INTERNATIONAL RECOMMENDATION

OIML R 49-3

Edition 2013 (E)

Water meters for cold potable water and hot water.

Part 3: Test report format

Compteurs d'eau potable froide et d'eau chaude.

Partie 3: Format du rapport d'essai

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:

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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 49-3:2013 (E) – was developed by a joint OIML/ISO/CEN working group comprising OIML TC 8/SC 5 *Water meters*, ISO/TC 30/SC 7 *Volume methods including water meters* and CEN/TC92 *Water meters*. The content is the same in substance as that of ISO 4064-3:2014 *Water meters for cold potable water and hot water*. This edition supersedes OIML R 49-3:2006 and was approved for final publication by the International Committee of Legal Metrology at its 48th meeting in Ho Chi Minh City, Viet Nam in October 2013. It will be submitted to the International Conference on Legal Metrology in 2016 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

Introduction

Implementation of this test report format is informative with regard to the implementation of OIML R 49-1 and OIML R 49-2 in national regulations; however, its implementation is required within the framework of the OIML Certificate System for Measuring Instruments [OIML R 49-2:2013, 11.1].

Clause 4 shows the required format of a type evaluation report for a complete or combined water meter.

A type evaluation report for a separable calculator (including indicating device) or a measurement transducer (including flow or volume sensor) requires a similar format. However, some modifications to the tables may be required because a large number of variations in the design of these separable units is possible.

Some examples of tables for presenting the test results for separable units are shown in Clause 5 for initial verifications. These tables can also be adapted for type evaluation reports.

Water meters for cold potable water and hot water. Part 3: Test report format

1 Scope

This part of OIML R 49 specifies a test report format to be used in conjunction with OIML R 49-1:2013 and OIML R 49-2:2013 for water meters for cold potable water and hot water.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

OIML R 49-1:2013, *Water meters for cold potable water and hot water. Part 1: Metrological and technical requirements*

OIML R 49-2:2013, *Water meters for cold potable water and hot water. Part 2: Test methods*

3 Terms, definitions, symbols, and abbreviated terms

For the purposes of this document, the terms and definitions given in OIML R 49-1:2013 apply.

Some symbols and abbreviated terms used in the tables are as follows.

+	pass
–	fail
n/a	not applicable
EUT	equipment under test
H	horizontal
MAP	maximum admissible pressure
MAT	maximum admissible temperature
MPE	maximum permissible error
V	vertical

4 Type evaluation report

4.1 General

For each examination and test the checklist shall be completed according to this example:

+	-	
X		Pass
	X	Fail
n/a	n/a	Not applicable

4.2 Information concerning the type

4.2.1 General

Application number: _____

Applicant: _____

Authorized representative: _____

Address: _____

_____

_____

_____

Testing laboratory: _____

Authorized representative: _____

Address: _____

_____

_____

_____

4.2.2 Model submitted

New model: _____

Variant of approved model(s):

Approval number: _____

Variation of approved model: _____

See Table 1.

Table 1 Model submitted

Submitted for approval tests	Yes[a]	No[a]	Remarks
Mechanical water meter (complete)			
Mechanical water meter (combined)			
Electronic water meter (complete)			
Electronic water meter (combined)			
Family of water meters			
Separable calculator (including indicating device)			
Separable measurement transducer (including flow or volume sensor)			
Supplementary electronic device(s) for testing (permanently attached to meter)			
Supplementary electronic device(s) for data transmission (permanently attached to meter)			
Supplementary electronic device(s) for testing (temporarily attached to meter)			
Supplementary electronic device(s) for data transmission (temporarily attached to meter)			
Ancillary devices			

[a] Tick as appropriate.

4.2.3 Mechanical water meter (complete or combined)

Manufacturer: _____

Model number: _____

Type details:

Q_1 _____ m^3/h

Q_2 _____ m^3/h

Q_3 _____ m^3/h

Q_4 _____ m^3/h

Q_3/Q_1 _____

for combination meters

Q_{x1} _____ m^3/h

Q_{x2} _____ m^3/h

Measuring principle: _____

Accuracy class: _____

Temperature class: _____

Environmental class: _____

Electromagnetic environment: _____

Maximum admissible temperature: _____ °C

Maximum admissible pressure: _____ MPa (_____ bar)

Orientation limitation: _____

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Installation details:

Connection type (flange, screw thread, concentric manifold): _____

Minimum straight length of inlet pipe: _____ mm

Minimum straight length of outlet pipe: _____ mm

Flow conditioner (details if required): _____

Mounting: _____

Orientation: _____

Other relevant information: _____

Note: If a family of meters is submitted, the details in this subclause are to be given for each size of water meter.

4.2.4 Electronic water meter (complete or combined)

Manufacturer: _____

Model number: _____

Type details:

Q_1 _____ m^3/h

Q_2 _____ m^3/h

Q_3 _____ m^3/h

Q_4 _____ m^3/h

Q_3/Q_1 _____

for combination meters

Q_{x1} _____ m^3/h

Q_{x2} _____ m^3/h

Measuring principle: _____

Accuracy class: _____

Temperature class: _____

Environmental class: _____

Electromagnetic environment: _____

Maximum admissible temperature: _____ °C

Maximum admissible pressure: _____ MPa (_____ bar)

Orientation limitation: _____

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Installation details (mechanical):

Connection type (flange, screw thread, concentric manifold): _____

Minimum straight length of inlet pipe: _____ mm

Minimum straight length of outlet pipe: _____ mm

Flow conditioner (details if required): _____

Mounting: _____

Orientation: _____

Other relevant information: _____

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Note: If a family of meters is submitted, the details in this subclause are to be given for each size of water meter.

4.2.5 Separable calculator (including indicating device)

Manufacturer: _____

Model number: _____

Type details:

Q_1 _____ m^3/h

Q_2 _____ m^3/h

Q_3 _____ m^3/h

Q_4 _____ m^3/h

Q_3/Q_1 _____

for combination meters

Q_{x1} _____ m^3/h

Q_{x2} _____ m^3/h

Measuring principle: _____

Accuracy class: _____

Temperature class: _____

Environmental class: _____

Electromagnetic environment: _____

Maximum admissible temperature: _____°C

Maximum admissible pressure: _____MPa (_____ bar)

Orientation limitation: _____

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Maximum relative error specified by the manufacturer:

Lower flow rate zone, $Q_1 \leq Q < Q_2$: _____%

Upper flow rate zone, $Q_2 \leq Q \leq Q_4$: _____%

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Approval number(s) of compatible measurement transducer(s) (including flow or volume sensor): _____

4.2.6 Separable measurement transducer (including flow or volume sensor)

Manufacturer: _____

Model number: _____

Type details:

Q_1 _____ m^3/h

Q_2 _____ m^3/h

Q_3 _____ m^3/h

Q_4 _____ m^3/h

Q_3/Q_1 _____

for combination meters

Q_{x1} _____ m^3/h

Q_{x2} _____ m^3/h

Measuring principle: _____

Accuracy class: _____

Temperature class: _____

Environmental class: _____

Electromagnetic environment: _____

Maximum admissible temperature: _____°C

Maximum admissible pressure: _____MPa (_____ bar)

Orientation limitation: _____

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Maximum relative error specified by the manufacturer:

Lower flow rate zone, $Q_1 \leq Q < Q_2$: _____%

Upper flow rate zone, $Q_2 \leq Q \leq Q_4$: _____%

Installation details (mechanical):

Connection type (flange, screw thread, concentric manifold): _____

Minimum straight length of inlet pipe: _____mm

Minimum straight length of outlet pipe: _____mm

Flow conditioner (details if required): _____

Mounting: _____

Orientation: _____

Other relevant information: _____

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Approval number(s) of compatible calculator(s) (including indicating device): _____

4.2.7 Supplementary electronic device(s) used for testing (permanently attached to meter)

Manufacturer: _____

Model number: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

4.2.8 Supplementary electronic device(s) used for data transmission (permanently attached to meter)

Manufacturer: _____

Model number: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

4.2.9 Supplementary electronic device(s) used for testing (temporarily attached to meter)

Manufacturer: _____

Model number: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

4.2.10 Supplementary electronic device(s) used for data transmission (temporarily attached to meter)

Manufacturer: _____

Model number: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

4.2.11 Ancillary devices

Manufacturer: _____

Model number: _____

Power supply:

Type (battery, mains AC, mains DC): _____

U_{max}: _____ V

U_{min}: _____ V

Frequency: _____ Hz

Approval number(s) of compatible calculator(s) (including indicating device): _____

EUT testing requirements (OIML R 49-2:2013, 8.1.8):

Category: _____

Case: _____

Installation details (electrical):

Wiring instructions: _____

Mounting arrangement: _____

Orientation limitations: _____

Approval number(s) of compatible water meters, calculator(s) (including indicating device) and measurement transducer(s) (including flow or volume sensor): _____

4.2.12 Documents concerning the type

A list of documents shall be submitted with the type approval application as in Annex A.

