

ANNEX TBD

MEASURING SYSTEMS FOR THE CONTINUOUS AND DYNAMIC MEASUREMENT OF QUANTITIES OF COMPRESSED GAS

The relevant essential requirements of Annex I, the specific requirements of this Annex and the conformity assessment procedures listed in this Annex, apply to measuring systems intended for the continuous and dynamic measurement of quantities (mass or energy) of compressed gas, marked by a start and a stop at zero flow conditions, capable of serving more than two parties.

Commented [VW(1)]: For direct sales, must only one be indicated, or both? Comment FR

Commented [VW(2)]: In combination with the definition of measuring system this should make a clear distinction from MI-002.

DEFINITIONS

Meter	An instrument designed to measure continuously, memorise and display the quantity at metering conditions of gas flowing through the measurement transducer in a closed, fully charged conduit.
Calculator	A part of a meter that receives the output signals from the measurement transducer(s) and possibly, from associated measuring instruments and displays the measurement results.
Associated measuring device	An instrument connected to the calculator for measuring certain quantities which are characteristic of the gas, with a view to make a correction and/or conversion.
Conversion device	A part of the calculator which by taking into account the characteristics of the gas, automatically converts the mass of the gas into the amount of energy delivered or received.
Measuring system	A system that comprises the meter itself, a transfer point, gas piping and all devices required to ensure correct measurement or intended to facilitate the measuring operations. A meter by itself is not a measuring system.
Compressed Gas (CG) dispenser	A measuring system intended for the fuelling of road vehicles, rail engines, boats, vessels, and aircraft with compressed gaseous fuel.
Transfer point	Point (physical location) at which the gas is defined as being delivered or received.
Self-service arrangement	An arrangement that allows the customer to use a measuring system for the purpose of obtaining gas for his own use.
Self-service device	A specific device that is part of a self-service arrangement and which allows one of more measuring systems to perform in this self-service arrangement.
Minimum measured quantity (MMQ)	The smallest quantity of gas for which the measurement is metrologically acceptable for the measuring system.
Direct indication	The indication of mass or energy, corresponding to the measure and that the meter is physically capable of measuring. Note: The direct indication may be converted into another quantity using a conversion device.
Interruptible/non-interruptible	A measuring system is considered as interruptible/non-interruptible when the gas flow can/cannot be stopped easily and rapidly.
Flowrate range	The range between the minimum flowrate ($Q_{\min}$) and maximum flowrate ($Q_{\max}$).

SPECIFIC REQUIREMENTS

1. Rated operating conditions

The manufacturer shall specify the rated operating conditions for the instrument, in particular:

1.1. The flowrate range

For CG dispensers, the ratio between the minimum and maximum flow rate shall be at least 10.

(i) the flowrate range of a measuring system shall be within the flowrate range of each of its elements, in particular the meter.

- 1.2. The properties of the gas to be measured by the instrument by specifying the name or type of the gas or its relevant characteristics, for example:
 - Temperature range;
 - Pressure range;
 - Heating value of the gas;
 - The nature and characteristics of the gas to be measured.
- 1.3. The nominal value of the AC voltage supply and/or limits of the DC voltage supply.

2. Accuracy classification and maximum permissible errors (MPEs)

- 2.1. The MPE on the indication of measured or converted amounts transferred at the transfer point is:

Table 1

Type of compressed gas measuring systems	Accuracy Class (Maximum Permissible Error [% of measured value])
Compressed hydrogen measuring systems	2
Other compressed gas measuring systems	1.5

The maximum permissible error on the minimum measured quantity equals twice the value stated above.

- 2.2. The minimum measured quantity of a measuring system shall have the form $1 \times 10n$, $2 \times 10n$, or $5 \times 10n$ authorised units of mass or energy, where n is a positive or negative whole number, or zero.
The minimum measured quantity shall satisfy the conditions of use of the measuring system; except in exceptional cases, the measuring system shall not be used for measuring quantities less than this minimum measured quantity.
- 2.3. The measuring system shall not exploit the MPEs or systematically favour any party.

3. Maximum permissible effect of disturbances

- 3.1. The effect of an electromagnetic disturbance on a measuring system shall be one of the following:
 - the change in the measurement result is not greater than the critical change value as defined in point 3.2, or
 - the indication of the measurement result shows a momentary variation that cannot be interpreted, memorised or transmitted as a measuring result. Furthermore, in the case of an interruptible system, this can also mean the impossibility to perform any measurement, or
 - the change in the measurement result is greater than the critical change value, in which case the measuring system shall permit the retrieval of the measuring result just before the critical change value occurred and cut off the flow.

- 3.2. The critical change value is the greater of the following values:
- one tenth of the MPE; or
 - three times the minimum measured quantity divided by 100.
- In the case of a failure of the main power source, the critical change value shall be increased by 5 % of the minimum measured quantity.

4. **Durability**

For systems fitted with meters with moving parts, after an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criterion shall be satisfied:
The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed two fifths of the MPE.

5. **Suitability**

- 5.1. For any measured quantity relating to the same measurement, the indications and/or printouts provided by various devices shall have the same scale interval and the results shall not deviate one from another.
The scale interval of a CG measuring system shall not exceed one and a half times the minimum measured quantity divided by 100.
- 5.2. It shall not be possible to divert the measured quantity in normal conditions of use unless it is readily apparent.
- 5.3. During the warm-up time of the CG measuring system, no measurements can take place.

5.4. *Instruments for direct sales*

- 5.4.1. A measuring system for direct sales shall be provided with means for resetting the display to zero.
No means shall be provided by which any measured gas can be diverted downstream of the meter during a filling operation.
- 5.4.2. The display of the quantity on which the transaction is based shall be permanent until all parties in the transaction have accepted the measurement result.
- 5.4.3. Measuring systems for direct sales shall be interruptible.
- 5.4.4. Measuring systems for direct sales shall either display in units of mass or energy.
- 5.5. *CG Dispensers*
- 5.5.1. Displays on CG dispensers shall not be capable of being reset to zero during a measurement.
- 5.5.2. The start of a new measurement shall be inhibited until the display has been reset to zero.
- 5.5.3. Where a measuring system is fitted with a price display, the difference between the indicated price and the price calculated from the unit price and the indicated quantity shall not exceed the smallest currency unit. However this difference need not be less than the smallest monetary value.

6. **Power supply failure**

A measuring system shall be equipped with an emergency power supply that ensures that all measuring functions are performed during a failure in the main power source or a provision to store and indicate the data present at the time of a failure of the main power source in order to be able to close the current transaction, and a provision to stop the flow of gas in case of failure.

Commented [VW(3)]: 5.4 and 5.5 copy-pasted from MI-005

7. Units of measurement

The metered quantity shall be displayed in grams, kilograms, kJ, MJ or kWh.

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 or G.