Operating Instruction
OI/FMT500-IG-EN

Thermal Mass Flowmeter
Sensyflow FMT500-IG

for gases, intelligent
Analog / HART
PROFIBUS DPV1

HART COMMUNICATION PROTOCOL

PROFIBUS

Thermal Mass Flowmeter
Sensyflow FMT500-IG

Operating Instruction

OI/FMT500-IG-EN

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Rev. B

Translation of the original instruction

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1 Safety

1.1 General information and notes for the reader

You must read these instructions carefully prior to installing and commissioning the device.

These instructions are an important part of the product and must be kept for future reference.

These instructions are intended as an overview and do not contain detailed information on all designs for this product or every possible aspect of installation, operation and maintenance.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.

The content of these instructions is neither part of any previous or existing agreement, promise or legal relationship nor is it intended to change the same.

This product is built based on state-of-the-art technology and is operationally safe. It has been tested and left the factory in perfect working order from a safety perspective. The information in the manual must be observed and followed in order to maintain this state throughout the period of operation.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Only by observing all of the safety instructions and all safety/warning symbols in these instructions can optimum protection of both personnel and the environment, as well as safe and fault-free operation of the device, be ensured.

Information and symbols directly on the product must be observed. They may not be removed and must be fully legible at all times.

1.2 Intended use

Mass flow measurement of gases and gas mixtures in closed pipelines.

The device is designed for use exclusively within the values stated on the name plate and in the technical specifications (see the section titled "Specifications").

1.2.1 General information

- The device (including the pipe components) has been designed, produced and approved in accordance with Pressure Equipment Directive 2014/68/EU. The pipe components take the form of a
  - Wafer design
  - Flange design with integrated measuring section
  - Weld-on adapter

  The device may only be used in accordance with the application specified on the order confirmation; other operating conditions may prevent the device from functioning correctly, cause damage to it or even damage it beyond repair.
- Care must be taken to ensure that the measuring media used do not impair the chemical and physical properties of the components that come into contact with the fluids concerned.
- The threshold value for alternating load cycles corresponds to AD-2000 instruction sheet S1, Section 1.4 and is not calculated or checked by the manufacturer.
- The device should be included in any regular maintenance activities that are carried out on the entire system.
- The materials used must be checked by the user to ensure their suitability for the application concerned.
- The maximum operating conditions relating to pressure and temperature, as stated on the name plate / in the operating instructions, must not be exceeded.
- When installing and disassembling pipe components or flowmeter sensors, ensure that the pipeline has been depressurized.
  - Exception: If you are using a hot tap fitting.
- Before carrying out installation work on pipelines used to carry aggressive or toxic measuring media, media that may be classed as irritant, or other kinds of hazardous media, the fluids concerned must be adequately flushed out. Compliance with the relevant accident prevention regulations must also be ensured.
- If damaged, components must no longer be used. They must be taken out of circulation and sent to the manufacturer for repair.
- If disassembled components have come into contact with aggressive or toxic measuring media, media that may be classed as irritant, or other kinds of hazardous media, before being sent off they must be cleaned and then packed and labeled accordingly.
- If leaks occur at the measuring point, it must immediately be taken out of service.
- Defective gaskets or O-rings must be removed from use and must be replaced as a matter of urgency.
- The subsequent mechanical labeling or machining of pipe components and flowmeter sensors can result in damage and is prohibited.
  - Exception: Cutting to length and welding onto the pipeline in the case of weld-on adapters.

1.2.2 Installing / Disassembling pipe components

- During installation, it is important to ensure that the flow direction corresponds to the attached label.
- When welding the weld-on adapter, remember to observe the relevant welding instructions. The amount of heat introduced must be kept to an absolute minimum to prevent warping of the mounting flange's sealing surface.
- In the case of flanged connections, flat gaskets must be installed. These must be in perfect condition and resistant to the measuring media.
- Before installing pipe components or flowmeter sensors, check all components and gaskets for damage.
- Pipe components must not be installed under tension, otherwise the pipeline may be subjected to impermissible forces.
- When assembling the flanged connections, use screws that offer the required strength and dimensions.
- The screws must be tightened evenly and to the required torque.
- Once the pipe components have been installed, the insertion connection must be sealed by means of a blind flange plus gasket or by closing a shut-off device (if present).

1.2.3 Installing / Disassembling the flowmeter sensor

- Installation in the pipe component or weld-on adapter is only possible if the flowmeter sensor data matches the measuring point specifications.
- It is very important to use the O-ring supplied (not a flat gasket). This is resistant to measuring media and should be inserted in the groove provided in the pipe component flange.
- Take care not to damage the measuring elements when inserting the flowmeter sensor into the pipe component, as this is not permitted.
- The flowmeter sensor should be firmly bolted together with the flange of the insertion connection. The screws must be tightened evenly to the required torque.
- Torque for screws supplied: 87 Nm (unlubricated, without using spring washers).
- If you are using a pipe component with a hot tap fitting, you must check that the hot tap fitting is in the disassembly position before releasing the mounting screws.

1.3 Target groups and qualifications

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator to do so. The specialist personnel must have read and understood the manual and comply with its instructions.

Prior to using corrosive and abrasive materials for measurement purposes, the operator must check the level of resistance of all parts coming into contact with the materials to be measured. ABB Automation Products GmbH will gladly support you in selecting the materials, but cannot accept any liability in doing so.

The operators must strictly observe the applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical products.

1.4 Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this instruction, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

1.5 Plates and symbols

1.5.1 Safety- / warning symbols, note symbols

DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent danger. Failure to observe this safety information will result in death or severe injury.

DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.

WARNING – <Bodily injury>

This symbol in conjunction with the signal word “Warning“ indicates a possibly dangerous situation. Failure to observe this safety information may result in death or severe injury.

WARNING – <Bodily injury>

This symbol in conjunction with the signal word "Warning" indicates a potential electrical hazard. Failure to observe this safety information may result in death or severe injury.

CAUTION – <Minor injury>

This symbol in conjunction with the signal word “Caution“ indicates a possibly dangerous situation. Failure to observe this safety information may result in minor or moderate injury. This may also be used for property damage warnings.

NOTICE – <Property damage>!

The symbol indicates a potentially damaging situation.

Failure to observe this safety information may result in damage to or destruction of the product and/or other system components.

IMPORTANT (NOTE)

This symbol indicates operator tips, particularly useful information, or important information about the product or its further uses. It does not indicate a dangerous or damaging situation.

1.5.2 Accompanying documents

Depending on the version, the following are supplied in addition to the operating instructions:

- In the case of devices manufactured according to DVGW: A copy of the DVGW approval
- In the case of devices used in gaseous oxygen: Clearance certificate in the form of a manufacturer's certificate

1.6 Name plates

1.6.1 Standard

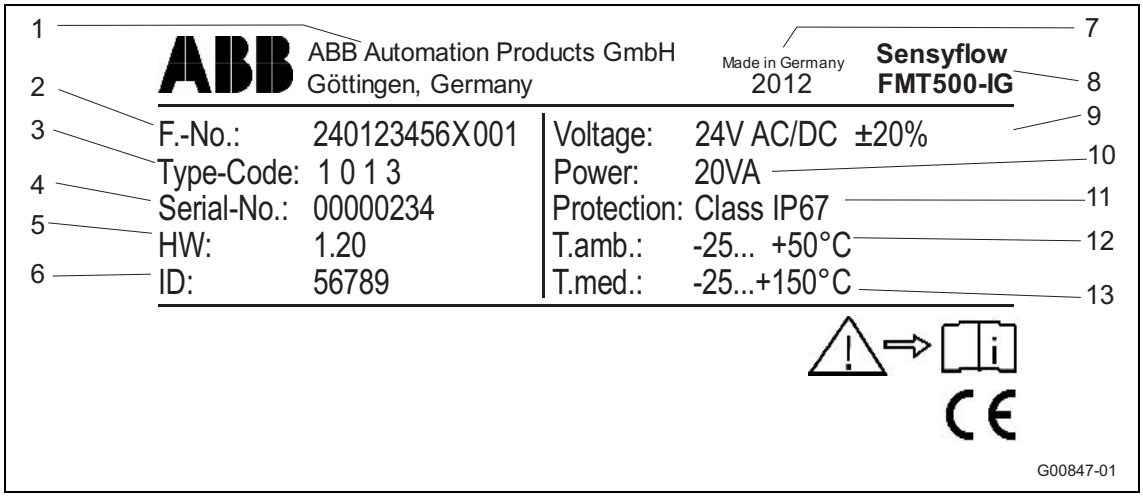


Fig. 1

1 Manufacturer
2 Serial number
3 Internal model number
4 Serial number
5 Hardware version
6 ID number (internal calibration number)
7 Year of manufacture, country of manufacture
8 Full name of model
9 Power supply
10 Maximum power
11 Protection class
12 Permissible ambient temperature
13 Measured medium temperature

1.6.2 Transmitter with remote mount design

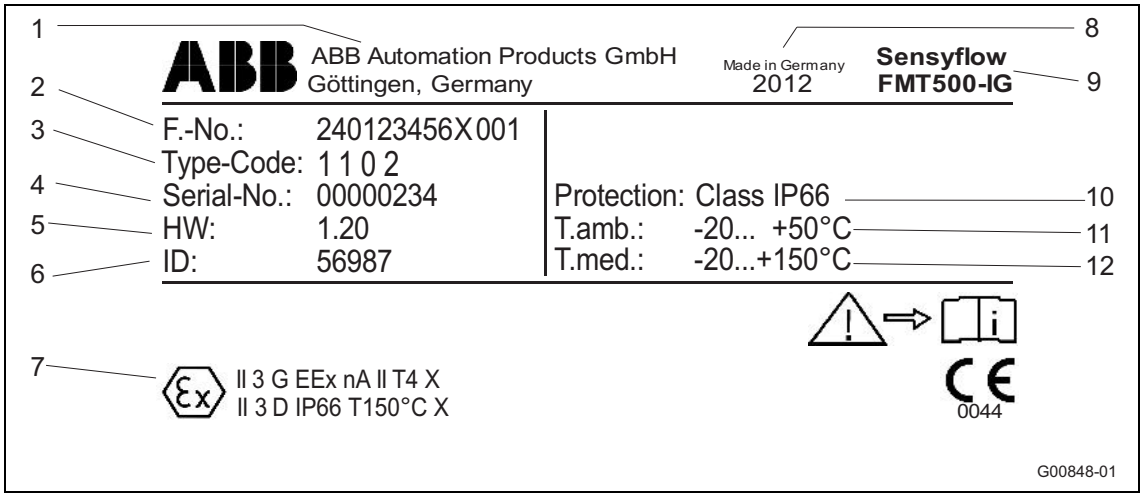


Fig. 2

1 Manufacturer
2 Serial number
3 Internal model number
4 Serial number
5 Hardware version
6 ID number (internal calibration number)
7 Explosion protection labeling, e.g., ATEX
8 Year of manufacture, country of manufacture
9 Full name of model
10 Power supply
11 Maximum power
12 Protection class
13 Permissible ambient temperature

1.6.3 Flowmeter sensor with remote mount design

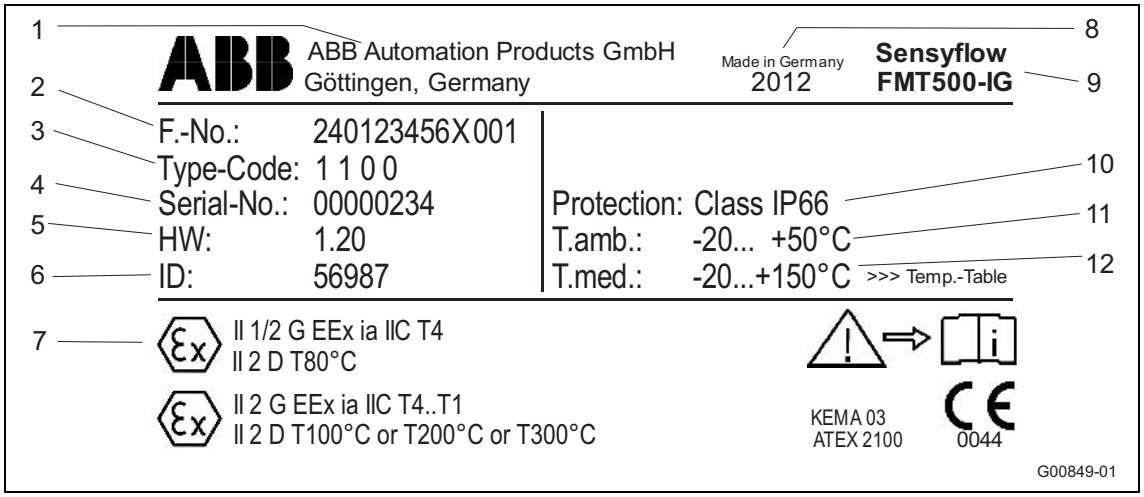


Fig. 3

1 Manufacturer
2 Serial number
3 Internal model number
4 Serial number
5 Hardware version
6 ID number (internal calibration number)
7 Explosion protection labeling, e.g., ATEX
8 Year of manufacture, country of manufacture
9 Full name of model
10 Protection class
11 Permissible ambient temperature
12 Measured medium temperature

1.6.4 Integral mount design

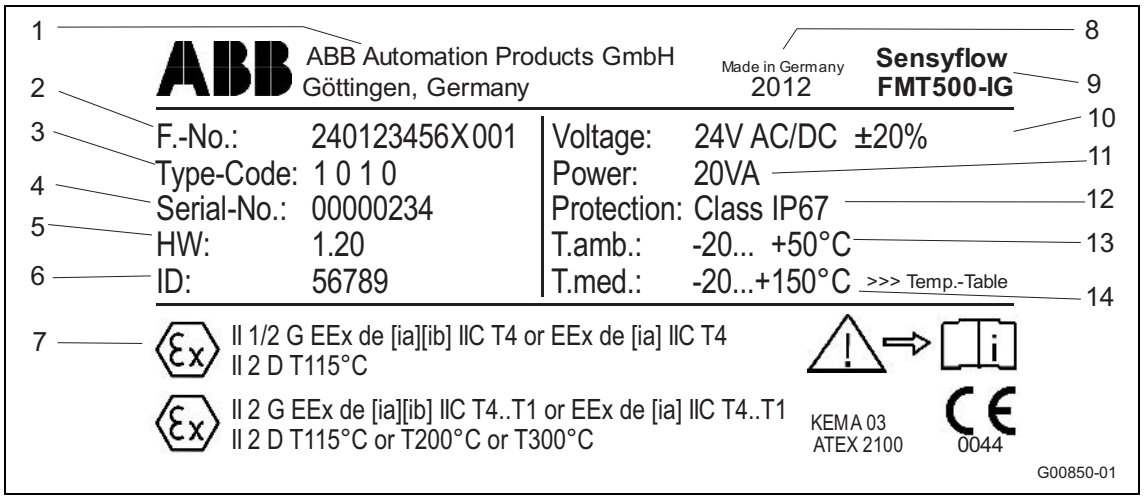


Fig. 4

1 Manufacturer
2 Serial number
3 Internal model number
4 Serial number
5 Hardware version
6 ID number (internal calibration number)
7 Explosion protection labeling, e.g., ATEX
8 Year of manufacture, country of manufacture
9 Full name of model
10 Power supply
11 Maximum power
12 Protection class
13 Permissible ambient temperature
14 Measured medium temperature

1.7 Safety instructions for electrical installation

The electrical connection may only be made by authorized specialist personnel according to the electrical plans.

The electrical connection information in the manual must be observed; otherwise, the electrical protection type may be adversely affected.

Ground the measurement system according to requirements.

1.7.1 Safety instructions for operation

WARNING

Touching the surface can lead to burns if the measuring media are hot.
This can result in severe injuries or death.
Do not touch.

WARNING

If the measuring medium is allowed to escape in an uncontrolled manner, this can result in severe injuries or death.
Check pipelines and gaskets on a regular basis.

1.8 Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes. Fill out the return form (see the Appendix) and include this with the device.

The EU Directive governing hazardous materials dictates that the owners of any hazardous waste are also responsible for disposing of it.

All devices delivered to the manufacturer must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Pipe components and flowmeter sensors contain hollow spaces. If they have been used in conjunction with hazardous materials, they must therefore be rinsed out in order to neutralize any such substances.

