

ANNEX IV

GAS METERS AND CONVERSION DEVICES (MI-002)



The relevant requirements of Annex I, the specific requirements of this Annex and the conformity assessment procedures listed in this Annex, apply to gas meters and conversion devices defined below, intended for residential, commercial and light industrial use.

DEFINITIONS

Gas meter	An instrument designed to measure, memorise and display the quantity of fuel gas (volume or mass) and/or energy that has passed it.
Volume Conversion device	A device fitted to a gas meter that automatically converts the quantity measured at metering conditions into a quantity at base conditions.
Calorific value determining device	An associated measuring instrument for determining the calorific value of gas
Energy Conversion device	A device which calculates, integrates and displays energy using volume at base conditions or mass, and the superior/gross calorific value
Minimum flowrate (Q_{\min})	The lowest flowrate at which the gas meter provides indications that satisfy the requirements regarding maximum permissible error (MPE).
Maximum flowrate (Q_{\max})	The highest flowrate at which the gas meter provides indications that satisfy the requirements regarding MPE.
Transitional flowrate (Q_t)	The transitional flowrate is the flowrate occurring between the maximum 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.
Overload Flowrate (Q_r)	The overload flowrate is the highest flowrate at which the meter operates for a short period of time without deteriorating.
Base conditions	The specified conditions to which the measured quantity of fluid is converted.
Superior/Gross calorific value	Amount of heat that would be released by the complete combustion with oxygen of a specified quantity of gas, in such a way that the pressure, p_1 , at which the reaction takes place remains constant, and all the products of combustion are returned to the same specified temperature, t_1 , as that of the reactants, all of these products being in the gaseous state except for water, which is condensed to the liquid state at t_1





PART I
SPECIFIC REQUIREMENTS
GAS METERS

1. **Rated operating conditions**

The manufacturer shall specify the rated operating conditions of the gas meter, taking into account:

1.1. The flowrate range of the gas shall fulfil at least the following conditions:

Class	Q_{\max} / Q_{\min}	Q_{\max} / Q_t
1,5	≥ 150	≥ 10
1,0	≥ 10 	≥ 5

If a gas meter has multiple gas application-dependent flow rate ranges, each shall be inscribed on the meter, accompanied by a clear description of the gas application. 

1.2. The temperature range of the gas, with a minimum range of 40 °C.

1.3. *The fuel/gas related conditions*

The gas meter shall be designed for the range of gases and supply pressures of the country of destination. In particular the manufacturer shall indicate:

- the gas family or group;
- the maximum operating pressure.

1.4. A minimum temperature range of 50 °C for the climatic environment.

1.5. The nominal value of the AC voltage supply and/or the limits of DC supply.

2. **Maximum permissible error (MPEs)**

2.1. Gas meter indicating the volume at metering conditions or mass

Table 1

Class	1,5	1,0
$Q_{\min} \leq Q < Q_t$	3 %	2 %
$Q_t \leq Q \leq Q_{\max}$	1,5 %	1 %

The gas meter shall not exploit the MPEs or systematically favour any party.

2.2. For a gas meter with temperature conversion, which only indicates the converted volume, the MPE of the meter is increased by 0,5 % in a range of 30 °C extending symmetrically around the temperature specified by the manufacturer that lies between 15 °C and 25 °C. Outside this range, an additional increase of 0,5 % is permitted in each interval of 10 °C.

3. **Permissible effect of disturbances**

3.1. *Electromagnetic immunity*

- 3.1.1. The effect of an electromagnetic disturbance on a gas meter or volume conversion device shall be such that:
- the change in the measurement result is no greater than the critical change value as defined in point 3.1.3, or
 - 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.
- 3.1.2. After undergoing a disturbance, the gas meter shall:
- recover to operate within MPE, and
 - have all measurement functions safeguarded, and
 - allow recovery of all measurement data present just before the disturbance.
- 3.1.3. The critical change value is the smaller of the two following values:
- the quantity corresponding to half of the magnitude of the MPE in the upper zone on the measured volume;
 - the quantity corresponding to the MPE on the quantity corresponding to one minute at maximum flowrate.
- 3.2. *Effect of upstream-downstream flow disturbances*
Under installation conditions specified by the manufacturer, the effect of the flow disturbances shall not exceed one third of the MPE.

4. **Durability**

After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criteria shall be satisfied:

4.1. *Class 1,5*

- 4.1.1. The variation of the measurement result after the durability test when compared with the initial measurement result for the flow rates in the range Q_t to Q_{max} - shall not exceed the measurement result by more than 2 %.
- 4.1.2. The error of indication after the durability test shall not exceed twice the MPE in point 2.

