimination system upstream of the meter. The air elimination device must make use of a constant level tank which is usually combined in one device but may be separate if the air elimination device is downstream of the constant level tank and before the meter. It must be possible to verify a constant level in the air elimination device before and after each measurement. The level shall be established automatically.				
5.6.2.1	The air elimination device may be placed either upstream of the pump or between the pump and the meter. The air elimination device is necessary whether the meter is fed by gravity, by emptying milk churns, by means of an auxiliary pump, or by means of a vacuum system. If the milk is introduced by means of pump or a vacuum system, a gas elimination device is necessary. This device may be combined with the constant level tank.				
5.6.2.2	The requirement in 2.13.3 does not apply to measuring systems for milk, and the meter may be fed by means of a vacuum system. In this case, the pressure inside the pipework connecting the constant level tank to the meter will be lower than atmospheric pressure and the tightness of the joints of this connection must be particularly well ensured. It must be possible to check the tightness and a notice plate drawing attention to this checking shall be provided.				
5.6.2.3	In all installations for reception, the pipework upstream of the air elimination device shall empty completely and automatically under the rated operating conditions.				
5.6.2.4	The constant level in the air elimination device/constant level tank is monitored by means of a sight glass or a level indicating device. The level is considered to be constant when it settles within a range defined by two marks at least 15 mm apart and corresponding to a difference in quantity of no more than twice the minimum specified quantity deviation.				
5.6.2.5	If, in order to meet the above condition, devices for reducing the flowrate are incorporated in the measuring system, the flowrate during the period of reduced flowrate shall be at least equal to the minimum flowrate of the meter.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.6.2.6	If, in a reception installation, the measured liquid flows to a level lower than that of the meter, a device shall automatically ensure that the pressure at the outlet of the meter remains above atmospheric pressure.				
5.6.2.7	Measuring systems shall be fully filled before a measurement commences. In the case of receiving systems, if it is not practical to fill the measuring system before a measurement, it is acceptable to determine the quantity required to fill the measuring system and this quantity shall be indicated on the data plate of the measuring system so that it can be taken into account, by calculation, in the first measurement of a reception period. The first quantity measured by the measuring system during a reception period shall be equal to or greater than the quantity which is necessary for the complete filling of the measuring system.				
5.6.3	In spite of the general requirements in 2.10 concerning the elimination of air or gases, the gas elimination devices shall meet the requirements in 2.10.1 under operating conditions only, such as when air enters at the beginning and end of each measuring operation. However, when the measuring system is equipped with hoses, which are designed to be coupled to the outlet of the supply tank, the gas elimination device shall also comply with the requirements in 2.10.1 during the whole measuring operation. For reception equipment, the user shall be able to ascertain the leak-tightness of the connections so that no air may enter upstream of the meter during measuring. For delivery equipment, the system shall be assembled so that the liquid pressure in the connecting pipes running from the supply tank is always positive.				
5.6.4	The indicating device of a transportable measuring system and its printing device, if provided, shall comply with the requirements in 5.2.7.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.7	**Measuring systems on pipelines and systems for loading ships**				
5.7.1	The ratio between the maximum flowrate and the minimum flowrate of the measuring system may be less than 5 (see 2.3.3). In this case, the measuring system shall be fitted with an automatic checking device to verify that the flowrate of the liquid to be measured is within the restricted measuring range of the measuring system. This checking device shall be of type P and shall meet the requirements in 4.3.1.2. The maximum and minimum flowrates may be determined in relation to the liquid to be measured and manually introduced into the calculator.				
5.7.2	Prevention of gas flow The measuring system shall be provided with a means of eliminating any air or gas contained in the liquid unless the entry of air into the liquid or release of gas from the liquid is prevented by the configuration of the pipework or by the arrangement and operation of the pump(s).				
5.7.3	Special conditions of installation Reverse flow of the liquid to be measured in the measuring system shall be prevented by a suitable device, unless otherwise approved.				
5.7.4	Sampling device The measuring system may include a sampling device intended to determine the properties of the liquid to be measured. It is not necessary to take into account the quantity of the sample in the results of the measurement if this sample is less than 0.1 times the maximum permissible error of the measuring system.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.8	**Measuring systems intended for the refuelling of aircraft**				
	The requirements of this section also apply to the refuelling of helicopters.				
5.8.1	General				
5.8.1.1	If more than one transfer point is provided, interlocks should prevent the usage of two or more together unless the arrangement is such that it would be difficult to use them on different aircrafts at the same time.				
5.8.1.2	They may be designed for defuelling aircraft provided that the connecting point for defuelling is located upstream of the gas elimination device. A weir-type sight glass is not mandatory. Interlocks may also be necessary to prevent bypassing metered liquid through the return line back to the supply tank while delivering fuel to the aircraft.				
5.8.1.3	These systems shall be interruptible measuring systems.				
5.8.2	**Stationary measuring systems**				
5.8.2.1	The requirements applicable to fuel dispensers apply to stationary measuring systems intended for the refuelling of aircraft, except those in 5.1.1.				
5.8.2.2	These systems may include their own pumps or be designed for installation in a centrally pumped system.				
5.8.2.3	The microfilter-water elimination device shall be fitted upstream of the gas elimination device.				
5.8.3	**Mobile measuring systems**				
5.8.3.1	General				
5.8.3.1.1	If more than one transfer point is provided, interlocks should prevent the usage of two or more together unless the arrangement is such that it would be difficult to use them on different aircrafts at the same time.				
5.8.3.1.2	They may be designed for defuelling aircraft provided that the connecting point for defuelling is located upstream of the gas elimination device. A weir-type sight glass is not mandatory. Interlocks may also be necessary to prevent bypassing metered liquid through the return line back to the supply tank while delivering fuel to the aircraft.				
5.8.3.1.3	Where the microfilter-water elimination device may be used to perform the function of the gas elimination device, it may be verified by an examination of documents only if the requirements in 2.10 are fulfilled.				
5.8.3.1.4	5.8.3.1.4 Each installation shall be provided with or accompanied by: • instructions for use; • a liquid circulation plan; • a description of necessary operations for use; and • a description of control and connecting devices positions related to their use.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.8.3.2	Aircraft refuelling tanker measuring systems The requirements in 5.2.2, 5.2.3, 5.2.4, 5.2.6, 5.2.7 and 5.2.8.1 apply. *Note*: For good practice in the use of the system, when the aircraft refuelling tanker measuring system is fitted with a device used to perform the gas extractor or special gas extractor function, a manometer should be provided upstream of the pump in order to detect depressions when they occur. Its indications should be easily visible by the operator.				
5.8.3.3	**Aircraft hydrant measuring systems**				
5.8.3.3.1	The gas elimination device may be a device performing the function of a gas extractor when the underground pipe: • is designed for easy elimination of the air contained in the pipe with appropriate devices; • is fitted with special connecting devices for full hoses; and is supplied so that, in designed supply conditions, no gaseous formation can occur or enter the underground pipe.				
5.8.3.3.2	When the aircraft hydrant measuring system is equipped with a device for froth recovery and reinjection, it shall be located upstream of the gas elimination device and it shall not permit permanent introduction of gas into the meter.				
5.8.3.3.3	Depressurization valves for the hoses so that connection and disconnection can be easily made, shall be accompanied with interlocks to prevent metered liquid from being diverted.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.9	**Blend dispensers**				
5.9.1	The requirements in 5.1.1 to 5.1.15 are applicable to both parts of the multigrade-dispenser and to the gasoline part of the gasoline-oil-dispenser (with the text "blend dispensers" in the place of "fuel dispensers" where appropriate). However, by design, the ratio between the maximum flowrate and the minimum flowrate may be at least five in the case of multigrade-dispensers.				
5.9.2	When only one nozzle can be used during a delivery, and after the nozzle has been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. When two or more nozzles can be used simultaneously or alternately, and when the utilized nozzles have been replaced, the next delivery shall be inhibited until the indicating device has been reset to zero. Moreover, by design, the provisions in the first paragraph of 2.16.1 shall be fulfilled.				
5.9.3	The requirements in 5.9.4 through 5.9.8 do not apply if the designations of the various mixtures do not allow conclusions to be drawn concerning the ratio of quantities of the two components. Examples for such designations: • number of stars (2, 3, 4 stars); • octane-number (92, 95, 98 octane); and • two-stroke-mixture (without designation such as 5 %).				
	Moreover, the requirement in 5.9.4 or 5.9.5 only applies where the measuring system provides the indication of the mixed quantity and the price of the mixture depends on the blending ratio. It does not apply where the measuring system provides: • an indication of the mixed quantity and the price does not depend on the blending ratio; or • a quantity indication for each component of the mixture and does not provide an indication of the mixed quantity.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
	To permit compliance with the requirement in 5.9.4 or 5.9.5 to be verified, it is necessary: • for multigrade-dispensers to measure the quantities of both components; • for gasoline-oil-dispensers to measure either the quantities of oil and gasoline or the quantities of oil and mixture; and • for both types to make the separate collection of both components feasible during verification.				
5.9.4	The accuracy of the blending ratio for multigrade-dispensers shall be as follows. The designations of the various mixtures being indicated as the ratio of quantities of the two components (for example 1:1), the real ratio of the quantities of two components shall be within the limits of ± 5 %, i.e. the real ratio $k_{real} = V_2 / V_1$ of quantities of both components determined during the verification shall be equal to the nominal (indicated) ratio k_{nom} , within the limits: $k_{min} = k_{nom} - 0.05\ k_{nom}$ and $k_{max} = k_{nom} + 0.05\ k_{nom}$ Examples: Designation 3:1 1:1 1:3 k_{nom} 0.333 1.00 3.00 k_{min} 0.316 0.95 2.85 k_{max} 0.350 1.05 3.15				
