

BS EN 16314:2013



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Gas meters — Additional functionalities

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Compteurs à gaz - Fonctionnalités supplémentaires

Gaszähler - Zusatzfunktionen

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Foreword

This document (EN 16314:2013) has been prepared by Technical Committee CEN/TC 237 “Gas meters”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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Introduction

This European Standard has been drafted as part of the work being undertaken by the European Standards Organisations (CEN/CENELEC/ETSI) under the Commission Mandate M/441. This standard utilises the six functionalities agreed by the Smart Meters Coordination Group (SM-CG) (see Annex C) as the basis for its additional functionalities. It is not necessary for the Additional Functionality Device (AFD) to incorporate all functions. This standard builds on CEN/TR 16061 by providing specific requirements for the additional functionality that can be fitted to a gas meter.

This standard contains requirements for gas valves integral within the meters and controlled by an AFD where the capacity of the gas meter does not exceed 10 m³/h. Such gas valves are intended for interruption of the gas supply but do not replace any valve intended to isolate the gas supply.

Communications for gas meters are outside the scope of this standard and are covered by the appropriate parts of EN 13757, which provide a number of protocols and transport layers for meter communications for Gas, Water and Heat meters.

A number of methods can provide the additional functionality for gas meters: these are illustrated below, see Figure 1, and described in detail within this standard. The AFD can be integral to the gas meter, attached to the meter or remote from the meter.

AFD1, AFD2 and AFD3

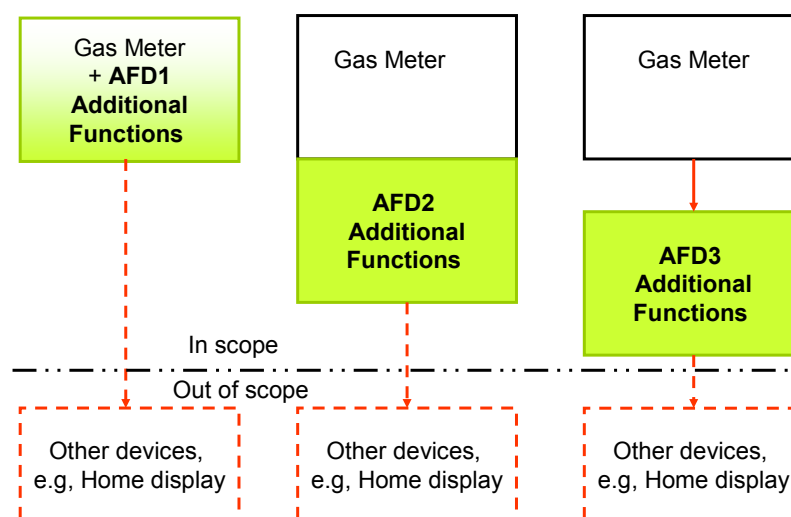


Figure 1 — Additional functionality device

1 Scope

This European Standard specifies the additional requirements and tests for gas meters with a maximum capacity of 40 m³/h and a maximum operating pressure of not exceeding 500 mbar, conforming to EN 1359, EN 12261, EN 12480, EN 12405 and EN 14236, which have battery powered devices providing additional functionalities that form part of the gas meter (hereafter referred to as meter) or contained in an Additional Functionality Device (AFD). It also covers the additional requirements when an electronic index is used rather than a mechanical one. Where the option of an integral valve to the meter is specified, this standard only gives requirements for meters having a maximum capacity not exceeding 10 m³/h.

This European Standard is applicable to first, second and third family gases according to EN 437.

This European Standard specifies the construction requirements for electronic components but communication protocols are dealt within other European Standards, e.g. appropriate parts of EN 13757.

NOTE This European Standard covers connections to auxiliary devices but not the requirements for these devices.

This European Standard applies to AFDs that are installed in locations with vibration and shocks of low significance and in:

- closed locations (indoor or outdoor with protection as specified by the manufacturer) with condensing or with non-condensing humidity,

or, if specified by the manufacturer:

- open locations (outdoor without any covering) with condensing humidity or with non-condensing humidity,
- locations liable to temporary saturation,

and in locations with electromagnetic disturbances corresponding to those likely to be found in residential, commercial buildings or similar buildings.

