NMI R 49-3 Water meters for cold potable water and hot water

Part 3: Test report format

September 2015

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(OIML R 49-3:2013(E), MOD)

The English version of international standard OIML R 49-3 Water meters for cold potable water and hot water. Part 3: Test report format, is adopted as the modified national standard with the reference number NMI R 49-3.

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**SCOPE**

NMI R 49-3 specifies the test report format for the pattern approval of water meters used to measure the volume of cold potable and hot water flowing through fully charged, closed conduits. The corresponding parts of this document are:

* Part 1: NMI R 49-1 Metrological and Technical Requirements
* Part 2: NMI R 49-2 Test Methods

**CONTENTS**

NMI R 49-3 (2015) is a modified version of OIML R 49-3 *Water meters for cold potable water and hot water. Part 3: Test report format* published by the International Organisation of Legal Metrology (OIML). These modifications are listed below.

**INTERPRETATIONS**

The following interpretations shall apply to NMI R 49-3:

* The ‘metrological authority’ is NMI.
* The national authority for the pattern approval of water meters is the National Measurement Institute (NMI).
* NMI is solely responsible for issuing pattern approval certificates for water meters in Australia.
* The ‘body responsible for pattern evaluation’ or ‘body responsible for meter evaluation’ is the Chief Metrologist, or a person or organisation appointed as an **approving authority** by the Chief Metrologist, in accordance with Regulation 76 of the *National Measurement Regulations 1999*.
* For references to ‘national regulations’ or ‘national legislation’ refer to the *National Measurement Act 1960,* *National Measurement Regulations 1999* and the *National Trade Measurement Regulations 2009*.
* References to ‘this Recommendation’ or ‘the Recommendation’ are taken as being NMI R 49-3.
* Previous restrictions on approval of water meters with a temperature class greater than T30 no longer apply. Water meters may be pattern approved with any temperature class specified in Table 1, on page 20 of NMI R 49-1.

**MODIFICATIONS**

NMI R 49-3 has been modified from the 2013 edition of OIML R 49-3 such that deletions are indicated with a ‘~~red strikethrough’~~ and additions are indicated in ‘blue text’ (unless otherwise indicated below). All modifications to OIML R 49-3 that appear in NMI R 49-3 are described below:

* References to “OIML R 49-3” have been replaced with “NMI R 49-3”. These amendments have not been indicated with red or blue text.
* In all instances the term ”type approval”, and all associated references concerning the testing, evaluation and certification of water meters, have been changed to the equivalent term “pattern approval”. In this case, for ease of readability the deleted “type” has not been indicated with a   
  ‘~~red strikethrough’~~.
* The unit ‘kilolitre’ (kL) is included as an acceptable unit of measurement of volume throughout this Recommendation. The measurement of the volume of water may be made and displayed in units of cubic metres or kilolitres.
* The unit ‘kilolitres per hour’ (kL/h) is included as an acceptable unit of measurement of flowrate throughout this Recommendation. The measurement of flowrate may be made and displayed in units of cubic metres per hour or kilolitres per hour.
* The following amendment has been made to the list item under clause 4.4.1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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). This marking is optional. |  |  |  |

* The following amendment has been made to the list item under clause 4.4.1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 6.6.2 i) | The maximum admissible pressure (MAP) if it exceeds 1.4 MPa (14 bar) ~~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. The National Measurement Regulations 1999 (Cth) do not specify the unit bar as an Australian Legal Unit of Measurement for the purposes of measuring water pressure.) |  |  |  |

* The following item has been added to the list under clause 4.4.2.1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4.2.8 | The requirements relating to MPEs shall be met for T30 water meters following exposure to a limiting condition of 50°C. |  |  |  |

* The following amendment has been made to the title of clause 4.5.5:

Water temperature test (NMI R 49-2:2015, 7.5), water temperature test for T30 water meters (NMI R 49-2:2015, 7.5A) and overload water temperature test (NMI R 49-2:2015, 7.6)

