

## SCHEDULE 1

Regulations 2(1), 14(a) and 15(2)

### ESSENTIAL REQUIREMENTS

1. The essential requirements are the relevant requirements relating to cold-water meters contained in Annex I and Annex MI-001, set out in this Schedule.

#### Definitions

2. In this Schedule—

“climatic environments” means the conditions in which cold-water meters may be used;

“critical change value” means the value at which the change in the measurement result is considered undesirable;

“disturbance” means an influence quantity having a value within the limits specified in the appropriate requirement but outside the specified rated operating conditions of the instrument. An influence quantity is a disturbance if for that influence quantity the rated operating conditions are not specified;

“influence quantity” means a quantity that is not the measurand but that affects the result of measurement;

“measurand” means the particular quantity subject to measurement;

“minimum flowrate” means the lowest flowrate at which the cold-water meter provides indications that satisfy the requirements concerning the maximum permissible errors (MPEs);

“overload flowrate” means the highest flowrate at which the cold-water meter operates in a satisfactory manner for a short period of time without deteriorating;

“permanent flowrate” means the highest flowrate at which the cold-water meter operates in a satisfactory manner under normal conditions of use, that is, under steady or intermittent flow conditions;

“Q<sub>1</sub>” means the minimum flowrate;

“Q<sub>2</sub>” means the transitional flowrate;

“Q<sub>3</sub>” means the permanent flowrate;

“Q<sub>4</sub>” means the overload flowrate;

“rated operating conditions” means the values for the measurand and influence quantities making up the normal working conditions of an instrument;

“transitional flowrate” means the flowrate value occurring between the permanent and minimum flowrates, at which the flowrate range is divided into two zones, the upper zone and the lower zone; each zone has a characteristic MPE; and

“utility” means a supplier of cold water.

#### Allowable Errors

3.—(1) Under rated operating conditions and in the absence of a disturbance, the error of measurement shall not exceed the maximum permissible error (MPE) value set out in paragraph 15.

(2) MPE is expressed as a bilateral value of the deviation from the true measurement value.

(3) Under rated operating conditions and in the presence of a disturbance, the performance requirement shall be as set out in paragraph 16.

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(4) Where the cold-water meter is intended to be used in a specified permanent continuous electromagnetic field the permitted performance during the radiated electromagnetic field-amplitude modulated test shall be within MPE.

(5) The manufacturer shall specify the climatic, mechanical and electromagnetic environments in which the cold-water meter is intended to be used, power supply and other influence quantities likely to affect its accuracy, taking account of the requirements in this Schedule.

(a) Climatic environments—

The manufacturer shall specify the upper temperature limit and the lower temperature limit from any of the values in the following Table, and indicate whether the instrument is designed for condensing or non-condensing humidity as well as the intended location for the instrument, i.e. open or closed.

**Table**

	<i>Temperature Limits</i>			
Upper temperature limit	30°C	40°C	55°C	70°C
Lower temperature limit	5°C	-10°C	-25°C	-40°C

(b) Mechanical environments—

(i) M1: This class applies to cold-water meters used in locations with vibration and shocks of low significance e.g. for instruments fastened to light supporting structures subject to negligible vibrations and shocks transmitted from local blasting or pile-driving activities and slamming doors.

(ii) The following influence quantities shall be considered in relation with mechanical environments—

- (aa) vibration;
- (bb) mechanical shock.

(c) Electromagnetic environments—

(i) E1: This class applies to cold-water meters used in locations with electromagnetic disturbances corresponding to those likely to be found in residential buildings.

(ii) The following influence quantities shall be considered in relation with electromagnetic environments—

- (aa) voltage interruptions;
- (bb) short voltage reductions;
- (cc) voltage transients on supply lines and/or signal lines;
- (dd) electrostatic discharges;
- (ee) radio frequency electromagnetic fields;
- (ff) conducted radio frequency electromagnetic fields on supply lines and/or signal lines;
- (gg) surges on supply lines and/or signal lines.

(6) Other influence quantities to be considered, where appropriate, are—

- (a) voltage variation;

- (b) mains frequency variation;
  - (c) power frequency magnetic fields;
  - (d) any other quantity likely to influence in a significant way the accuracy of the instrument.
- (7) When carrying out the tests as envisaged in these Regulations, the following paragraphs apply—
- (a) Basic rules for testing and the determination of errors—
    - (i) Essential requirements specified in sub-paragraphs (1) to (4) shall be verified for each relevant influence quantity. These essential requirements apply when each influence quantity is applied and its effect evaluated separately, all other influence quantities being kept relatively constant at their reference value.
    - (ii) Metrological tests shall be carried out during or after the application of the influence quantity, whichever condition corresponds to the normal operational status of the instrument when that influence quantity is likely to occur.
  - (b) Ambient humidity—
    - (i) According to the climatic operating environment in which the instrument is intended to be used either the damp heat-steady state (non-condensing) or damp heat cyclic (condensing) test may be appropriate.
    - (ii) The damp heat cyclic test is appropriate where condensation is important or when penetration of vapour will be accelerated by the effect of breathing. In conditions where non-condensing humidity is a factor the damp-heat steady state is appropriate.