This European Standard does not cover the changing of metrological software within the meter or the upload/download of metrological software.

This European Standard only covers valves integral to the meter.

2 Normative references

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

EN 1359, *Gas meters — Diaphragm gas meters*

EN 12261, *Gas meters — Turbine gas meters*

EN 12405-2, *Gas meters — Conversion devices — Part 2: Energy conversion*

EN 12480, *Gas meters — Rotary displacement gas meters*

EN 13611, *Safety and control devices for gas burners and gas-burning appliances — General appliances*

EN 13757-1, *Communication system for meters and remote reading of meters — Part 1: Data exchange*

EN 13757-2, *Communication systems for remote reading of meters — Part 2: Physical and link layer*

- EN 13757-3, *Communications systems for and remote reading of meters — Part 3: Dedicated application layer*
- EN 13757-4, *Communication systems for meters and remote reading of meters — Part 4: Wireless meter readout (radio meter reading for operation in the 868 MHz to 870 MHz SRD band)*
- EN 13757-5, *Communications systems for and remote reading of meters — Part 5: Wireless relaying*
- EN 13757-6, *Communications systems for and remote reading of meters — Part 6: Local bus*
- EN 14236, *Ultrasonic domestic gas meters*
- EN 55022, *Information Technology Equipment — Radio disturbance characteristics — Limits and methods of measurement*
- EN 60079 (all parts), *Explosive atmospheres*
- EN 60086-1, *Primary batteries — Part 1: General*
- EN 60086-4, *Primary batteries — Part 4: Safety of lithium batteries*
- EN 60529, *Degrees of protection provided by enclosures (IP code)*
- EN 60950-1, *Information technology equipment — Safety — Part 1: General requirements*
- EN 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*
- EN 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*
- EN 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test*
- EN 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test*
- EN 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields*
- EN 61000-4-8, *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test*
- EN 61000-4-9, *Electromagnetic compatibility (EMC) — Part 4-9: Testing and measurement techniques — Pulse magnetic field immunity test*
- EN 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments*
- EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*
- EN 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements*
- EN 62056-21, *Electricity metering — Data exchange for meter reading, tariff and load control — Part 21: Direct local data exchange*

EN ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3)*

EN ISO 6270-1, *Paints and Varnishes — Determination of resistance to humidity — Part 1: Continuous condensation (ISO 6270-1)*

EN ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1)*

IEC 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General Requirements*

ISO 7724-3, *Paints and Varnishes — Colorimetry — Part 3: Calculation of colour differences*

ASTM D1003, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics (edition 11)*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

function

process which constantly or at defined intervals, automatically or on demand, performs specific activities such as sampling data, reading a data set, verifying or changing a status, or activating a switch

3.1.2

additional functionality

functions over and above that within the meter, which can be integral to the meter, or included within a connected device

3.1.3

additional functionality device

carries out the additional functionalities

3.1.4

additional functionality device Type 1

factory fitted additional functionality integral within the meter

3.1.5

additional functionality device Type 2

factory or field fitted additional functionality directly attached to the meter

3.1.6

additional functionality device Type 3

field fitted additional functionality connected to the meter

3.1.7

meter

instrument designed to measure, memorise and display the quantity of gas (volume or mass) that has passed it

Note 1 to entry: A volume conversion device is a sub-assembly of a meter and therefore in this standard it is part of the meter.

3.1.8

automatic meter reading

technology for obtaining metering data from an on-site meter by communication from an access point outside the premises

3.1.9

connector

mechanical device, or pair of devices, that makes a semi-permanent circuit between the meter and a cable

3.1.10

universal time coordinated

world time, without daylight savings

3.1.11

index

current reading of the total volume (mass) passed through the meter

3.1.12

metrological software

software identified during the type testing examination, which is part of the meter and is critical to its metrological characteristics

3.1.13

register

electronic component which memorises the values of the meter and/or the AFD

3.1.14

maximum permissible error

extreme value of measurement error, with respect to a known reference quantity value, permitted by specifications or regulations for a given measurement, measuring instrument, or measuring system

3.1.15

tariff

price structure (normally comprising a set of one or more rates of charge) applied to the consumption of a product or service provided to a consumer

3.1.16

event

condition requiring action or to log an action

3.1.17

display

shows visual information in either numbers or text

3.2 Abbreviated terms

Table 1 — Abbreviations

AFD1	Additional functionality device Type 1
AFD2	Additional functionality device Type 2
AFD3	Additional functionality device Type 3
UTC	Universal Time Coordinated
MPE	Maximum Permissible Error

4 General requirements

4.1 Meter

A meter shall comply with one of the following European Standards: EN 1359, EN 12405-2, EN 12261, EN 12480 or EN 14236 as applicable.