The owner will be charged for any costs incurred as a result of the device not having been adequately cleaned or of any failure to dispose of hazardous materials. The manufacturer reserves the right to return a contaminated device.

Please contact Customer Center Service acc. to page 2 for nearest service location.

1.9 Integrated management system

ABB Automation Products GmbH operates an integrated management system, consisting of:

- Quality management system to ISO 9001
- Environmental management system to ISO 14001
- Occupational health and safety management system to BS OHSAS 18001 and
- Data and information protection management system

Environmental awareness is an important part of our company policy.

Our products and solutions are intended to have a minimal impact on the environment and on people during manufacturing, storage, transport, use, and disposal.

This includes the environmentally-friendly use of natural resources. We conducts an open dialog with the public through our publications.

1.10 Disposal

This product is manufactured from materials that can be reused by specialist recycling companies.

1.10.1 Information on WEEE Directive 2012/19/EU (Waste Electrical and Electronic Equipment)

This product is not subject to WEEE Directive 2012/19/EU or relevant national laws (e.g., ElektroG in Germany).

The product must be disposed of at a specialist recycling facility. Do not use municipal garbage collection points. According to the WEEE Directive 2012/19/EU, only products used in private applications may be disposed of at municipal garbage facilities. Proper disposal prevents negative effects on people and the environment, and supports the reuse of valuable raw materials.

If it is not possible to dispose of old equipment properly, ABB Service can accept and dispose of returns for a fee.

1.11 Calibration certificate

The production process is precisely documented for each measuring system and all the key information relating to the measuring instrument concerned (such as the measuring medium, measuring range(s), nominal diameter(s), serial numbers, and order numbers) is recorded on a calibration certificate (see Appendix).

2 Use in potentially explosive atmospheres

Special regulations must be observed in potentially explosive atmospheres as regards the power supply, signal input / output and ground connections.

All parts must be installed in accordance with the manufacturer's specifications, as well as relevant standards and regulations.

Commissioning and operation must comply with EN 60079-14 (Installation of equipment in potentially explosive atmospheres).

2.1 Approvals

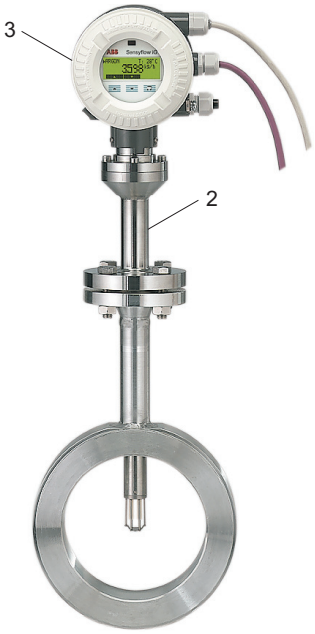
Data relating to the approvals for use in potentially explosive atmospheres can be found in the section titled "Ex relevant specifications".

2.2 Ex relevant specifications

See the section titled "Ex relevant specifications", page 109.

3 Design and function

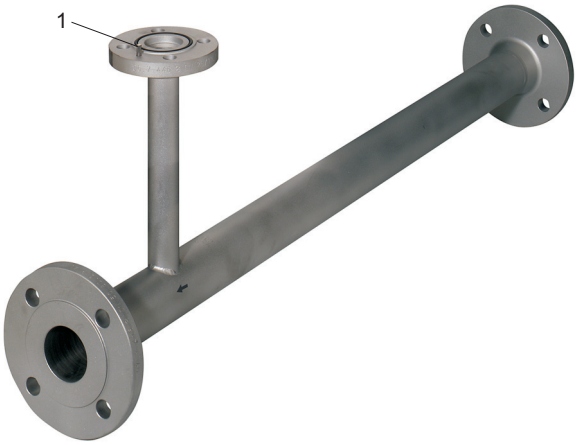
Integral mount design with display



Pipe component design 1
in wafer flange version
DN 40 ... DN 200 / ASME 1 1/2 ... 8“

Remote design with transmitter in field housing

Integrated hot tap fitting in
wafer flange version
DN 50 ... DN 200 / ASME 2 ... 8“



Pipe component design 2 as partial measuring section
DN 25 ... DN 80 / ASME 1 ... 2“

Weld-on adapter
from DN 100 / ASME 4“

Weld-on adapter with ball valve
from DN 100 / ASME 4“

Abb. 5

1 Centering pin on outlet side
2 Flowmeter sensor FMT500-IG
3 Transmitter
4 Connection box

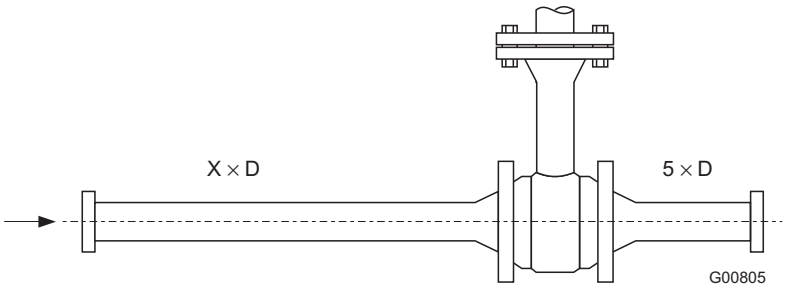
In the case of the integral mount design, the measuring system consists of the following components: transmitter, flowmeter sensor, and pipe component. In the case of the remote mount design, the flowmeter sensor and transmitter are connected by means of a cable with a maximum length of 50 m (164 ft.). In the case of the Zone 0 / 1 / 21 and Zone 2/22 versions with constant power method, the maximum cable length is 25 m (82 ft).

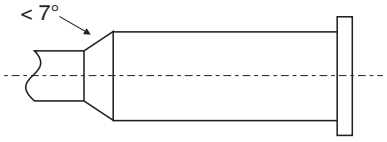
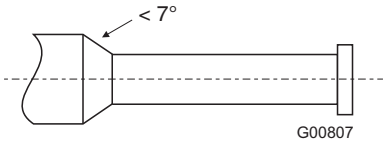
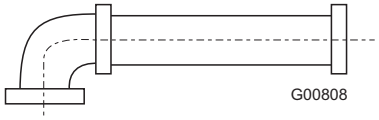
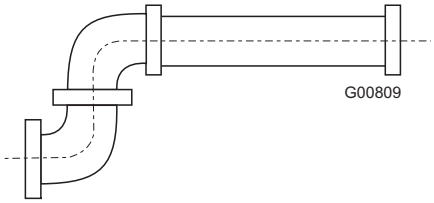
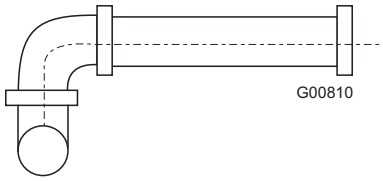
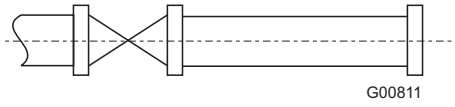
The flowmeter sensor supplies the measuring signals on PROFIBUS or as an analog / HART signal, depending on the version concerned. Operation involves PROFIBUS / HART communication or can be performed locally using the magnetic pen.

The pipe component can be supplied in various designs for nominal diameters ranging from DN 25 ... DN 200 (1 ... 8“). In addition, a weld-on adapter makes it possible to install the flowmeter sensor in rectangular ducts or pipelines with any diameter.

4 Mounting

4.1 Recommended steadying lengths according to DIN EN ISO 5167-1



	Expansion X = 15
	Reducer X = 15
	90° elbow X = 20
	Two 90° elbow in one level X = 25
	Two 90°elbow in two levels X = 40
	Valve / slide X = 50

To achieve the stated measuring accuracy, the steadying lengths seen above must be provided. For combinations of inlet run disturbances, e. g. valve and reducer, you must always consider the longer inlet run length. In confined spaces at the mounting location the outlet run length can be shortened to 3 x D. The reduction of the minimum inlet run length, however, will impact on the achievable accuracy.

High repeatability of the measuring value is still provided. Under certain circumstances, special calibration can be performed for insufficient steadying lengths. For this purpose and in individual cases consulting is necessary.

For gases with extremely low density (hydrogen, helium) the steadying lengths must be doubled.

4.2 Installing the flowmeter sensor and pipe components

Pipe components can be supplied in a wafer type design (type 1) or as a measuring section (type 2) (see Abb. 5) and should be installed stress-free (without torsion / bending stress) in the pipeline along with the appropriate gaskets.

Gaskets must not alter the cross-section of the opening in the pipeline and must ensure complete tightness once the flowmeter sensor and pipe component have been installed. It must be ensured that the gaskets are compatible with the measured medium and the associated temperature.

In the case of the type 1 pipe component (wafer type design), care must be taken to ensure centered installation. The internal diameters of the pipe and flange must match exactly. Any differences in levels or edges, or untidy weld seams, will reduce the measuring accuracy.

Installation is described using the example of a pipe component of type 1 with the wafer type design. The description also applies to a type 2 pipe component and the weld-on adapters.

The flow direction must correspond to the arrow indicated on the pipe component. The centering pin on the pipe component / weld-on adapter must be located on the outflow side (behind the measuring point).

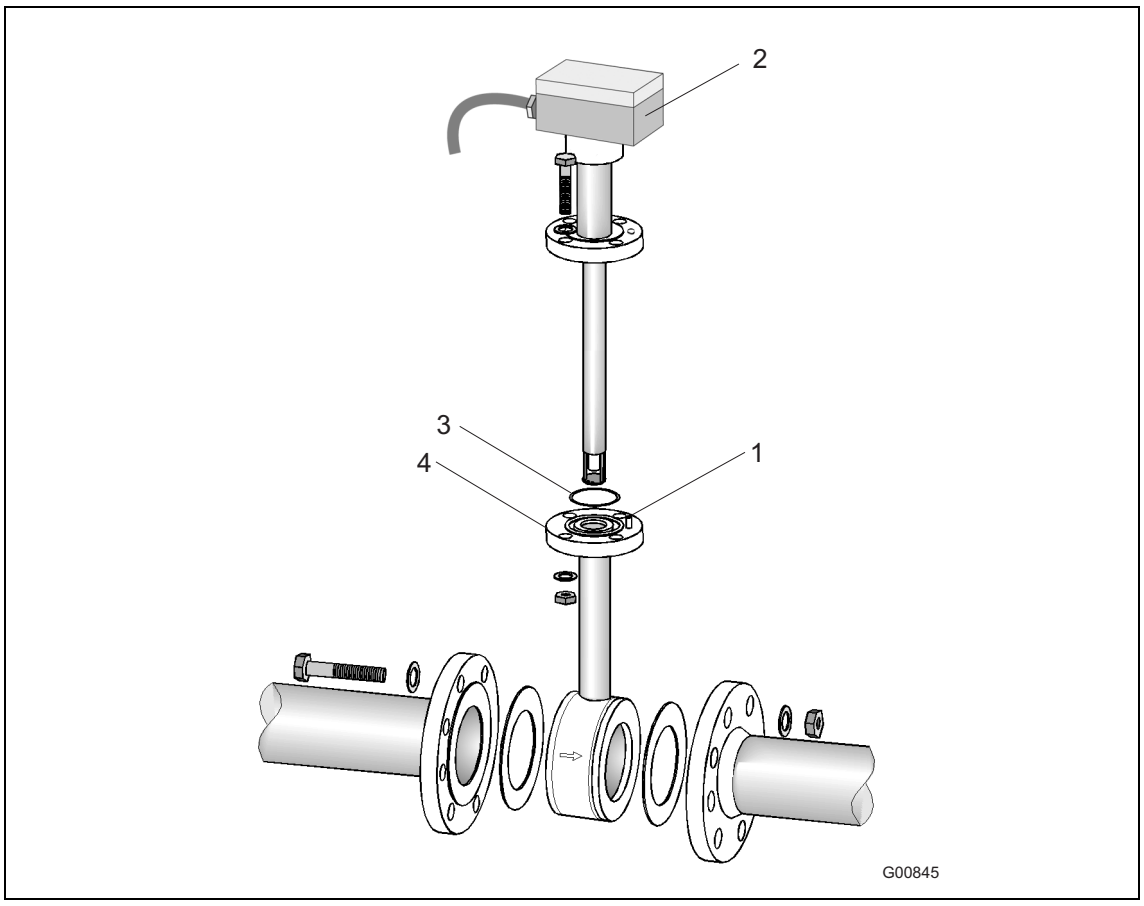


Fig. 6: Schematic representation of type 1 pipe component with wafer type design

1 Centering pin, outflow side
2 FMT500-IG flowmeter sensor
3 O-ring
4 Type 1 pipe component with wafer type design DN 40 .... DN 200 (ASME 1 1/2 ... 8")

Installing the flowmeter sensor

1. Insert the O-ring (55 x 3 mm [2.16 x 0.12 inches]) supplied into the groove provided for this purpose.
2. Push the flowmeter sensor into the adapter and screw into place.
3. All flange screws must be installed properly.

Before disassembling the flowmeter sensor, ensure that the pipeline has been depressurized.

WARNING

If you attempt to install / disassemble the flowmeter sensor at an absolute pressure of more than 1.1 bar, it could fly out, resulting in severe injuries or death.
Use the integrated hot tap fitting.

WARNING

Attempting the installation / disassembly process at high temperatures or when using hazardous gases can result in severe injuries or death.
Use the integrated hot tap fitting.

IMPORTANT (NOTE)

In the case of the type 1 pipe component (wafer type design) with ball valve, flowmeter sensors with a length of 425 mm (16.73 inches) must be used for nominal diameters of DN 125, DN 150, and DN 200 / ASME 6" and ASME 8".

4.3 Weld-on adapter for Sensyflow FMT500-IG

If you are installing the flowmeter sensor in larger nominal diameters or non-circular cable cross sections, you must observe the following points when attaching the weld-on adapter to the pipeline:

1 The length of the weld-on adapter must be equal to L once it has been welded on (see Figures 7 and 8)

L = h – 1/2 x Ø $D_{external}$ where h = 263 mm (10.35 inches), 425 mm (16.73 inches) or 775 mm (30.51 inches) (flowmeter sensor lengths)

- Shorten the length of the weld-on adapter as appropriate before welding it on. Once it has been welded on, the weld-on adapter may extend into the pipeline by several mm (max. 10 mm [0.39 inches]).
- Observe thickness of pipeline wall and degree of shrinkage when welding on.
- The distance h from the upper edge of the adapter flange to the the pipe central axis must be within a tolerance of ± 2 mm (0.08 inches).

2 It is essential to maintain a right angle to the pipe axis (max. tolerance: 2°).

3 The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).

4 Once welding is complete, there must be a passage of at least 28 mm (1.10 inches) free for the purpose of mounting the flowmeter sensor; drill to create if necessary.

5 Installing the flowmeter sensor:

- Insert the O-ring (55 x 3 mm [2.16 x 0.12 inches]) supplied into the groove provided for this purpose.
- Push the flowmeter sensor into the adapter and screw into place.