* In order to report the results of testing in accordance with 7.5A of NMI R 49-2, some amendments have been made to the test report format in clause 4.5.5. The amendments to the report format are indicated below:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 10 °Cb | *Q*2 |  |  |  |  |  |  |  |  |  |
| 30 °Cc | *Q*2 |  |  |  |  |  |  |  |  |  |
| Following exposure to 50 °Cd | *Q2* |  |  |  |  |  |  |  |  |  |
| *Q3* |  |  |  |  |  |  |  |  |  |
| MAT | *Q*2 |  |  |  |  |  |  |  |  |  |
| Referencee | *Q*2 |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | | |
| a For a complete water meter, this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4).  b Applicable to temperature classes T30 to T180.  c Applicable to temperature classes T30/70 to T30/180.  d Applicable to temperature class T30 only.  e 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. | | | | | | | | | | |

|  |  |
| --- | --- |
| International | **OIML R 49-3** |
| Recommendation | 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 |
|  |

|  |  |  |  |
| --- | --- | --- | --- |
| OIML R 49-3 Edition 2013 (E) |  |  |  |
|  |  | Organisation Internationale  de Métrologie Légale |
| International Organization  of Legal Metrology |

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Foreword

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

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

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

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

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

This publication – reference OIML R 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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# Introduction

Implementation of this test report format is informative with regard to the implementation of NMI R 49-1 and NMI R 49-2 in national regulations; however, its implementation is required within the framework of the OIML Certificate System for Measuring Instruments [NMI R 49-2:2015, 11.1].

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

A pattern 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 pattern evaluation reports.

Water meters for cold potable water and hot water.

Part 3: Test report format

# Scope

This part of NMI R 49 specifies a test report format to be used in conjunction with OIML   
R 49-1:2015 and NMI R 49-2:2015 for water meters for cold potable water and hot water.

# 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.

NMI R 49-1:2015, *Water meters for cold potable water and hot water. Part 1: Metrological and technical requirements*

NMI R 49-2:2015, *Water meters for cold potable water and hot water. Part 2: Test methods*

# Terms, definitions, symbols, and abbreviated terms

For the purposes of this document, the terms and definitions given in NMI R 49-1:2015 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 |

# 

# Pattern evaluation report

## 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 |

## Information concerning the pattern

### General

|  |  |
| --- | --- |
| Application number: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Applicant: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Authorized representative: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Address: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Testing laboratory: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Authorized representative: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Address: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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. | | | |

### Mechanical water meter (complete or combined)

|  |  |  |
| --- | --- | --- |
| Manufacturer: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Model number: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Pattern details: | |  |
|  | *Q*1 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*2 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*4 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3/*Q*1 | \_\_\_\_\_\_\_\_\_ |

for combination meters

|  |  |  |
| --- | --- | --- |
|  | *Q*x1 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*x2 | \_\_\_\_\_\_\_\_\_ m3/h or kL/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 (NMI R 49-2:2015, 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.

### Electronic water meter (complete or combined)

|  |  |  |
| --- | --- | --- |
| Manufacturer: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Model number: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Pattern details: | |  |
|  | *Q*1 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*2 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*4 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3/*Q*1 | \_\_\_\_\_\_\_\_\_ |

for combination meters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Q*x1 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/h | |
|  | *Q*x2 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/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 (NMI R 49-2:2015, 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.

### Separable calculator (including indicating device)

|  |  |  |
| --- | --- | --- |
| Manufacturer: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Model number: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Pattern details: | |  |
|  | *Q*1 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*2 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*4 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3/*Q*1 | \_\_\_\_\_\_\_\_\_ |

for combination meters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Q*x1 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/h | |
|  | *Q*x2 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/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 (NMI R 49-2:2015, 8.1.8):

|  |  |  |
| --- | --- | --- |
|  | Category: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Case: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Maximum relative error specified by the manufacturer:

|  |  |  |
| --- | --- | --- |
|  | Lower flow rate zone, *Q*1 ≤ *Q* < *Q*2: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% |
|  | Upper flow rate zone, *Q*2 ≤ *Q ≤ 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): | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### Separable measurement transducer (including flow or volume sensor)

|  |  |  |
| --- | --- | --- |
| Manufacturer: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Model number: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Pattern details: | |  |
|  | *Q*1 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*2 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*4 | \_\_\_\_\_\_\_\_\_ m3/h or kL/h |
|  | *Q*3/*Q*1 | \_\_\_\_\_\_\_\_\_ |

for combination meters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Q*x1 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/h | |
|  | *Q*x2 | | \_\_\_\_\_\_\_\_\_ m3/h or kL/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 (NMI R 49-2:2015, 8.1.8):

|  |  |  |
| --- | --- | --- |
|  | Category: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Case: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Maximum relative error specified by the manufacturer:

|  |  |  |
| --- | --- | --- |
|  | Lower flow rate zone, *Q*1 ≤ *Q* < *Q*2: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% |
|  | Upper flow rate zone, *Q*2 ≤ *Q ≤ 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): | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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 (NMI R 49-2:2015, 8.1.8):

|  |  |  |
| --- | --- | --- |
|  | Category: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Case: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Installation details (electrical):

|  |  |  |
| --- | --- | --- |
|  | Wiring instructions: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Mounting arrangement: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Orientation limitations: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 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 (NMI R 49-2:2015, 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): | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### Documents concerning the pattern