4.3 General information concerning the test equipment

Details of all items of measuring equipment and test instruments used for the type examinations, and initial verifications shall be listed in Annex B, including:

Manufacturer

Model number

Serial number

Date of last calibration

Date of next calibration due of e.g. instruments for measuring:

- linear dimensions
- pressure gauges
- pressure transmitters
- manometers
- temperature transducers
- reference meters
- volume tanks
- weighing machines
- signal generators (for pulse, current or voltage)

4.4 Check list for water meter examinations and performance tests

4.4.1 Check list for water meter examinations

External examination for all water meters				
OIML R 49-1:2013, subclause	**Requirement**	+	−	**Remarks**
Function of the indicating device				
6.7.1.1	The indicating device shall provide an easily read, reliable and unambiguous visual indication of the indicated volume			
6.7.1.1	The indicating device shall include visual means for testing and calibration.			
6.7.1.1	The indicating device may include additional elements for testing and calibration by other methods, e.g. for automatic testing and calibration			
Unit of measurement and its placement				
6.7.1.2	The indicated volume of water shall be expressed in cubic metres			
6.7.1.2	The symbol m^3 shall appear on the dial or immediately adjacent to the numbered display			
Indicating range				
6.7.1.3	For $Q_3 \leq 6.3$, the minimum indicating range is 0 m^3 to 9 999 m^3			
6.7.1.3	For $6.3 < Q_3 \leq 63$, the minimum indicating range is 0 m^3 to 99 999 m^3			
6.7.1.3	For $63 < Q_3 \leq 630$, the minimum indicating range is 0 m^3 to 999 999 m^3			
6.7.1.3	For $630 < Q_3 \leq 6\,300$, the minimum indicating range is 0 m^3 to 9 999 999 m^3			
Colour coding for indicating device				
6.7.1.4	The color black should be used to indicate the cubic metre and its multiples			
6.7.1.4	The color red should be used to indicate sub-multiples of a cubic metre			
6.7.1.4	The colors shall be applied to either the pointers, indexes, numbers, wheels, discs, dials or aperture frames			
6.7.1.4	Other means of indicating the cubic metre may be used provided there is no ambiguity in distinguishing between the primary indication and alternative displays, e.g. sub-multiples for verification and testing			
Types of indicating device: Type 1 — Analogue device				
6.7.2.1	The indicated volume shall be shown by continuous movement of either: a) one or more pointers moving relative to graduated scales; or b) one or more circular scales or drums each passing an index			

6.7.2.1	The value expressed in cubic metres for each scale division shall be of the form 10^n, where n is a positive or a negative whole number or zero, thereby establishing a system of consecutive decades.			
6.7.2.1	The scale shall be graduated in values expressed in cubic metres or accompanied by a multiplying factor (×0.001; ×0.01; ×0.1; ×1; ×10; ×100; ×1 000 etc.)			
6.7.2.1	Rotational movement of the pointers or circular scales shall be clockwise			
6.7.2.1	Linear movement of pointers or scales shall be left to right			
6.7.2.1	Movement of numbered roller indicators shall be upwards			
Types of indicating device: Type 2 — Digital device				
6.7.2.2	The indicated volume is given by a line of digits appearing in one or more apertures			
6.7.2.2	The advance of one digit shall be completed while the digit of the next immediately lower decade changes from 9 to 0			
6.7.2.2	The apparent height of the digits shall be at least 4 mm			
6.7.2.2	For non-electronic devices, movement of numbered roller indicators (drums) shall be upwards			
6.7.2.2	For non-electronic devices, the lowest value decade may have a continuous movement, the aperture being large enough to permit a digit to be read without ambiguity			
6.7.2.2	For electronic devices with non-permanent displays the volume shall be able to be displayed at any time for at least 10 s			
6.7.2.2	For electronic devices, the meter shall provide visual checking of the entire display which shall have the following sequence: — for seven segment type displaying all the elements (e.g. an “eights” test); and — for seven segment type blanking all the elements (a “blanks” test). For graphical displays, an equivalent test is required to demonstrate that display faults cannot result in any digit being misinterpreted. Each step of the sequence shall last at least 1 s			
Types of indicating device: Type 3 — Combination of analogue and digital devices				
6.7.2.3	The indicated volume is given by a combination of type 1 and type 2 devices and the respective requirements of each shall apply			
Verification devices — General requirements				
6.7.3.1	Every indicating device shall provide means for visual, non-ambiguous verification testing and calibration			
6.7.3.1	The visual verification may have either a continuous or a discontinuous movement			
6.7.3.1	In addition to the visual verification display, an indicating device may include provisions for rapid testing by the inclusion of complementary elements (e.g. star wheels or discs), providing signals through externally attached sensors.			

Verification devices — Visual verification displays				
6.7.3.2.1	The value of the verification scale interval, expressed in cubic metres, shall be of the form:1×10^n, 2×10^n or 5×10^n, where n is a positive or negative whole number, or zero			
6.7.3.2.1	The indicated volume is given by a line of digits appearing in one or more apertures			
6.7.3.2.1	For analogue or digital indicating devices with continuous movement of the first element, the verification scale interval may be formed from the division into 2, 5 or 10 equal parts of the interval between two consecutive digits of the first element. Numbering shall not be applied to these divisions			
6.7.3.2.1	For digital indicating devices with discontinuous movement of the first element, the verification scale interval is the interval between two consecutive digits or incremental movements of the first element			
6.7.3.2.2	On indicating devices with continuous movement of the first element, the apparent scale spacing shall be not less than 1 mm and not more than 5 mm			
6.7.3.2.2	The scale shall consist of either: a) lines of equal thickness not exceeding one quarter of the scale spacing and differing only in length; or b) contrasting bands of a constant width equal to the scale spacing			
6.7.3.2.2	The apparent width of the pointer at its tip shall not exceed one-quarter of the scale spacing and in no case shall it be greater than 0.5 mm			
Resolution of the indicating device				
6.7.3.2.3	The sub-divisions of the verification scale shall be small enough to ensure that the resolution of the indicating device does not exceed 0.25 % of the actual volume for accuracy class 1 meters, and 0.5 % of the actual volume for accuracy class 2 meters, for a 90 min test at the minimum flow rate, Q_1. *Note 1:* When the display of the first element is continuous, an allowance should be made for a maximum error in each reading of not more than half of the verification scale interval. *Note 2:* When the display of the first element is discontinuous, an allowance should be made for a maximum error in each reading of not more than one digit of the verification scale			
Note: For combination meters with two indicating devices, the above requirements apply to both indicating devices.				
Marks and inscriptions				
6.6.1	A place shall be provided on the meter for affixing the verification mark, which shall be visible without dismantling the meter			
6.6.2	The water meter shall be clearly and indelibly marked with the information listed in the following, either grouped or distributed on the casing, the indicating device dial, an identification plate or on the meter cover if is not detachable			
6.6.2 a)	Unit of measurement: cubic metre			
6.6.2 b)	The accuracy class, where it differs from accuracy class 2			