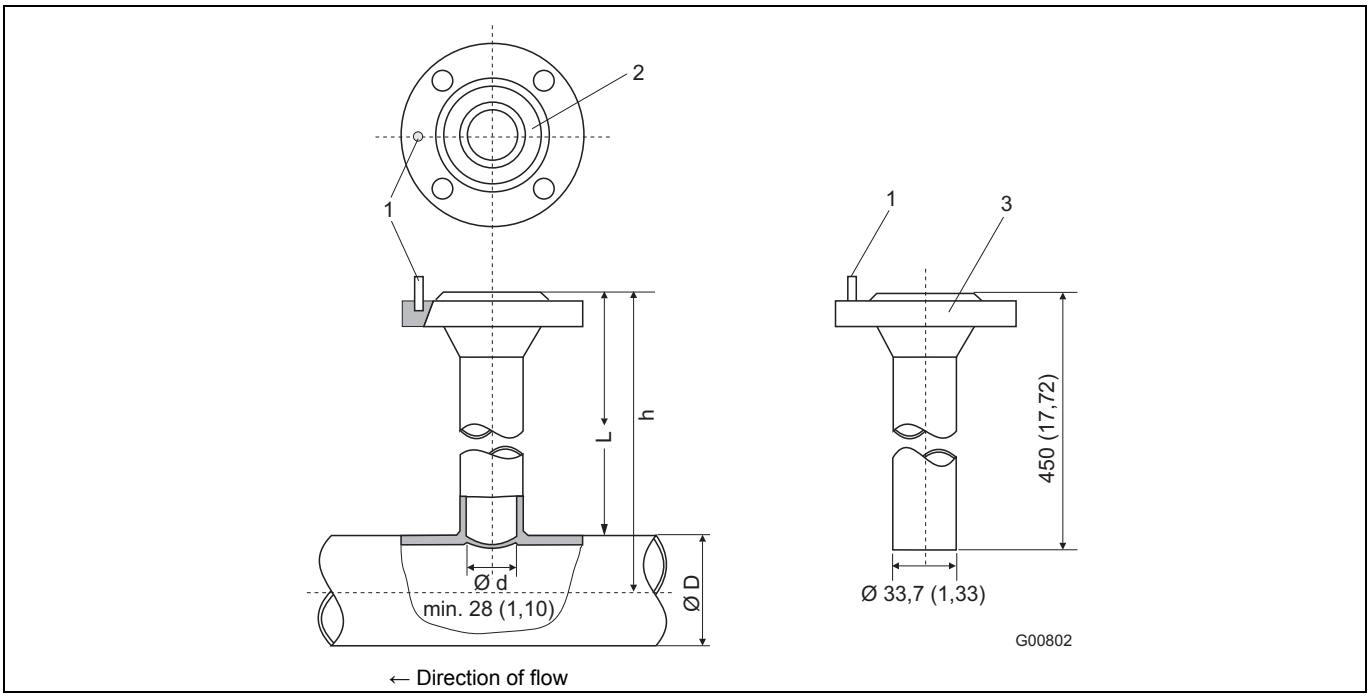


Fig. 7: Dimensions in mm (inch)

1 Centering pin
2 Sealing ring groove
3 Connection flange DN 25 (1”)
D Outer pipe diameter

Flowmeter sensor length h in mm (inch)	**Outer pipe diameter min. / max.** in mm (inch)
263 (10.35)	100 ... 350 (3.94 ... 13.78)
425 (16.73)	> 350 ... 700 (13.78 ... 27.56)
775 (30.51)	> 700 ... 1400 (27.56 ... 55.12)[1)]

1) This maximum pipe diameter specification is only valid when installing the sensor unit centrically in the pipe. For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.

IMPORTANT (NOTE)

Deviations from the stated dimension and position tolerances cause additional measuring uncertainty.

4.4 Weld-on adapter with ball valve for Sensyflow FMT500-IG

Versions featuring a ball valve enable the flowmeter sensor to be installed and disassembled at low gauge pressures in the pipeline with minimal gas leakage.

Install the weld-on adapter as described in Section 4.3.

WARNING

During welding, the gaskets in the ball valve may overheat.
This can lead to the measuring medium escaping in an uncontrolled manner.
This can result in severe injuries or death.
Disassemble the ball valve prior to welding.

Before the flowmeter sensor is installed, the ball valve must be opened completely. Then, the flowmeter sensor can be installed along with the appropriate gasket and screwed into place.

Before disassembling the flowmeter sensor, ensure that the pipeline has been depressurized. Then, you can release the screws on the flange, remove the flowmeter sensor and close the ball valve.

NOTICE - Potential damage to parts!

Closing the ball valve before you remove the flowmeter sensor can seriously damage the protective cage or the sensor elements.
Do not close the ball valve until the flowmeter sensor has been removed.

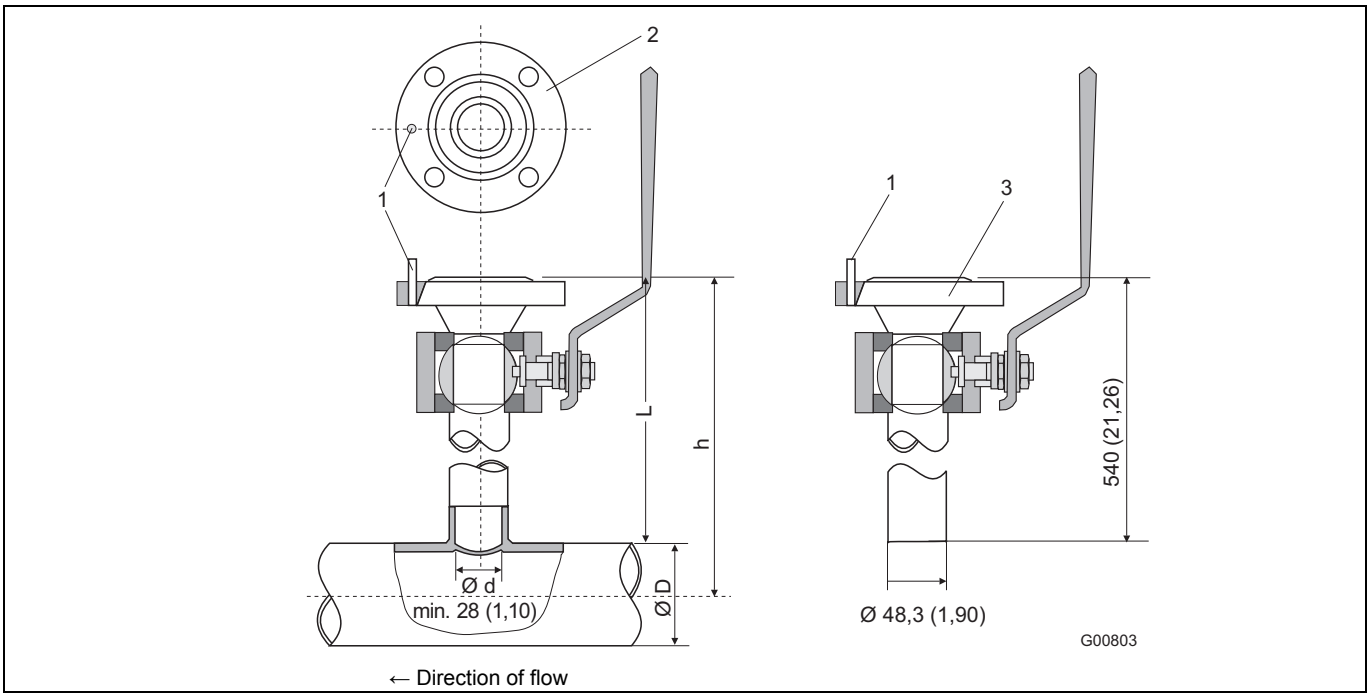


Fig. 8: Dimensions in mm (inch)

1 Centering pin
2 Sealing ring groove
3 Connection flange DN 25 (1”)
D Outer pipe diameter

Flowmeter sensor length h in mm (inch)	**Outer pipe diameter min. / max.** in mm (inch)
263 (10.35)	100 ... 150 (3.94 ... 5.91)
425 (16.73)	> 150 ... 500 (5.91 ... 19.69)
775 (30.51)	> 500 ... 1150 (19.69 ... 45.28)[1)]

1) This maximum pipe diameter specification is only valid when installing the sensor unit centrically in the pipe. For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.

IMPORTANT (NOTE)

Deviations from the stated dimension and position tolerances cause additional measuring uncertainty.

4.5 Integrated hot tap fitting for Sensyflow FMT500-IG

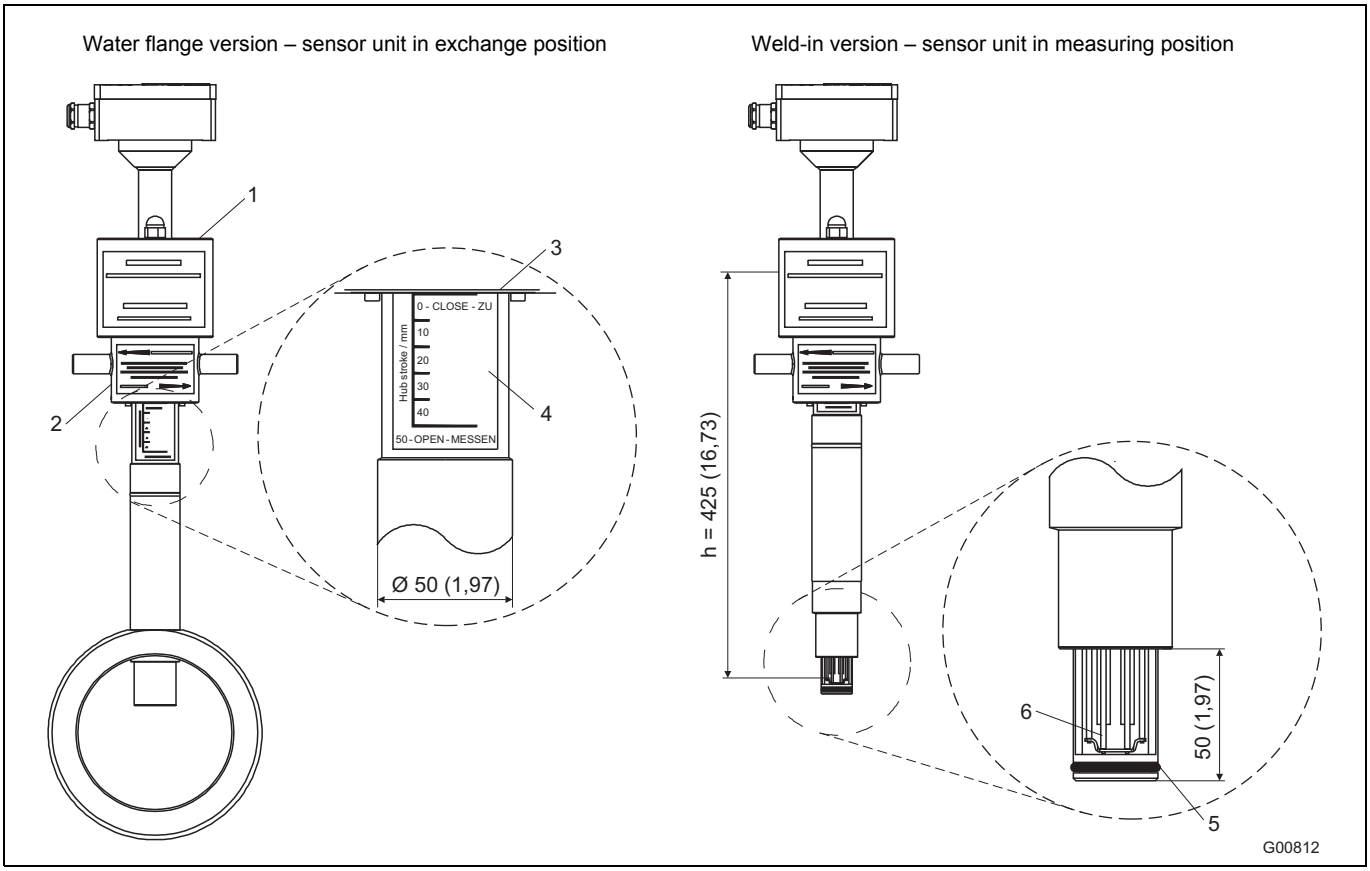


Fig. 9: Dimensions in mm (inch)

1 Covers for DN 25 flange
2 Spigot nur
3 Bottom edge of spigot nut
4 Display of sensor unit position, 50 mm (1,97“) stroke
5 Sealing ring
6 Sensor elements

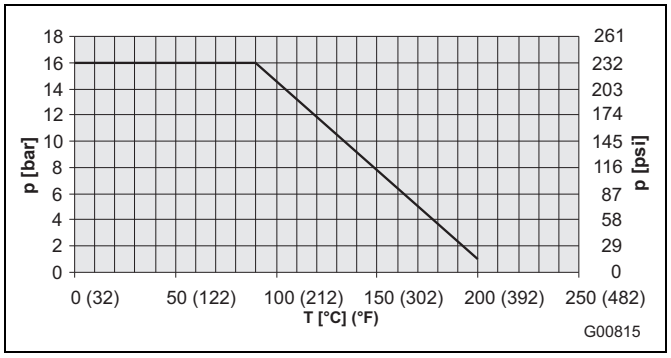
Flowmeter sensor length h	
Water flange version	Weld-in version
h = 263 mm (10.35“) for DN 50, DN 65 and DN 80 / 2“, 3“ h = 425 mm (16.73“) for DN 100, DN 125, DN 150 and DN 200 / 4“, 6“, 8“	h = always 425 mm (16.73“)

If you want to be able to remove the sensor during actual operation without gas escaping, the integrated hot tap fitting should be used instead of the pipe components and weld-on adapter.

We recommend that it is installed in main lines (e.g., compressed air supply), at measuring points that need to be flushed out before disassembling the sensor or, more generally, in the case of measurements that make it necessary to shut off system components before removing the sensor.

4.5.1 Specifications for integrated hot tap fittings

The hot tap fitting is designed for pressure loads of max. 16 bar abs. To ensure interchangeability with standard pipe components (type 1), the wafer version (Fig. 11) has been developed for DN 50 and DN 80 DIN flanges with a pressure stage of PN 40. In the case of the DN 65 version with a pressure stage of PN 16, you should use connection flanges with 4 screw holes. Imperial versions 2 ... 8“ designed for connection flange ASME B16.5 Cl.150 only. For suitable flowmeter sensor lengths, see Fig. 9.



Temperature: Max. 200 °C (392 °F)
Pressure (abs):
16 bar - 90 °C (232 psi - 194 °F)
1 bar - 200 °C (14.5 psi - 392 °F)

Fig. 10: Maximum pressure / temperature values for integrated hot tap fitting

4.5.2 Installing the wafer version

Fig. 11 (left) shows the installed wafer version of the hot tap fitting in the disassembly position. The guide tube is in its upper end position and seals the Sensyflow opening (right).

By means of the flat gaskets, the hot tap fitting is sealed on both sides against the mounting flange of the pipeline. To ensure maximum measurement accuracy, it must be centered exactly between the flanges (see Fig. 6). It is very important that you observe the proper flow direction (arrow on pipe component).

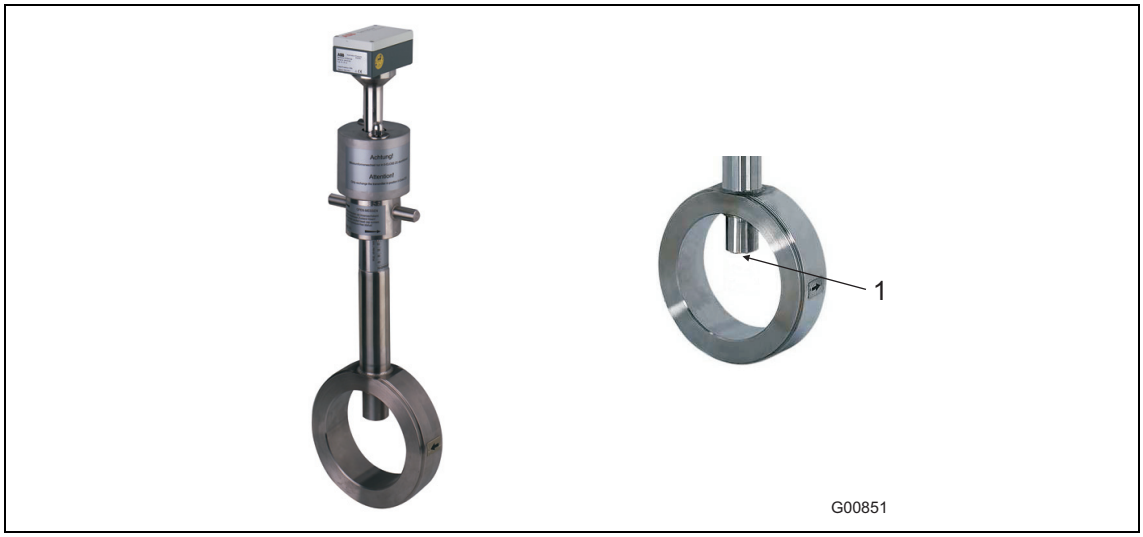


Fig. 11: Hot tap fitting in disassembly position
1 Sensyflow opening

4.5.3 Installing the weld-in version

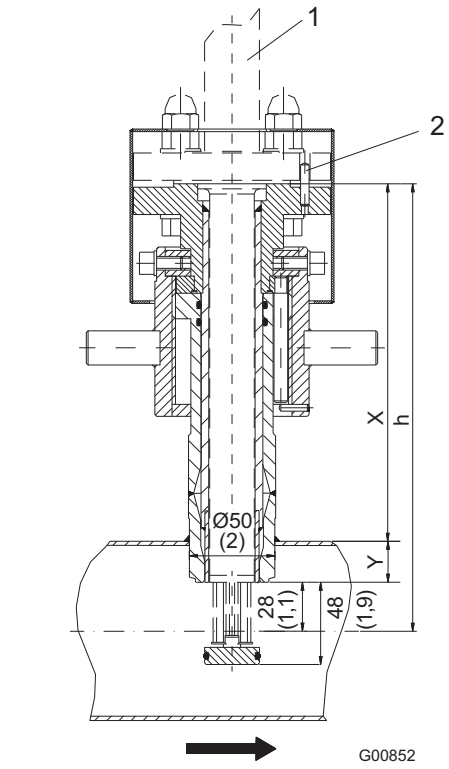
The weld-in version of the hot tap fitting is available in two overall lengths:

- For nominal diameters DN 100 ... DN 125 (4 ... 5") and
- For nominal diameters DN 150 ... DN 300 (6 ... 12")

The flowmeter sensor length is h = 425 mm (16.73 inches) in both cases.