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

## General information concerning the test equipment

Details of all items of measuring equipment and test instruments used for the pattern 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)

## Check list for water meter examinations and performance tests

### Check list for water meter examinations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **External examination for all water meters** | | | | |
| NMI R 49-1:2015, 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 or kilolitres |  |  |  |
| 6.7.1.2 | The symbol m3 or kL shall appear on the dial or immediately adjacent to the numbered display |  |  |  |
| ***Indicating range*** | | | | |
| 6.7.1.3 | For *Q*3 ≤ 6.3, the minimum indicating range is 0 m3 or kL to 9 999 m3 or kL |  |  |  |
| 6.7.1.3 | For 6.3 < *Q*3 ≤ 63, the minimum indicating range is 0 m3 or kL to 99 999 m3 or kL |  |  |  |
| 6.7.1.3 | For 63 < *Q*3 ≤ 630, the minimum indicating range is 0 m3 or kL to 999 999 m3 or kL |  |  |  |
| 6.7.1.3 | For 630 < *Q*3 ≤ 6 300, the minimum indicating range is 0 m3 or kL to 9 999 999 m3 or kL |  |  |  |
| ***Colour coding for indicating device*** | | | | |
| 6.7.1.4 | The color black should be used to indicate the cubic metre or kilolitre and its multiples |  |  |  |
| 6.7.1.4 | The color red should be used to indicate sub-multiples of a cubic metre or kilolitre |  |  |  |
| 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 or kilolitre 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 or kilolitres 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 kilolitres 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 or kilolitres, 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 or kilolitre |  |  |  |
| 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 pattern 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). This marking is optional. |  |  |  |
| 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 1.4 MPa (14 bar) ~~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. The National Measurement Regulations 1999 (Cth) do not specify the unit bar as an Australian Legal Unit of Measurement for the purposes of measuring water pressure.) |  |  |  |
| 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 Δ*p* 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 49-1:2015, 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 NMI R 49-1:2015, 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 pattern.  *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 NMI R 49-1:2015, 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 NMI R 49-1:2015, 4.2.7. |  |  |  |

### Checklist for water meter performance tests

#### Performance tests for all water meters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NMI R 49-1:2015, 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 NMI R 49-1:2015, 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 NMI R 49-1:2015, 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 NMI R 49-1:2015, 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 |  |  |  |
| 4.2.8 | The requirements relating to MPEs shall be met for T30 water meters following exposure to a limiting condition of 50°C. |  |  |  |
| ***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 NMI R 49-1:2015, 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 ≤ 16 m3/h or kL/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 m3/h or kL/h:  a) 800 h at *Q*3;  b) 200 h at *Q*4;  and for combination meters:  c) 50 000 flow cycles between *Q* ≥ 2*Q*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 ≤ *Q* < *Q*2) and 1 % for flow rates in the upper zone (*Q*2 ≤ *Q ≤ Q*4).  For the purpose of these requirements, the arithmetic mean value of the errors (of indication)  for each flow rate shall apply.  For flow rates in the lower flow rate zone (*Q*1 ≤ *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 ≤ *Q ≤ 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 ≤ *Q* < *Q*2) and 1.5 % for flow rates in the upper zone (*Q*2 ≤ *Q* < *Q*4).  For the purpose of these requirements, the arithmetic mean value of the errors (of indication)  for each flow rate shall apply.  For flow rates in the lower flow rate zone (*Q*1 ≤ *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 ≤ *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 NMI R 49-2:2015, 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 |  |  |  |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NMI R 49-1:2015, subclause | **Requirement** | **+** | **−** | **Remarks** |
| ***Dry heat*** | | | | |
| A.5 | To verify compliance with the provisions in 4.2 under conditions of high temperature  (see NMI R 49-2:2015, 8.2) |  |  |  |
| ***Cold*** | | | | |
| A.5 | To verify compliance with the provisions in 4.2 under conditions of low temperature  (see NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 8.5) |  |  |  |
| ***Vibration (random)*** | | | | |
| A.5 | To verify compliance with the provisions in 5.1.1 under conditions of random vibration.  (see NMI R 49-2:2015, 8.6) |  |  |  |
| ***Mechanical shock*** | | | | |
| A.5 | To verify compliance with the provisions in 5.1.1 under conditions of mechanical shocks.  (see NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 8.12) |  |  |  |
| A.5 | To verify compliance with the provisions in 5.1.1 under conditions of conducted electromagnetic fields.  (see NMI R 49-2:2015, 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 NMI R 49-2:2015, 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 NMI R 49-2:2015, 8.15) |  |  |  |