6.6.2 c)	The numerical value of Q_3 and the ratio Q_3/Q_1 (may be preceded by R). If the meter measures reverse flow and Q_3 and the ratio Q_3/Q_1 are different in the two directions, both values of Q_3 and Q_3/Q_1 shall be inscribed; the direction of flow to which each pair of values refers shall be clear. If the meter has different values of Q_3/Q_1 in horizontal and vertical positions, both values of Q_3/Q_1 shall be inscribed, and the orientation to which each value refers shall be clear			
6.6.2 d)	The type approval sign according to national regulations			
6.6.2 e)	The name or trademark of the manufacturer			
6.6.2 f)	The year of manufacture (or the last two digits of the year of manufacture or the month and year of manufacture)			
6.6.2 g)	The serial number (as near as possible to the indicating device)			
6.6.2 h)	The direction of flow (shown on both sides of the body; or on one side only, provided the direction of flow arrow is easily visible under all circumstances)			
6.6.2 i)	The maximum admissible pressure (MAP) if it exceeds 1 MPa (10 bar) or 0.6 MPa (6 bar) for nominal diameter ≥ 500 mm. (The unit bar may be used where national regulations permit)			
6.6.2 j)	The letter V or H, if the meter can only be operated in the vertical or horizontal position			
6.6.2 k)	The temperature class where it differs from T30			
6.6.2 l)	The pressure loss class where it differs from Δp 63			
6.6.2 m)	The installation sensitivity class where it differs from U0/D0			
Additional markings for water meters with electronic devices				
6.6.2 n)	For an external power supply: the voltage and frequency			
6.6.2 o)	For a replaceable battery: the latest date by which the battery shall be replaced			
6.6.2 p)	For a non-replaceable battery: the latest date by which the meter shall be replaced			
6.6.2 q)	Environmental classification			
6.6.2 r)	Electromagnetic environmental class			
Protection devices				
6.8.1	Water meters shall include protection devices which can be sealed so as to prevent, both before and after correct installation of the water meter, dismantling or modification of the meter, its adjustment device or its correction device, without damaging these devices. In the case of combination meters, this requirement applies to both meters			
Protection devices — Electronic sealing devices				
6.8.2.1	When access to parameters that influence the determination of the results of measurements is not protected by mechanical sealing devices, the protection shall fulfil the following provisions. a) Access shall only be allowed to authorized people, e.g. by means of a code (password) or of a special device (hard key, etc.). The code shall be capable of being changed.			

	b) It shall be possible for at least the last intervention to be memorized. The record shall include the date and a characteristic element identifying the authorized person making the intervention [see a)]. If it is possible to memorize more than one intervention and if a previous intervention requires deletion to permit a new record, the oldest record shall be deleted			
6.8.2.2	For meters with parts which can be disconnected one from another by the user and which are interchangeable, the following provisions shall be fulfilled: a) it shall not be possible to access parameters that participate in the determination of results of measurements through disconnected points unless the provisions of OIML R 49-1:2013, 6.8.2.1 are fulfilled; b) interposing any device which may influence the accuracy shall be prevented by means of electronic and data processing securities or, if this is not possible, by mechanical means			
6.8.2.3	For meters with parts which may be disconnected one from the other by the user and which are not interchangeable, the provisions in OIML R 49-1:2013, 6.8.2.2 apply. Moreover, these meters shall be provided with devices which do not allow them to operate if the various parts are not connected according to the approved type. *Note:* Disconnections which are not allowed to the user may be prevented, e.g. by means of a device that prevents any measurement after disconnecting and reconnecting			
Examination and testing of checking facilities				
General requirements for examining checking facilities				
5.1.3	Water meters with electronic devices shall be provided with the checking facilities specified in OIML R 49-1:2013, Annex B, except in the case of non-resettable measurements between two constant partners			
5.1.3	All meters equipped with checking facilities shall prevent or detect reverse flow, as laid down in OIML R 49-1:2013, 4.2.7.			

4.4.2 Checklist for water meter performance tests

4.4.2.1 Performance tests for all water meters

OIML R 49-1:2013, subclause	Requirement	+	−	Remarks
	Static pressure test			
4.2.10	The meter shall be capable of withstanding the following test pressures without leakage or damage: — 1.6 times the maximum admissible pressure for 15 min; — 2 times the maximum admissible pressure for 1 min			
	Intrinsic errors (of indication)			
7.2.3	The errors (of indication) of the water meter (in the measurement of the actual volume), shall be determined at least at the following flow rate ranges: a) Q_1 to 1.1 Q_1; b) Q_2 to 1.1 Q_2; c) 0.33 (Q_2 + Q_3) to 0.37 (Q_2 + Q_3); d) 0.67 (Q_2 + Q_3) to 0.74 (Q_2 + Q_3); e) 0.9 Q_3 to Q_3; f) 0.95 Q_4 to Q_4; and for combination meters:; g) 0.85 Q_{x1} to 0.95 Q_{x1}; h) 1.05 Q_{x2} to 1.15 $Q_{x2.}$ The water meter should be tested without its temporary supplementary devices attached (if any). During a test all other influence factors shall be held at reference conditions. Other flow rates may be tested depending on the shape of the error curve. 1) The relative errors (of indication) observed for each of the flow rates shall not exceed the maximum permissible errors (MPEs) given in OIML R 49-1:2013, 4.2.2 or 4.2.3. If the error observed on one or more meters is greater than the MPE at one flow rate only, then if only two results have been taken at that flow rate, the test at that flow rate shall be repeated. The test shall be declared satisfactory if two out of the three results at that flow rate lie within the MPE and the arithmetic mean of the results for the three tests at that flow rate lies within the MPE. 2) If all the relative errors (of indication) of the water meter have the same sign, at least one of the errors shall not exceed one-half of the MPE. In all cases, this requirement shall be applied equitably with respect to the water supplier and the consumer (see also OIML R 49-1:2013, 4.3.3 3) and 8)			
7.2.4	The meter shall be repeatable: the standard deviation of three measurements at the same flow rate shall not exceed one-third of the MPEs given in OIML R 49-1:2013, 4.2.2 or 4.2.3. Tests shall be carried out at nominal flow rates of Q_1, Q_2, and Q_3			
	Water temperature test			

4.2.8	The requirements relating to the MPEs shall be met for all water temperature variations within the rated operating conditions of the meter			
Water pressure test				
4.2.8	The requirements relating to the MPEs shall be met for all water pressure variations within the rated operating conditions of the meter			
Reverse flow test				
4.2.7	A water meter designed to measure reverse flow shall either: a) subtract the reverse flow volume from the indicated volume; or b) record the reverse flow volume separately. The MPEs of OIML R 49-1:2013, 4.2.2 or 4.2.3 shall be met for both forward and reverse flow			
4.2.7	A water meter not designed to measure reverse flow shall either: a) prevent it; or b) be capable of withstanding an accidental reverse flow at a flow rate up to Q_3 without any deterioration or change in its metrological properties for forward flow			
Meter characteristics at zero flow rate				
4.2.9	The water meter totalization shall not change when the flow rate is zero			
Pressure loss test				
6.5	The pressure loss of the water meter, including its filter where the latter forms an integral part of the water meter, shall not be greater than 0.063 MPa (0.63 bar) between Q_1 and Q_3			
Flow disturbance test				
6.3.4	If the accuracy of water meters is affected by disturbances in the upstream or downstream pipeline, the meter shall be provided with sufficient straight pipe lengths with or without a flow straightener (as specified by the manufacturer) so that the indications of the installed water meter do not exceed MPEs according to the accuracy class of the meter. Forward flow tests Reverse flow tests (where applicable)			
Overload temperature test				
7.2.5	Water meters with MAT ≥ 50 °C shall be capable of withstanding a water temperature of MAT + 10 °C for 1 h			
Durability tests				
7.2.6	The water meter shall undergo a durability test according to the permanent flow rate Q_3 and the overload flow rate Q_4 of the meter, simulating service conditions			
7.2.6	Meters with $Q_3 \leq 16$ m^3/h: a) 100 000 flow cycles between 0 and Q_3; b) 100 h at Q_4			
7.2.6	Meters with $Q_3 > 16$ m^3/h:			