The installation depth depends on the pipe diameter and is calculated individually.

WARNING
Do not shorten hot tap fitting components or interfere with the design.
This can lead to the measuring medium escaping in an uncontrolled manner.
This can result in severe injuries or death.



Calculating the installation depth (hot tap fitting in measuring position):

X = h - (Ø pipe exterior / 2)
Y = (Ø pipe exterior / 2) - 28

Example:
Transmitter with overall length h = 425 mm
Pipe with external diameter of 210 mm
Hot tap fitting is in measuring position

X = 425 mm - (210 mm / 2) = 320 mm

Fig. 12: Dimensions in mm (inches) hot tap fitting in measuring position

1 Flowmeter sensor
2 Centering pin

Weld the hot tap fitting in the pipeline while taking account of the following points:

- Observe thickness of pipeline wall and degree of shrinkage when welding.
- The distance h from the upper edge of the fitting flange to the the pipe central axis must be within a tolerance of ± 2 mm (0.08 inch) when in the measuring position.
- It is essential to maintain a right angle to the pipe axis (max. tolerance: 2°).
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point), see Fig. 12.

NOTICE - Potential damage to parts!

If the welded joints become hot, warping of the sealing surfaces and / or damage to the O-rings can occur.
Pause occasionally to allow the fitting to cool.

IMPORTANT (NOTE)

Deviations from the stated dimension and position tolerances cause additional measuring uncertainty.

4.5.4 Installing the transmitter during actual operation

- The hot tap fitting must be in the disassembly position (Fig. 11), whereby the Sensyflow opening is sealed.
- Insert the O-ring (55 x 3 mm [2.16 x 0.12 inches]) into the groove provided for this purpose (Fig. 13). The O-ring gasket and screws are included in the scope of delivery.
- Insert the transmitter in the hot tap fitting and secure with screws (two M12 screws and two extended special screws, installed opposite each other (Fig. 14)).
- Install the dust caps and use nuts to attach them to the special screws (Fig. 14).
- Rotate the transmitter into the measuring position using the lock nut (Fig. 14). The lower edge of the lock nut indicates the position of the measuring element. When you reach the measuring position 50 – OPEN – MESSEN (lower limit stop of lock nut), the measuring elements are in the middle of the pipeline and it is only at this point that accurate values can be provided (see detail A in Fig. 9).

NOTICE - Potential damage to parts!

Using tools or other devices to operate the lock nut can damage the hot tap fitting.
Only ever operate the lock nut manually.

- Transmitter electrical connection (see Section 5).

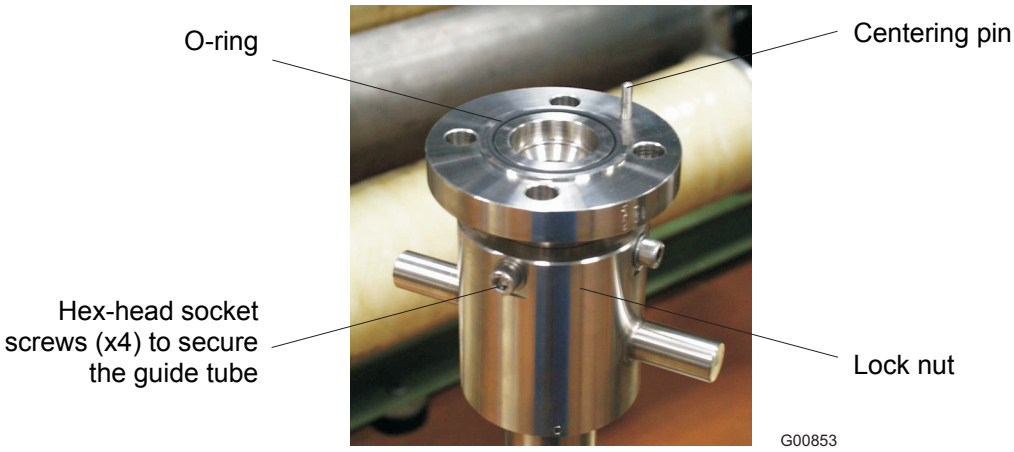


Fig. 13

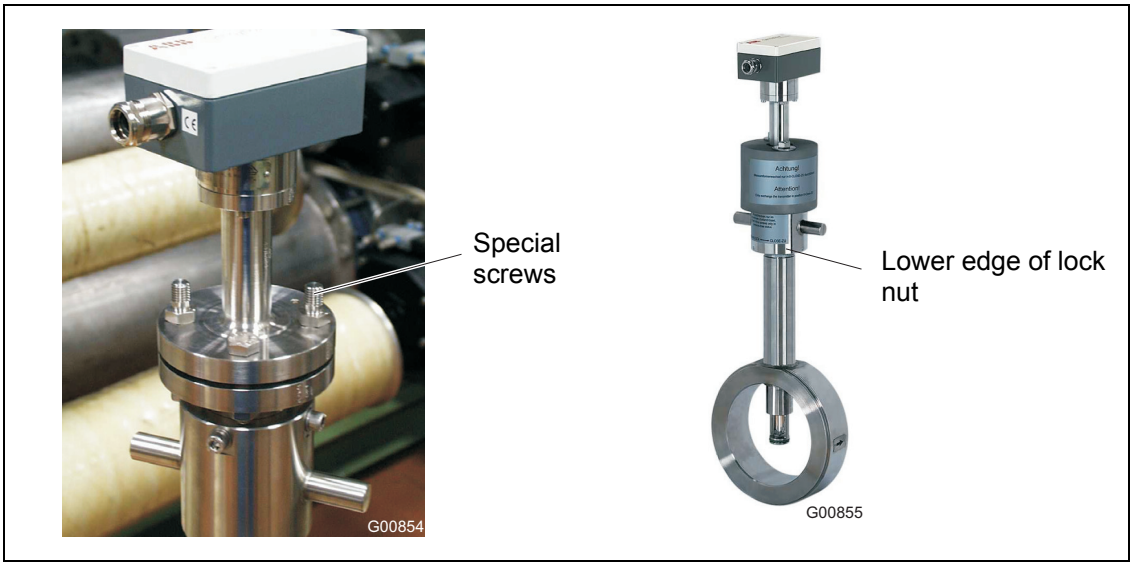


Fig. 14: Special screws for dust caps

Transmitter with integrated hot tap fitting in measuring position

4.5.5 Disassembling the transmitter during actual operation

- Using the lock nut, rotate the hot tap fitting into the disassembly position. (Upper limit stop of lock nut, with lettering 0 - CLOSE - ZU must be visible; see detail A in Fig. 9).
- Electrically disconnect transmitter according to operating instructions.
- Remove the nuts for the dust caps and carefully release the transmitter mounting screws.

WARNING

If you release the transmitter mounting screws while the fitting is in the measuring position, the flowmeter sensor will fly out.
This can result in severe injuries or death.
Only release the screws when the fitting is in the disassembly position.

CAUTION

When you disassemble the transmitter, small quantities of process gas may escape due to the nature of the design.
If you are using hazardous gases, this can result in minor injuries.
Ensure adequate ventilation.

WARNING

If the fitting is in the installation position or the hot tap fitting is defective, larger quantities of hazardous gases can escape when you release the mounting screws.
This can result in severe injuries or death.
Abort the procedure immediately and retighten the screws.
If the fitting is in the disassembly position, the transmitter can only be disassembled once the pipeline has been emptied, and where necessary, flushed out.

- Pull the transmitter out of the hot tap fitting (do not tip to the side).

4.5.6 Maintenance

After approx. 100 transmitter installation and disassembly procedures, the O-ring gaskets for the PN 16 hot tap fitting must be replaced. If you are working with dusty, abrasive or aggressive measuring media, it may be necessary to replace these more frequently.

O-ring gaskets may only be replaced by the manufacturer's Service department or by qualified personnel employed by the operator (see General safety instructions).

Fig. 15: Components of the integrated hot tap fitting

1 Pipe component with lock nut (flange version)
2 Guide tube with slip ring and guide pin.
3 Protective caps
4 Transmitter

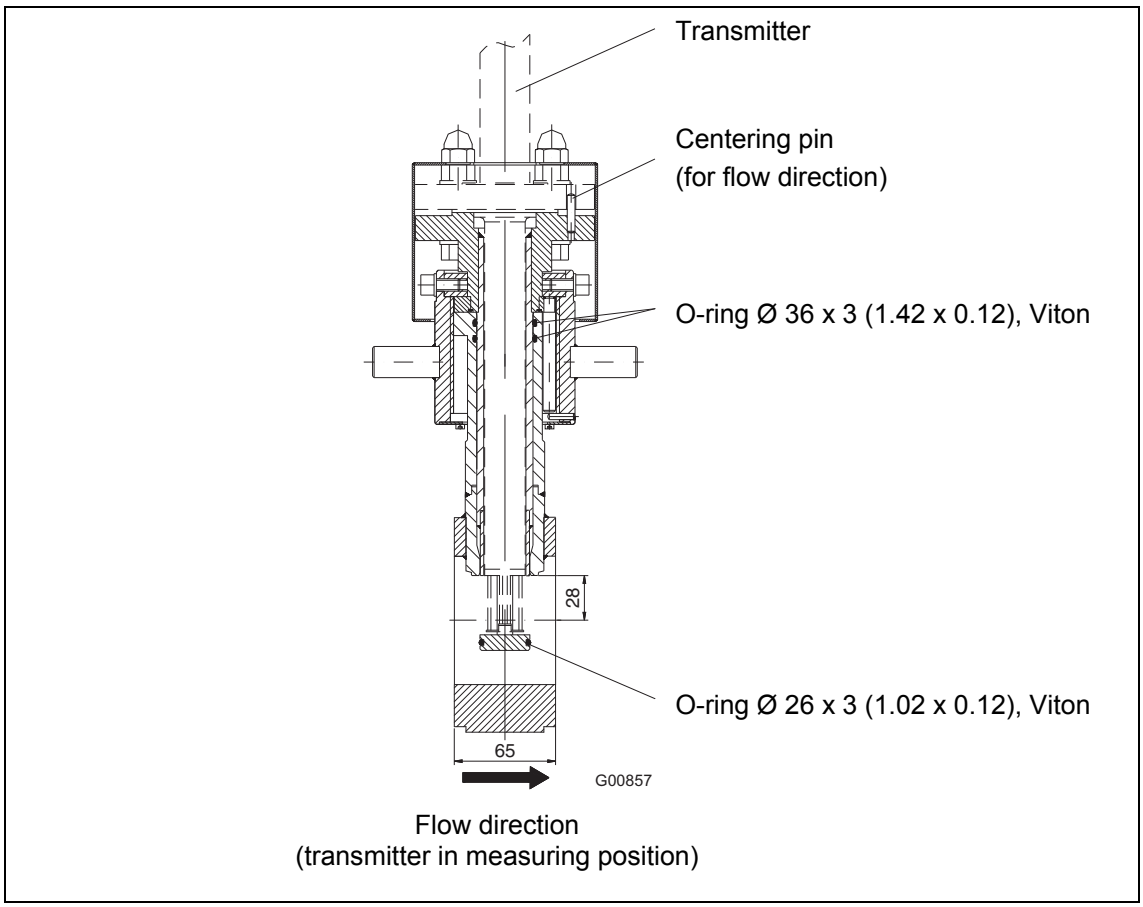


Fig. 16: Dimensions in mm (inches). Hot tap fitting with wafer design

WARNING
The guide tube must not be disassembled at operating pressure and without first being flushed out.
This can lead to the measuring medium escaping in an uncontrolled manner.
This can result in severe injuries or death.
Reduce the pipeline pressure to the level of atmospheric pressure and flush it out.

Disassembling the transmitter (see Section 4.5.5)

- To disassemble the guide tube, release the 4 hex-head screws on the lock nut (Fig. 13) and remove the guide tube. Clean parts, if necessary.
- Replace the two internal Viton 36 x 3 mm (1.42 x 0.12) O-rings of the fitting and the Viton 26 x 3 mm (1.02 x 0.12) O-ring of the guide tube (see Fig. 16). Lightly lubricate the O-rings as well as the threads of the lock nut and slip ring of the guide tube. For oxygen applications, only approved O2 fittings grease may be used (e.g., Krytox GPL-226).
- Insert the guide tube in the fitting and tighten the 4 hex-head screws of the lock nut as far as the limit stop in exactly the same position as with disassembly.
- Verify correct installation by rotating the lock nut into measuring and disassembly positions.

4.6 Installing the flowmeter sensor in conditions involving high temperatures

NOTICE - Potential damage to parts!

The device must not be operated outside the permissible ambient temperatures of -25°... 50 °C (-58 ... 122 °F).
This may prevent the device from functioning correctly and cause damage to the electronic components.
Shield the device from sources of heat and provide protection against the sun if used outdoors.

Under high but permissible air temperatures, avoid additional thermal stress from heat convection or radiation, since these sources of heat may exceed the permissible ambient temperature on the equipment surface.

To prevent damage to equipment through overheating of the electronic unit, the device must be installed as follows:

- If it is being installed close to sources of heat, adequate shielding must be put in place.
- If it is being installed outdoors, sun protection must be provided.

If a device with integral mount design needs to be installed directly on a hot, horizontal pipeline, we recommend installing it on the side. In such cases, you should avoid installing it in the 12 o'clock position, otherwise the warm air that rises up will cause additional heating of the electronics.

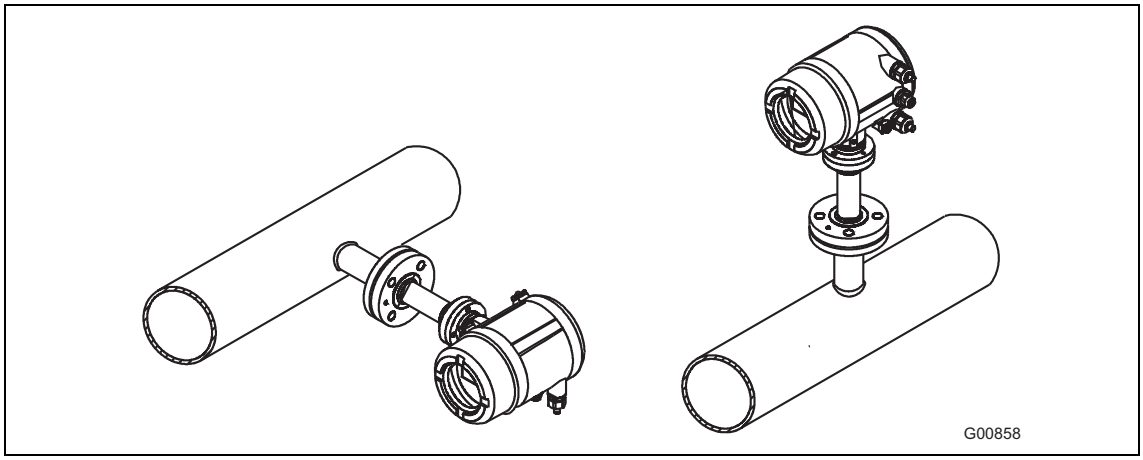


Fig. 17: Display rotated 90°, for hot pipelines

Installation in the 12 o'clock position, for non-critical ambient temperatures

4.7 Aligning the housing head and display

In the case of the integral mount design, the transmitter housing has been pivot-mounted to make the display easier to read. From the center position it can be rotated by approximately 170° to the right or the left as far as the limit stop. The three grub screws can be tightened to secure it (see Fig. 18).