## Pattern evaluation tests (for all water meters)

### Static pressure test (NMI R 49-2:2015, 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 | Start time | Initial pressure | End time | Final pressure | Remarks |
| MPa (bar) | MPa (bar) | MPa (bar) |
|  |  |  |  |  |  |  |

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

Comments:

### Determination of changeover flow rates for combination meters (NMI R 49-2:2015, 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 — m3 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, |  |

Decreasing flow rate

|  |  |
| --- | --- |
| Flow rate immediately before changeover, *Q*c |  |
| Flow rate immediately after changeover, *Q*d |  |
| Changeover flow rate, |  |

Comments:

### Determination of the intrinsic errors (of indication) and the effects of meter orientation (NMI R 49-2:2015, 7.4.4)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | 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 — m3 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 | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m |  |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
|  | | | | | |  |  |  |
|  | | | | | |  | Standard deviation  % | MPEa/3  % |
|  | | | | | | sc |  |  |
|  | | | | | |  |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2: 2013, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (NMI R 49-2:2015, 7.4.5) | | | | | | | | |

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

**Flow direction (see Requirement 3): \_\_\_\_ Location of indicating device (see Requirement 4):\_\_\_**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Actual  flowrate | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m |  |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
|  | | | | | |  |  |  |
|  | | | | | |  | Standard deviation  % | MPEa/3  % |
|  | | | | | | sc |  |  |
|  | | | | | |  |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (NMI R 49-2:2015, 7.4.5) | | | | | | | | |

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

**Flow direction (see Requirement 3): \_\_\_ Location of indicating device (see Requirement 4): \_\_\_**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Actual  flowrate | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m |  |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
|  | | | | | |  |  |  |
|  | | | | | |  | Standard deviation  % | MPEa/3  % |
|  | | | | | | sc |  |  |
|  | | | | | |  |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (NMI R 49-2:2015, 7.4.5) | | | | | | | | |

**Requirements**

requirement 1: Tables for each flow rate according to NMI R 49-2:2015, 7.4.4 shall be added.

requirement 2: Tables for each orientation, which shall be as specified in NMI R 49-2:2015, 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:

### Interchange test on all patterns of cartridge meters and meters with exchangeable metrological modules (NMI R 49-1:2015, 7.2.7, NMI R 49-2:2015, 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 — m3 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 | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m |  |
| m3/h | MPa(bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  The error variation (see NMI R 49-2:2015, 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 | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m |  |
| m3/h | MPa(bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  The error variation (see NMI R 49-2:2015, 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 | Initial  supply  pressure | Water  temp. | Initial  reading | Final  reading | Indicated  volume | Actual  volume | Meter  error | MPEa |
| *Q*( ) |  | *T*w | *V*i(i) | *V*i(f) | *V*i | *V*a | *E*m | (1) |
| m3/h | MPa(bar) | °C | m3 | m3 | m3 | m3 | % | % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
|  | | | | | | *Ē*m3 |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5)  The error variation (see NMI R 49-2:2015, 7.4.6.4) shall be checked | | | | | | | | |

**Requirements**

requirement 1: Tables for each flow rate according to NMI R 49-2:2015, 7.4.4 shall be added.

Requirement 2: Tables for each orientation, which shall be as specified in NMI R 49-2:2015, 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.