	a) 800 h at Q_3; b) 200 h at Q_4; and for combination meters: c) 50 000 flow cycles between $Q \geq 2Q_{x2}$ and 0			
7.2.6.2	Accuracy class 1 meters The variation in the error curve shall not exceed 2 % for flow rates in the lower zone ($Q_1 \leq Q < Q_2$) and 1 % for flow rates in the upper zone ($Q_2 \leq Q \leq Q_4$). For the purpose of these requirements, the arithmetic mean value of the errors (of indication) $\overline{E}$ for each flow rate shall apply. For flow rates in the lower flow rate zone ($Q_1 \leq Q < Q_2$), the error (of indication) curve shall not exceed a maximum error limit of ±4 % for all temperature classes. For flow rates in the upper flow rate zone ($Q_2 \leq Q \leq Q_4$), the error (of indication) curve shall not exceed a maximum error limit of ±1.5 % for meters of temperature class T30 and ±2.5 % for all other temperature classes			
7.2.6.3	Accuracy class 2 meters The variation in the error curve shall not exceed 3 % for flow rates in the lower zone ($Q_1 \leq Q < Q_2$) and 1.5 % for flow rates in the upper zone ($Q_2 \leq Q < Q_4$). For the purpose of these requirements, the arithmetic mean value of the errors (of indication) $\overline{E}$ for each flow rate shall apply. For flow rates in the lower flow rate zone ($Q_1 \leq Q < Q_2$), the error (of indication) curve shall not exceed a maximum error limit of ±6 % for all temperature classes. For flow rates in the upper flow rate zone ($Q_2 \leq Q < Q_4$) the error (of indication) curve shall not exceed a maximum error limit of ±2.5 % for meters of temperature class T30 and ±3.5 % for all other temperature classes			
7.2.7	It shall be demonstrated that cartridge meters and exchangeable metrological modules for water meters with exchangeable metrological modules are independent of the connection interfaces they are made for, as far as their metrological performance is concerned. The cartridge meters and exchangeable metrological modules shall be tested in accordance with the test specified in OIML R 49-2:2013, 7.4.6			
7.2.8	All water meters where the mechanical components may be influenced by a static magnetic field and all meters with electronic components shall be tested by applying a specified field. The test shall be carried out at Q_3 and show that the indications of the installed water meter do not exceed MPEs of the upper zone according to the accuracy class of the meter: Forward flow tests Reverse flow tests (where applicable) Application of the field in different planes			

4.4.2.2 Performance tests for electronic water meters and electronic devices fitted to mechanical meters (first version)

OIML R 49-1:2013, subclause	Requirement	+	−	Remarks
	Dry heat			
A.5	To verify compliance with the provisions in 4.2 under conditions of high temperature (see OIML R 49-2:2013, 8.2)			
	Cold			
A.5	To verify compliance with the provisions in 4.2 under conditions of low temperature (see OIML R 49-2:2013, 8.3)			
	Damp heat, cyclic, condensation			
A.5	To verify compliance with the provisions in 5.1.1 under conditions of high humidity when combined with cyclic temperature changes. Cyclic tests shall be applied in all the cases where condensation is important or when the penetration of vapor is accelerated by the breathing effect (see OIML R 49-2:2013, 8.4)			
	Power voltage variation, for water meters powered by DC batteries and DC mains			
A.5	To verify compliance with the provisions in 4.2 under conditions of varying DC voltage (if relevant). (see OIML R 49-2:2013, 8.5)			
	Replaceable battery			
5.2.4	To verify compliance with the provisions in 5.2.4.3. The properties and parameters of the meter shall not be affected by the interruption of the electrical supply when the battery is replaced			
	Power voltage variation, for water meters powered by direct AC or by AC/DC converters			
A.5	To verify compliance with the provisions in 4.2 under conditions of varying AC mains power voltage (if relevant). (see OIML R 49-2:2013, 8.5)			
	Vibration (random)			
A.5	To verify compliance with the provisions in 5.1.1 under conditions of random vibration. (see OIML R 49-2:2013, 8.6)			
	Mechanical shock			
A.5	To verify compliance with the provisions in 5.1.1 under conditions of mechanical shocks. (see OIML R 49-2:2013, 8.7)			
	Short time power reductions			
A.5	To verify compliance with the provisions in 5.1.1 under conditions of short time mains voltage reductions.			

	(see OIML R 49-2:2013, 8.8)			
Bursts				
A.5	To verify compliance with the provisions in 5.1.1 under conditions where electrical bursts are superimposed on input/output and communication ports. (see OIML R 49-2:2013, 8.9)			
A.5	To verify compliance with the provisions in 5.1.1 under conditions where electrical bursts are superimposed on the mains voltage. (see OIML R 49-2:2013, 8.10)			
Electrostatic discharge				
A.5	To verify compliance with the provisions in 5.1.1 under conditions of direct and indirect electrostatic discharges. (see OIML R 49-2:2013, 8.11)			
Electromagnetic susceptibility — electromagnetic fields				
A.5	To verify compliance with the provisions in 5.1.1 under conditions of radiated electromagnetic fields. (see OIML R 49-2:2013, 8.12)			
A.5	To verify compliance with the provisions in 5.1.1 under conditions of conducted electromagnetic fields. (see OIML R 49-2:2013, 8.13)			
Surges on signal, data, and control lines				
A.5	To verify compliance with the provisions in 5.1.1 under conditions where electrical surges are superimposed on I/O and communication ports. (see OIML R 49-2:2013, 8.14)			
Surges on AC and DC mains power lines				
A.5	To verify compliance with the provisions in 5.1.1 under conditions where electrical surges are superimposed on the mains voltage. (see OIML R 49-2:2013, 8.15)			

4.5 Type evaluation tests (for all water meters)

4.5.1 Static pressure test (OIML R 49-2:2013, 7.3)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Meter serial No.	MAP × 1.6 MPa (bar)	Start time	Initial pressure MPa (bar)	End time	Final pressure MPa (bar)	Remarks

Meter serial No.	MAP × 2 MPa (bar)	Start time	Initial pressure MPa (bar)	End time	Final pressure MPa (bar)	Remarks

Comments:

4.5.2 Determination of changeover flow rates for combination meters (OIML R 49-2:2013, 7.4.3)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Increasing flow rate

Flow rate immediately before changeover, Q_a	
Flow rate immediately after changeover, Q_b	
Changeover flow rate, $Q_{x2} = \frac{(Q_a + Q_b)}{2}$	

Decreasing flow rate

Flow rate immediately before changeover, Q_c	
Flow rate immediately after changeover, Q_d	
Changeover flow rate, $Q_{x1} = \frac{(Q_c + Q_d)}{2}$	

Comments:

4.5.3 Determination of the intrinsic errors (of indication) and the effects of meter orientation (OIML R 49-2:2013, 7.4.4)

Application No.: _____

Model: _____

Date: _____

Observer: _____

	At start	At end	
Ambient temperature:			°C
Ambient relative humidity:			%
Ambient atmospheric pressure:			MPa
Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ____ Location of indicating device (see Requirement 4):___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE[a]/3 %
						s[c]		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2: 2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (OIML R 49-2:2013, 7.4.5)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ____ Location of indicating device (see Requirement 4):___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE[a]/3 %
						s[c]		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (OIML R 49-2:2013, 7.4.5)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4): ___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE[a]/3 %
						s[c]		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (OIML R 49-2:2013, 7.4.5)

Requirements

requirement 1: Tables for each flow rate according to OIML R 49-2:2013, 7.4.4 shall be added.

requirement 2: Tables for each orientation, which shall be as specified in OIML R 49-2:2013, 7.4.2.2.7.5 shall be provided for meters not marked either "H" or "V".

requirement 3: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

requirement 4: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

Comments:

4.5.4 Interchange test on all types of cartridge meters and meters with exchangeable metrological modules (OIML R 49-1:2013, 7.2.7, OIML R 49-2:2013, 7.4.4, 7.4.6)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4): ___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa(bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

The error variation (see OIML R 49-2:2013, 7.4.6.4) shall be checked

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4): ___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa(bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

The error variation (see OIML R 49-2:2013, 7.4.6.4) shall be checked

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4): ___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa(bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] (1) %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		

[a] For a complete water this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5

[b] Perform a third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

The error variation (see OIML R 49-2:2013, 7.4.6.4) shall be checked

Requirements

requirement 1: Tables for each flow rate according to OIML R 49-2:2013, 7.4.4 shall be added.

Requirement 2: Tables for each orientation, which shall be as specified in OIML R 49-2:2013, 7.4.2.2.7.5 shall be provided for meters not marked either "H" or "V".

requirement 3: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

requirement 4: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.5 Water temperature test (OIML R 49-2:2013, 7.5) and overload water temperature test (OIML R 49-2:2013, 7.6)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Nominal flow rate	Actual flow rate $Q_{(\,)}$	Initial supply pressure	Initial inlet water temperature	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
10 °C[b]	Q_2									
30 °C[c]	Q_2									
MAT	Q_2									
Reference[d]	Q_2									
Comments:										

[a] For a complete water meter, this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] Applicable to temperature classes T30 to T180.

[c] Applicable to temperature classes T30/70 to T30/180.

[d] Applicable to meters with an MAT ≥ 50 °C. After exposing the meter to a flow of water at a temperature of MAT +10 °C ± 2.5 °C for a period of 1 h after the meter has reached temperature stability; and after recovery, the meter functionality with regard to volume totalization shall remain unaffected; additional functionality, as indicated by the manufacturer, shall remain unaffected; the error (of indication) of the meter shall not exceed the applicable MPE.