4.2 Meters with electronic index

Where a meter conforming to 4.1 is equipped with a primary electronic index, the electronic index and its associated software and hardware shall meet the requirements of Annex C and the relevant parts of this standard and the meter standard.

4.3 Suitability – AFD/Meter combination

The AFD shall work at the same minimum operating conditions as the meter required by the appropriate above mentioned standards.

The AFD shall be connected to the meter and tested as a combined unit in all the tests given in 4.4 to 4.17 to ensure the connection of the AFD to the meter has no metrological influence. The connection of the AFD to the meter or any labelling on the meter/AFD shall not obscure or damage the metrological seals of the meter.

The index on the meter shall not be obscured by the connection of the AFD and the index shall be accessible to the consumer without the use of tools.

The manufacturer of the AFD shall declare the conditions for compatibility with any interface and meters.

4.4 Types of additional functionality devices

The additional functionality shall be provided by one of the following devices:

- a) AFD1,
- b) AFD2,
- c) AFD3.

In the case of an AFD1, all functions shall be within the same casing as the meter.

In the case of an AFD2, the AFD2 shall be directly attached to the meter.

In the case of an AFD3, the AFD3 shall be connected to the meter.

The fitting of the AFD to the meter shall not obstruct or obscure the metrological seal.

The AFD shall be connected to the meter in accordance with the manufacturer's instructions during all tests specified in this standard.

The index shall be easily read without the use of tools by the consumer and shall be unambiguously and boldly displayed within the index.

4.5 AFD1

4.5.1 Requirements

When tested in accordance with 4.5.2, the AFD shall have no influence on the metrological characteristics of the meter.

4.5.2 Test

Test the meter with the AFD1 incorporated according to the appropriate standard, i.e. EN 1359, EN 12405-2, EN 12480, EN 12261 or EN 14236, to ensure conformity.

4.6 AFD2

4.6.1 Requirements

- a) When tested in accordance with 4.6.2 a), the AFD shall have no influence on the metrological characteristics of the meter.
- b) If the AFD provides a facsimile of the meter's results, it shall be tested in accordance with 4.6.2 b) to ensure these results are identical to that on the meter.
- c) When tested in accordance with 4.6.2 c), the AFD shall operate with the interfaces specified by the manufacturer and display the information as specified by the manufacturer.
- d) There shall be the possibility to be able to apply a protective seal between the ADF and the meter.

4.6.2 Test

- a) Fit the AFD to the meter and undertake the relevant tests specified in Clauses 4 and 7.
- b) Examine the meter and AFD and ensure these results are identical to that on the meter.
- c) Verify the AFD is interoperable with those interfaces specified by the manufacturer.
- d) Examine the meter and AFD and ensure there is the possibility to apply a protective seal between the ADF and the meter.

4.7 AFD3

4.7.1 Requirements

- a) When tested in accordance with 4.7.2 a), the AFD shall have no influence on the metrological characteristics of the meter.
- b) If the AFD provides a facsimile of the meter's results, it shall be tested in accordance with 4.7.2 b) to ensure these results are identical to that on the meter.
- c) The AFD manufacturer shall ensure interoperability and specify the types of interface with which it is compatible.

4.7.2 Test

- a) Fit the AFD to the meter in accordance with the AFD manufacturer's instructions and repeat the relevant tests specified Clauses 4 and 7.

- b) Examine the meter and AFD and ensure these results are identical to that on the meter.
- c) Undertake an assessment of the documented evidence provided by the manufacturer.

4.8 Resistance to high ambient temperature

If the manufacturer declares the meter associated with any AFD1 or AFD2 is resistant to high ambient temperatures, the connection or incorporation of the AFD shall not affect its resistance to high ambient temperature.