### Water temperature test (NMI R 49-2:2015, 7.5), Water temperature test for T30 water meters (NMI R 49-2:2015, 7.5A) and overload water temperature test (NMI R 49-2:2015, 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 — m3 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 10 °Cb | *Q*2 |  |  |  |  |  |  |  |  |  |
| 30 °Cc | *Q*2 |  |  |  |  |  |  |  |  |  |
| Following exposure to 50 °Cd | *Q2* |  |  |  |  |  |  |  |  |  |
| *Q3* |  |  |  |  |  |  |  |  |  |
| MAT | *Q*2 |  |  |  |  |  |  |  |  |  |
| Referencee | *Q*2 |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | | |
| a For a complete water meter, this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4).  b Applicable to temperature classes T30 to T180.  c Applicable to temperature classes T30/70 to T30/180.  d Applicable to temperature class T30 only.  e 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.

### Water pressure test (NMI R 49-2:2015, 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 — m3 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):\_\_\_**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Applica- tion conditions | Nominal flow rate | Actual flow rate | Initial supply pressure | Initial inlet water tempera- ture | Initial reading  *V*i(i) | Final reading  *V*i(f) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Reverse flow test (NMI R 49-2:2015, 7.8)

#### 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 — m3 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 designed to measure accidental reverse flow (NMI R 49-2:2015, 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). | | | | | | | | | | |

#### Meters not designed to measure accidental reverse flow (NMI R 49-2:2015, 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). | | | | | | | | | | |

#### Meters which prevent reverse flow (NMI R 49-2:2015, 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Pressure-loss test (NMI R 49-2:2015, 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  ∆*p*1 |
| m3/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  ∆*p*2 | Meter pressure loss  Δ*p*meter |
| m3/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.

### Flow disturbance tests (NMI R 49-2:2015, 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 — m3 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 NMI R 49-2:2015, 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 | MPEa |
|  | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

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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

### Durability tests (NMI R 49-2:2015, 7.11)

#### Discontinuous flow test (NMI R 49-2:2015, 7.11.2)

This test is applicable only to meters with values of *Q*3 ≤ 16 m3/h.

|  |  |
| --- | --- |
| Application No.: |  |
| Test method: | Gravimetric/volumetric |
| Volume measures/weighbridge used — m3 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 | Down  stream  pressure | Up  stream  temp. | Actual  flowrate | Meter  reading | Flow cycle times - s | | | | Total  volume  discharged | Total no.  of flow cycles |
|  |  |  | MPa (bar) | MPa (bar) | °C | m3/h | m3 | rise | on | fall | off | m3 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | | | | | | | | Totals at end of test = | | | |  |  |
|  | | | | | | | | Theoretical total a = | | | |  |  |
| a Minimum theoretical volume passed during the test is 0.5 × *Q*3 × 100 000 × 32 / 3600 expressed in m3. 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  % | MPEa  % | Curve  variation  errorb  *Ē*m(B) - *Ē*m(A)  % | MPE  (of curve  variation  error)c  % |
|  |  |  |  |  |  | |  |  |  |  |  |
|  |  |  |  |  |  | |  |  |  |  |  |
| d |  |  |  |  |  | |  |  |  |  |  |
|  |  |  |  |  |  | *Ē*m2 | |  |  |  |  |
|  |  |  |  |  |  | *Ē*m3 | |  |  |  |  |
|  |  |  |  |  |  | *Ē*m(B) | |  |  |  |  |
| a For MPE values refer to NMI R 49-1:2015, 4.2. For acceptance criteria, refer to NMI R 49-2:2015, 7.4.5  b *Ē*m(A) is the mean intrinsic error (of indication) – see test report 5.3; *Ē*m(B) is the mean error (of indication) measured after this discontinuous flow test  c For MPE values and acceptance criteria refer to NMI R 49-2, 7.11.2.4.  d Perform a third test if *Q = Q1, Q2 or Q3* or if the first or second test is outside the MPE (NMI R 49-2, 7.4.5) | | | | | | | | | | | |