Requirements

requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.6 Water pressure test (OIML R 49-2:2013, 7.7)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Nominal flow rate	Actual flow rate	Initial supply pressure	Initial inlet water temperature	Initial reading $V_i(i)$	Final reading $V_i(f)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
0.03 MPa (0.3 bar)	Q_2									
MAP	Q_2									
Comments:										

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.1 or 4.2.2 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.7 Reverse flow test (OIML R 49-2:2013, 7.8)

4.5.7.1 General

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

4.5.7.2 Meters designed to measure accidental reverse flow (OIML R 49-2:2013, 7.8.3.1)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): __ Location of indicating device (see Requirement 2):____

Application conditions	Nominal flow rate	Actual flow rate	Initial supply pressure	Initial inlet water temperature	Initial reading $V_i(i)$	Final reading $V_i(f)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
Reverse flow	Q_1									
Reverse flow	Q_2									
Reverse flow	Q_3									
Comments:										

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

4.5.7.3 Meters not designed to measure accidental reverse flow (OIML R 49-2:2013, 7.8.3.2)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Nominal flow rate	Actual flow rate $Q_{( )}$	Initial supply pressure	Initial inlet water temperature	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
reverse flow	0.9 Q_3									
forward flow	Q_1									
forward flow	Q_2									
forward flow	Q_3									
Comments:										

[a] For a complete water meter, this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

4.5.7.4 Meters which prevent reverse flow (OIML R 49-2:2013, 7.8.3.3)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Nominal flow rate	Actual flow rate	Initial supply pressure	Initial inlet water temperature	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
MAP at reverse flow	0	—			—	—	—	—	—	—
forward flow	Q_1									
forward flow	Q_2									
forward flow	Q_3									
Comments:										

[a] For a complete water meter, this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.8 Pressure-loss test (OIML R 49-2:2013, 7.9)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Measurement 1

Flow rate $Q_{()}$	L_1	L_2	L_3	L_4	Initial supply pressure	Water temp.	Measuring section	Pressure loss Δp_1
m^3/h	mm	mm	mm	mm	MPa (bar)	°C	mm	MPa (bar)

Measurement 2

Flow rate $Q_{()}$	L_1	L_2	L_3	L_4	Initial supply pressure	Water temp.	Measuring section	Pressure loss Δp_2	Meter pressure loss Δp_{meter}
m^3/h	mm	mm	mm	mm	MPa (bar)	°C	mm	MPa (bar)	MPa (bar)
Comments:									

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.9 Flow disturbance tests (OIML R 49-2:2013, 7.10, Annex C)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Installation arrangement (see OIML R 49-2:2013, Annex C) — for each test applied, insert the actual pipe dimensions used (as stated by the meter manufacturer):

Test No.	Flow-disturber type (location)	Flow-straightener installed	Installation dimensions (see key to Figure 1)						
			mm						
			L_1	L_2	L_3	L_4	L_5	L_6	L_7
1	1 (upstream)	no	—			—	—	—	—
1A	1 (upstream)	yes	—			—		—	
2	1 (downstream)	no		—	—		—	—	—
2A	1 (downstream)	yes		—	—		—		
3	2 (upstream)	no	—			—	—	—	—
3A	2 (upstream)	yes	—			—		—	
4	2 (downstream)	no		—	—		—	—	—
4A	2 (downstream)	yes		—	—		—		
5	3 (upstream)	no	—			—	—	—	—
5A	3 (upstream)	yes	—			—		—	
6	3 (downstream)	no		—	—		—	—	—
6A	3 (downstream)	yes		—	—		—		
Comments:									

Direction of flow: forward / reverse

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Test No.	Actual flow rate $Q_{(\ )}$	Pressure p_W	Water temp T_w	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
1									
1A									
2									
2A									
3									
3A									
4									
4A									
5									
5A									
6									
6A									
Comments:									

[a] For a complete water meter, this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

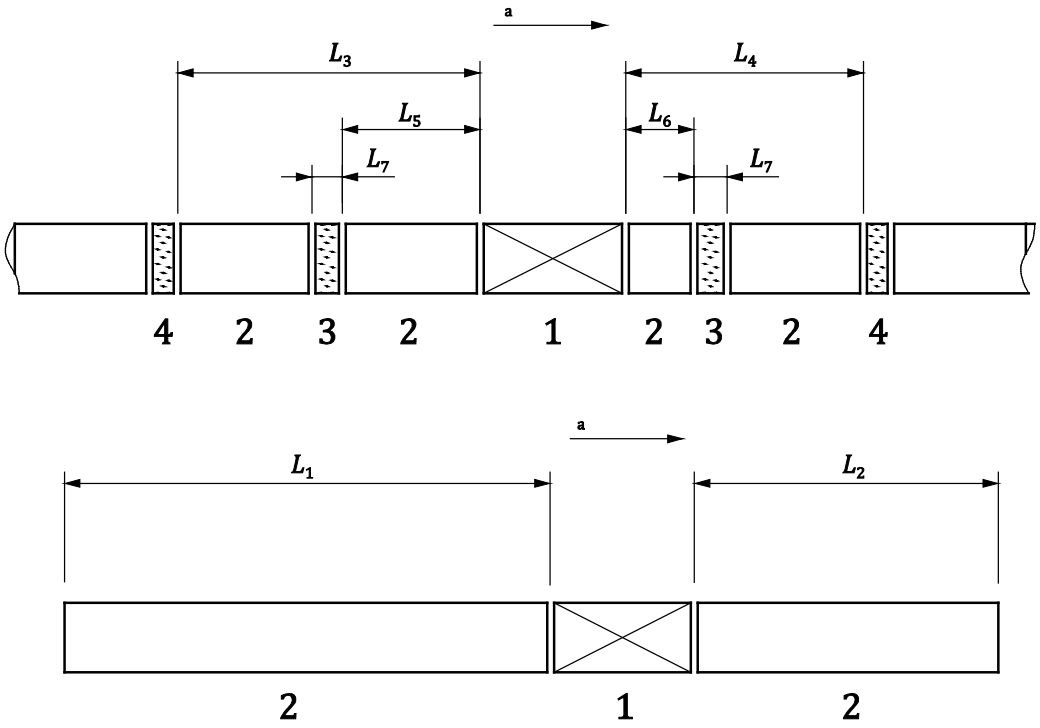
For meters where the manufacturer has specified installation lengths of at least 15 × DN upstream and 5 × DN downstream of the meter, no external straighteners are allowed.

When a minimum straight pipe length (L_2), of 5 × DN downstream of the meter is specified by the manufacturer, only tests numbers 1, 3 and 5 are required.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.



Key

L_1	straight inlet pipe length, without flow-disturber or flow-straightener	1	water meter
L_2	straight outlet pipe length, without flow-disturber or flow-straightener	2	straight pipe
L_3	length between outlet of upstream flow-disturber and inlet of meter (or manifold)	3	flow straightener
L_4	length between outlet of meter (or manifold) and inlet of downstream flow-disturber	4	flow disturber
L_5	length between outlet of upstream flow-straightener and inlet of meter (or manifold)		
L_6	length between outlet of meter (or manifold) and inlet of downstream flow-straightener		
L_7	flow-straightener length		
[a]	Flow.		

Figure 1 Key to relative positions

4.5.10 Durability tests (OIML R 49-2:2013, 7.11)

4.5.10.1 Discontinuous flow test (OIML R 49-2:2013, 7.11.2)

This test is applicable only to meters with values of $Q_3 \leq 16$ m^3/h.

Application No.:	
Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Readings taken during the test

Meter serial No.:_____

Note: Readings are recorded every 24 h or once for every shorter period, if so divided.