NOTE Further information is provided in the appropriate meter standard for the requirements for meter's resistance high ambient temperature.

4.9 Climatic environments

4.9.1 General

For an AFD1 and AFD2, the AFD shall be at least suitable for the same climatic requirements as the meter. This shall be achieved by fulfilling the requirements given in 4.9.2, 4.9.3, 4.9.4, 4.9.5 and 4.9.6.

The AFD3 and any physical connection shall meet the requirements given in 4.9.2, 4.9.3, 4.9.5 and 4.9.6.

4.9.2 Closed location

4.9.2.1 Requirement

All meters/AFDs shall meet this requirement.

- a) When tested in accordance with 4.9.2.2 a), the AFD shall meet the requirements of EN 60529 for an IP54 code.
- b) When tested in accordance with 4.9.2.2 b), the functions specified by the manufacturer of the meter/AFD shall be maintained and the index/register markings shall remain legible.

4.9.2.2 Test

- a) Test one meter/AFD in accordance with EN 60529 and confirm it is suitable for an IP54 code.
- b) Test one meter/AFD in accordance with EN ISO 6270-1 for a period of 120 h. Then check the functions of the AFD for correct operation, and ensure the index/register marking and information are legible.

4.9.3 Open location

4.9.3.1 General

When the manufacturer declares that the meter/AFD is suitable for 'Open locations' it shall meet the following requirement and shall be marked in accordance with Clause 8.

4.9.3.2 Requirement

- a) When tested in accordance with 4.9.3.3 a), the AFD shall meet the requirements of EN 60529 for an IP65 code.
- b) When tested in accordance with 4.9.3.3 b), the functions specified by the manufacturer of the meter/AFD shall be maintained and the index/register markings shall remain legible.

- c) All markings on the meter/AFD, the index and index plate when viewed through the index window and any separate data plate, if fitted, shall remain easily legible after being subjected to the test given in 4.9.3.3.c).

Total colour difference measured in accordance with ISO 7724-3 shall be inside the following limits:

- $\Delta L^* \leq 7$
- $\Delta a^* \leq 7$
- $\Delta b^* \leq 14$

Light transmission in accordance with ASTM D1003 shall have Haze ≤ 15 %.

4.9.3.3 Test

- a) Test one meter/AFD in accordance with EN 60529 and confirm it will be suitable for an IP65 code.
- b) Test one meter/AFD in accordance with EN ISO 6270-1 for a period of 340 h. Then check the functions of the AFD for correct operation, and ensure the index/register marking and information are legible.
- c) One meter/AFD shall be exposed for 66 days to artificial weathering and exposure to artificial radiation in accordance with EN ISO 4892-3 and the parameters in Table 2.

Prior to exposure measurements will be made to enable the test criteria to be assessed.

Table 2 — Solar Radiation

Test cycle	Wavelength/ Lamp type	Irradiance	Black panel- temperature
8 h dry	UVA 340	0,76 W(m ⁻² •nm ⁻¹) at 340 mm	(60 - 3) °C
4 h condensation		light out	(50 - 3) °C

Following exposure, the meter shall be visually inspected for legibility. All markings on the meter, the index and index plate when viewed through the index window and any separate data plate, if fitted, shall remain legible. Appropriate tests shall be carried out to check the requirements for colour difference and transmission of light are met.

4.9.4 Location liable to temporary saturation

4.9.4.1 General

When the manufacturer declares that the meter/AFD is suitable for locations liable to temporary saturation, it shall meet the following requirement and shall be marked in accordance with Clause 8.

4.9.4.2 Requirement

- a) When tested in accordance with 4.9.4.3 a), the meter/AFD shall meet the requirements of EN 60529 for an IP67 code.

- b) When tested in accordance with 4.9.3.2 b) and 4.9.3.2 c), the function of the meter/AFD specified by the manufacturer of the meter/AFD shall be maintained and the index/register markings shall remain legible.