#### Continuous flow test (NMI R 49-2:2015, 7.11.3)

|  |  |
| --- | --- |
| Application No.: |  |
| Test method: | Gravimetric/volumetric |
| Volume measures/weighbridge used — m3 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 | Down  stream pressure | Up  stream  temp | Actual  flowrate | Meter  reading | Total volume discharged | Hours  run |
|  |  |  | MPa (bar) | MPa (bar) | °C | m3/h | m3 | m3 | h |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Totals at end of test = | | |  |  |
|  |  |  |  |  | Minimum volume discharged a = | | |  |  |
| Comments: | | | | | | | | | |
| a For meters with *Q*3 ≤ 16 m3/h or kL, total hours run = 100 h at *Q*4 (minimum volume discharged at end of test is [*Q*4] × 100, expressed in m3, where [*Q*4] is the number equal to the value of *Q*4, expressed in m3/h)  For meters with *Q*3 > 16 m3/h or kL, total hours run = 800 h at *Q*3 (minimum volume discharged at end of test is [*Q*3] × 800, expressed in m3, where [*Q*3] is the number equal to the value of *Q*3, expressed in m3/h) and 200 h at *Q*4 (minimum volume discharged at end of test is [*Q*4] × 200, expressed in m3) where [*Q*4] is the number equal to the value of *Q*4, expressed in m3/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*( )  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  % | MPEa  % | Curve  variation  error b  *Ē*m(B) - *Ē*m(A)  % | MPE  (of curve  variation  error) c  % |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| d |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | *Ē*m2 |  |  |  |  |
|  |  |  |  |  |  | *Ē*m3 |  |  |  |  |
|  |  |  |  |  |  | *Ē*m(B) |  |  |  |  |
| Comments: | | | | | | | | | | |
| a For MPE values refer to NMI R 49-1:2015, 4.2. For acceptance criteria refer to NMI R 49-2:2015, 7.4.5.  b  *Ē*m(A) is the Mean intrinsic error (of indication). See test report 5.3. *Ē*m(B) is the mean error (of indication) measured after this continuous flow test (= either *Ē*m2 or *Ē*m3).  c For MPE values and acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5) | | | | | | | | | | |

#### Discontinuous flow test (NMI R 49-2:2015, 7.11.2)

**(Applicable only to combination meters)**

|  |  |
| --- | --- |
| Application No.: |  |
| Test method: | Gravimetric/volumetric |
| Volume measures/weighbridge used — m3 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 | Down  stream pressure | Up  stream  temp | Actual  flowrate | Meter  reading | Flow cycle times - s | | | | Total volume discharged | Total no. of flow cycles |
|  |  |  | MPa (bar) | MPa (bar) | °C | m3/h | m3 | rise | on | fall | off | m3 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | Totals at end of test = | | | |  |  |
|  |  |  |  |  |  |  |  | Theoretical total a = | | | |  |  |
| a Minimum theoretical volume passed by meters during the test is 0.5 × *Q*1 × 50000 × 32 / 3600 expressed in m3. 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  % | MPEa  % | Curve  variation  error b  *Ē*m(B) - *Ē*m(A)  % | MPE  (of curve  variation  error) c  % |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| d |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | *Ē*m2 |  |  |  |  |
|  |  |  |  |  |  | *Ē*m3 |  |  |  |  |
|  |  |  |  |  |  | *Ē*m(B) |  |  |  |  |
| Comments: | | | | | | | | | | |
| a For MPE values refer to NMI R 49-1:2015, 4.2. For acceptance criteria refer to NMI R 49-2:2015, 7.4.5.  b  *Ē*m(A) is the Mean intrinsic error (of indication). See test report 5.3. *Ē*m(B) is the mean error (of indication) measured after this discontinuous flow test (= either *Ē*m2 or *Ē*m3).  c For MPE values and acceptance criteria refer to NMI R 49-2:2015, 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 49-2:2015, 7.4.5) | | | | | | | | | | |

### Static magnetic field test (NMI R 49-2:2015, 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 — m3 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 | MPEa |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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 (NMI R 49-2:2015, 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 — m3 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* ( )  m3/h | Initial  supply  pressure  MPa  (bar) | Water  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  % | MPEa  % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
| *Ē*m3 |  |  |
|  | Standard deviation  % | MPE/3a  % |
| *s* c d |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5).  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (R 49-2:2015, 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* ( )  m3/h | Initial  supply  pressure  MPa  (bar) | Water  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  % | MPEa  % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
| *Ē*m3 |  |  |
|  | Standard deviation  % | MPE/3a  % |
| *s* c d |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5).  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (R 49-2:2015, 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* ( )  m3/h | Initial  supply  pressure  MPa  (bar) | Water  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  % | MPEa  % |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| b |  |  |  |  |  |  |  |  |
|  | | | | | | *Ē*m2 |  |  |
| *Ē*m3 |  |  |
|  | Standard deviation  % | MPE/3a  % |
| *s* c d |  |  |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 9.4). For acceptance criteria refer to NMI R 49-2:2015, 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 (NMI R 49-2:2015, 7.4.5).  c Calculate standard deviation if *Q* = *Q*1, *Q*2 or *Q*3 (R 49-2:2015, 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 NMI R 49-2:2015 shall be added.