5.9.5	The accuracy of the blending ratio for gasoline-oil-dispensers shall be as follows. If V_1 is the quantity of the minority component in the mixture and V_2 the quantity of the majority component, the real quantity ratio related to the minority component, expressed as a percentage [$T = 100 \times V_1 / (V_1 + V_2)$], shall be equal to the nominal ratio within a limit of plus or minus: • 5 % in relative value; or • 0.2 % absolute, whichever is greater. In other words, T being the real quantity ratio as a percentage, and T_{nom} the nominal quantity ratio as a percentage, the following must be satisfied: $[T - T_{nom}] / T_{nom} \leq 0.05$ if the nominal quantity ratio is at least 4 %, and $[T - T_{nom}] \leq 0.2$ % if the nominal quantity ratio is less than 4 %.				
5.9.6	If the blend dispenser is capable of delivering more than one mixture with the same nozzle and the blending ratios are being guaranteed, the installation of two hoses and a special blending device close to the transfer point is required. If the blend dispenser can deliver only one mixture per nozzle, the blending device may be installed inside the dispenser, using a single hose per nozzle.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.9.7	If the blend dispenser is capable of delivering one or both single components (in addition to the mixtures) with a common nozzle, a device shall prevent the liquid flow through the unused part of the blend device.				
5.9.8	The lubricating oil part of a gasoline-oil-dispenser shall be designed so as to prevent air bubbles in the oil passing through the oil measuring device. There shall also be a device to detect the presence of oil. In the absence of oil, delivery has to be stopped by means, e.g. of: • an intermediate oil reservoir and a device which stops the delivery when the oil reservoir is empty; and • a pressure detecting device which stops the delivery in the case of an oil pressure drop.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.10	**Self-service arrangements with fuel dispensers**				
	The following requirements apply to measuring systems covered by 5.1, 5.5, or 5.9 when fitted with self-service arrangements. It is advisable, in particular, that national or international regulations include provisions prescribing that primary indications shall remain accessible to the parties involved in the transaction up to the settlement of the transaction.				
5.10.1	General requirements				
5.10.1.1	Marking, sealing and connection of the components are left to national regulations.				
5.10.1.2	Where the self-service device serves two or more dispensers, each dispenser shall be provided with a dispenser identification that shall accompany any primary indication provided by the self-service device.				
5.10.1.3	The primary indications on indicating devices and printing devices of the self-service arrangement shall not indicate any mutual differences. Scale intervals of the primary indication on indicating devices and the printing devices and memory devices of the self-service arrangement shall be the same. However, in case the data transmission between the fuel dispenser and self-service device is in the form of pulses, all primary indications provided by the self-service device shall not indicate any mutual differences for any measured quantity relating to the same measurement. The indications provided by the self-service device shall not deviate from (each of) the primary indications on the fuel dispenser by more than one scale interval or the greater of the two scale intervals if they differ.				
5.10.1.4	Printing devices on the self-service arrangement shall not reproduce the indications of a dispenser as the difference between two printed values.				
5.10.1.5	Indication of information that is not subject to metrological control is allowed, provided that it cannot be confused with metrological information.				
5.10.1.6	A change of the type of payment and/or mode of operation shall not be effective before the end of the current measurement operation.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.10.1.7	The self-service arrangement, including provisions related to clearly defined methods of operation, shall be such that at least one primary indication for the benefit of the customer must be available at least up to the settlement of the transaction to enable the delivered quantity and the price to pay to be checked.				
5.10.1.8	In the case of a self-service arrangement that totalizes the delivered quantities for different registered customers over the course of time, the minimum measured quantity is not affected by the scale interval used for such totalizations.				
5.10.2	Attended service mode				
	If the dispenser indicating device provides the only primary indication, it shall bear a legend, which is clearly visible to the customer which states that the next authorization of a particular dispenser can only be given by the supplier after settlement of the current transaction and that in case of dispute, the primary indication on the indicating device of the fuel dispenser is correct.				
	Notes: 1. In attended service mode, the settlement of the transaction takes place before the customer leaves the site of the delivery. 2. In attended service mode, the measurement operation ends at the moment settlement of the transaction takes place.				
5.10.2.1	Attended post-payment				
5.10.2.1.1	Where the self-service arrangement includes a device that provides an additional primary indication (additional to those of the indicating device of the dispenser), it shall consist of at least one installation for the reproduction of the quantity and the price (if calculated) indicated by the primary dispenser indicating device, consisting of at least: • an indicating device for the benefit of the supplier; and • a display, or a printing device for the issue of a receipt, for the benefit of the customer.				
5.10.2.1.2	For self-service devices with temporary storage (temporary storage mode) of measurement data of dispensers the following requirements apply: a) temporary storage of measurement data shall be restricted to one delivery for each dispenser, that is, a dispenser may be authorized for a next delivery before the previous transaction on the same dispenser has been settled; b) the mandatory primary indication for the benefit of the supplier shall be accompanied by a clear mark representing the sequence (for example, the numbers 1 or 2, or the letters A or B); and				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.10.2.1.2	c) when a mandatory primary indication of the self-service device is out of service, the self-service arrangement may continue its operation provided that it no longer uses any temporary storage, and that the dispenser indicating device remains the primary indication. In such a case, the fuel dispensers shall bear a legend, which is clearly visible to the customer, which states that in case of dispute, the primary indication on the indication device of the fuel dispenser is correct.				
5.10.2.1.3	Where the mandatory primary indication for the benefit of the customer is provided by a device in the form of a separate constructional unit and this unit becomes uncoupled, or if the checking facilities detect a malfunction, the temporary storage mode shall be prohibited and the dispenser indicating device remains the primary indication.				
5.10.2.1.4	The self-service device should be capable of indicating the status of the dispensers (e.g. running, authorized, or unauthorized) that are connected to the self-service device and in the case of multiple modes of service and/or type of payment, also that particular status of the measuring system.				
5.10.2.2	Pre-payment in attended service mode				
5.10.2.2.1	The requirements in 3.6 are applicable.				
5.10.2.2.2	A printed or hand-written receipt of the pre-paid amount shall be provided.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.10.3	Unattended service mode				
5.10.3.1	General In unattended service mode, the end of the measurement operation is the end of the registration (printing and/or memorizing) of information concerning the measurement operation.				
5.10.3.1.1	The self-service arrangement shall provide additional primary indications by means of: • a printing device for the issue of a receipt to the customer; and • a device (printing or memory) on which measurement data are registered for the benefit of the supplier.				
5.10.3.1.2	When the printing device or memory device, as required by 5.10.3.1.1, are not able to provide any indication or become unserviceable, the customer shall be clearly warned by automatic means before the operation commences. Passing from attended to unattended service mode shall not be possible before correct operation of the arrangement is concluded as feasible by the checking facilities, including compliance with the above provision. Memorized data older than 3 months may be automatically deleted.				
5.10.3.1.3	Where the self-service arrangement is provided with individual volume totalizers, one for each registered customer and visible to the customer, the requirements in 5.10.3.1.1 and 5.10.3.1.2 do not apply.				
5.10.3.1.4	Self-service devices shall be provided with a means for controlling the continuity of the calculation program (“watch-dog”) for ensuring the discontinuation of the current delivery when the continuity of the processor program is no longer ensured. The next effective acceptance of notes, cards or other equivalent mode of payment shall only take place if the continuity of the processor program is re-established.				
5.10.3.1.5	When a power supply failure occurs, the delivery data shall be memorized. The requirements in 5.1.9 apply.				
5.10.3.2	Delayed-payment The printed and/or memorized indications as mentioned in 5.10.3.1 shall contain sufficient information for further checking and at least the measured quantity, the price to pay (if calculated) and information to identify the particular transaction (e.g. the dispenser number, location, date, time).				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.10.3.3	Pre-payment in unattended service mode				
5.10.3.3.1	Following the termination of each delivery, the printed and/or memorized indications as intended in 5.10.3.1 shall be made available, clearly indicating the amount which has been pre-paid and the price corresponding to the liquid obtained. These printed and/or memorized indications may be divided into two parts as follows: a) one part provided prior to the delivery on which the prepaid amount is shown and recognizable as such; and b) one part provided following the termination of delivery, provided that it is clear from the information provided on both parts that they are related to the same delivery.				
5.10.3.3.2	The requirements in 3.6 are applicable.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.11	**Other self-service arrangements**				
	It is advisable, in particular, that national or international regulations include provisions prescribing that primary indications shall remain accessible to the parties interested in a transaction up to the settlement of this transaction. Measuring systems, especially those for loading road or rail tankers, may be designed in such a way that the transaction is not settled when the customer leaves the loading site, in implicit agreement with the supplier. In this case, national or international regulations may prescribe that the self-service arrangement provide additional primary indications by means of: • a printing device for the issue of a receipt to the customer; and • a device (printing or memory) on which measurement data are registered for the benefit of the supplier.				
	The printed and/or memorized indications shall contain sufficient information for further checking and at least the measured quantity and information to identify the particular transaction (e.g. the system number, location, date, time). Moreover, after a delivery, measuring systems shall not be capable of being reset to zero and authorized until measurement data are memorized or printed out.				