4.9.4.3 Test

- a) One meter/AFD shall be tested for its function before and after the testing in accordance with the IP67 code of EN 60529.
- b) Test one meter/AFD in accordance with 4.9.3.2 b) and check the functions of the meter/AFD for correct operation. Test one meter/AFD in accordance with 4.9.3.2 c) and check if the requirements of 4.9.3.1 c) are met.

4.9.5 Mechanical (Vibration) class

4.9.5.1 Requirements

As declared by the manufacturer, the AFD shall retain its functions before and after being subjected to the vibration test described in 4.9.5.2.

4.9.5.2 Test

In the case of an AFD2 it shall be directly attached to the meter.

Carry out the functions test to secure that the functions of the AFD are correct.

Secure the AFD under test to the vibration test rig, a diagrammatic layout of which is shown in Figure 2, by means of a horizontal clamp across the top of the AFD.

In Figure 2, the AFD under test (2) is shown mounted to the spindle of an electrodynamic shaker (1), which is driven by an amplified sine wave from a voltage generator. The head of the shaker can be rotated through 90° for the fore-aft and lateral planes.

The acceleration level is sensed using an accelerometer (3) (piezoelectric transducer) whose output is conditioned using a charge amplifier (4).

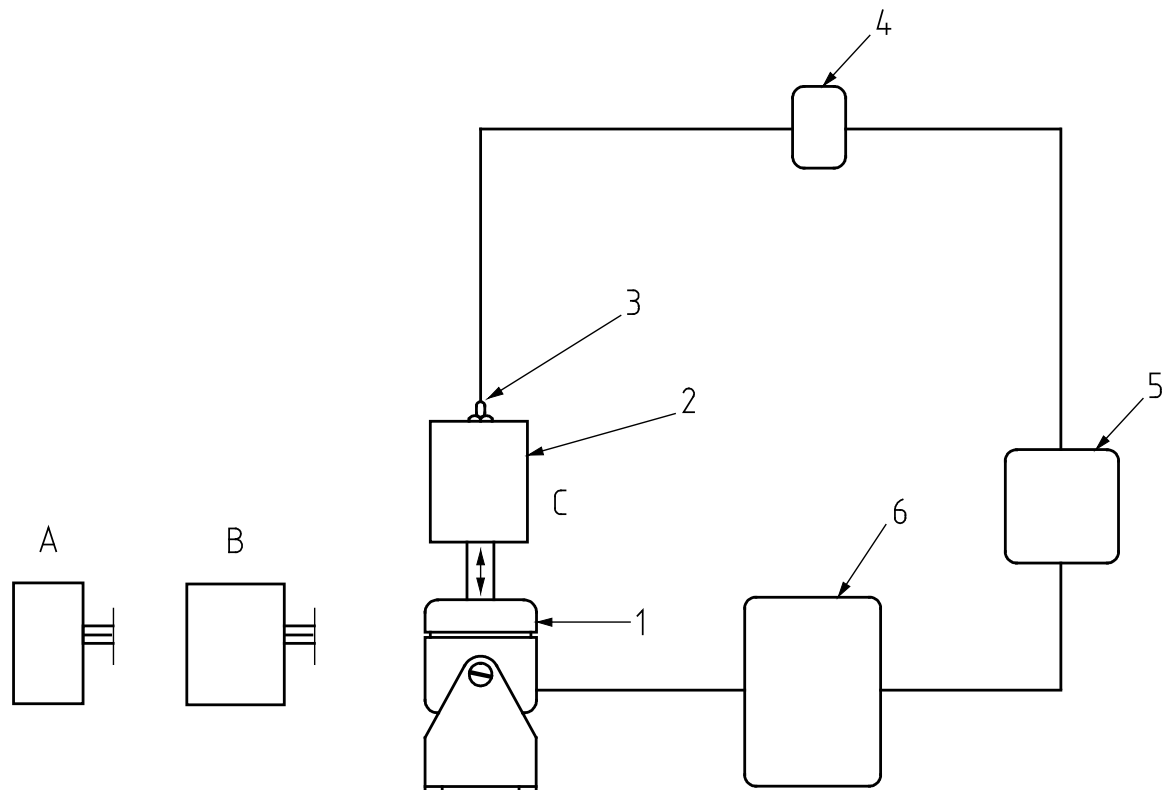
An automatic vibration exciter control (5), which is inserted between the conditioned accelerometer signal and the power amplifier (6), is used in a sweeping mode in which the frequency is cycled between a pair of selected frequencies, alternatively increasing and decreasing.