Requirement 2: Tables for each orientation, which shall be as specified in NMI R 49-2:2015, 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:

## Pattern evaluation tests (for electronic water meters and mechanical water meters with electronic components)

### Dry heat (non-condensing) (NMI R 49-2:2015, 8.2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | 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 — m3 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 pressurea  *p*w | Working temperaturea  *T*w | Initial reading  *Vi*(i) | Final reading  *Vi*(j) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEb |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Cold (NMI R 49-2:2015, 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 — m3 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 pressurea  *p*w | Working temperaturea  *T*w | Initial reading  *Vi*(i) | Final reading  *Vi*(j) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEb |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Damp heat, cyclic (condensing) (NMI R 49-2:2015, 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 — m3 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  pressurea  *p*w | Working  temperaturea  *T*w | Initial  reading  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEb | Fault  *E*m2) − *E*m1) | | Significant  fault | | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | | % | |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Power supply variation (NMI R 49-2:2015, 8.5)

#### 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 — m3 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) or AC/DC converters, mains power supply (NMI R 49-2:2015, 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  *Vi*(i) | Final reading  *Vi*(j) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEa |
| V | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| *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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

#### Meters powered by primary batteries or by external DC voltage (NMI R 49-2:2015, 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  *Vi*(i) | Final reading  *Vi*(j) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEa |
| V | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| *U*max |  |  |  |  |  |  |  |  |  |  |
| *U*min |  |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | | |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Vibration (random) (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | | Significant  fault | | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | | % | |
| 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 m2.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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Mechanical shock (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | | Significant  fault | | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | | % | |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### AC mains voltage dips, short interruptions and voltage variations (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | Significant  faultb | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| Reference conditions 1) Before voltage reductions | No voltage reductions. | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| 2) During voltage reduction | Voltage interruptions and reductions as in NMI R 49-2:2015, 8.8. | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  | yes | no |
| Comments: | | | | | | | | | | | | | |
| a For a complete water meter this is the maximum permissible error as defined in NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Bursts on signal lines (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | Significant  faultb | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 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 NMI R 49-2:2015, 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Bursts (transients) on AC and DC mains (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indicated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | Significant  faultb | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Electrostatic discharge (NMI R 49-2:2015, 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 — m3 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  *Vi*(i) | Final  reading  *Vi*(j) | Indi- cated  volume  *V*i | Actual  volume  *V*a | Meter  error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant  faultb | EUT  functioning  correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| Reference conditions (no discharges) | | |  | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| 2) Discharge pointc | Moded | |  |  |  |  |  |  |  |  |  |  |  | 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Radiated electromagnetic field (NMI R 49-2:2015, 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 — m3 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 tempera- ture  *T*w | Initial read- ing  *V*i(i) | Final read- ing  *V*i(f) | Indicated volume  *V*i | Actual volume  *V*a | Meter error  *E*m | MPEa | Fault  *E*m2) − *E*m1) | Signi-ficant faultb | EUT  functioning correctly | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 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 |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Conducted electromagnetic field (NMI R 49-2:2015, 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 — m3 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Surges on signal, data and control lines (NMI R 49-2:2015, 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 — m3 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 1) Reference conditions (no surges) | | |  | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| 2) Surge | Modec | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Surges on AC and DC mains power lines (NMI R 49-2:2015, 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 — m3 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 1) Reference conditions (no surges) | | |  | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| 2) DC power | Modec | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 1) Reference conditions (no surges) | | |  | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| AC supply voltage  0° | Modec | |  | | | | | | | | | | | | |
| 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| AC supply voltage  90° | Modec | |  | | | | | | | | | | | | |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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 | MPEa | Fault  *E*m2) − *E*m1) | Signi- ficant faultb | EUT  functioning correctly | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % | % | % |
| 1) Reference conditions (no surges) | | |  | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | — | — | — | — |
| AC supply voltage  180° | Modec | |  | | | | | | | | | | | | |
| 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 |
| AC supply voltage  270° | Modec | |  | | | | | | | | | | | | |
| 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 NMI R 49-1:2015, 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 (NMI R 49-2:2015, 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.