The display orientation can be changed in increments of 90°. To do this, unscrew the front housing cover (not in potentially explosive atmospheres) and remove the display cover. In the case of devices with explosion-proof design, the safety locking device for the cover must be released before removing the front housing cover.

WARNING

Do not open the front housing cover in potentially explosive atmospheres.
Risk of explosion! This can result in severe injuries or death.
Before opening the front cover, you must disconnect the device from the supply.
Always take ESD precautions before touching modules.

Once you have released the four mounting screws, remove the display panel and reinsert it in the desired position. Then retighten the mounting screws, attach the display cover and screw on the housing cover. In the case of devices with explosion-proof design, the safety locking device must be reinstalled.

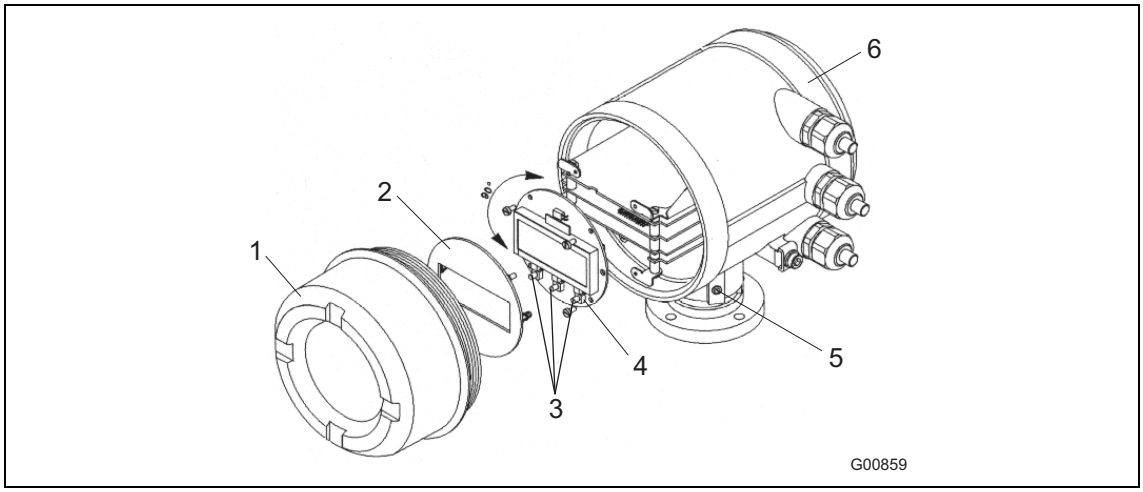


Fig. 18: The display can be rotated in increments of 90°.

1 Front housing cover
2 Display cover
3 Push buttons
4 Display panel
5 Grub screw
6 Rear housing cover

4.8 Installing the transmitter (with remote mount design)

With the remote mount design, cable lengths of up to 50 m (164 ft.) (ATEX / GOST Zone 0 / 1 / 21, FM / CSA and Zone 2/22 versions with constant power method up to 25 m [82 ft.]) are supported between the flowmeter sensor (sensor) and the transmitter. The flowmeter sensor is installed in the pipe component / weld-on adapter as described above. The transmitter is installed on a flat wall surface, taking into account the maximum permissible ambient temperatures.

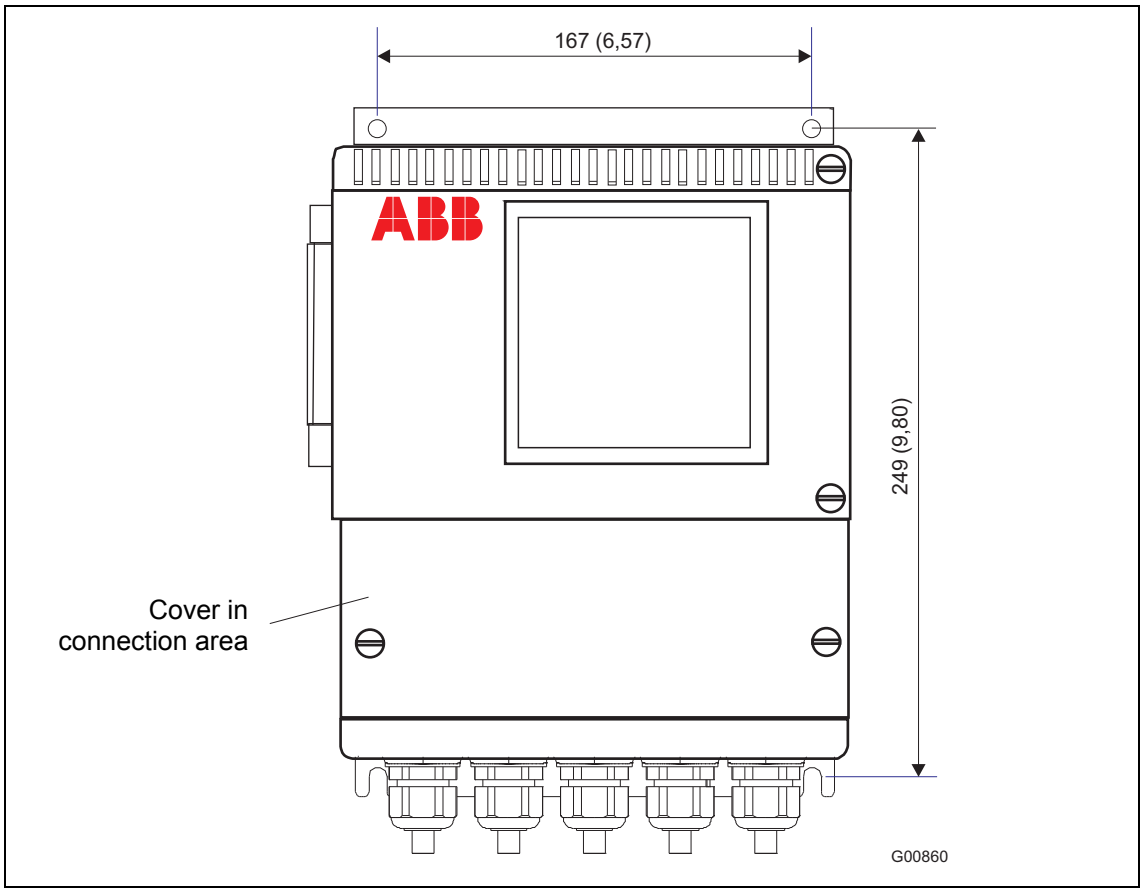


Fig. 19: Dimensions in mm (inches). Wall-mounted housing, remote mount design

The sensor and transmitter are connected by means of 10-pin, numbered terminal blocks, which can be accessed once the covers have been removed from the wall-mounted housing and sensor terminal box.

5 Electrical connections

The Sensyflow FMT500-IG is a thermal gas-mass flowmeter in four-wire technology. It features a 0/4 to 20 mA HART-enabled analog output as well as two digital inputs and two digital outputs.

Please pay attention to the following version information as regards connection of the standard and Zone 2/22 versions.

For connection to comply with ATEX / GOST Russia for Zone 0 / 1 / 21 and FM / CSA, attention must be paid to the drawings and safety instructions in Section 13.2 "Versions for potentially explosive atmospheres according to ATEX, GOST Russia and FM / CSA"

WARNING

Opening the rear housing cover and the cover for the supply terminal block while the device is live can result in an electric shock. This can result in severe injuries or death. Disconnect the device from the supply.

IMPORTANT (NOTE)

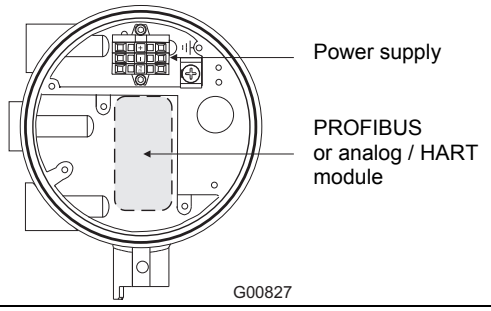
Before connecting the power supply, the signal wiring process must have been completed.

5.1 Standard and Zone 2/22 version

Transmitter with integral mount design

L / + Phase / + terminal
N / - Neutral / - terminal
PE Grounding

Wide-range power supply unit 110 ... 230 V AC / DC ± 10 %
or
Low-voltage power supply unit 24 V AC / DC ± 20 %

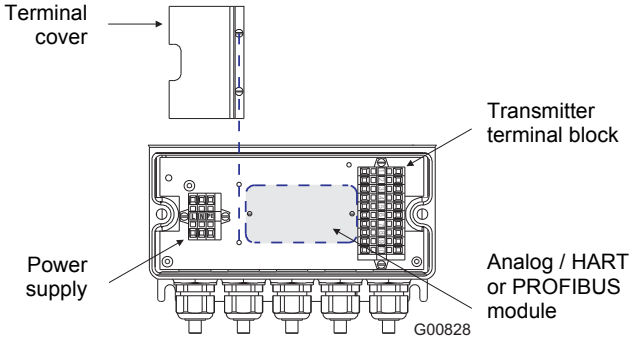


Transmitter with remote mount design

L / + Phase / + terminal
N / - Neutral / - terminal
PE Grounding

Wide-range power supply unit 110 ... 230 V AC / DC ± 10 %
or
Low-voltage power supply unit 24 V AC / DC ± 20 %

1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned).

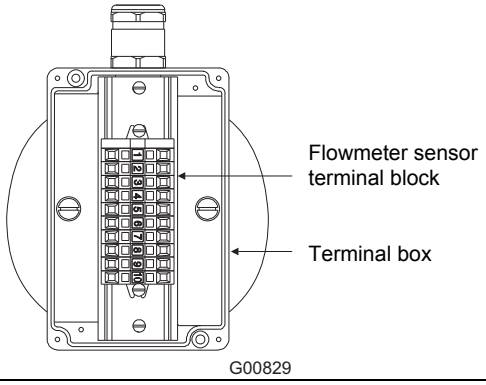


Flowmeter sensor with remote mount design

Flowmeter sensor	Terminals 1 ... 10
Cable	Min. 9 wires
Min. cross section	Min. 0.5 mm^2 AWG 20
Max. cable length	50 m (164 ft.) (25 m [82 ft.] for Zone 2/22 version with constant power method)

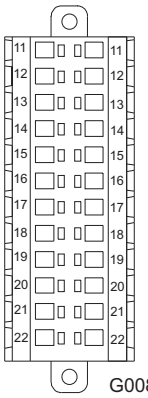
1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned).

Place one side of the cable shield in the metal cable gland for the terminal box.



Analog / HART module

11	Shield
12	+ I_{out} analog output / HART
13	- I_{out} analog output / HART
14	+ 24 V DC for external supply, 30 mA max.
15	GND 24 V
16	D_{out} 1
17	D_{out} 2
18	GND D_{out} (D_{out} 1 + 2)
19	D_{in} 1
20	D_{in} 2
21	GND D_{in} (D_{in} 1 + 2)
22	Shield



G00831

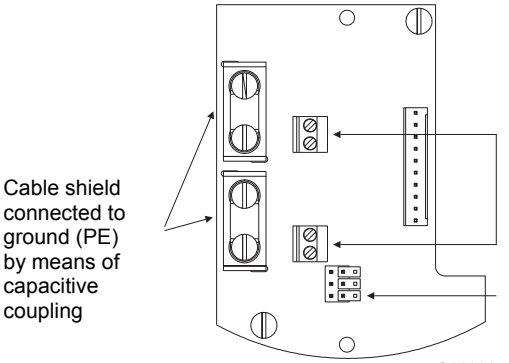
PROFIBUS module

A	PROFIBUS DPV1 in / out signal
B	PROFIBUS DPV1 in / out signal

Note:
The system design is such that the entire bus connection will be interrupted if you disconnect the PROFIBUS cable on the device. As an alternative, please consider the version with DP M12 connection socket (Section **5.1.2**).

[1)] Note regarding terminating resistor: The bus termination with jumpers should only be used if just the device is connected to this PROFIBUS line.

The incoming and outgoing PROFIBUS cables are connected to terminals A (green cable) and B (red cable) respectively. The other terminal blocks must not be used (CAN bus, for internal use only).



G00830

IMPORTANT (NOTE)

To help ensure safe operation of the module and to minimize EMC interference, the cable shield for the PROFIBUS lines must be attached to the relevant terminals in the terminal box. A low-resistance ground must also be connected to the grounding screw for the box (M6 threads) (cable cross section of at least 4 mm^2).

IMPORTANT (NOTE)

Disconnecting the PROFIBUS cable on the device interrupts the entire bus connection. Device versions that can be disconnected without causing an interruption: See Section 5.3.

5.1.1 Examples for connecting peripherals (Analog / HART version)

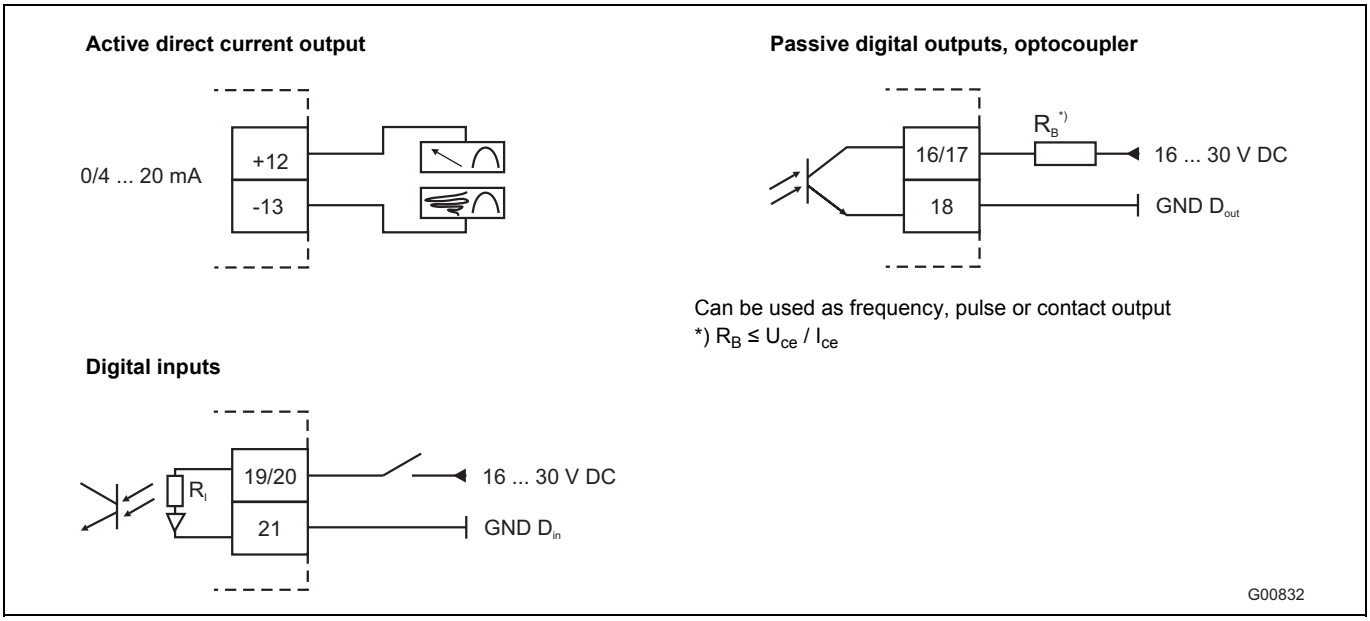


Abb. 20

Active DC output

The mA analog output is HART-enabled if configured as a "4 … 20 mA output".

Passive digital outputs, optocoupler

The passive digital outputs D_{out} 1 and D_{out} 2 need to be connected as open-collector outputs (see Abb. 20). They can be used as a binary contact as well as a pulse and frequency output. The maximum current must be limited to 100 mA by means of series resistor R_B.

As far as digital output 1 is concerned, terminals 16 (D_{out} 1) and 18 (GND D_{out}) should be connected in accordance with the diagram shown above. Terminals 17 and 18 should be used for digital output 2. The 24 V voltage at terminals 14 and 15 can be used as the voltage source for the open-collector circuit.

Digital inputs

Digital inputs are used for switching over the characteristic curve within the device or for controlling the totalizer.