§ (R 117-1)	Requirement	Pass	Fail	N/A	Remarks
5.12	**Unattended delivery**				
	Measuring systems for unattended delivery (such as those for fuel delivery from road tankers into filling stations or for direct sale to the public) may be designed in such a way that the transaction is not settled when the supplier leaves the delivery location. This arrangement is only applicable when there is an existing agreement between the parties.				
	National or regional regulations may require that measuring systems intended for unattended delivery are equipped with: • an automatic device to identify the unloading location; • a printing device for automatically issuing a receipt to the customer; and • a memory device in which the following data are recorded: identification of the measuring system, measurement data, time and date of delivery, and the unloading location.				

E.2 Symbols, units and equations used

Symbol	Description	Unit
Q	Flow rate	[L/min]
Q_i	Indicated flow rate	[L/min]
V	Volume under metering conditions	[L]
V_b	Base volume	[L]
M	Mass	[kg]
T	Temperature	[°C]
P	Pressure	[kPa]
ρ	Density	[kg/m^3]
T_{min}	Minimum temperature (for the application)	[°C]
T_{med}	Medium temperature (for the application)	[°C]
T_{max}	Maximum temperature (for the application)	[°C]
P_{min}	Minimum pressure (for the application)	[kPa]
P_{med}	Medium pressure (for the application)	[kPa]
P_{max}	Maximum pressure (for the application)	[kPa]
ρ_{min}	Minimum density (for the application)	[kg/m^3]
ρ_{med}	Medium density (for the application)	[kg/m^3]
ρ_{max}	Maximum density (for the application)	[kg/m^3]
ρ_{15}	Base density	[kg/m^3]
V_i	Indicated volume under metering conditions*	[L]
V_{bi}	Indicated base volume*	[L]
M_i	Indicated mass*	[kg]
T_i	Indicated temperature	[°C]
P_i	Indicated pressure	[bar]
ρ_i	Indicated density	[kg/m^3]
ρ_{15i}	Indicated base density	[kg/m^3]
V_{ref}	Reference volume under metering conditions	[L]
V_{bref}	Reference base volume	[L]
M_{ref}	Reference mass	[kg]
T_{ref}	Reference temperature	[°C]
P_{ref}	Reference pressure	[bar]
ρ_{ref}	Reference density	[kg/m^3]
ρ_{15ref}	Reference base density	[kg/m^3]
np_{out}	Number of output pulses	[-]
R_{out}	Output resistance	[Ω]
I_{out}	Output current	[mA]
f_{out}	Output frequency	[Hz]

Symbol	Description	Unit
np_{in}	Number of input pulses	[-]
R_{in}	Input resistance	[Ω]
I_{in}	Input current	[mA]
f_{in}	Input frequency	[Hz]
E_V	Deviation on volume under metering conditions	[%]
E_{Vb}	Deviation on base volume	[%]
E_M	Deviation on mass	[%]
E_T	Deviation on temperature	[^oC]
E_P	Deviation on pressure	[kPa] or [%]
E_ρ	Deviation on density	[kg/m^3]
MPE_V	Maximum permissible error on volume under metering conditions	[%]
MPE_{Vb}	Maximum permissible error on base volume	[%]
MPE_M	Maximum permissible error on mass	[%]
MPE_T	Maximum permissible error on temperature	[^oC]
MPE_P	Maximum permissible error on pressure	[kPa] or [%]
MPE_ρ	Maximum permissible error on density	[kg/m^3]
Avg.	Average	[-]
ε_0	Initial intrinsic error	[L], [kg] or [kg/m^3]
ε_{0V}	Initial intrinsic error on volume	[L]
ε_{0M}	Initial intrinsic error on mass	[kg]
$\varepsilon_{0\rho}$	Initial intrinsic error on density	[kg/m^3]
CCV_V	Critical change value on volume under metering conditions	[%]
CCV_{Vb}	Critical change value on base volume	[%]
CCV_M	Critical change value on mass	[%]
CCV_T	Critical change value on temperature	[^oC]
CCV_P	Critical change value on pressure	[bar] or [%]
CCV_ρ	Critical change value on density	[kg/m^3]

*Note*s:

*Indicated measurement value can be the difference between the beginning and the end of the measurement.

Where applicable, flow rate, indicated and/or reference values can be calculated from simulated signals.

Absolute errors are calculated by subtracting the reference value from the indicated value.

Relative errors are calculated by subtracting the reference value from the indicated value; that result is divided by the reference value and multiplied by 100 %.

F Performance tests

F.1 Influence factor tests and disturbance tests

F.1.1 Disturbance and influence factor tests – climatic and mechanical environmental conditions (R 117-2, 4.8)

F.1.1.1 Dry heat (R 117-2, Table 4.8.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition	Input value[(b)]	Indicated measurement value[(b)]	Reference value[(b)]	E_i [%]	MPE [%]
Reference at 20 °C					
°C [(a)]					
Reference at 20 °C					

Passed	☐ Yes	☐ No

Remarks:

Note: [(a)] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.8.5
[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.1.2 Cold (R 117-2, Table 4.8.6)

Application no.:
Model:
Serial no.:
Test date:
Observer:

	Ambient conditions		
	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition	Input value[(b)]	Indicated measurement value[(b)]	Reference value[(b)]	E_i [%]	MPE [%]
Reference at 20° C					
°C [(a)]					
Reference at 20° C					

Passed	☐ Yes	☐ No

Remarks:

Note: [(a)] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.8.6
[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.1.3 Damp heat, cyclic (R 117-2, Table 4.8.7)

Application no.:
Model:
Serial no.:
Test date:
Observer:

	Ambient conditions		
	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition	Input value[(b)]	Indicated measurement value[(b)]	Reference value[(b)]	E_i [%]	MPE [%]
Reference at 20° C					
Damp heat, EUT switched off [(a)]					
Reference at 20° C					

Passed	☐ Yes	☐ No

Remarks:

Note: [(a)] Specified by the manufacturer, see applicable test levels in R 117-2 4.8.3 and Table 4.8.7
[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.4, F.4.4, F.5.2, F.7.1, F.7.3.2
C.F.: Checking facility activated during the test

F.1.1.4 Vibration (R 117-2, Table 4.8.8)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition	Input value[(b)]	Indicated measurement value[(b)]	Reference value[(b)]	E_i [%]	MPE [%]
Reference					
Vibration, EUT switched off [(a)]					
Reference					

Passed	☐ Yes	☐ No

Remarks:

Note: [(a)] Specified by the manufacturer, see applicable test levels in R 117-2 4.8.4 and Table 4.8.8
[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2 Disturbance and influence factor tests – electrical tests (R 117-2, 4.9)

F.1.2.1 AC mains voltage variation (R 117-2, Table 4.9.2.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	MPE [%]
	U [V]				
Reference	U_{nom}				
$U_{min}= U_{nom} –15\%$					
$U_{max}=U_{nom} +10\%$					
Reference	U_{nom}				

Passed		Yes		No

Remarks:

***Note*: [(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2**

F.1.2.2 DC mains voltage variation (R 117-2, Table 4.9.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [b]	Indicated measurement value [b]	E_i [%]	MPE [%]
	U [V]				
Reference	U_{nom}				
U_{min}= [a]					
U_{max}= [a]					
Reference	U_{nom}				

Passed	☐ Yes	☐ No

Remarks:

Note: [a] Specified by the manufacturer but not less than $U_{nom} - 15\ \% \leq U_{nom} \leq U_{nom} + 10\ \%$
[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.3 AC mains voltage dips, short interruptions and reductions (R 117-2, Table 4.9.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition [a]			Input value [b]	Indicated measurement value [b]	E_i [%]	S.F. [%]	C.F. [yes/no]
Test	Reduction to [%]	Cycles					
Reference							
a							
b							
c							
d							
e							
Reference							

Passed		Yes		No

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.9.3
C.F.: Checking facility activated during the test

[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.4 Bursts (transients) on AC and DC mains (R 117-2, Table 4.9.4)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

AC mains power lines

Test condition [a]		Input value [a]	Indicated measurement value [a]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
L1 - Phase	+					
	-					
L2 - Neutral	+					
	-					
PE - Earth	+					
	-					
L1 + PE	+					
	-					
L2 + PE	+					
	-					
L1 + L2	+					
	-					
L1 + L2 +PE	+					
	-					
Reference 2						

DC mains power lines

Test condition [a]		Input value [b]	Indicated measurement value [ba]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
DC mains cable	+					
DC mains cable	-					
Reference						

Passed	☐ Yes	☐ No

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.9.4
C.F.: Checking facility activated during the test

[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.5 Electrostatic discharge (R 117-2, Table 4.9.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition				Input value [(b)]	Indicated measurement value [(b)]	E_i [%]	S.F. [%]	C.F. [yes / no]
Nr.	Test Point [(a)]	Level [kV]	C/A					
1	Reference							
2	[1]	+						
3		-						
4	[2]	+						
5		-						
n-2	[n]	+						
n-1		-						
n	Reference							
Reference quantity = (Reference quantity 1 + Reference quantity 2) / 2								

Passed		Yes		No

Remarks:

Note: C: Contact discharge, A: Air discharge
C.F.: Checking facility activated during the test
[(a)] Location of the discharge points

[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.6 Bursts (transients) on signal, data and control lines (R 117-2, Table 4.9.6)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition [a]		Input value [b]	Indicated measurement value [b]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
IO-line	+					
	-					
Reference						

Passed	☐ Yes	☐ No

Comments:

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.9.6
C.F.: Checking facility activated during the test

[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.7 Surges on signal, data and control lines (R 117-2, Table 4.9.7)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
IO-line	+					
	-					
Reference						

Passed		Yes		No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.8 DC mains voltage dips, short interruptions and (short term) variations (R 117-2, Table 4.9.8)

Voltage dips

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [a]	Indicated measurement value [a]	E_i [%]	S.F. [%]	C.F. [yes/no]
Amplitude [% of U_{nom}]	Duration [s]					
Reference						
40	0.01					
	0.03					
	0.1					
	0.3					
	1					
Reference						

Test condition		Input value[a]	Indicated measurement value[a]	E_i [%]	S.F. [%]	C.F. [yes/no]
Amplitude [% of U_{nom}]	Duration [s]					
Reference						
70	0.01					
	0.03					
	0.1					
	0.3					
	1					
Reference						

Passed	☐ Yes	☐ No

Remarks:

Note: C.F.: Checking facility activated during the test
[a] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

Voltage variations

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Amplitude [% of U_{nom}]	Duration [s]					
Reference						
85	0.1					
	0.3					
	1					
	3					
	10					
Reference						

Test condition		Input value	Indicated measurement value	E_i [%]	S.F. [%]	C.F. [yes/no]
Amplitude [% of U_{nom}]	Duration [s]					
Reference						
120	0.1					
	0.3					
	1					
	3					
	10					
Reference						

Passed	☐ Yes	☐ No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

Short interruptions

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition (High and/or low impedance)		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Amplitude [% of U_{nom}]	Duration [s]					
Reference						
0	0.001					
	0.003					
	0.01					
	0.03					
	0.1					
	0.3					
	1					
Reference						