Ambient conditions at start

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Date	Time	Observer	Up stream pressure MPa (bar)	Down stream pressure MPa (bar)	Up stream temp. °C	Actual flowrate m^3/h	Meter reading m^3	Flow cycle times - s				Total volume discharged m^3	Total no. of flow cycles
								rise	on	fall	off		
								Totals at end of test =					
								Theoretical total [a] =					

[a] Minimum theoretical volume passed during the test is $0.5 \times Q_3 \times 100\,000 \times 32 / 3600$ expressed in m^3. Minimum number of test cycles during the test = 100 000

Ambient conditions at finish

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Comments:

Observer: _____ Date: _____

Errors (of indication) measured after the discontinuous flow test

Meter serial No.:_____

Actual flowrate Q( ) m³/h	Working pressure p_w MPa (bar)	Working temp T_w °C	Initial reading V_i(i) m³	Final reading V_i(f) m³	Indicated volume V_i m³	Actual volume V_a m³	Meter error E_m %	MPE[a] %	Curve variation error[b] $\bar{E}_m$(B) - $\bar{E}_m$(A) %	MPE (of curve variation error)[c] %
[d]										
						$\bar{E}_{m2}$				
						$\bar{E}_{m3}$				
						$\bar{E}_m$(B)				

[a] For MPE values refer to OIML R 49-1:2013, 4.2. For acceptance criteria, refer to OIML R 49-2:2013, 7.4.5

[b] $\bar{E}_m$(A) is the mean intrinsic error (of indication) – see test report 5.3; $\bar{E}_m$(B) is the mean error (of indication) measured after this discontinuous flow test

[c] For MPE values and acceptance criteria refer to OIML R 49-2, 7.11.2.4.

[d] Perform a third test if $Q = Q_1$, Q_2 *or* Q_3 or if the first or second test is outside the MPE (OIML R 49-2, 7.4.5)

4.5.10.2 Continuous flow test (OIML R 49-2:2013, 7.11.3)

Application No.:	
Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Readings taken during the test
Meter serial No.:_____

Note: Readings are recorded every 24 h or once for every shorter period, if so divided.

Ambient conditions at start

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Date	Time	Observer	Up stream pressure MPa (bar)	Down stream pressure MPa (bar)	Up stream temp °C	Actual flowrate m^3/h	Meter reading m^3	Total volume discharged m^3	Hours run h
					Totals at end of test =				
					Minimum volume discharged [a] =				

Comments:

[a] For meters with $Q_3 \leq 16$ m^3/h, total hours run = 100 h at Q_4 (minimum volume discharged at end of test is $[Q_4] \times 100$, expressed in m^3, where $[Q_4]$ is the number equal to the value of Q_4, expressed in m^3/h)

For meters with $Q_3 > 16$ m^3/h, total hours run = 800 h at Q_3 (minimum volume discharged at end of test is $[Q_3] \times 800$, expressed in m^3, where $[Q_3]$ is the number equal to the value of Q_3, expressed in m^3/h) and 200 h at Q_4 (minimum volume discharged at end of test is $[Q_4] \times 200$, expressed in m^3) where $[Q_4]$ is the number equal to the value of Q_4, expressed in m^3/h).

Ambient conditions at finish

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Observer: _____ Date: _____

Errors (of indication) measured after the continuous flow test

Meter serial No.:_____

Actual flowrate $Q(\ )$ m^3/h	Working pressure p_w MPa (bar)	Working temp T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE [a] %	Curve variation error [b] $\bar{E}_m(B) - \bar{E}_m(A)$ %	MPE (of curve variation error) [c] %
[d]										
						$\bar{E}_{m2}$				
						$\bar{E}_{m3}$				
						$\bar{E}_m(B)$				

Comments:

[a] For MPE values refer to OIML R 49-1:2013, 4.2. For acceptance criteria refer to OIML R 49-2:2013, 7.4.5.

[b] $\bar{E}_m(A)$ is the Mean intrinsic error (of indication). See test report 5.3. $\bar{E}_m(B)$ is the mean error (of indication) measured after this continuous flow test (= either $\bar{E}_{m2}$ or $\bar{E}_{m3}$).

[c] For MPE values and acceptance criteria refer to OIML R 49-2:2013, 7.11.3.4.

[d] Perform third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

4.5.10.3 Discontinuous flow test (OIML R 49-2:2013, 7.11.2)

(Applicable only to combination meters)

Application No.:	
Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	
Specified changeover flow rate Q_{x2}	
Selected test flow rate (minimum is twice the changeover flow rate Q_{x2})	

Readings taken during the test

Meter serial No.:_____

Note: Readings are recorded every 24 h or once for every shorter period, if so divided.

Ambient conditions at start

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Date	Time	Observer	Up stream pressure MPa (bar)	Down stream pressure MPa (bar)	Up stream temp °C	Actual flowrate m^3/h	Meter reading m^3	Flow cycle times - s				Total volume discharged m^3	Total no. of flow cycles
								rise	on	fall	off		
								Totals at end of test =					
								Theoretical total [a] =					

[a] Minimum theoretical volume passed by meters during the test is $0.5 \times Q_1 \times 50000 \times 32 / 3600$ expressed in m^3. Minimum number of test cycles during the test = 50000.

Ambient conditions at finish

Ambient temperature	Ambient relative humidity	Ambient atmospheric pressure	Time
°C	%	MPa (bar)	

Comments:

Observer: _____ Date: _____

Errors (of indication) measured after the discontinuous flow test

Meter serial No.:_____

Actual flowrate $Q(\ )$ m³/h	Working pressure p_w MPa (bar)	Working temp T_w °C	Initial reading V_i(i) m³	Final reading V_i(f) m³	Indicated volume V_i m³	Actual volume V_a m³	Meter error E_m %	MPE[a] %	Curve variation error [b] $\bar{E}_m$(B) - $\bar{E}_m$(A) %	MPE (of curve variation error) [c] %
[d]										
						$\bar{E}_{m2}$				
						$\bar{E}_{m3}$				
						$\bar{E}_m$(B)				

Comments:

[a] For MPE values refer to OIML R 49-1:2013, 4.2. For acceptance criteria refer to OIML R 49-2:2013, 7.4.5.

[b] $\bar{E}_m$(A) is the Mean intrinsic error (of indication). See test report 5.3. $\bar{E}_m$(B) is the mean error (of indication) measured after this discontinuous flow test (= either $\bar{E}_{m2}$ or $\bar{E}_{m3}$).

[c] For MPE values and acceptance criteria refer to OIML R 49-2:2013, 7.11.3.4.

[d] Perform third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5)

4.5.11 Static magnetic field test (OIML R 49-2:2013, 7.12, 8.16)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Nominal flow rate	Actual flow rate	Initial supply pressure	Initial inlet water temperature	Initial reading $V_i(i)$	Final reading $V_i(f)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
Location 1	Q_3									
Location 2 (optional)	Q_3									
Location 3 (optional)	Q_3									
Comments: Note location of magnet										

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.5.12 Tests on ancillary devices of a water meter (OIML R 49-2:2013, 7.13)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4):____

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE/3[a] %
						s [c d]		

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5.

[b] Perform third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5).

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (R 49-2:2013, 7.4.5)

[d] Standard deviation of three measurements of the error (of indication) taken at the same nominal flowrate

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ___ Location of indicating device (see Requirement 4):____

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE/3[a] %
						s [c d]		

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5.

[b] Perform third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5).

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (R 49-2:2013, 7.4.5)

[d] Standard deviation of three measurements of the error (of indication) taken at the same nominal flowrate.

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 3): ____ Location of indicating device (see Requirement 4):___

Actual flowrate $Q_{(\ )}$ m^3/h	Initial supply pressure MPa (bar)	Water temp. T_w °C	Initial reading $V_i(i)$ m^3	Final reading $V_i(f)$ m^3	Indicated volume V_i m^3	Actual volume V_a m^3	Meter error E_m %	MPE[a] %
[b]								
						$\bar{E}_{m2}$		
						$\bar{E}_{m3}$		
							Standard deviation %	MPE/3[a] %
						s [c d]		

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable sub-assembly the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4). For acceptance criteria refer to OIML R 49-2:2013, 7.4.5.

[b] Perform third test if $Q = Q_1$, Q_2 or Q_3 or if the first or second test is outside the MPE (OIML R 49-2:2013, 7.4.5).

[c] Calculate standard deviation if $Q = Q_1$, Q_2 or Q_3 (R 49-2:2013, 7.4.5)

[d] Standard deviation of three measurements of the error (of indication) taken at the same nominal flowrate.

Requirements

Requirement 1: Tables for each flow rate according to 7.4.4 of OIML R 49-2:2013 shall be added.

Requirement 2: Tables for each orientation, which shall be as specified in OIML R 49-2:2013, 7.4.2.2.7.5 shall be provided for meters not marked either ‘H’ or ‘V’.