A 24 V input signal can be defined as „"HIGH" or "LOW", depending on the polarity of D_{in} 1 and D_{in} 2.

IMPORTANT (NOTE)

The connection area for the explosion-proof designs according to ATEX / GOST Zone 0 / 1 / 21 and FM/CSA is described in Section 13, "Ex relevant specifications".

IMPORTANT (NOTE)

It is not possible to operate the Sensyflow FMT500-IG in multi-drop or burst modes.

5.1.2 PROFIBUS DPV1 communication with DP M12 connector socket

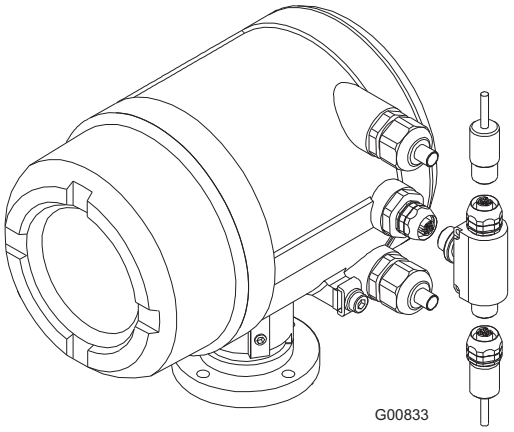
The version with PROFIBUS DP M12 connector socket allows disconnection of the device from the bus without interrupting PROFIBUS DP operation. Instead of the center cable gland an assembled and wired DP M12 connector socket is supplied.

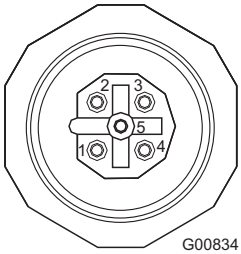
For connection to the PROFIBUS DP line you need 1 T-plug, cable socket and cable plug (see accessories).

Type of protection of the plug-in connections: IP 66.

Only available for non-Ex devices in integral mount design.

Please refer to Data Sheet 10/63-6.40 for other versions of T-plugs and appropriate DP connector plugs.





Pin assignment of the device

Pin	Signal	Description
1	VP	+ 5 V
2	RxD/TxD-N	Receive / transmit data line A (green wire)
3	DGND	Data transmission potential
4	RxD/TxD-P	Receive / transmit data line B (red wire)
5	Shield	Shield / protective earth
Thread	Shield	Shield / protective earth

5.2 Versions for potentially explosive atmospheres according to ATEX, GOST Russia and FM / CSA

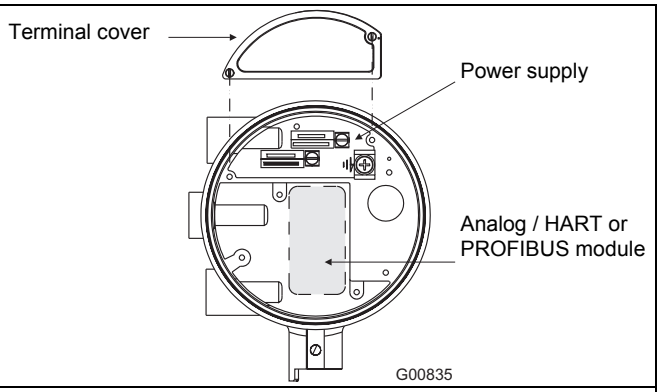
Transmitter with integral mount design

L / + Phase / + terminal
N / - Neutral / - terminal
PA Potential equalization

Wide-range power supply unit 110 ... 230 V AC / DC ± 10 %, 20 VA
48 ... 62 Hz, U_{max} = 250 V or

Low-voltage power supply unit 24 V AC / DC ± 20 %, 20 VA
48 ... 62 Hz, U_{max} = 29 V

Type of protection for power supply connection: Ex e (ATEX, GOST), XP (FM, CSA)
Before opening the cover to the connection area, remove the safety locking device and reattach it after closing the housing.



Transmitter with remote mount design

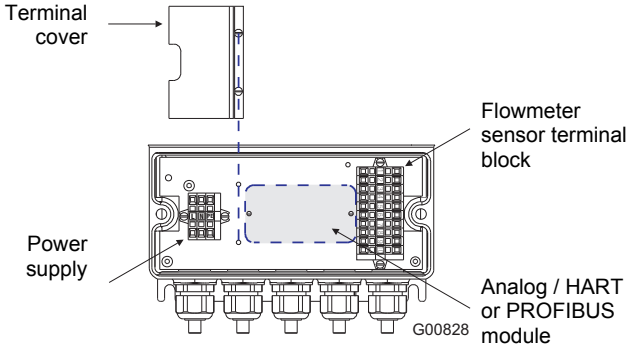
L / + Phase / + terminal
N / - Neutral / - terminal
PE Grounding

Wide-range power supply unit 110 ... 230 V AC / DC ± 10 %, 20 VA
48 ... 62 Hz, U_{max} = 250 V or

Low-voltage power supply unit 24 V AC / DC ± 20 %, 20 VA
48 ... 62 Hz, U_{max} = 29 V

1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned)

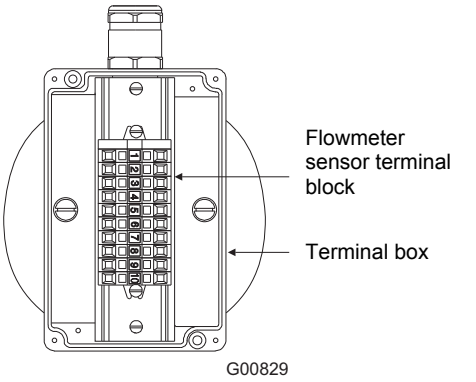
Type of protection for flowmeter sensor connection: Ex ia (ATEX, GOST), IS (FM, CSA)



Flowmeter sensor with remote mount design

Type of protection	Ex ia (ATEX, GOST), IS (FM, CSA)
Flowmeter sensor	Terminals 1 ... 10
Cable	Min. 9 wires
Min. cross section	Min. 0.5 mm^2 AWG 20
Max. cable length	25 m (82 ft.)

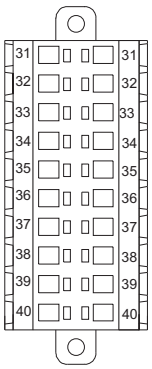
1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned)



Analog / HART module

31 + I_{out} analog output / HART
32 - I_{out} analog output / HART
33 D_{out} 1
34 GND D_{out} (D_{out} 1)
35 D_{out} 2
36 GND D_{out} (D_{out} 2)
37 D_{in} 1
38 GND D_{in} (D_{in} 1)
39 D_{in} 2
40 GND D_{in} (D_{in} 2)

Type of protection: Ex ib or Ex e (ATEX, GOST), IS or XP, NI (FM, CSA)
When connecting the fieldbus / signal lines, the safety-related parameters in the relevant certificates must be observed.

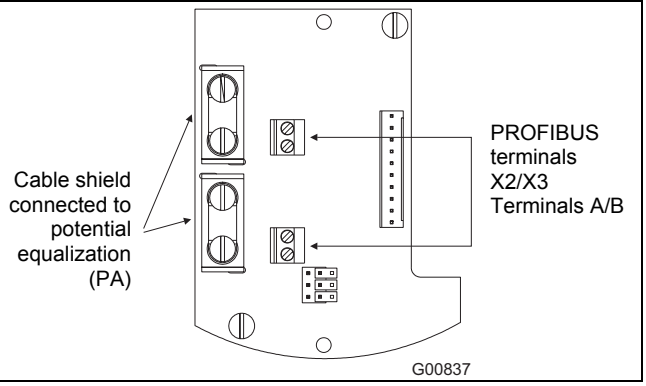


PROFIBUS module

A PROFIBUS DPV1 in / out signal
B PROFIBUS DPV1 in / out signal
Type of protection Ex ib (ATEX, GOST), IS (FM, CSA)

Connect to intrinsically safe PROFIBUS DP only (integral and remote mount designs)
Bus termination internally via 150 Ω resistor or externally according to RS485 IS specification

When connecting the fieldbus/signal lines, the safety-related parameters in the relevant certificates must be observed.



IMPORTANT (NOTE)

With ATEX and GOST Russia versions, cable glands and connecting pieces must be implemented and installed properly in compliance with explosion protection type "e" for increased safety according to operating conditions. Close unused openings in accordance with EN 60079.

IMPORTANT (NOTE)

With FM and CSA versions, the electrical connection can be made via an approved cable gland or approved, suitable threaded pipe connection with flame arrester (located directly on the device). The relevant test certificates must be available for pipe and cable fittings. Use of cable or wire entries as well as plugs of simple design is prohibited. Cable and pipe fittings are not included in the scope of delivery.

5.3 PROFIBUS DPV1

5.3.1 Bus termination

To minimize line reflection phenomena and ensure a defined quiescent level on the transmission line, the following terminating resistor combination should be used for the connections at both ends.

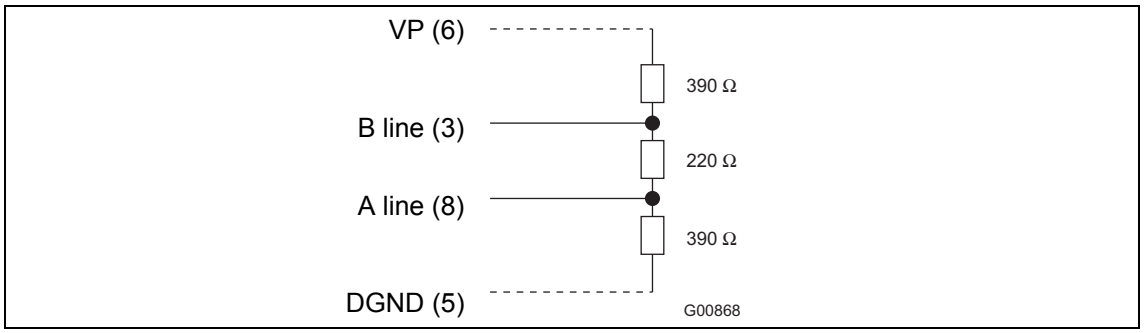


Fig. 21

The numbers in brackets correspond to the assignment on the 9-pin SUB-D connector. You can also use the 3 jumpers for bus termination purposes. Keep in mind, however, that the bus termination will be deactivated in the event of a device failure.

Bus termination:

As the factory default, the jumpers are connected to only one contact. To establish the bus termination, all 3 jumpers must be connected to their adjacent contacts.

5.3.2 Cables

The cables for the PROFIBUS connection must meet the following parameters in accordance with PROFIBUS specification EN 50170 part 8-2:

Parameter	DP, cable type A, shielded
Surge impedance in Ω	135 ... 165 at a frequency of 3 ... 20 MHz
Effective capacitance (pF / m)	30
Loop resistance (Ω / km)	≤ 110
Solid conductor	AWG 22/1
Flexible conductor	> 0.32 mm^2

IMPORTANT (NOTE)

To ensure reliable operation / minimize line reflection phenomena and to benefit from a defined quiescent level, the PROFIBUS network must be terminated (see Section 5.3.1, "Bus termination").
Spur lines should be avoided, as they can result in line reflection phenomena and malfunctions.

IMPORTANT (NOTE)

To ensure reliable PROFIBUS communication, the PROFIBUS DP / FMS technical / configuration guideline must be observed.

6 Commissioning

The device may only be started up / opened by qualified operating personnel. The device must be installed and the electrical signal lines must be connected prior to start-up.

6.1 Checking the installation

Prior to start-up, check that the equipment has been installed correctly:

- Is the device securely fastened?
- Have all the electrical signal, control and interface cables been laid and connected correctly?

6.2 Connecting the power supply

Connecting the 115 / 230 V power supply

Step	Action
1.	Check whether the voltage specified on the name plate matches the line voltage.
	Use a supply power line with sufficient dimensions and ratings (circuit breaker).
2.	In the vicinity of the device, install a supply circuit isolator in the power supply line or a switched socket so that the device can be fully isolated (all poles) from the power supply. Label the supply circuit isolator to make it clear that it relates to the equipment that needs to be isolated.
3.	Connect the power cord to the power supply.
4.	

Connecting the 24 V power supply

Step	Action
1.	Check whether the voltage specified on the name plate matches the line voltage.
	Use a supply power line with sufficient dimensions and ratings (circuit breaker).
2.	Connect the supply line to the supply power.
3.	

WARNING

When connecting the supply power, the information provided below must be observed. Failure to observe the information provided can result in severe injuries or death.

IMPORTANT (NOTES)

When using a device with an explosion-proof design, comply with the explosion protection regulations. For Sensyflow FMT500-IG values, please refer to the relevant certificates (ATEX, FM, CSA, GOST).

Before connecting the power supply, check that the set operating voltage matches the line voltage.

Before making any other connections, you must first establish a connection between the protective-conductor terminal and a protective conductor.

A line switch with adequate switching capacity and capable of fully isolating the device from the supply system (all poles) must be installed within reach of the installation location. The protective benefits of the protective conductor must not be canceled out as a result of this.

The protective conductor must not be interrupted or detached either inside or outside the device.

In the case of 24 V UC supply power, the device may only be supplied with a safely isolated low voltage (DIN VDE 0106).

Under no circumstances must the line voltage (115 V AC or 230 V AC) be connected to the 24 V UC input. Doing so would damage the device electronics beyond repair.

The maximum rated current for the overcurrent protection device on the installation side is 16 A.

6.3 Switching on

WARNING

Before switching the device on, check that all the tasks described in the previous sections have been carried out correctly.
Failure to observe the information provided can result in severe injuries or death.

Check again to ensure that the set operating voltage matches the supply power voltage.

WARNING

Switching the device on while the rear housing cover is open can result in an electric shock; in potentially explosive atmospheres, there is an additional risk of explosion.
This can result in severe injuries or death.
Only switch on the supply power when the housing cover is closed.

Switching on the supply power

The system will boot automatically and the device will be initialized. The device will then switch to the set display screen and enter measuring mode.

IMPORTANT (NOTE)

If an error is detected during the system boot phase or during measurement, the problem will be automatically highlighted on the display ("E" for error). The error can be read out in the SERVICE MENU / STATUS MENU.

Parameterization (password-protected)

Local parameterization via display using magnetic pen (see Section 8, "Operation") or

Parameterization via DTM in FDT 1.2 frame applications (e.g., ASSET VISION).

Once a period of two minutes has elapsed following successful configuration or since the last entry was made, the device automatically switches to the default display screen and reverts to the STANDARD operation mode.

Configuration of the PROFIBUS slave address

- Set locally on the display in SPECIALIST / SERVICE mode

  or

- By the class 1 master process control system or class 2 master parameterization and configuration tool using the SET-SLAVE address telegram.

PROFIBUS DP configuration of cyclic data exchange with the class 1 master process control system

- Read the GSD file supplied into the control system and save it in the relevant subdirectory.

Parameterization and configuration

- Local parameterization via display using magnetic pen

  or

- Parameterization and configuration via DTM in FDT 1.2 frame applications (e.g., ASSET VISION).

Once a period of two minutes has elapsed following successful configuration or since the last entry was made, the device automatically switches to the default display screen and reverts to the STANDARD operation mode.

IMPORTANT (NOTE)

On the various display screens, the -II- connect symbol indicates whether there is an active PROFIBUS connection to the class 1 / class 2 master. If there is no connection, -I I- is displayed instead.
In the event of an error, the error symbol "E" appears (see Section 8, "Operation").

7 Communication

7.1 HART

HART protocol Rev. 6.0 is used for digital communication between a process control system or PC, a hand-held terminal and the field device. It can be used to send all device and measuring point parameters from the transmitter to the process control system or PC. Conversely, it also provides a means of reconfiguring the transmitter.

Digital communication utilizes an alternating current superimposed on the analog output (4 ... 20 mA) that does not affect any meters connected to the output.

The ASSET VISION DAT200 and DTM400 program can be used for operation and configuration purposes. This is a piece of universal communication software for intelligent field devices based on FDT / DTM technology. Data can be exchanged with a comprehensive range of field devices using various means of communication. The main applications include parameter display, configuration, diagnostics, recording, and data management for all intelligent field devices that specifically meet the communication requirements involved.

Basic functions (such as the measuring range end value or certain mass flow units) can be parameterized with the universal HART DTM. If you use the FMT500-IG HART DTM, you will have access to the full range of functions.