Passed	☐ Yes	☐ No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.9 Ripple on DC mains power (R 117-2, Table 4.9.9)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Frequency [Hz]					
Reference						
Ripple	50					
Ripple	100					
Ripple	150					
Ripple	300					
Reference						

Passed		Yes		No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.10 Surges on AC and DC mains power lines (R 117-2, Table 4.9.10)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

AC mains power lines

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
phase to earth	+ 2					
phase to earth	– 2					
neutral to earth	+ 2					
neutral to earth	– 2					
phase to neutral	+ 1					
phase to neutral	– 1					
Reference						

Passed	☐ Yes	☐ No

DC mains power lines

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Line	Level [kV]					
Reference						
+ line to earth	+ 2					
+ line to earth	– 2					
- line to earth	+ 2					
- line to earth	– 2					
+ line to line	+ 1					
+ line to line	– 1					
Reference						

Passed	☐ Yes	☐ No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.11 Electromagnetic fields of general origin (R 117-2, Tables 4.9.11 and 4.9.11.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition [(a)]			Input value [(b)]	Indicated measurement value [(b)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Frequency		Pol [H/V]					
Start [MHz]	Stop [MHz]						
Reference							
26							
	1000						
Reference							

Passed		Yes		No

Remarks:

Note: [(a)] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.9.11.1
C.F.: Checking facility activated during the test

[(b)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.12 Electromagnetic fields specifically caused by wireless communication networks (R 117-2, Tables 4.9.11 and 4.9.11.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition			Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Frequency		Pol [H/V]					
Start [GHz]	Stop [GHz]						
Reference							
0.446							
0.8							
	3						
Reference							

Passed		Yes		No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.2.13 Conducted (common mode) currents generated by RF EM fields (R 117-2, Table 4.9.11.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition [a]			Input value [b]	Indicated measurement value [b]	E_i [%]	S.F. [%]	C.F. [yes/no]
Frequency		Pol [H/V]					
Start [MHz]	Stop [MHz]						
Reference							
0.15							
	80						
Reference							

Passed		Yes		No

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.9.11.3
C.F.: Checking facility activated during the test

[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.3 Tests for EUTs powered by a road vehicle battery (R 117-2, 4.10)

F.1.3.1 Voltage variations (R 117-2, Table 4.10.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	MPE [%]
Line	Level [V]				
Reference	U_{nom}				
$U_{min}=U_{nom}$ –15%					
$U_{max}=U_{nom}$ +10%					
Reference	U_{nom}				

Passed		Yes		No

Remarks:

Note: C.F.: Checking facility activated during the test
[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.3.2 Electrical transient conduction along supply lines (R 117-2, Table 4.10.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test condition		Input value [(a)]	Indicated measurement value [(a)]	E_i [%]	S.F. [%]	C.F. [yes/no]
Test pulse	Pulse voltage [V]					
Reference						
2a						
2b						
3a						
3b						
Reference						

Passed		Yes		No

Remarks:

Note: C.F.: Checking facility activated during the test

[(a)] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.3.3 Battery voltage variations during starting up a vehicle engine (R 117-2, Table 4.10.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test pulse shape [a]	Input value [b]	Indicated measurement value [b]	E_i [%]	S.F. [%]	C.F. [yes/no]
Reference					
U_S [V]					
U_A [V]					
t_S [s]					
t_f [ms]					
Reference					

Passed	☐ Yes	☐ No

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.10.3
C.F.: Checking facility activated during the test
[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.1.3.4 Load dump test (R 117-2, Table 4.10.4)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test pulse shape [a]	Input value [b]	Indicated measurement value [b]	E_i [%]	S.F. [%]	C.F. [yes/no]
Reference					
U_S [V]					
R_i [V]					
t_r [ms]					
t_f [ms]					
Reference					

Passed		Yes		No

Remarks:

Note: [a] Specified by the manufacturer, see applicable test levels in R 117-2, Table 4.10.4
[b] The applicable units are defined in F.2.11, F.3.2, F.4.2, F.4.4, F.5.2, F.7.1, F.7.3.2

F.2 Test reports for meter sensors and measuring devices (R 117-2, 5.3)

F.2.1 Indication at zero flowrate (R 117-2, 5.3.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Test time [s]	$V_{i\,start}$ [L]	$V_{i\,end}$ [L]	p_t [kPa]	T_t [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

***Note*:**

F.2.2 Accuracy at reverse flow conditions

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

$Q(2)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

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$Q(n)$ [ℓ/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	Test measures used:	
α:	°C^{-1}	T_r:	°C
χ:	kPa^{-1}	β:	°C^{-1}
μ (20 °C):	mPa·s	Nominal volume:	L

F.2.3 Accuracy at metering conditions (R 117-2, 5.3.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

$Q(2)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

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$Q(n)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	Test measures used:	
α:	°C^{-1}	T_r:	°C
χ:	kPa^{-1}	β:	°C^{-1}
μ (20 °C):	mPa·s	Nominal volume:	L

F.2.4 Accuracy at metering conditions for drum meter for alcohol (R 117-2, 5.3.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no.	Q [L/min]	V_i [L]	T_t [°C]	T_s [°C]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1	Q_1							0.2
2								
3								
1	Q_2							0.25
2								
3								
1	Q_3							0.3
2								
3								

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.2.5 Accuracy at limits of temperature, pressure, viscosity and density (R 117-2, 5.3.3.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no.	Limits of T, p, μ, ☐	Q [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1	T_{min} [°C]	Q_{min}					
		Q_{mid}					
		Q_{max}					
	T_{max} [°C]	Q_{min}					
		Q_{mid}					
		Q_{max}					
2	p_{min} [kPa]	Q_{min}					
		Q_{mid}					
		Q_{max}					
	p_{max} [kPa]	Q_{min}					
		Q_{mid}					
		Q_{max}					
3	μ_{min} [mPa·s]	Q_{min}					
		Q_{mid}					
		Q_{max}					
	μ_{max} [mPa·s]	Q_{min}					
		Q_{mid}					
		Q_{max}					
4	ρ_{min} [kg/m^3]	Q_{min}					
		Q_{mid}					
		Q_{max}					
	ρ_{max} [kg/m^3]	Q_{min}					
		Q_{mid}					
		Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	Test measures used:	
α:	°C^{-1}	T_r:	°C
χ:	kPa^{-1}	β:	°C^{-1}
μ (20 °C):	mPa·s	Nominal volume:	L

F.2.6 Accuracy of the converted indication within a Coriolis meter (R 117-2, 5.3.3.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	Meter indication				Reference				
Q(1) [kg/min]	M_i [kg]	V_i [L]	T_i [°C]	ρ_i [kg/m^3]	M_n [kg]	V_s [L]	ρ [kg/m^3]	T_t [°C]	p_t [kPa]

	Mass		Volume		Density		Temperature	
Q(1) [kg/min]	E [%]	MPE [%]	E [%]	MPE [%]	E [%]	MPE [%]	E [%]	MPE [%]
$\bar{E}$ =	%							
Range =	%							

.
.
.

	Meter indication				Reference				
Q(n) [kg/min]	M_i [kg]	V_i [L]	T_i [°C]	ρ_i [kg/m^3]	M_n [kg]	V_s [L]	ρ [kg/m^3]	T_t [°C]	p_t [kPa]

	Mass		Volume		Density		Temperature	
Q(n) [kg/min]	E_{Mi} [%]	MPE [%]	E_{vi} [%]	MPE [%]	$E_{\rho i}$ [%]	MPE [%]	E_{Ti} [%]	MPE [%]
$\bar{E}$ =	%							
Range =	%							

Passed		☐ Yes	☐ No

Remarks:

Note: (1) V_s may be replaced by V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.2.7 Flow disturbance test (R 117-2, 5.3.4)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Disturber used: Half moon plate

Test no.	Disturber installation position	Q [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
Reference		Q_{min}					
		Q_{max}					
1	0°	Q_{min}					
		Q_{max}					
	90°	Q_{min}					
		Q_{max}					
2	0°	Q_{min}					
		Q_{max}					
	90°	Q_{min}					
		Q_{max}					
3	0°	Q_{min}					
		Q_{max}					
	90°	Q_{min}					
		Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Disturber used: Ball valve

Test no.	Valve opening position	Q [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	E_{vi} [%]	MPE [%]
Reference		Q_{min}					
		Q_{max}					
1	90°	Q_{min}					
		Q_{max}					
	80°	Q_{min}					
		Q_{max}					
	65°	Q_{min}					
		Q_{max}					
	45°	Q_{min}					
		Q_{max}					
2	90°	Q_{min}					
		Q_{max}					
	80°	Q_{min}					
		Q_{max}					
	65°	Q_{min}					
		Q_{max}					
	45°	Q_{min}					
		Q_{max}					
3	90°	Q_{min}					
		Q_{max}					
	80°	Q_{min}					
		Q_{max}					
	65°	Q_{min}					
		Q_{max}					
	45°	Q_{min}					
		Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	ℓ
μ (20 °C):	mPa·s		

Test measures used:

F.2.8 Drum meters for alcohol (R 117-2, 5.3.5)

F.2.8.1 Conversion device (R 117-2, 5.3.5.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	Indications				Reference values						
Test no. [-]	V_i [L]	V_{bi} [L]	M_i [kg]	ρ_{15i} [kg/m^3]	Q [L/min]	np_{in} [-]	V_{ref} [L]	V_{bref} [L]	M_{ref} [kg]	T_{ref} [°C]	ρ_{15ref} [kg/m^3]
1										T_{min}	
2										T_{med}	
3										T_{max}	

	Error calculations					
	V		V_b		M	
Test no. [-]	E_V [%]	MPE_V [%]	E_{Vb} [%]	MPE_{Vb} [%]	E_M [%]	MPE_M [%]
1						
2						
3						

Passed		Yes		No

Remarks:

Note: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.2.8.2 Volume of individual measuring chambers (R 117-2, 5.3.5.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Chamber no. [-]	V_{nom} [L]	V_s [L]	T_L [°C]	T_s [°C]	E_v [L]	E_v [%]	MPE [%]
1							0.2
n							0.2

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.2.8.3 Inclined drum axis (R 117-2, 5.3.5.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	Test no.	Q_{min} [L/min]	V_i [L]	T_t [°C]	T_s [°C]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
Reference									
Drum axis Inclined 3°	1								
	2								
	3								
Reference									

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

F.2.8.4 Test of accuracy of the sampling device (R 117-2, 5.3.5.4)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	V_{nom} [L]	V_s [L]	T_L [°C]	T_s [°C]	E_v [L]	E_v [%]	MPE [ℓ]
1							
n							

Passed	☐ Yes	☐ No

Remarks:

Note: $V_{nom} = n \bullet V_{nom\ ladles}$ [L]
MPE = $0.1 \bullet V_{nom}$ [L]

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

F.2.8.5 Test of the volume of the containers (R 117-2, 5.3.5.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	V_{nom} [L]	V_s [L]	T_t [°C]	T_s [°C]	E_{vi} [ℓ]	E_{vi} [%]	MPE [%]
Collecting container							± 5
Inserting container							– 5
Surge container							– 2.5

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.2.8.6 Test of accuracy of the thermometer (R 117-2, 5.3.5.6)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	T_i [°C]	T_s [°C]	E_{Ti} [°C]	MPE [°C]
T_{min}				1
T_{mid}				
T_{max}				

Passed	☐ Yes	☐ No

Remarks:

F.2.9 Endurance test (R 117-2, 5.4)

Accuracy before endurance test

Application no.:
Model:
Serial no.:
Test date:
Observer:

	Ambient conditions		
	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(B) = %	Range = %

$Q(2)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(B) = %	Range = %

$Q(3)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(B) = %	Range = %

Passed		☐	Yes	☐ No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Endurance test

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions at start

Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Date	Time	Observer	Q [ℓ/min]	V_i [L]	Hours run [h]

Remarks:

Note: The units of volume may be replaced by units of mass, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Accuracy after endurance test

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions at end

Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(A) = %	$\bar{E}$(A) – $\bar{E}$(B) = %

$Q(2)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(A) = %	$\bar{E}$(A) – $\bar{E}$(B) = %

$Q(3)$ [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$(A) = %	$\bar{E}$(A) – $\bar{E}$(B) = %

Passed		Yes		No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.2.10 Accuracy on minimum measured quantity (R 117-2, 5.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Q_{min} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Q_{max} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed		☐	Yes	☐ No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.2.11 Additional influence and disturbance tests for electronic measuring devices

The test report formats of F.1 are applied.

Input value is:	Flowrate	[L/min or m^3/h or t/h or kg/min or pulses/min]
Indicated measurement value is:	Indicated quantity	[L or m^3 or t or kg]

F.3 Test procedures for electronic calculators, indicating devices and associated devices (R 117-2, 6)

F.3.1 Accuracy of electronic calculators and indicating devices (R 117-2, 6.2.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test No. [-]	Q_i [L/min]	np_{in} [-]	V_{ref} [L]	V_i [L]	E_V [%]	MPE_V [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

Note: The units of volume may be replaced by units of mass, if appropriate.

F.3.2 Influence factor tests and disturbance tests (R 117-2, 6.2.2 and 6.2.3)

The test report formats of F.1 are applied.

Input value is:	Flowrate	[L/min or m^3/h or t/h or kg/min or pulses/min]
Indicated measurement value is:	Indicated quantity	[L or m^3 or t or kg]

F.4 Test reports for conversion devices as part of an electronic calculator (R 117-2, 6.3)

F.4.1 Accuracy: First approach: (R 117-2, 6.3.1.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

	Indications				Reference values								
Test no. [-]	V_i [L]	V_{bi} [L]	M_i [kg]	ρ_{15i} [kg/m^3]	Q [L/min]	np_{in} [-]	V_{ref} [L]	V_{bref} [L]	M_{ref} [kg]	T_{ref} [^{o}C]	P_{ref} [kPa]	ρ_{ref} [kg/m^3]	ρ_{15ref} [kg/m^3]
1										T_{min}	P_{min}	ρ_{min}	
2										T_{med}	P_{med}	ρ_{med}	
3										T_{max}	P_{max}	ρ_{max}	

	Error calculations					
	V		V_b		M	
Test no. [-]	E_V [%]	MPE_V [%]	E_{Vb} [%]	MPE_{Vb} [%]	E_M [%]	MPE_M [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

F.4.2 Influence factor tests and disturbance tests (R 117-2, 6.3.1.2 and 6.3.1.3)

The test report formats of F.1 are applied.

Input values are:	Flowrate Q	[L/min]
	Reference temperature T_{ref}	[°C]
	Reference pressure p_{ref}	[kPas]
	Reference density ρ_{ref}	[kg/m^3]
	Reference volume V_{ref}	[L]
	Reference mass M_{ref}	[kg]
Indicated measurement values are:	Indicated volume V_i	[L]
	Indicated volume at base condition V_{bi}	[L]
	Indicated mass M_i	[kg]

F.4.3 Accuracy: Second approach (R 117-2, 6.3.2.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	V						*T*				
Test No. [-]	Q_i [L/min]	np_{in} [-]	V_{ref} [L]	V_i [L]	E_V [%]	MPE_V [%]	R_{in} [Ω]	T_{ref} [°C]	T_i [°C]	E_T [°C]	MPE_T [°C]
1								T_{min}			
2								T_{med}			
3								T_{max}			

	P							*ρ*				
Test No. [-]	I_{in} [mA]	p_{ref} [kPa]	p_i [kPa]	E_P [kPa]	E_P [%]	MPE_P [kPa]	MPE_P [%]	f_{in} [Hz]	ρ_{ref} [kg/m^3]	ρ_i [kg/m^3]	E_ρ [kg/m^3]	MPE_ρ [kg/m^3]
1		p_{min}			-				ρ_{min}			
2		p_{med}		-					ρ_{med}			
3		p_{max}			-				ρ_{max}			

	Calculation V_{bi}, V_{bref} based on V_i, T_{ref}, p_{ref} and ρ_{ref}					Calculation M_i, M_{ref} based on V_i, T_{ref}, p_{ref} and ρ_{ref}			
Test No. [-]	V_{bi} [L]	V_{bref} [L]	ρ_{15ref} [kg/m^3]	E_{Vb} [%]	MPE_{Vb} [%]	M_i [kg]	M_{ref} [kg]	E_M [%]	MPE_M [%]
1									
2									
3									

Passed	☐ Yes	☐ No

Remarks:

F.4.4 Influence factor tests and disturbance tests (R 117-2, 6.3.2.2 and 6.3.2.3)

The test report formats of F.1 are applied.

Input values are:	Flowrate Q or number of pulses np_{in} Reference temperature T_{ref} or resistance R_{in} Reference pressure p_{ref} or current I_{in} Reference density ρ_{ref} or frequency f_{in}	[L/min] or [pulses/min] [°C] or [Ω] [bar] or [mA] [kg/m^3] or [Hz]
Indicated measurement values are:	Indicated volume V_i Indicated volume at base condition V_{bi} Indicated mass M_i	[L] [L] [kg]

F.5 Associated measuring devices (R 117-2, 6.4)

F.5.1 Accuracy test (R 117-2, 6.4.1)

Model:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	T				
Test No. [-]	T_{ref} [°C]	R_{out} [Ω]	T_i [°C]	E_T [°C]	MPE_T [°C]
1	T_{min}				
2	T_{med}				
3	T_{max}				

	P						
Test No.	P_{ref}	I_{out}	P_i	E_P	E_P	MPE_P	MPE_P
[-]	[kPa]	[mA]	[kPa]	[kPa]	[%]	[kPa]	[%]
1	P_{min}						
2	P_{med}						
3	P_{max}						

	ρ				
Test No.	ρ_{ref}	f_{out}	ρ_i	E_ρ	MPE_ρ
[-]	[kg/m^3]	[Hz]	[kg/m^3]	[kg/m^3]	[kg/m^3]
1	ρ_{min}				
2	ρ_{med}				
3	ρ_{max}				

Passed		☐ Yes	☐ No

Remarks:

F.5.2 Influence factor tests and disturbance tests (R 117-2, 6.4.2 and 6.4.3)

The test report formats of F.1 are applied.

Input values are:	Reference temperature T_{ref}	[°C]
	Reference pressure p_{ref}	[bar]
	Reference density ρ_{ref}	[kg/m^3]
Indicated measurement values are:	Indicated temperature T_i or resistance R_{out}	[°C] or [Ω]
	Indicated pressure p_i or current I_{out}	[bar] or [mA]
	Indicated density ρ_i or frequency f_{out}	[kg/m^3] or [Hz]

F.5.3 Test of response time of the measuring system temperature sensor (R 117-2, 6.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

ΔT [°C]	MMQ [L]	Q_{max} [L/min]	t_d [s]	t_{90} [s]	τ_{max} [s]

Passed	☐ Yes	☐ No

Remarks:

Note: t_d [s] = Delivery time = 2 MMQ / Q_{max}
τ_{max} [s] = Maximun time constant = $t_d \times 2.3025$
ΔT [°C] = Temperature change = $T_2 - T_1$
t_{90} = 90 % of T_2

F.6 Test reports for gas elimination devices

F.6.1 Gas separator test (R 117-2, 7.2.1.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_i [L]	V_s [L]	V_n [L]	p_t [kPa]	V_a [L]	V_a/V_n [-]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]
Reference	$Q(1)$									
1										
2										
Reference										
1										
2										
Reference	$Q(n)$									
1										
2										

Passed	☐ Yes	☐ No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i\ V_n) / V_n$
$V_a = (V_{gas\ meter}\ (p_t + p_{atm})) / p_{atm}$
V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.6.2 Gas extractor test (R 117-2, 7.2.1.2))

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Reference before testing											
Gas			Liquid								
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0								no	no