### **Reproducibility**

4. The application of the same measurand in a different location or by a different user, all other conditions being the same, shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.

### **Repeatability**

5. The application of the same measurand under the same conditions of measurement shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.

### **Discrimination and Sensitivity**

6. A cold-water meter shall be sufficiently sensitive and the discrimination threshold shall be sufficiently low for the intended measurement task.

### **Durability**

7. A cold-water meter shall be designed to maintain an adequate stability of its metrological characteristics over a period of time estimated by the manufacturer, provided that it is properly installed, maintained and used according to the manufacturer's instruction when in the environmental conditions for which it is intended.

### **Reliability**

8. A cold-water meter shall be designed to reduce as far as possible the effect of a defect that would lead to an inaccurate measurement result, unless the presence of such a defect is obvious.

### **Suitability**

9.—(1) A cold-water meter shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.

(2) A cold-water meter shall be suitable for its intended use taking account of the practical working conditions and shall not require unreasonable demands of the user in order to obtain a correct measurement result.

(3) Where a cold-water meter is designed for the measurement of values of the measurand that are constant over time, the instrument shall be insensitive to small fluctuations of the value of the measurand, or shall take appropriate action.

(4) The errors of a cold-water meter at flows outside the controlled range shall not be unduly biased.

(5) A cold-water meter shall be robust and its materials of construction shall be suitable for the conditions in which it is intended to be used.

(6) A cold-water meter shall be designed so as to allow the control of the measuring tasks after the instrument has been placed on the market and put into use. If necessary, special equipment or software for this control shall be part of the instrument. The test procedure shall be described in the operation manual.

(7) When an instrument has associated software which provides other functions besides the measuring function, the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software.

(8) The cold-water meter shall be able to be installed to operate in any position unless clearly marked otherwise.

(9) The manufacturer shall specify whether the cold-water meter is designed to measure reverse flow. In such a case, the reverse flow volume shall either be subtracted from the cumulated volume or shall be separately recorded. The same MPE shall apply to both forward and reverse flow.

(10) Cold-water meters not designed to measure reverse flow shall either prevent reverse flow or shall withstand an accidental reverse flow without any deterioration or change in metrological properties.

### **Protection against corruption**

10.—(1) The metrological characteristics of a cold-water meter shall not be influenced in any inadmissible way by the connection to it of another device, by any feature of the connected device itself or by any remote device that communicates with the instrument.

(2) A hardware component that is critical for metrological characteristics shall be designed so that it can be secured. Security measures foreseen shall provide for evidence of an intervention.

(3) Software that is critical for metrological characteristics shall be identified as such and shall be secured.

(4) Software identification shall be easily provided by the instrument.

(5) Evidence of a software intervention shall be available for a reasonable period of time.

(6) Measurement data, software that is critical for measurement characteristics and metrologically important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption.

(7) For utility measuring instruments the display of the total quantity supplied or the displays from which the total quantity supplied can be derived, whole or partial reference to which is the basis for payment, shall not be able to be reset during use.

### **Information to be borne by and to accompany the instrument**

- 11.—(1) A cold-water meter shall bear the following inscriptions—
- (a) manufacturer's mark or name;
  - (b) information in respect of its accuracy,
- plus, when applicable—
- (c) information in respect of the conditions of use;
  - (d) measuring capacity;
  - (e) measuring range;
  - (f) identity marking;
  - (g) number of the EC-type examination certificate or the EC design examination certificate;
  - (h) information whether or not additional devices providing metrological results comply with the provisions of these Regulations.
- (2) An instrument of dimensions too small or of too sensitive a composition to allow it to bear the relevant information shall have its packaging, if any, and the accompanying documents required by these Regulations suitably marked.
- (3) The cold-water meter shall be accompanied by information on its operation, unless the simplicity of the instrument makes this unnecessary. Information shall be easily understandable and shall include where relevant—
- (a) rated operating conditions;
  - (b) mechanical and electromagnetic environment classes;
  - (c) the upper and lower temperature limit, whether condensation is possible or not, open or closed location;
  - (d) instructions for installation, maintenance, repairs, permissible adjustments;
  - (e) instructions for correct operation and any special conditions of use;
  - (f) conditions for compatibility with interfaces or other measuring instruments.
- (4) Groups of identical cold-water meters used in the same location or used for utility measurement do not necessarily require individual instruction manuals.
- (5) The scale interval for a measured value shall be in the form  $1 \times 10^n$ ,  $2 \times 10^n$  or  $5 \times 10^n$ , where n is any integer or zero. The unit of measurement or its symbol shall be shown close to the numerical value.
- (6) The units of measurement used and their symbols shall be in accordance with the provisions of Community legislation on units of measurement and their symbols.
- (7) All marks and inscriptions required under any requirement shall be clear, non-erasable, unambiguous and non-transferable.