Requirement 3: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 4: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

Comments:

4.6 Type evaluation tests (for electronic water meters and mechanical water meters with electronic components)

4.6.1 Dry heat (non-condensing) (OIML R 49-2:2013, 8.2)

Application No.: _____

Model: _____

Date: _____

Observer: _____

	At start	At end	
Ambient temperature:			°C
Ambient relative humidity:			%
Ambient atmospheric pressure:			MPa
Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Actual or simulated flow rate $Q_{(\,)}$	Working pressure[a] p_w	Working temperature[a] T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[b]
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
20 °C									
55 °C									
20 °C									
Comments:									

[a] Temperature and pressure shall be recorded using a data-logging device to ensure conformity with the relevant IEC standard.

[b] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.2 Cold (OIML R 49-2:2013, 8.3)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Environmental class:_____

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{(\,)}$	Working pressure[a] p_w	Working temperature[a] T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[b]
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
20 °C									
+5 °C or −25 °C									
20 °C									
Comments:									

[a] Temperature and pressure shall be recorded using a data-logging device to ensure conformity with the relevant IEC standard.

[b] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.3 Damp heat, cyclic (condensing) (OIML R 49-2:2013, 8.4)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Environmental class:_____

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Actual or simulated flow rate $Q_{(\ )}$	Working pressure[a] p_w	Working temperature[a] T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[b]	Fault $E_{m2)} - E_{m1)}$	Significant fault	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before cycling													
										—	—	—	—
Precondition meter. Apply damp heat cycles (duration 24 h), two cycles between 25 °C and 40 °C (environmental class B) or 55 °C (environmental classes O and M).													
2) After cycling												yes	no
Comments:													

[a] Temperature and pressure shall be recorded using a data-logging device to ensure conformity with the relevant IEC standard.

[b] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.4 Power supply variation (OIML R 49-2:2013, 8.5)

4.6.4.1 General

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

4.6.4.2 Meters powered by direct AC (single phase) or AC/DC converters, mains power supply (OIML R 49-2:2013, 8.5.2)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions (single voltage)	U_i	Actual or simulated flow rate $Q_{( )}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	V	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
U_{nom} + 10 %										
f_{nom} + 2 %										
U_{nom} − 15 %										
f_{nom} − 2 %										
Comments:										

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.4.3 Meters powered by primary batteries or by external DC voltage (OIML R 49-2:2013, 8.5.3)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ____Location of indicating device (see Requirement 2):____

Application conditions (single voltage)	U_i	Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]
	V	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
U_{max}										
U_{min}										
Comments:										

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.5 Vibration (random) (OIML R 49-2:2013, 8.6)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Environmental class:_____

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before vibrations										—	—	—	—
Apply random vibrations to the EUT, over the frequency range 10 Hz to 150 Hz, in three mutually perpendicular axes, for a period of at least 2 min per axis. Total RMS level: 7 $m.s^{-2}$. ASD level at 10 Hz to 20 Hz = 1 $m^2.s^{-3}$ and at 20 Hz to 150 Hz = −3 dB/octave.													
2) After vibrations												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.6 Mechanical shock (OIML R 49-2:2013, 8.7)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Environmental class:_____

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before shock										—	—	—	—
Place the EUT on a rigid level surface in its normal position of use and tilted towards one bottom edge until the opposite edge of the EUT is 50 mm above the rigid surface. The angle made by the bottom of the EUT and the test surface shall not exceed 30°. Allow the EUT to drop freely on to the rigid surface. Repeat the test for each bottom edge of the EUT.													
2) After shock												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.7 AC mains voltage dips, short interruptions and voltage variations (OIML R 49-2:2013, 8.8)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meters powered by direct AC (single-phase) mains power supply

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{( )}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before voltage reductions	No voltage reductions.												
										—	—	—	—
2) During voltage reduction	Voltage interruptions and reductions as in OIML R 49-2:2013, 8.8.												
												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.8 Bursts on signal lines (OIML R 49-2:2013, 8.9)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meters containing electronics and provided with I/O and communication ports (including its external cables)

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{(\ )}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before burst													
										—	—	—	—
Each spike shall have an amplitude (positive or negative) of 0.5 kV for environmental class E1 instruments, or 1 kV for environmental class E2 instruments (see OIML R 49-2:2013, 8.1.3), phased randomly, with a rise time of 5 ns and a half amplitude duration of 50 ns.													
2) After burst												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.9 Bursts (transients) on AC and DC mains (OIML R 49-2:2013, 8.10)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meters powered by direct AC (single-phase) mains power supply

Meter serial No.:_____ Orientation (V, H, other):_____

Flow direction (see Requirement 1): _____ Location of indicating device (see Requirement 2):____

Application conditions	Actual or simulated flow rate $Q_{( )}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions 1) Before burst	With no significant noise in mains supply.												
										—	—	—	—
2) After burst	Randomly phased bursts (electromagnetic environment, E1 — 1 000 V peak amplitude electromagnetic environment, E2 — 2 000 V peak amplitude) applied asynchronously in asymmetrical mode (common mode).												
												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.10 Electrostatic discharge (OIML R 49-2:2013, 8.11)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): _____ Location of indicating device (see Requirement 2):____

Test conditions			Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
Reference conditions (no discharges)															
												—	—	—	—
2) Discharge point[c]	Mode[d]													yes	no
	C	A												yes	no
	C	A												yes	no
	C	A												yes	no
	C	A												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of a water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

[c] Indicate by drawings if necessary.

[d] C — contact discharge (6 kV); A — air discharge (8 kV).

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.11 Radiated electromagnetic field (OIML R 49-2:2013, 8.12)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Test conditions	Antenna polarization vertical/ horizontal		Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no disturbance)	V	H										—	—	—	—
2) Disturbance															
26–40 MHz	V	H												yes	no
40–60 MHz	V	H												yes	no
60–80 MHz	V	H												yes	no
80–100 MHz	V	H												yes	no
100–120 MHz	V	H												yes	no
120–144 MHz	V	H												yes	no
144–150 MHz	V	H												yes	no
150–160 MHz	V	H												yes	no
160–180 MHz	V	H												yes	no
180–200 MHz	V	H												yes	no
200–250 MHz	V	H												yes	no
250–350 MHz	V	H												yes	no
350–400 MHz	V	H												yes	no
400–435 MHz	V	H												yes	no

Test conditions	Antenna polarization vertical/ horizontal		Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Significant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
435–500 MHz	V	H												yes	no
500–600 MHz	V	H												yes	no
600–700 MHz	V	H												yes	no
700–800 MHz	V	H												yes	no
800–934 MHz	V	H												yes	no
934–1 000 MHz	V	H												yes	no
1 000–1 400 MHz	V	H												yes	no
1 400–2 000 MHz	V	H												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.12 Conducted electromagnetic field (OIML R 49-2:2013, 8.13)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Test conditions	Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no disturbance)										—	—	—	—
2) Disturbance													
0.15–0.30 MHz												yes	no
0.30–0.57 MHz												yes	no
0.57–1.1 MHz												yes	no
1.1–2.2 MHz												yes	no
2.2–3.9 MHz												yes	no
3.9–7.5 MHz												yes	no
7.5–14 MHz												yes	no
14–30 MHz												yes	no
30–50 MHz												yes	no
50–80 MHz												yes	no
Comments:													

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.13 Surges on signal, data and control lines (OIML R 49-2:2013, 8.14) (applicable only for environmental class E2)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Test conditions			Actual or simulated flow rate $Q_{(}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no surges)															
												—	—	—	—
2) Surge	Mode[c]														
Positive	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Negative	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Positive	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Negative	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of the water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

[c] L–L — line to line surge; L–E — line to earth surge.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.14 Surges on AC and DC mains power lines (OIML R 49-2:2013, 8.15) (applicable only for environmental class E2)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): _____ Location of indicating device (see Requirement 2):____

Test conditions			Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no surges)															
												—	—	—	—
2) DC power	Mode[c]														
Positive	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Negative	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Positive	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Negative	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of the water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

[c] L–L — line to line surge; L–E — line to earth surge.

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Test conditions			Actual or simulated flow rate $Q_{(\,)}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no surges)															
												—	—	—	—
AC supply voltage 0°	Mode[c]														
Positive	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Negative	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Positive	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Negative	L	E												yes	no
	L	E												yes	no
	L	E												yes	no

Test conditions			Actual or simulated flow rate $Q_{(\ )}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
AC supply voltage 90°	Mode[c]														
Positive	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Negative	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Positive	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Negative	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of the water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

[c] L–L — line to line surge; L–E — line to earth surge.