4.2. *Class 1,0*

- 4.2.1. The variation of the measurement result after the durability test when compared with the initial measurement result shall not exceed one-third of the MPE in point 2.
- 4.2.2. The error of indication after the durability test shall not exceed the MPE in point 2.

5. Suitability

- 5.1. A gas meter powered from the mains (AC or DC) shall be provided with an emergency power supply device or other means to ensure, during a failure of the principal power source, that all measuring functions are safeguarded.
- 5.2. A dedicated power source shall have a lifetime of at least five years. After 90 % of its lifetime an appropriate warning shall be shown.
- 5.3. An indicating device shall have a sufficient number of digits to ensure that the quantity passed during 8 000 hours at Q_{\max} does not return the digits to their initial values.
- 5.4. The gas meter shall be able to be installed to operate in any position declared by the manufacturer in its installation instruction.
- 5.5. The gas meter shall have a test element, which shall enable tests to be carried out in a reasonable time.
- 5.6. The gas meter shall respect the MPE in any flow direction or only in one flow direction clearly marked.

6. Units

Metered quantity shall be displayed in cubic metre, or in kilogram.
Quantity of energy shall be displayed in Joules or in Watt-hours.



PART II SPECIFIC REQUIREMENTS CONVERSION DEVICES



A **conversion device** constitutes a sub-assembly when it is together with one or several measuring instruments with which it is compatible.

For a **conversion device**, the essential requirements for the gas meter shall apply, if applicable. In addition, the following requirements shall apply:

7. Base conditions for converted quantities

The manufacturer shall specify the base conditions for converted quantities.

8. MPE for volume conversion devices



- 0,5 % at ambient temperature $20\text{ °C} \pm 3\text{ °C}$, ambient humidity $60\% \pm 15\%$, nominal values for power supply;
- 0,7 % for temperature conversion devices at rated operating conditions;
- 1 % for other conversion devices at rated operating conditions.

Note:

The errors of the gas meter and, if applicable, of the calorific value determining device are not taken into account.

The conversion device shall not exploit the MPEs or systematically favour any party.

9. Suitability

- 9.1. An electronic conversion device shall be capable of detecting when it is operating outside the operating range(s) stated by the manufacturer for parameters that are relevant for measurement accuracy. In such a case, the conversion device must stop integrating the converted quantity, and may totalise separately the converted quantity for the time it is operating outside the operating range(s).
- 9.2. An electronic conversion device shall be capable to display all relevant data for the measurement without additional equipment.

PART III SPECIFIC REQUIREMENTS CALORIFIC VALUE DETERMINING DEVICE



The calorific value determining device:

- either is locally installed and sends signal directly to Energy Conversion Device
- or not locally installed and considered as an external transducer.

For a calorific value determining device, the essential requirements for the gas meter shall apply, if applicable. In addition, the following requirements shall apply:

10. Base conditions for converted quantities

The manufacturer shall specify :

- the range for gas chemical composition,
- the base conditions for calorific value and converted quantities.

11. Maximum permissible error (MPEs)

Table X

Class	0.5	1.0
MPE	0,5 %	1 %



The calorific value determining device shall not exploit the MPEs or systematically favour any party.

12. Durability

After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criteria shall be satisfied:

- the variation of the measurement result after the durability test when compared with the initial measurement result shall not exceed half of the magnitude of the MPE.
- the error of indication after the durability test shall not exceed the MPE.

13. **Suitability**

A calorific value determining device shall be capable of detecting when it is operating outside the operating range(s) stated by the manufacturer for parameters that are relevant for measurement accuracy. In such a case, the calorific value determining device must consider calculated calorific value as not relevant, and may register them for the time it is operating outside the operating range(s).

14. **Units**

Calorific value shall be displayed in Joules and/or Kilowatt-hours per unit of mass or volume at base conditions.

PART IV
PUTTING INTO USE AND CONFORMITY ASSESSMENT

Putting into use

15. (a) Where a Member State imposes measurement of residential use, it shall allow such measurement to be performed by means of any Class 1,5, and by Class 1,0 which have a Q_{\max} / Q_{\min} ratio equal or greater than 150.
- (b) Where a Member State imposes measurement of commercial and/or light industrial use, it shall allow such measurement to be performed by any Class 1,5
- (c) As regards the requirements under points 1.2 and 1.3, Member States shall ensure that the properties be determined by the utility or the person legally designated for installing the meter, so that the meter is appropriate for the accurate measurement of consumption that is foreseen or foreseeable.

CONFORMITY ASSESSMENT

The conformity assessment procedures referred to in Article 17 that the manufacturer can choose between are

B + F or B + D or H1.