Test												
Gas			Liquid									Gas extractor
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_{ref} [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]	MPE [%]

Reference after testing											
Gas			Liquid								
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0									

Passed		Yes		No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.6.3 Special gas extractor not indended for road tankers (R 117-2, 7.2.1.3)

Test on gas separator function: see test report format F.6.1
Test on gas extractor function: see test report format F.6.2

F.6.4 Special gas extractor indended for road tankers (R 117-2, 7.2.1.4)

F.6.4.1 Residual discharge test from the supply tank (R 117-2, 7.2.1.4.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	T_t [°C]	p_t [kPa]	V_s [L]	T_s [°C]	V_n [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1										
2										
3										

$\bar{E}$ = %	Range = %

Passed		☐	Yes	☐	No

Remarks:

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.6.4.2 Gas pocket test (R 117-2, 7.2.1.4.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Reference before testing											
Gas			Liquid								
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0								no	no

Test												
Gas			Liquid									Gas extractor
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_{ref} [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]	MPE [%]

Reference after testing											
Gas			Liquid								
P_{gr} [bar]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0									

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.6.4.3 Switching test on an empty supply tank (R 117-2, 7.2.1.4.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	T_t [°C]	p_t [kPa]	V_s [L]	T_s [°C]	V_n [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1										
2										
3										

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

F.6.5 Gas elimination devices forming part of a measuring system (R 117-2, 7.2.2)

F.6.5.1 Gas separator in fuel dispenser (R 117-2, 7.2.2.1.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_i [L]	V_s [L]	V_n [L]	p_t [kPa]	V_a [L]	V_a/V_n [-]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]
Reference	$Q(1)$									
1										
2										
Reference										
1										
2										
Reference	$Q(n)$									
1										
2										

Passed	☐ Yes	☐ No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i\ V_n) / V_n$
$V_a = (_{Vgas\ meter}\ (p_t + p_{atm})) / p_{atm}$

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

F.6.5.2 Gas extractor test (R 117-2, 7.2.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Reference before testing											
Gas			Liquid								
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0								no	no

Test												
Gas			Liquid									Gas extractor
P_{gr} [kPa]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_{ref} [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]	MPE [%]

Reference after testing											
Gas			Liquid								
P_{gr} [bar]	V_{gr} [L]	V_{nom} [L]	Q_{max} [L/min]	T_L [°C]	P_L [bar]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
0	0	0									

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.6.5.3 Special gas extractor not intended for measuring systems on road tankers (R 117-2, 7.2.2.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Reference before testing								
Q_{max} [L/min]	T_L [°C]	P_L [kPa]	V_s [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]
							no	no

Test									
Q_{max} [L/min]	T_l [°C]	P_L [kPa]	V_{ref} [L]	V_i [L]	E [L]	E [%]	Gas in liquid [Yes/no]	Gas sep. shut off [Yes/no]	Gas extractor MPE [%]

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

Test measures used:

T_r:	°C
β:	°C^{-1}
Nominal volume:	L

F.6.5.4 Special gas extractor intended for measuring systems on road tankers (R 117-2, 7.2.2.3)

Residual discharge test: Test report format F.6.4.1 can be used.
Gas pocket test: Test report format F.6.4.2 can be used
Switching test on empty supply tank: Test report format F.6.4.3 can be used

F.7 Test reports for ancillary devices (R 117-2, 8)

F.7.1 Influence factor tests and disturbance tests for printing devices (R 117-2, 8.3)

The test report formats of F.1 are applied.

Input values are:	Data sent to the printing device	These data can be for example: [L or m^3 or t or kg or NCU or NCU / L or NCU /m^3 or NCU / t or NCU / kg]
Output values are:	Data printed by the printing device	

F.7.2 Influence factor tests and disturbance tests for memory devices (R 117-2, 8.4)

The test report formats of F.1 are applied.

Input values are:	Data to be stored	These data can be for example: [L or m^3 or t or kg or NCU or NCU / L or NCU /m^3 or NCU / t or NCU / kg]
Output values are:	Accessed data	

F.7.3 Conversion devices (R 117-2, 8.5)

F.7.3.1 Accuracy tests (R 117-2, 8.5.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

	V						T				
Test No. [-]	Q_i [L/min]	np_{in} [-]	V_{ref} [L]	V_i [L]	E_V [%]	MPE_V [%]	R_{in} [Ω]	T_{ref} [°C]	T_i [°C]	E_T [°C]	MPE_T [°C]
1								T_{min}			
2								T_{med}			
3								T_{max}			

	P							ρ				
Test No. [-]	I_{in} [mA]	p_{ref} [kPa]	p_i [kPa]	E_P [kPa]	E_P [%]	MPE_P [bar]	MPE_P [%]	f_{in} [Hz]	ρ_{ref} [kg/m^3]	ρ_i [kg/m^3]	E_ρ [kg/m^3]	MPE_ρ [kg/m^3]
1		p_{min}			-				ρ_{min}			
2		p_{med}		-					ρ_{med}			
3		p_{max}			-				ρ_{max}			

	Calculation V_{bi}, V_{bref} based on V_i, T_{ref}, p_{ref} and ρ_{ref}					Calculation M_i, M_{ref} based on V_i, T_{ref}, p_{ref} and ρ_{ref}			
Test No. [-]	V_{bi} [L]	V_{bref} [L]	ρ_{15ref} [kg/m^3]	E_{Vb} [%]	MPE_{Vb} [%]	M_i [kg]	M_{ref} [kg]	E_M [%]	MPE_M [%]
1									
2									
3									

Passed		Yes		No

F.7.3.2 Influence factor tests and disturbance tests (R 117-2, 8.5.2)

The test report formats of F.1 are applied.

Input values are:	Flowrate Q or number of pulses np_{in}	[L/min] or [pulses/min]
	Reference temperature T_{ref} or resistance R_{in}	[°C] or [Ω]
	Reference pressure p_{ref} or current I_{in}	[bar] or [mA]
	Reference density ρ_{ref} or frequency f_{in}	[kg/m^3] or [Hz]
Indicated measurement values are:	Indicated volume V_i	[L]
	Indicated volume at base condition V_{bi}	[L]
	Indicated mass M_i	[kg]

F.8 Additional test reports for complete measuring systems

F.8.1 Additional test reports for complete fuel dispensers (R 117-2, A.6)

For tests of individual components of the measuring system, the test report formats of F.1 to F.7 can be used.

F.8.1.1 Flow interruption (R 117-2, A.6.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	Test no.	Q_{max} [L/min]	V_i [L]	T_t [°C]	T_s [°C]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
Reference									
5 interruptions	1								
5 interruptions	2								
5 interruptions	3								
Reference									

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.1.2 Variation of the internal volume of the hose (R 117-2, A.6.3.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	V_i [L]	Hose reel present [yes/no]	E [L]	MPE [ℓ]
Initial indication	0			
Hose pressurized for 10 s				

Passed	☐ Yes	☐ No

Remarks:

Note: MPE = 2 × E_{min} if hose reel is present
MPE = E_{min} if hose reel is not present

F.8.1.3 Functional test of the communication protocol (R 117-2, A.6.4.1)

Test a: Communication link lost during ongoing transaction

Test no.	Test description	Transaction authorized [yes/no]	Display indication		
			Volume [L]	Price [NCU]	Unit price [NCU/L]
1	Connect dispenser to POS				
2	Start transaction, disconnect dispenser from POS, hang nozzle				
3	Lift nozzle				
4	Hang nozzle				

Passed	☐ Yes	☐ No

Test b: influence of remote price change on display indication

Test no.	Test description	Transaction authorized [yes/no]	Display indication		
			Volume [L]	Price [NCU]	Unit price [NCU/L]
1	Lift nozzle				
2	Authorize transaction		0	0	
3	Try to change unit price		0	0	
4	Perform a delivery, hang the nozzle				
5	Carry out usual “cash in” steps at POS				

Passed	☐ Yes	☐ No

F.8.1.4 Accuracy at MMQ (R 117-2, A.6.4.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Q [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.1.5 Temperature conversion (R 117-2, A.6.4.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

	Indications			Reference values				
Test no. [-]	V_i [L]	V_{bi} [L]	ρ_{15i} [kg/m^3]	Q [L/min]	V_{ref} [L]	V_{bref} [L]	T_{ref} [°C]	ρ_{15ref} [kg/m^3]
1							T_{min}	
2							T_{med}	
3							T_{max}	

	Error calculations			
	V		V_b	
Test no. [-]	E_V [%]	MPE_V [%]	E_{Vb} [%]	MPE_{Vb} [%]
1				
2				
3				

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.1.6 Test of timeout function (R 117-2, A.6.4.4)

Test no.	Test description	dispenser switch off time [s]	Maximum permissible dispenser switch off time [s]
1	Activate dispenser, no delivery, wait for timeout.		120
2	Activate dispenser, deliver, stop flow, wait for timeout.		120

Passed		Yes		No

F.8.1.7 Blender testing

F.8.1.7.1 Blending gasoline / gasoline (R 117-2, A.6.5.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Accuracy test							
Test conditions	Q_{max} [L/min]	V_i [L]	V_s [L]	p_t [bar]	T_t [°C]	T_s [°C]	MPE [%]
Meter 1							
Meter 2							

Calculations					
k_{nom} [%]	k_{real} [%]	$V_{Meter\ 1}$ [L]	$V_{Meter\ 2}$ [L]	E_{Blend} [%]	MPE [(c)] [%]

Passed	☐ Yes	☐ No

Remarks:

Note: $V_{Oil/Additive} = V_{i\ Test\ 1} - V_{i\ Test\ 2}$
$V_{Gasoline} = V_{i\ Test\ 1}$
$k_{real} = 100\ V_{Meter\ 1} / (V\ V_{Meter\ 1} + V_{Meter\ 2})$
k_{nom} = Nominal blending ratio
$E_{Blend} = (k_{real} - k_{nom}) / k_{nom}$