Subject the AFD under test to a swept frequency of between 10 Hz and 150 Hz ($\pm 5\%$) at a sweep rate of 1 octave per minute with a peak acceleration of $2 g_n$ ($\pm 5\%$), for 20 sweeps in the vertical plane, 20 sweeps in the fore-aft plane and 20 sweeps in the lateral plane.

Recheck the functions of the AFD under test.

The clamping force should be sufficient to restrain the AFD under test without causing damage or distortion to the AFD case.

NOTE An octave is a band of frequency where the upper frequency limit of the band is exactly twice the lower limit, e.g. 10 Hz to 20 Hz, 20 Hz to 40 Hz, 40 Hz to 80 Hz and 80 Hz to 160 Hz. Therefore, the time taken to sweep from 10 Hz to 100 Hz at a sweep rate of 1 octave per minute is 3 min 15 s.



Key

- 1 electronic shaker
- 2 AFD
- 3 accelerometer
- 4 charge amplifier
- 5 automatic vibration exciter control
- 6 power amplifier
- A ADF for-aft plane
- B ADF lateral plane
- C ADF vertical plane

Figure 2 — Diagrammatic layout of the vibration test apparatus

4.9.6 Temperature range

As a minimum, the AFD shall be capable of meeting the requirements for the minimum storage temperature range of $\leq -20\text{ °C}$ to $\geq +60\text{ °C}$.

For an AFD1 or AFD2 the manufacturer shall specify the ambient temperature range with a minimum temperature range of 50 °C for the climatic environment, and the minimum temperature limit being either -40 °C , -25 °C , -10 °C or 5 °C , and the maximum temperature limit being either 30 °C , 40 °C , 55 °C or 70 °C . An AFD1 or AFD2 shall have at least the same ambient temperature range as the meter.

For an AFD3, the manufacturer shall specify the ambient temperature range with a minimum temperature of at least $+5\text{ °C}$ to $+30\text{ °C}$.

4.10 Gas temperature range

For an AFD1, the gas temperature range shall be a minimum of 40 °C and be within the ambient temperature range.

4.11 Safety Requirements

4.11.1 Pressure Absorption

Any additional functionality shall not cause the pressure absorption to be greater than that required by the appropriate meter standard.

NOTE 1 EN 1359 and EN 14236 have requirements for the pressure absorption of the meter. Pressure at the appliance is very important to safe use of gas, especially for older appliances which may lack flame failure detection.

NOTE 2 Correct operation of valves and their impact on pressure absorption is given in 7.13.

4.11.2 Use in hazardous areas

When the manufacturer declares that the meter / AFD is suitable for use in hazardous zones as defined in EN 60079-10-1, the manufacturer shall declare the zone for which it is intended and shall identify the route to compliance as defined in EN 60079-0. The general requirements for, construction and marking of the meter / AFD shall then comply with EN 60079-0.

4.11.3 Electrical Safety

The manufacturer of the AFD shall declare:

- a) any electrical safety requirements;
- b) suitable environments where it can be fitted;
- c) how to install, maintain and use it.

When the AFD incorporates a radio communications device it shall meet the general safety requirements as defined in EN 61010-1 or EN 60950-1.

4.12 Immunity to electromagnetic disturbances

4.12.1 General

The meter/AFD shall be designed and manufactured in such a way to tolerate the effects of magnetic fields, electrostatic discharge and other electromagnetic disturbances.

4.12.2 Permanent magnetic fields

4.12.2.1 Requirements

When tested in accordance with 4.12.2.2, the difference in mean errors and the errors during the positioning of a permanent magnet that generates a magnetic field of 200 mT shall not exceed one third of the MPE specified in the appropriate meter standard. The functionalities of the AFD as declared by the manufacturer shall remain operable without any loss of data.

4.12.2.2 Test

Ensure the AFD is connected to the meter in accordance with the manufacturer's instructions. Stabilise the meter/AFD to room temperature and test the meter three times at Q_{max} and 0,2 Q_{max} in accordance with the appropriate meter standard.