Transmission method

FSK modulation at current output of 4 ... 20 mA based on the Bell 202 standard. Max. signal amplitude 1.2 mA_{SS}.

Load

Min. 250 Ω, max. 600 Ω (IG-Ex < 400 Ω)

Max. cable length 1,500 m AWG 24, twisted and shielded (for standard and Zone 2/22 devices).

Max. cable length for Ex devices depends on the safety specifications in the certificates.

Baud rate

1,200 baud

Log. 1 representation: 1200 Hz

Log. 0 representation: 2200 Hz

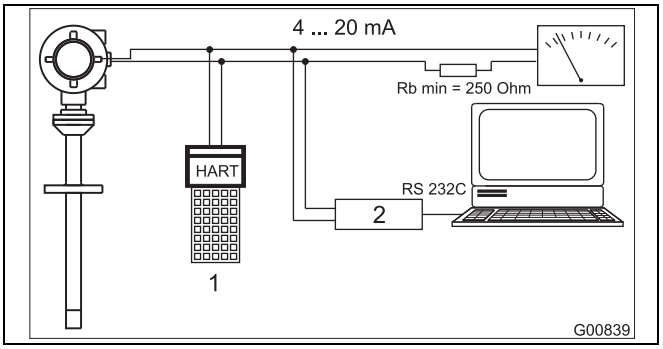


Fig. 22

1 Handheld terminal
2 FSK modem

7.2 PROFIBUS DPV1

With the Sensyflow FMT500-IG thermal mass flowmeter plus PROFIBUS interface, bus communication is based on the "Profile For Process Control Devices" Version 3.0 (PA Profile 3.0) of October 1999. PROFIBUS DP (RS 485 transmission) is used for the bus interface and the acyclic PROFIBUS DPV1 services are supported.

PROFIBUS interface parameters

- DPV1 communication without alarms
- Master C1 and C2 support
- Max. transmission rate: 1.5 Mbaud
- ID number: 0x05CA
- GSD file name: ABB_05CA.GSD

The cables for the PROFIBUS connection must meet the following parameters in accordance with PROFIBUS specification EN 50170 part 8-2:

Parameter	DP, cable type A, shielded
Surge impedance in Ω	135 ... 165 at a frequency of 3 ... 20 MHz
Effective capacitance	(pF/m) 30
Loop resistance (Ω/km)	≤ 110
Solid conductor	AWG 22/1
Flexible conductor	> 0.32 mm^2

As with the analog / HART version, you can parameterize the device using ASSET VISION DAT200 and DTM400 and FMT500-IG PROFIBUS-DTM.

Direct connection to intrinsically safe PROFIBUS DP lines is permitted, provided you use approved models and comply with safety-related parameters in accordance with certificates (see figure). The line length and number of bus nodes depend on the Ex barrier used.

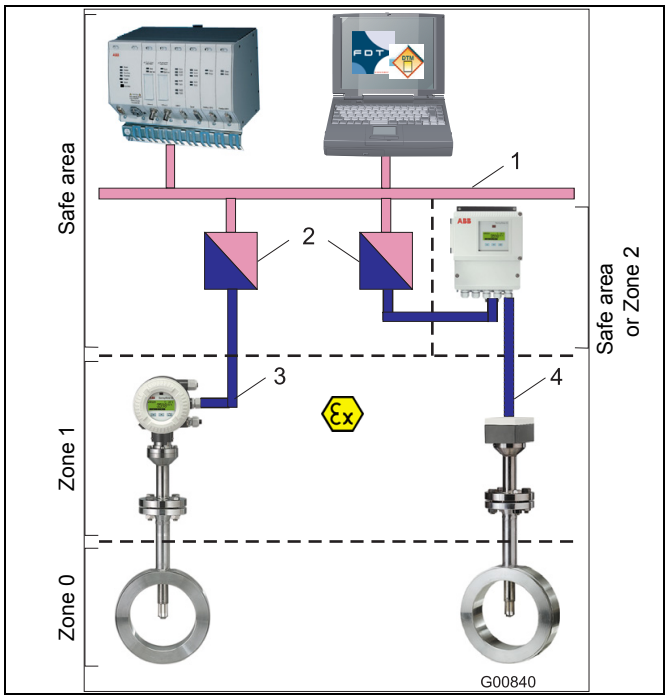


Fig. 23

1 PROFIBUS DPV1 non-intrinsically safe
2 Ex barrier PROFIBUS DP (RS 485_IS interface)
3 PROFIBUS DP intrinsically safe
4 Intrinsically safe circuit

Up to 127 nodes can be addressed on the PROFIBUS network, with a maximum of 32 nodes connected in each segment. If more than n x 32 nodes need to be run on the network (n = 1,2,3, etc.), they will need to be linked via segment couplers. There is a class 1 master on every PROFIBUS network, which is used for cyclic data exchange. Thus, there are 126 slave addresses available on the PROFIBUS network. Slave address 0 should not be used for slaves, as it frequently serves as the default master address. Slave address 126 is used as the default address for commissioning slaves that support address setting via PROFIBUS and so should not be used either. Class 2 master diagnostic or configuration devices also require a PROFIBUS address, whether they are operated permanently or temporarily on the PROFIBUS network.

The Sensyflow FMT500-IG with PROFIBUS connection offers two options for setting the PROFIBUS slave address.

Option 1:

Setting made via display using magnetic pen in SPECIALIST / SERVICE operation modes. In this case, you should avoid having a PROFIBUS communication connection to a class 1 or class 2 master. If there is a connection, the slave address cannot be changed. After setting new communication parameters (PROFIBUS address, baud rate), you must perform a hardware reset to ensure that the master accepts the newly entered data (see Section 10.1.3).

Option 2:

Setting made via a SET-SLAVE address telegram, which is sent to the slave by the class 1 or class 2 master over the PROFIBUS network.

IMPORTANT (NOTE)

PROFIBUS addresses must not be assigned more than once. PROFIBUS nodes with the same address cannot engage in data exchange with a class 1 or class 2 master. In fact, not even slave address setting via PROFIBUS will work if you attempt to operate two or more nodes with the slave default address 126.

IMPORTANT (NOTE)

When changing the slave address via the display using the magnetic pen in the SPECIALIST / SERVICE operation modes, you must ensure that the details match the slave addresses set in the class 1 master process control system / class 2 master diagnostic and configuration system.

7.2.1 GSD file

In addition to physically connecting nodes to a PROFIBUS line, the entire DP system must be configured in the PROFIBUS master. Manufacturers of industrial control systems (PLCs) or control systems that can be used as PROFIBUS masters offer very convenient, PC-based configuration programs. Electronic data sheets can be used as the basis for configuration; within the context of PROFIBUS, these are referred to as GSD files (device data files). The GSD file contains all the properties of the slave that are important from the point of view of running it on PROFIBUS. To enable a non-manufacturer-specific approach to slave configuration, the data format has been standardized.

GSD file structure

The GSD file's basic structure is defined in EN 50170. The PROFIBUS user association (PNO, http://www.profibus.com) assigns each GSD file an identification number and provides additional information. GSD files are available directly from the manufacturer, or are sometimes made available over the Internet.

All manufacturers of PROFIBUS slaves provide their clients with GSD files. For the Sensyflow FMT500-IG, an English version is available (ID no. ABB_05CA.GSD). This allows the user or configuration tool to eliminate potential errors resulting from invalid parameters as early as the configuration phase. At this point, the slave is not yet communicating with the master.

The GSD file is an ASCII text file and can be viewed with any text editor.

IMPORTANT (NOTE)

Only the original GSD file provided by the manufacturer is capable of ensuring that the slave will function correctly. Any manipulation of the GSD file may cause serious errors and is undertaken at the user's own risk.

It contains communication-specific parameters, such as the baud rate that is supported, and will sometimes also contain possible slave parameters. The Sensyflow FMT500-IG is what is known as a modular slave. In contrast to a compact slave, the structure is variable and it is made up of individual modules. The way the modules are arranged in the station is referred to as the configuration. The GSD file describes the modules with their corresponding properties. These include:

- Range of input data
- Range of output data
- Configurable parameters
- Diagnostic information

Additionally, system limitations such as the number of modules that can be plugged in, the maximum totals for input and output data, etc., are specified.

Module definitions in the GSD file

The module of a modular slave is described in terms of range and structure of I/O data. Moreover, modules with the same I/O data can have different parameters in the GSD file.

Configuring the Sensyflow FMT500-IG with the GSD file

The procedure can only be described here in general terms, as the precise approach depends on the master system used. For a detailed description, refer to the respective manual. Systems such as the ABB control system AC800F (field controller) with Control Builder F programming software provide convenient configuration and parameterization options with plaintext displays for the Sensyflow FMT500-IG. A number of other programs function according to a similar principle, which we will describe briefly below.

The GSD file must first be copied to a subdirectory of the configuration tool or programming software, where all the other GSD files are stored (typically \GSD\...). Additionally, three files are supplied for graphical representation.

In some cases, the addition of new slaves / GSD files to the the database or hardware catalog must be activated directly in the programming software (Import GSD...). For more information about creating a new system, including the master, refer to the relevant manual.

Typically, additions (new slaves or modules) are made to a modular slave using "Drag and drop" functionality. The slave must first be logically connected to the bus. Select the slave, from the corresponding menu. Once connected, a free bus address is assigned to it.

As soon as the project is enabled, the slave can communicate with the master and be put into operation. The application program is now able to access the individual items of I/O data. The data is processed in the master application. The data for AC800F and Control Builder F is entered graphically in a logic diagram.

7.2.2 "Cyclic data exchange" module configuration

The Sensyflow FMT500-IG offers the following modules for cyclic data exchange and these are described in the manufacturer-specific GSD file.

Module no.	Module	Input bytes	Input data type	Output bytes	Output data type
1	Empty_Module	-	0	-	0
2	Massflow	5 bytes (float + status)	Bytes 0 ... 3 float Byte 4 status	-	0
3	Gastemp.	5 bytes (float + status)	Bytes 0 ... 3 float Byte 4 status	-	0
4	Total	5 bytes (float + status)	Bytes 0 ... 3 float Byte 4 status	-	0
5	SET_Total	5 bytes (float + status)	Bytes 0 ... 3 float Byte 4 status	1 bytes	Byte 0 0 = Totalize 1 = Reset 2 = PRESET
6	SET/MODE_Total	5 bytes (float + status)	Bytes 0 ... 3 float Byte 4 status	2 bytes	Byte 0 0 = Totalize 1 = Reset 2 = PRESET Byte 1 0 ... 2 = Totalize 3 = HOLD
7	Characteristics-Input	-	0	7 bytes (2 bytes, float + status)	Byte 0 Bit 0..3 0x0 = Characteristic curve 1 0x1 = Characteristic curve 2 0x2 = Characteristic curve 3 0x3 = Characteristic curve 4 Bit 4 ... 6 Reserved Bit 7 0x0 = Change characteristic curve 0x1 = Characteristic curve active Byte 1 Bit 0 ... 3 0x0 = Totalize 0x1 = Hold 0x3 = Preset 0x4 = Reset Byte 2 (reserved) Byte 3 ... 6 Float totalizer value

You need to select four modules for cyclic data exchange, but please note that it is only possible to configure the following modules on the individual slots:

- Slot 1: Empty_Module, Massflow
- Slot 2: Empty_Module, Gastemp.
- Slot 3: Empty_Module, Total, SET_Total, SET/MODE_Total, Characteristics-Input
- Slot 4: Empty_Module, Characteristics-Input

IMPORTANT (NOTE)

Configuration of the individual slots is supported by GSD Rev. 3.0. If the process control system does not support GSD Rev. 3.0, the relevant configuration options (see table) will need to be taken into account.

The bytes are arranged in the data telegram in ascending order according to the slot assignment. An Empty_Module has no effect on how bytes are assigned in the telegram.

IMPORTANT (NOTE)

If a Total, SET_Total or SET / MODE_Total module is selected at the same time as the Characteristics-Input module, then byte 1 of the Characteristics-Input module will not have any function. The totalizer will be controlled via the bytes of the Total module (see table).

IMPORTANT (NOTE)

If the process control system is not capable of processing GSD Rev. 3.0 files, such files can be edited with a text editor to enable import into the process control system. The relevant points are described in the GSD file.

The CD supplied contains a GSD Rev. 2.0 file that can be integrated directly into systems that do not support Rev. 3.0. No form of module configuration is possible with GSD Rev. 2.0.

7.2.3 Description of function blocks

With PROFIBUS devices, the primary sensor signals are processed in the transducer blocks. In the case of the Sensyflow FMT500-IG, these are the FLOW and TEMP transducer blocks. The next stage of signal processing takes places in the Analog Input Function Blocks (AI FB) and in the totalizer block.

Within the individual blocks, parameterization options are available in terms of signal output, dimensions, limit values, etc.