### **Indication of result**

- 12.—(1) Indication of the result shall be by means of a display or hard copy.
- (2) The indication of any result shall be clear and unambiguous and accompanied by such marks and inscriptions necessary to inform the user of the significance of the result. Easy reading of the presented result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrologically controlled indications.
- (3) In the case of hard copy the print or record shall also be easily legible and non-erasable.

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(4) Whether or not an instrument intended for utility measurement purposes can be remotely read it shall in any case be fitted with a metrologically controlled display accessible without tools to the consumer. The reading of this display is the measurement result that serves as the basis for the price to pay.

### **Conformity evaluation**

**13.** A cold-water meter shall be designed so as to allow ready evaluation of its conformity with the appropriate requirements of these Regulations.

### **Rated Operating Conditions**

**14.** The manufacturer shall specify the rated operating conditions for the instrument, in particular—

- (a) the flowrate range of the cold water, the values for which shall fulfil the following conditions—
  - (i)  $Q_3/Q_1 \geq 10$ ;
  - (ii)  $Q_2/Q_1 = 1.6$ ;
  - (iii)  $Q_4/Q_3 = 1.25$ ,
 and for 5 years from the date of entry into force of the Directive the ratio  $Q_2/Q_1$  may be 1.5, 2.5, 4 or 6.3;
- (b) the temperature range of the cold water, the values for which shall be 0.1°C to and including 30°C;
- (c) the relative pressure of the cold water, the range being 0.3 bar to at least 10 bar at  $Q_3$ ; and
- (d) for the power supply, the nominal value of the AC voltage supply and/or the limits of DC supply.

### **MPE**

**15.—(1)** The MPE, positive or negative, on volumes delivered at flowrates between the transitional flowrate (included) and the overload flowrate is 2%.

(2) The MPE, positive or negative, on volumes delivered at flowrates between the minimum flowrate and the transitional flowrate (excluded) is 5%.

### **Permissible Effect of Disturbances**

**16.—(1)** Electromagnetic immunity—

- (a) The effect of an electromagnetic disturbance on a cold-water meter shall be such that—
  - (i) the change in the measurement result is no greater than the critical change value as defined in paragraph (c);
  - (ii) the indication of the measurement result is such that it cannot be interpreted as a valid result, such as a momentary variation that cannot be interpreted, memorised or transmitted as a measuring result.
- (b) After undergoing an electromagnetic disturbance the cold-water meter shall—
  - (i) recover to operate within MPE;
  - (ii) have all measurement functions safeguarded; and
  - (iii) allow recovery of all measurement data present just before the disturbance.

- (c) The critical change value is the smaller of the two following values—
  - (i) the volume corresponding to half of the magnitude of the MPE in the upper zone on the measured volume;
  - (ii) the volume corresponding to the MPE on the volume corresponding to one minute at  $Q_3$ .
- (2) Durability—
  - (a) After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the criteria in paragraphs (b) and (c) shall be satisfied.
  - (b) The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed—
    - (i) 3% of the metered volume between  $Q_1$  included and  $Q_2$  excluded;
    - (ii) 1.5% of the metered volume between  $Q_2$  included and  $Q_4$  included.
  - (c) The error of indication for the volume metered after the durability test shall not exceed—
    - (i)  $\pm 6\%$  of the metered volume between  $Q_1$  included and  $Q_2$  excluded;
    - (ii)  $\pm 2.5\%$  of the metered volume between  $Q_2$  included and  $Q_4$  included.

### **Units of Measurement**

- 17. Metered volume shall be displayed in cubic metres.

### **Putting into Use**

- 18. The member State shall ensure that the requirements under paragraphs 14(a) to 14(c) are determined by the distributor or the person legally designated for installing the cold-water meter, so that the instrument is appropriate for the accurate measurement of consumption that is foreseen or foreseeable.