[(c)] As required in R 117-1, 5.9.4

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.8.1.7.2 Oil or additive injected upstream of the meter (R 117-2, A.6.5.2.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no.	Blending ratio k [-]	Q [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
	k_{min}	Q_{min}					
		Q_{mid}					
		Q_{max}					
	k_{mid}	Q_{min}					
		Q_{mid}					
		Q_{max}					
	k_{max}	Q_{min}					
		Q_{mid}					
		Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.8.1.7.3 Oil or additive injected downstream of the meter (R 117-2, A.6.5.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Accuracy test							
Test conditions	Q_{max} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	MPE [%]
Test 1 (a)							0.5
Test 2 (b)							0.5

Calculations					
T_{nom} [%]	T_{real} [%]	$V_{Oil/Additive}$ [L]	$V_{Gasoline}$ [L]	E_{Blend} [%]	MPE (c) [%]

Passed	☐ Yes	☐ No

Remarks:

Note: (a) Oil/Additive blend disengaged or oil injection disconnected
(b) Oil/Additive blend engaged or oil injection connected
$V_{Oil/Additive} = V_{i\ Test\ 1} - V_{i\ Test\ 2}$
$V_{Gasoline} = V_{i\ Test\ 1}$
$T_{real} = 100\ V_{Gasoline} / (V_{Gasoline} + V_{Oil/Additive})$
T_{nom} = Nominal blending ratio
$E_{Blend} = (k_{real} - k_{nom}) / k_{nom}$
(c) As required in R 117-1, 5.9.5

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.8.2 Additional test reports for complete LPG dispensers (R 117-2, A-LPG.6)

For tests of individual components of the measuring system, the test report formats of F.1 to F.7 can be used.

F.8.2.1 Flow interruption (R 117-2, A-LPG.6.2.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	Test no.	Q_{max} [L/min]	V_i [L]	T_t [°C]	T_s [°C]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
Reference									
5 interruptions	1								
5 interruptions	2								
5 interruptions	3								
Reference									

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.2.2 Variation of the internal volume of the hose (R 117-2, A-LPG.6.3.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test conditions	V_i [L]	Hose reel present [yes/no]	E [L]	MPE [L]
Initial indication	0			
Hose pressurized for 10 s				

Passed	☐ Yes	☐ No

Remarks:

Note: MPE = 2 × E_{min} if hose reel is present
MPE = E_{min} if hose reel is not present

F.8.2.3 Functional test of the communication protocol (R 117-2, A-LPG.6.4.1)

Test a: Communication link lost during ongoing transaction (R 117-2, A-LPG.6.4.1.2)

Test no.	Test description	Transaction authorized [yes/no]	Display indication		
			Volume [L]	Price [NCU]	Unit price [NCU/L]
1	Connect dispenser to POS				
2	Start transaction, disconnect dispenser from POS, hang nozzle				
3	Lift nozzle				
4	Hang nozzle				

Passed	☐ Yes	☐ No

Test b: influence of remote price change on display indication (R 117-2, A-LPG.6.4.1.3)

Test no.	Test description	Transaction authorized [yes/no]	Display indication		
			Volume [L]	Price [NCU]	Unit price [NCU/L]
1	Lift nozzle				
2	Authorize transaction		0	0	
3	Try to change unit price		0	0	
4	Perform a delivery, hang the nozzle				
5	Carry out usual “cash in” steps at POS				

Passed	☐ Yes	☐ No

F.8.2.4 Accuracy at MMQ (R 117-2, A-LPG.6.4.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

	Ambient conditions		
	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Q [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) The units of volume may be replaced by units of mass, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.2.5 Temperature conversion (R 117-2, A-LPG.6.4.3)

Method 1:

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

	Q_{max} [L/min]	T_i [°C]	V_{bi} [L]	V_s [L]	V_{bref} [L]	E [%]	MPE (c) [%]
Tank 1							
Tank 2							
Tank 1							

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

Method 2:

	T_{P1} [°C]	T_{P2} [°C]	T_{P0} [°C]	T_{Ps} [°C]	T_{PI} [°C]	MPE (c) [%]
T1						
T2						

Passed	☐ Yes	☐ No

F.8.2.6 Test of timeout function (R 117-2, A-LPG.6.4.4)

Test no.	Test description	Dispenser switch off time [s]	Maximum permissible dispenser switch off time [s]
1	Activate dispenser, no delivery, wait for timeout.		120
2	Activate dispenser, deliver, stop flow, wait for timeout.		120

Passed		Yes		No

F.8.2.7 LPG remaining liquid in measuring system (R 117-2, A-LPG.6.4.5)

Test no.	Test description	Q [L/min]	P_L [bar]	P_G [bar]	ΔP_{GL} [bar]	PMD [yes/no]
1	Gas return line open	0				no
2	Gas return line open					no
3	Gas return line close	0			0	yes
4	Gas return line open					no

Passed	☐ Yes	☐ No

Note: PDM: Pressure maintaining device activated

F.8.3 Additional test reports for complete road tankers (R 117-2, Annex B)

For tests of individual components of the measuring system, the test report formats of F1 to F.7 can be used.

F.8.3.1 Complete emptying of the compartment of a road tanker (single compartment trucks only) (R 117-2, B.3.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			hPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	T_t [°C]	p_t [kPa]	V_s [L]	T_s [°C]	V_n [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1										
2										
3										

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	Test measures used:	
α:	°C^{-1}	T_r:	°C
χ:	kPa^{-1}	β:	°C^{-1}
μ (20 °C):	mPa·s	Nominal volume:	L

F.8.3.2 Connection of an empty compartment (multiple compartment trucks only) (R 117-2, B.3.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	T_t [°C]	p_t [kPa]	V_s [L]	T_s [°C]	V_n [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1										
2										
3										

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.3.3 Variation of the internal volume of the hose (R 117-2, B.3.4)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	V_{nom} [L]	V_i [L]	$V_{nom} - V_i$ [L]	Hose reel present [yes/no]	MPE [L]

Passed		Yes		No

Remarks:

Note: $E = V_{nom} - V_i$
V_{nom} is the nominal volume between the anti-drain device and the hose closing device
MPE = 2 × E_{min} if hose reel is present
MPE = E_{min} if hose reel is not present

F.8.3.4 Complete emptying of the hose (R 117-2, B.3.5)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_i [L]	T_t [°C]	p_t [kPa]	V_s [L]	T_s [°C]	V_n [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1										
2										
3										

$\bar{E}$ = %	Range = %

Passed		☐	Yes	☐	No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.8.4 Test report for complete measuring systems for milk, beer and other foaming potable liquids (R 117-2, Annex E)

For tests of individual components of the measuring system, the test report formats of F.1 to F.7 can be used.

F.8.4.1 Measuring systems for milk (R 117-2, E.6.1)

F.8.4.1.1 Receiving measuring systems (R 117-2, E.6.1.1)

F.8.4.1.1.1 Accuracy with suction pipe (R 117-2, E.6.1.1)
(sampling device not activated)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.4.1.1.2 Reports on accuracy without suction pipe (R 117-2, E.6.1.1)

(sampling device not activated)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.4.1.1.3 MMQ with suction pipe (R 117-2, E.6.1.1)

(sampling device not activated)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	$Q_{operation}$ [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.4.1.1.4 MMQ with suction pipe (R 117-2, E.6.1.1)
(sampling device activated)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	$Q_{operation}$ [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1						
2						
3						

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.4.1.1.5 Test of the special gas extractor function of the air elimination device (R 117-2, E.6.1.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	V_n [L]	p_t [kPa]	V_a [L]	V_a/V_n [-]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]
1										
2										
n-1										
n										

Passed	☐ Yes	☐ No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i - V_n) / V_n$
$V_a = (V_{gas\ meter}\ (p_t + p_{atm})) / p_{atm}$

Test liquid:

ρ (15 °C)	kg/m^3	Test measures used:	
α:	°C^{-1}	T_r:	°C
χ:	kPa^{-1}	β:	°C^{-1}
μ (20 °C):	mPa·s	Nominal volume:	L

F.8.4.1.2 Delivering measuring systems for milk (R 117-2, E.6.1.3)

F.8.4.1.2.1 Accuracy (R 117-2, E.6.1.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1	Q_{min}					
	Q_{mid}					
	Q_{max}					
2	Q_{min}					
	Q_{mid}					
	Q_{max}					
3	Q_{min}					
	Q_{mid}					
	Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:

ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Test measures used:

F.8.4.1.2.2 MMQ (R 117-2, E.6.1.3)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	E_{vi} [L]	E_{vi} [%]	MPE [%]
1	Q_{min}					
	Q_{mid}					
	Q_{max}					
2	Q_{min}					
	Q_{mid}					
	Q_{max}					
3	Q_{min}					
	Q_{mid}					
	Q_{max}					

Passed	☐ Yes	☐ No

Remarks:

Note: V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.4.1.2.3 Air elimination devices for delivering measuring systems for milk (R 117-2, E.6.1.4)

F.8.4.1.2.3.1 Gas separators for delivering measuring systems for milk (R 117-2, E.6.1.4.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_i [L]	V_s [L]	V_n [L]	p_t [kPa]	V_a [L]	V_a/V_n [-]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]
Reference	Q(1)									
1										
2										
Reference										
1										
2										
Reference	Q(n)									
1										
2										

Passed	☐ Yes	☐ No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i\ i_n) / V_n$
$V_a = (v_{gas\ meter}\ (p_t + p_{atm})) / p_{atm}$
V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:
ρ (15 °C) kg/m^3
α: °C^{-1}
χ: kPa^{-1}
μ (20 °C): mPa·s

Test measures used:
T_r: °C
β: °C^{-1}
Nominal volume: L

F.8.4.1.2.3.2 Gas extractors for delivering measuring systems for milk (R 117-2, E.6.1.4.2)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	V_n [L]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]
Reference							
1							
2							

Passed		Yes		No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i\ V_n) / V_n$

V_i and V_s may be replaced by V_n and V_r, if appropriate.