Place the magnet on all surfaces of the AFD in a grid pattern 4 cm wide. Test on every point of the grid at Q_{max} .

Retest the meter but again, stabilising the AFD to room temperature and test the meter three times at Q_{max} and 0,2 Q_{max} in accordance with the appropriate meter standard.

4.12.3 Electrostatic discharge

4.12.3.1 Requirements

When tested in accordance with 4.12.3.2, the difference in mean errors shall not exceed one third of the *MPE* specified in the appropriate meter standard and the additional functionalities of the AFD as declared by the manufacturer shall remain operable without any loss of data.

4.12.3.2 Test

Ensure the AFD is connected to the meter in accordance with the manufacturer's instructions.

Stabilise the meter/AFD to room temperature and test the meter three times at Q_{max} and 0,2 Q_{max} in accordance with the appropriate meter standard.

With no flow through the meter, test the meter in accordance with EN 61000-4-2 using 10 contact discharges to each of:

- a) the conductive surfaces;
- b) a horizontal;
- c) a vertical coupling plane with a charge voltage of 6 kV (EN 61000-6-1 and EN 61000-6-2) at intervals of a minimum of 1 s, with the battery fitted.

With no flow through the meter, test the meter in accordance with EN 61000-4-2 using 10 air discharges (to insulating surfaces) with a charge voltage of 8 kV (EN 61000-6-1 and EN 61000-6-2) at intervals of a minimum of 1 s, with the battery fitted.

During the test, connect the inlet boss of the meter under test to the 'ground plane'.

Retest the meter but again stabilise the meter/AFD to room temperature and test the meter three times at Q_{max} and 0,2 Q_{max} in accordance with the appropriate meter standard.

Confirm there has been no loss of data.

4.12.4 Radio frequency electromagnetic field

4.12.4.1 Requirements

During the test specified in 4.12.4.2 a), the meter index shall neither increment nor decrement and the additional functionalities declared by the manufacturer shall remain operable and without loss of data.

During the test specified in 4.12.4.2 b), the flow rate calculated from the meter readings shall not vary by more than three times the *MPE* and after testing in accordance with 4.12.4.2 b), the mean errors shall be within the *MPE* specified in the standard.

4.12.4.2 Test

Ensure the AFD is connected to the meter in accordance with the manufacturer's instructions.

a) Set the flow rate to zero.

Read the volume register and non-volatile memory

Test the meter in accordance with EN 61000-4-3, under the classification E1:

frequency band:	26 MHz to 3 000 MHz
test field strength:	10 V/m
amplitude modulation:	80 %, 1 kHz sine wave

Read the volume register and non-volatile memory and compare with the value before the high frequency test.

b) Arrange the test equipment so that it is possible to pass air through the test meter while it is being subjected to the electromagnetic field.

NOTE One way of achieving this is to use a sonic nozzle between the meter outlet and a vacuum line.

Test the meter under the conditions given below. During the test, read the index and elapsed time at suitable intervals. From these readings, calculate the corresponding flow rates.

Stabilise the meter/AFD to room temperature and test the meter three times at Q_{max} in accordance with the appropriate meter standard and determine its *MPE*. Maintain the meter at Q_{max} and subject the meter/AFD to the range of high frequency field in accordance with EN 61000-4-3, under the classification E1:

frequency band:	26 MHz to 3 000 MHz
test field strength:	10 V/m
amplitude modulation:	80 %, 1 kHz sine wave

With the high frequency field switched off retest the meter/AFD in accordance with the appropriate meter standard at Q_{max} and ensure the meter is still within its *MPE*.

Confirm there has been no loss of data and the mean errors have remained within the *MPE* specified in the standard.

4.12.5 Electromagnetic induction (power frequency)

4.12.5.1 Requirements

When tested in accordance with 4.12.5.2 a), the AFD register/index shall neither increment nor decrement and the additional functionalities declared by the manufacturer shall remain operable and without loss of data.

During the test described in 4.12.5.2 b), the flow rate calculated from the meter readings shall not vary by more than six times the *MPE* specified in the appropriate meter standard, during any of the eight periods of the test without showing an error flag (excluding any error flag designed to appear when entering a test mode).