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Test conditions			Actual or simulated flow rate $Q_{()}$	Working pressure p_w	Working temperature T_w	Initial reading V_i(i)	Final reading V_i(j)	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
1) Reference conditions (no surges)															
												—	—	—	—
AC supply voltage 180°	Mode[c]														
Positive	L	L												yes	No
	L	L												yes	No
	L	L												yes	No
Negative	L	L												yes	No
	L	L												yes	No
	L	L												yes	No
Positive	L	E												yes	No
	L	E												yes	No
	L	E												yes	No
Negative	L	E												yes	No
	L	E												yes	no
	L	E												yes	no

Test conditions			Actual or simulated flow rate $Q_{( )}$	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading $V_i(j)$	Indicated volume V_i	Actual volume V_a	Meter error E_m	MPE[a]	Fault $E_{m2)} - E_{m1)}$	Signi-ficant fault[b]	EUT functioning correctly	
			m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%	%	%		
AC supply voltage 270°	Mode[c]														
Positive	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Negative	L	L												yes	no
	L	L												yes	no
	L	L												yes	no
Positive	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Negative	L	E												yes	no
	L	E												yes	no
	L	E												yes	no
Comments:															

[a] For a complete water meter this is the maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3 according to the accuracy class of the meter. If the EUT is a separable part of the water meter, the MPE shall be defined by the manufacturer (OIML R 49-2:2013, 9.4).

[b] The significant fault is equal to half the MPE in the upper flow rate zone.

[c] L–L — line to line surge; L–E — line to earth surge.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

4.6.15 Absence of flow test (OIML R 49-2:2013, 8.17)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm:	
Length of straight pipe after meter (or manifold) — mm:	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Application conditions	Working pressure p_w	Working temperature T_w	Initial reading $V_i(i)$	Final reading after 15 min $V_i(j)$	Indicated volume V_i	EUT functioning correctly	
	MPa (bar)	°C	m^3	m^3	m^3		
Meter filled with water, purging out all air						yes	no
Water fully discharged from the meter						yes	no
Comments:							

The water meter totalization shall not change by more than the value of the verification scale interval during each test interval.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

5 Initial verification report

5.1 General

The specific format layout for reporting initial verifications and subsequent verifications of water meters is left largely to the metrological authorities and the individual organizations carrying out verification tests. However, the report (records) shall contain the minimum information detailed in OIML R 49-1:2013, 7.3 and OIML R 49-2:2013, 11.2.2.

In addition to this, any special requirements and/or restrictions for initial verification detailed in the type approval certificate for the EUT shall be applied. A record of equipment and instrumentation used with calibration details (see Annex B) shall be kept.

The following basic information should also be included in the verification report (record) followed by the results of the tests (three examples of how the report may be formatted are given below):

5.2 Information concerning the EUT verified

Type approval number of the EUT

Details of the EUT:

Model number: _____

Accuracy class: _____

Meter designation/s Q_3: _____

Ratio Q_3/Q_1: _____

Maximum pressure loss Δp_{max} : _____

Flow rate at Δp_{max}: _____

Year of manufacture: _____

The manufacturer: _____

Authorized representative: _____

Address: _____

_____

_____

Testing laboratory: _____

Authorized representative: _____

Address: _____

_____

5.3 Initial verification test report (OIML R 49-2:2013, Clause 10)

5.3.1 Example 1: Approved water meter (complete or combined) (OIML R 49-2:2013, 10.1)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Error (of indication) tests

EUT testing case (OIML R 49-2:2013, 8.1.8)	
Category for testing (OIML R 49-2:2013, <clause number>)	[a]
Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm	
Length of straight pipe after meter (or manifold) — mm	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

[a] Enter clause number according to one of the configuration categories for testing the EUT listed in OIML R 49-2:2013, 8.1.8.2 to 8.1.8.5.

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ____ Location of indicating device (see Requirement 2):___

Nominal flow rate[a]	Actual flow rate $Q_{(\,)}$	Working pressure	Working temperature	Initial reading V_i(i)	Final reading V_i(f)	Indicated volume V_i	Actual volume V_a	Meter error[b] E_c	MPE[c]
m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3	m^3	m^3	%	%
Q_1									
Q_2									
Q_3									
Comments:									

[a] These flow rates shall be applied unless alternatives are specified in the type approval certificate.

[b] Calculations for the error (of indication) are described in OIML R 49-2:2013, Annex B.

[c] The maximum permissible error as defined in OIML R 49-1:2013, 4.2.2 or 4.2.3, according to the accuracy class of the meter.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

5.3.2 Example 2: Approved calculator (including indicating device) (OIML R 49-2:2013, 10.2)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Error (of indication) tests

EUT testing case (OIML R 49-2:2013, 8.1.8)	
Category for testing (OIML R 49-2:2013, <clause number>)	[a]

[a] Enter clause number according to one of the configuration categories for testing the EUT listed in OIML R 49-2:2013, 8.1.8.2 to 8.1.8.5.

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): ___ Location of indicating device (see Requirement 2):____

Nominal flow rate[a]	Actual flow rate $Q_{(\,)}$	Applied pulse frequency[b]	Initial reading V_i(i)	Final reading V_i(f)	Total pulses injected[b] T_p	Indicated volume V_i	Actual volume V_a	Meter error[c] E_c	MPE[d]
m^3/h	m^3/h	Hz	m^3	m^3		m^3	m^3	%	%
Q_1									
Q_2									
Q_3									
Comments:									

[a] These flow rates shall be applied unless alternatives are specified in the type approval certificate.

[b] Other types of output signal may be appropriate according to the design of the water meter.

[c] Calculations for the error (of indication) are described in OIML R 49-2:2013, Annex B.

[d] The maximum error (of indication) allowed for the calculator (including indicating device) is given in the type approval certificate.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

5.3.3 Example 3: Approved measurement transducer (including flow or volume sensor) (OIML R 49-2:2013, 10.2)

			At start	At end	
Application No.:	_____	Ambient temperature:			°C
Model:	_____	Ambient relative humidity:			%
Date:	_____	Ambient atmospheric pressure:			MPa
Observer:	_____	Time:			

Error (of indication) tests

EUT testing case (OIML R 49-2:2013, 8.1.8)	
Category for testing (OIML R 49-2:2013, <clause number>)	[a]
Test method:	Gravimetric/volumetric
Volume measures/weighbridge used — m^3 or kg:	
Water conductivity (electromagnetic induction meters only) — S/cm:	
Length of straight pipe before meter (or manifold) — mm	
Length of straight pipe after meter (or manifold) — mm	
Nominal diameter DN of pipe before and after meter (or manifold) — mm:	
Describe flow straightener installation if used:	

[a] Enter clause number according to one of the configuration categories for testing the EUT listed in OIML R 49-2:2013, 8.1.8.2 to 8.1.8.5.

Meter serial No.:_____ **Orientation (V, H, other):_____**

Flow direction (see Requirement 1): __ Location of indicating device (see Requirement 2):____

Nominal flow rate[a]	Actual flow rate $Q_{( )}$	Working pressure	Working temperature	Initial reading $V_i(i)$	Final reading $V_i(f)$	Total output pulses[b] T_p	Indicated volume V_i	Actual volume V_a	Meter error[c] E_c	MPE[d]
m^3/h	m^3/h	MPa (bar)	°C	m^3	m^3		m^3	m^3	%	%
Q_1										
Q_2										
Q_3										
Comments:										

[a] These flow rates shall be applied unless alternatives are specified in the type approval certificate.

[b] Other types of output signal may be appropriate according to the design of the water meter.

[c] Calculations for the error (of indication) are described in OIML R 49-2:2013, Annex B.

[d] The maximum error (of indication) allowed for the measurement transducer (including flow or volume sensor) is given in the type approval certificate.

Requirements

Requirement 1: If the flow axis is vertical, the flow direction (from bottom to top or from top to bottom) shall be given.

Requirement 2: If the flow axis is horizontal and the meter has an indicating device which is integral with the body of the meter, the location of the indicating device (at the side or at the top of the meter) shall be given.

Annex A
(Mandatory)

List of documents concerning the type (OIML R 49-1:2013, 7.2.9)

Document reference	Date	Brief description

Annex B
(Mandatory)

Listing of test equipment used in examinations and tests

Parameter measured or applied	Instrument or equipment	Manu-facturer	Model number	Serial number	Calibration date		Used in test No. (OIML R 49-2:2013, subclause)
					Last	Next	
Comments:							