### Absence of flow test (NMI R 49-2:2015, 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 — m3 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 | m3 | m3 | m3 |
| 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.

# Initial verification report

## 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 NMI R 49-1:2015, 7.3 and NMI R 49-2:2015, 11.2.2.

In addition to this, any special requirements and/or restrictions for initial verification detailed in the pattern 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):

## Information concerning the EUT verified

|  |  |  |
| --- | --- | --- |
| Pattern 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 Δ*p*max : |  |
|  | Flow rate at Δ*p*max: |  |
|  | Year of manufacture: |  |
|  | The manufacturer: |  |
|  | Authorized representative: |  |
|  | Address: |  |
|  |  |  |
|  |  |  |
| Testing laboratory: | |  |
| Authorized representative: | |  |
| Address: | |  |
|  |  |  |
|  |  |  |

## Initial verification test report (NMI R 49-2:2015, Clause 10)

**5.3.1 Example 1: Approved water meter** (complete or combined) (NMI R 49-2:2015, 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 (NMI R 49-2:2015, 8.1.8) |  |
| Category for testing (NMI R 49-2:2015, <clause number>) | a |
| Test method: | Gravimetric/volumetric |
| Volume measures/weighbridge used — m3 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 NMI R 49-2:2015, 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 ratea | 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 errorb  *E*c | MPEc |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 | m3 | m3 | % | % |
| *Q*1 |  |  |  |  |  |  |  |  |  |
| *Q*2 |  |  |  |  |  |  |  |  |  |
| *Q*3 |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | |
| a These flow rates shall be applied unless alternatives are specified in the pattern approval certificate.  b Calculations for the error (of indication) are described in NMI R 49-2:2015, Annex B.  c The maximum permissible error as defined in NMI R 49-1:2015, 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)** (NMI R 49-2:2015, 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 (NMI R 49-2:2015, 8.1.8) |  |
| Category for testing (NMI R 49-2:2015, <clause number>) | a |
| a Enter clause number according to one of the configuration categories for testing the EUT listed in NMI R 49-2:2015, 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 ratea | Actual flow rate  *Q*( ) | Applied pulse frequencyb | Initial reading  *V*i(i) | Final reading  *V*i(f) | Total  pulses injectedb  *T*p | Indicated volume  *V*i | Actual volume  *V*a | Meter errorc  *E*c | MPEd |
| m3/h | m3/h | Hz | m3 | m3 |  | m3 | m3 | % | % |
| *Q*1 |  |  |  |  |  |  |  |  |  |
| *Q*2 |  |  |  |  |  |  |  |  |  |
| *Q*3 |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | |
| a These flow rates shall be applied unless alternatives are specified in the pattern 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 NMI R 49-2:2015, Annex B.  d The maximum error (of indication) allowed for the calculator (including indicating device) is given in the pattern 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)**(NMI R 49-2:2015, 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 (NMI R 49-2:2015, 8.1.8) |  |
| Category for testing (NMI R 49-2:2015, <clause number>) | a |
| Test method: | Gravimetric/volumetric |
| Volume measures/weighbridge used — m3 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 NMI R 49-2:2015, 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 ratea | Actual flow rate  *Q*( ) | Working pressure | Working temperature | Initial reading  *V*i(i) | Final reading  *V*i(f) | Total output pulsesb  *T*p | Indicated volume  *V*i | Actual volume  *V*a | Meter errorc  *E*c | MPEd |
| m3/h | m3/h | MPa (bar) | °C | m3 | m3 |  | m3 | m3 | % | % |
| *Q*1 |  |  |  |  |  |  |  |  |  |  |
| *Q*2 |  |  |  |  |  |  |  |  |  |  |
| *Q*3 |  |  |  |  |  |  |  |  |  |  |
| Comments: | | | | | | | | | | |
| a These flow rates shall be applied unless alternatives are specified in the pattern 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 NMI R 49-2:2015, Annex B.  d The maximum error (of indication) allowed for the measurement transducer (including flow or volume sensor) is given in the pattern 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.

1. (Mandatory)  
     
   List of documents concerning the pattern (NMI R 49-1:2015, 7.2.9)

|  |  |  |
| --- | --- | --- |
| **Document reference** | **Date** | **Brief description** |
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1. (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 49-2:2015, subclause) |
| **Last** | **Next** |
|  |  |  |  |  |  |  |  |
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| Comments: | | | | | | | |