Test liquid:		Test measures used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.4.1.2.3.3 Reports on special gas extractors (R 117-2, E.6.1.4.3)

F.8.4.1.2.3.3.1 Special gas extractor not intended for measuring systems on road tankers

Test on gas separator function: see test report format F.6.1
Test on gas extractor function: see test report format F.6.2

F.8.4.1.2.3.3.2 Special gas extractor intended for measuring systems on road tankers

Test on gas separator function and gas extractor function:

1a) Volumetric procedure by receiving the liquid from a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
2							

Passed	☐ Yes	☐ No

1b) Volumetric procedure by delivering the liquid into a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
2							

Passed	☐ Yes	☐ No

2a) Gravimetric procedure by receiving the liquid from a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
2										

Passed	☐ Yes	☐ No

Remarks:

Notes: $\rho(T_s) = \rho(T_s') + 200 \bullet 10^{-6} \bullet (T_s' - T_s)$
$V_n = (W_{gross} - W_{net}) / \rho(T_s) \bullet (1 + 0.0012 / \rho(T_s))$

2b) Gravimetric procedure by delivering the liquid into a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
2										

Passed	☐ Yes	☐ No

Remarks:

Notes: $\rho(T_s) = \rho(T_s') + 200 \times 10^{-6} \times (T_s' - T_s)$
$V_n = (W_{gross} - W_{net}) / \rho(T_s) \times (1 + 0.0012 / \rho(T_s))$

F.8.4.1.2.4 Volume required to fill the measuring system (R 117-2, E.6.1.6)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	V_s [L]	V_i [L]	V_{MS} [L]	V_{MSc} [L]	$\overline{V}_{MSc}$ [L]
1					
2					

Passed		Yes		No

Remarks:

Note: $V_{MS} = V_s - V_i$ [ℓ]
$\underline{V}_{MSc} = V_{MS}$ corrected by meter error
V_{MSc} = mean volume of V_{MSc}

F.8.4.2 Measuring systems for beer and other foaming liquids (R 117-2, E.6.2)

F.8.4.2.1 Delivering measuring systems (R 117-2, E.6.2.1)

F.8.4.2.1.1 Accuracy (R 117-2, E.6.2.1)

1) Gravimetric procedure by delivering the liquid into a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
n										

Passed	☐ Yes	☐ No

Remarks:

Notes: $V_{air/gas\ in\ tank} = V_{tank} - V_{liquid\ in\ tank}$
$\rho_{gas}(p) = \rho_{gas}(p_{atmosphere}) \times$ (reading of tankmanometer in bar + 1)
$\rho(T_s) = \rho(T_s') + 200 \times 10^{-6} \times (T_s' - T_s)$
$\rho_{CO2}(15\ °C, 1\ bar) \approx 1.8\ kg/m^3$
$V_n = (W_{gross} - W_{net}) / \rho(T_s)$

2) Volumetric procedure by delivering the liquid into a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
2							

Passed	☐ Yes	☐ No

F.8.4.2.1.2 Minimum measured quantity (R 117-2, E.6.2.1)

1) Gravimetric procedure by delivering the liquid into a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
n										

Passed	☐ Yes	☐ No

Remarks:

Notes: $V_{air/gas\ in\ tank} = V_{tank} - V_{liquid\ in\ tank}$
$\rho_{gas}(p) = \rho_{gas}(p_{atmosphere}) \times$ (reading of tankmanometer in bar + 1)
$\rho(T_s) = \rho(T_s') + 200 \times 10^{-6} \times (T_s' - T_s)$
$\rho_{CO2}(15\ °C, 1\ bar) \approx 1.8\ kg/m^3$
$V_n = (W_{gross} - W_{net}) / \rho(T_s)$

2) Volumetric procedure by delivering the liquid into a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
n							

Passed	☐ Yes	☐ No

F.8.4.2.1.3 Gas elimination device (R 117-2, E.6.2.1.1)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q_{max} [L/min]	V_i [L]	V_s [L]	V_n [L]	$E_{vi\ (without\ gas)}$ [%]	$E_{vi\ (gas)}$ [%]	E_{vi} [%]	$\bar{E}_{vi}$ [%]	MPE [%]
Reference									
1									
2									

Passed	☐ Yes	☐ No

Remarks:

Notes: $E_{vi} = E_{vi\ (gas)} - E_{vi\ (without\ gas)}$
$E_{vi\ (gas)} = (V_i - V_n) / V_n$
$\bar{E}_{vi}$ = mean value of E_{vi}

F.8.4.2.1.4 Variation of the internal volume of the hose (R 117-2, E.7)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	V_{nom} [L]	V_i [L]	$V_{nom} - V_i$ [L]	Hose reel present [yes/no]	MPE [L]

Passed	☐ Yes	☐ No

Remarks:

Note: $E = V_{nom} - V_i$
V_{nom} is the nominal volume between the anti-drain device and the hose closing device
MPE = 2 × E_{min} if hose reel is present
MPE = E_{min} if hose reel is not present

F.8.4.2.2 Receiving measuring systems (R 117-2, E.6.2.1)

F.8.4.2.2.1 Accuracy (R 117-2, E.6.2.1)

1) Gravimetric procedure by receiving the liquid from a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
n										

Passed	☐ Yes	☐ No

Remarks:

Notes: $V_{air/gas\ in\ tank} = V_{tank} - V_{liquid\ in\ tank}$
$\rho_{gas}(p) = \rho_{gas}(p_{atmosphere}) \times$ (reading of tankmanometer in bar + 1)
$\rho(T_s) = \rho(T_s') + 200 \times 10^{-6} \times (T_s' - T_s)$
$\rho_{CO2}(15\ °C, 1\ bar) \approx 1.8\ kg/m^3$
$V_n = (W_{gross} - W_{net}) / \rho(T_s)$

2) Volumetric procedure by receiving the liquid from a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
n							

Passed		Yes		No

F.8.4.2.2.2 Minimum measured quantity (R 117-2, E.6.2.1)

1) Gravimetric procedure by receiving the liquid from a tank on a balance

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	W_{gross} [kg]	W_{net} [kg]	$\rho(T_s')$ [kg/m^3]	$\rho(T_s)$ [kg/m^3]	T_s [°C]	(T_s') [°C]	V_n [L]	E_{vi} [%]	MPE [%]
1										
n										

Passed	☐ Yes	☐ No

Remarks:

Notes: $V_{air/gas\ in\ tank} = V_{tank} - V_{liquid\ in\ tank}$
$\rho_{gas}(p) = \rho_{gas}(p_{atmosphere}) \times$ (reading of tankmanometer in bar + 1)
$\rho(T_s) = \rho(T_s') + 200 \times 10^{-6} \times (T_s' - T_s)$
$\rho_{CO2}(15\ °C, 1\ bar) \approx 1.8\ kg/m^3$
$V_n = (W_{gross} - W_{net}) / \rho(T_s)$

2) Volumetric procedure by receiving the liquid from a standard capacity measure

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Test no. [-]	Q [L/min]	V_s [L]	T_s [°C]	V_i [L]	V_n [L]	E_{vi} [%]	MPE [%]
1							
n							

Passed	☐ Yes	☐ No

F.8.5 Test reports for complete measuring systems on pipelines and systems forloading of ships (R 117-2, Annex F)

For tests of individual components of the measuring system, the test report formats of F.1 to F.7 can be used.

F.8.6 Test reports for complete measuring systems for fuelling aircrafts (R 117-2, Annex G)

For tests of individual components of the measuring system, the test report formats of F.1 to F.7 can be used.

F.8.6.1 Accuracy test using a volumetric test measure (R 117-2, G.2.5.1.2 A)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Q(1) [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Q(2) [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Q(3) [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed		☐	Yes	☐ No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) Recommended flowrates $Q(1)$: 0.8 Q_{max} to Q_{max}
$Q(2)$: Intermediate flowrate
$Q(3)$: Q_{min} to 0.2 Q_{max}

Test liquid:		Test measure used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

Accuracy on minimum measured quantity

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

Q_{min} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Q_{min} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Q_{max} [L/min]	V_i [L]	V_s [L]	p_t [kPa]	T_t [°C]	T_s [°C]	E_{vi} [%]	MPE [%]

$\bar{E}$ = %	Range = %

Passed	☐ Yes	☐ No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) Recommended flowrates $Q(1)$: 0.8 Q_{max} to Q_{max}
$Q(2)$: Intermediate flowrate
$Q(3)$: Q_{min} to 0.2 Q_{max}

Test liquid:		Test measure used:	
ρ (15 °C)	kg/m^3	T_r:	°C
α:	°C^{-1}	β:	°C^{-1}
χ:	kPa^{-1}	Nominal volume:	L
μ (20 °C):	mPa·s		

F.8.6.2 Accuracy test using a master meter (R 117-2, G.2.5.1.2 B)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions

	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

$Q(2)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

$Q(3)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

Passed	☐ Yes	☐ No

Remarks:

Notes: (1) V_i and V_s may be replaced by V_n and V_r, if appropriate.
(2) Recommended flowrates $Q(1)$: 0.8 Q_{max} to Q_{max}
$Q(2)$: Intermediate flowrate
$Q(3)$: Q_{min} to 0.2 Q_{max}

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s

F.8.6.3 Accuracy on minimum measured quantity

(Test necessary for MMQ <500 ℓ)

Application no.:
Model:
Serial no.:
Test date:
Observer:

Ambient conditions	At start	At end	
Temperature:			°C
Relative humidity:			%
Atmospheric pressure:			kPa
Time:			

$Q(1)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

$Q(2)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

$Q(3)$ [L/min]	V_i [L]	V_s [L]	E_{vi} [%]	MPE [%]
$\bar{E}$ = %			Range = %	

Passed		Yes		No

Remarks:

Notes: (1) Recommended flowrates
$Q(1)$: 0.8 Q_{max} to Q_{max}
$Q(2)$: Intermediate flowrate
$Q(3)$: Q_{min} to 0.2 Q_{max}

Test liquid:

ρ (15 °C)	kg/m^3
α:	°C^{-1}
χ:	kPa^{-1}
μ (20 °C):	mPa·s