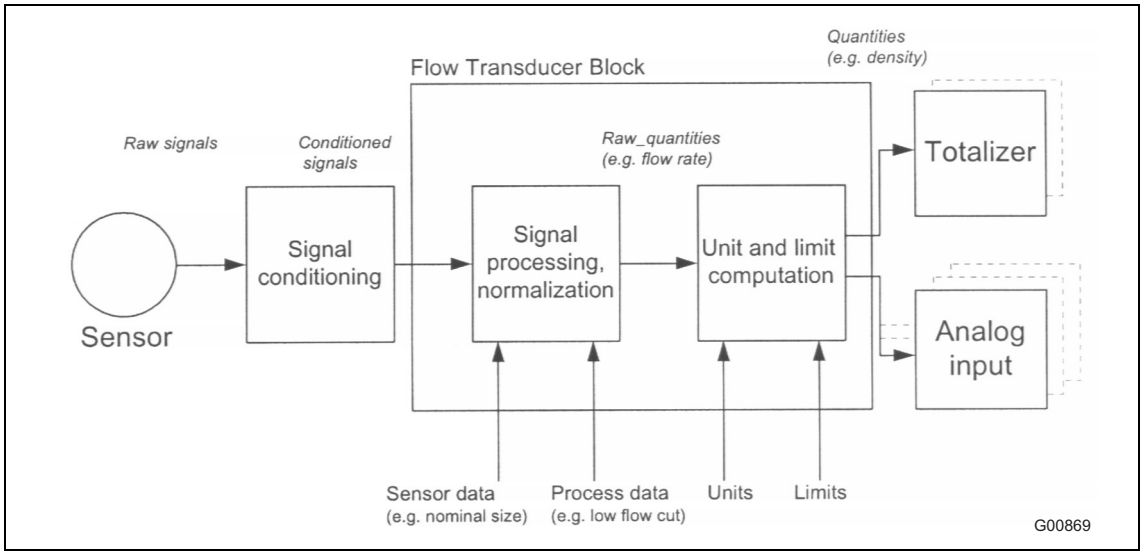


Fig. 24: Flow transducer block

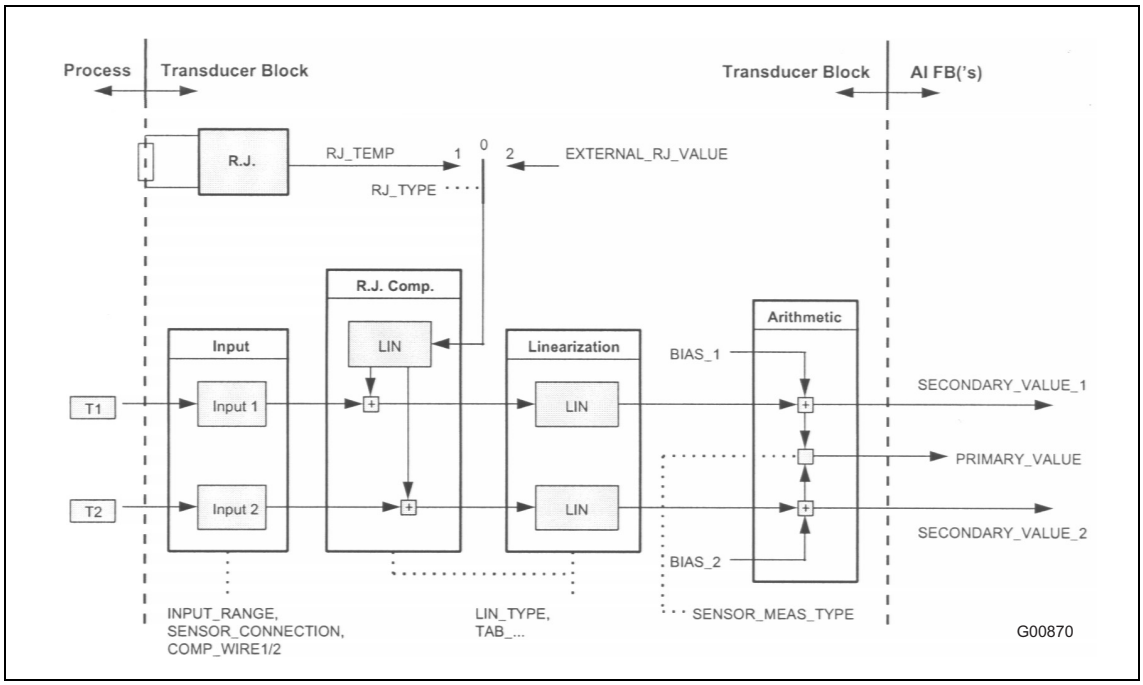


Fig. 25: Temp transducer block

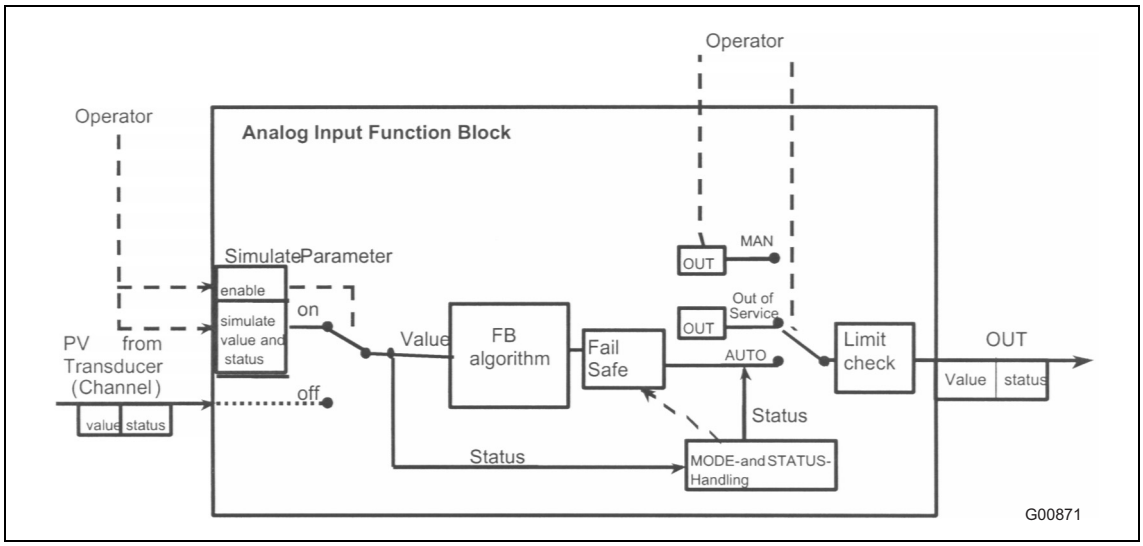


Fig. 26: Analog input function block (identical for flow and temp signals)

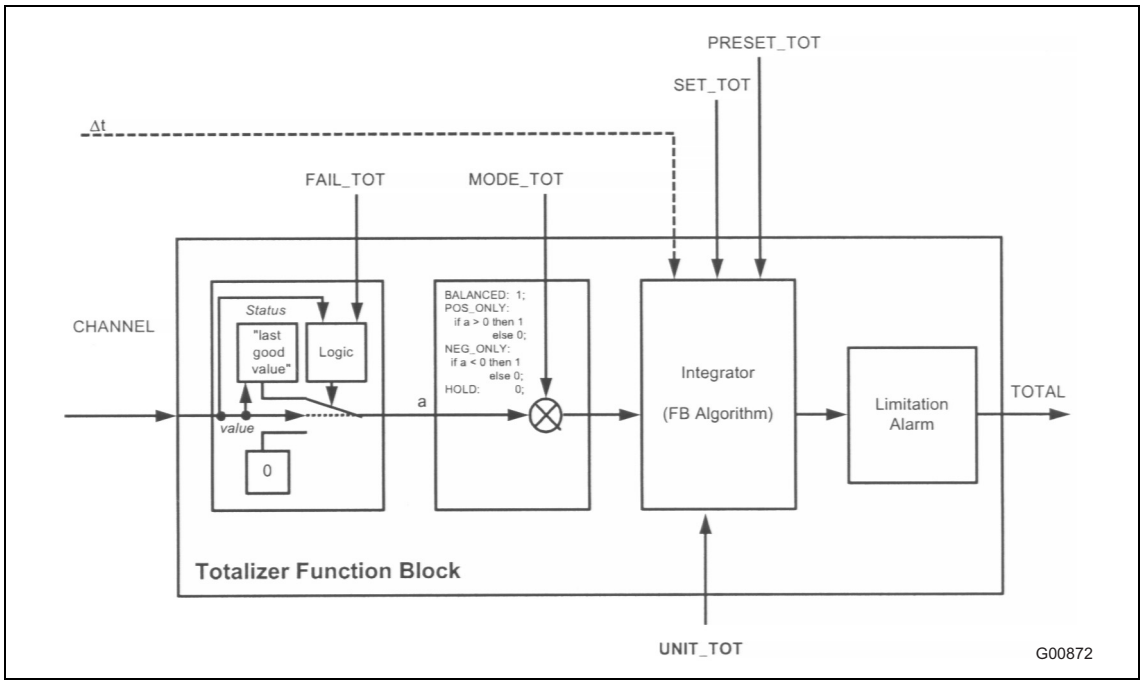


Fig. 27: Totalizer function block

Parameterization is performed on the device using the magnetic pen / keypad or via a class 1 / 2 master and the associated DTM.

8 Operation

8.1 Navigation via menus

Local operation involves using the graphic display (120 x 32 pixels) and 3 buttons that are activated by means of the magnetic pen.

In the case of the low-voltage version, you also have the option of removing the front cover and display cover frame in order to use the push buttons for parameterization purposes (see Fig. 18).

DANGER

Opening the front housing cover in potentially explosive atmospheres creates a risk of explosion.
This can result in severe injuries or death.
Only ever use the magnetic pen for parameterization purposes.

NOTICE - Potential damage to parts!

Always take ESD precautions before touching modules.

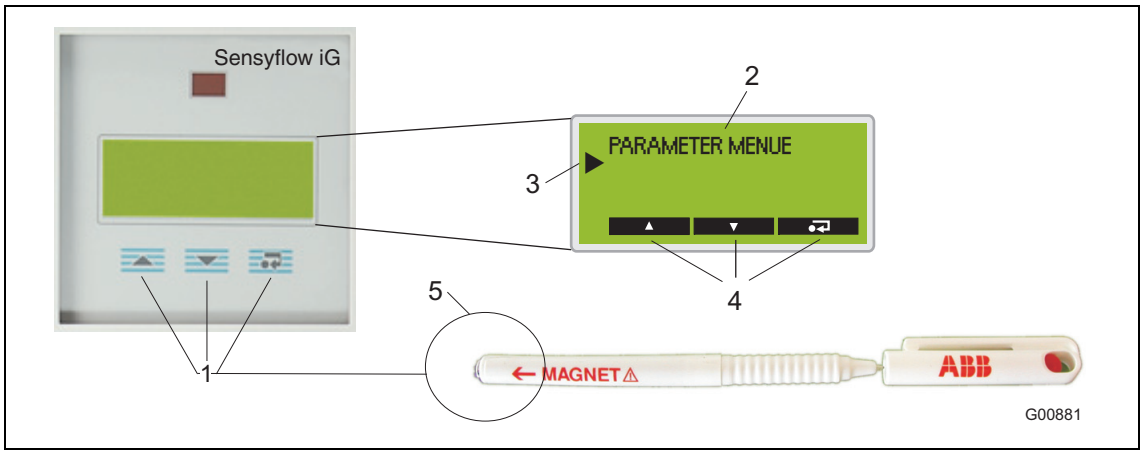


Fig. 28: Operation with the magnetic pen when the housing is closed

1 Buttons for menu navigation
2 Menu name
3 Relative position within menu
4 Function currently assigned to the , , and buttons
5 Magnet

8.2 Button functions

The function of the buttons depends on the context and is shown on the display accordingly. This makes operation and parameterization really easy.

	ENTER button	Meaning
	ENTER button	- For accessing submenus and input fields - For confirming entries
	ENTER button	- For returning to the previous menu level
	SCROLL button	- For navigating and making selections in the value range
	+ button	- For increasing numerical values (increment) - For changing letters and special characters

	ARROW keys	Meaning
	Vertical	- For navigating within a menu level (main menu, submenu level 1, submenu level 2)
	Horizontal	- For navigating within an input field (cursor position)

8.3 Description of symbols and error message

An arrow on the left-hand side indicates the relative position within the menu.

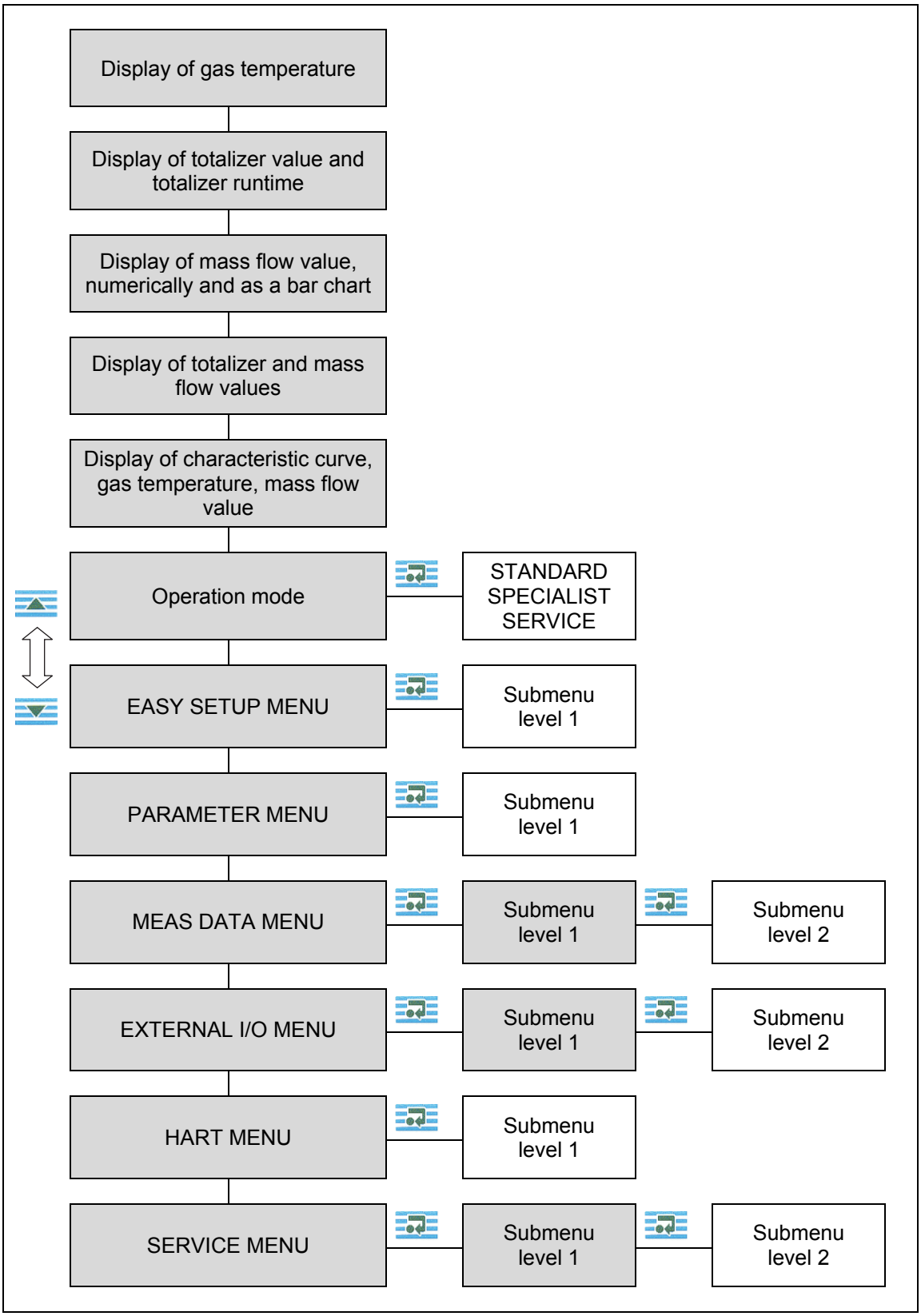
During parameterization, a single bar is shown towards the bottom of the display to indicate that the cursor is in submenu level 1; if it is in submenu level 2, two bars will appear. In the main menu and in the display modes, no bars are displayed.

In the display modes, the following symbols provide information about the status of the device.

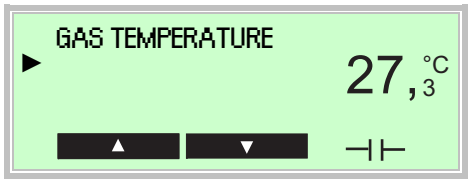
Symbol	Meaning	Description
-II-	Connect	HART communication active. No changes can be made to parameters directly on the device.
-I I-	Disconnect	HART communication not active.
O	Overflow	The measured value cannot be displayed (you may need to change the display unit), output values are not affected.
*	Flashing asterisk	Indicates normal operation (measuring mode).
S	Simulation	Simulated values and status signals are output instead of measured values.
A	Alarm	Indicates that limit values have been exceeded.
E	Error	Indicates status signal or diagnostic byte with error. Status signals, error messages and limit values can be accessed in the SERVICE MENU.

9 HART parameterization

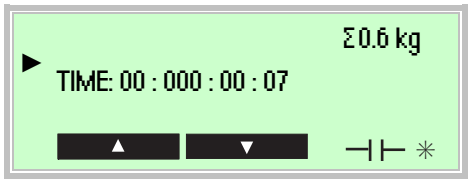
9.1 Menu levels



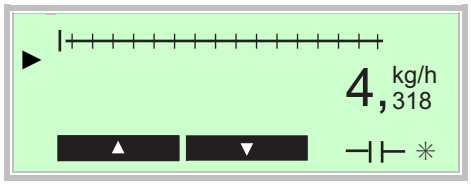
9.1.1 Process display



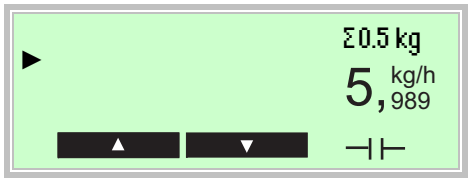
Gas temperature



Totalizer value and totalizer runtime



Mass flow value, numerically and as a bar chart



Totalizer and mass flow values

Characteristic curve, gas temperature and mass flow value

9.1.2 Operation modes

Display of parameters, cannot be changed.

Changes can only be made in the SPECIALIST and SERVICE modes, which are password-protected.

To access these, use

(When HART communication is active, it is not possible to make parameter changes on the device).

Use and to select the required mode: STANDARD, SPECIALIST or SERVICE.

Use to confirm your selection.

(PASSWORD SPECIALIST: 2000)

Use and to position the cursor.

Use to set the numerical value.

Use to complete password entry.

(Cursor must be positioned on the far right).

OK will appear to confirm that the password is correct.

Use and to access additional menus.

IMPORTANT (NOTE)

When the SPECIALIST or SERVICE (for manufacturer's Service department only) modes are activated, the outputs and totalizer will be frozen (i.e., the last value will be retained) when the menu is opened. As soon as you return to the STANDARD operation mode or one of the display modes, the outputs will be re-enabled and the totalizer will start running again.
If no entries are made for a period of 2 minutes, the device will automatically revert to display mode and the STANDARD operation mode. If this happens, any unsaved changes will be lost.

9.1.3 Parameter changes

To save parameter changes, you need to perform 3 separate operations:

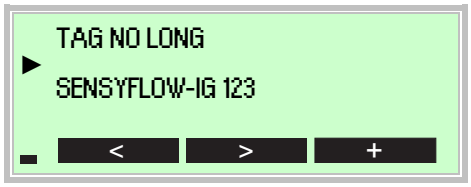
1. Enter password (OPERATION MODE)
2. Make changes to parameters in the menus
3. Save

Changing text and values

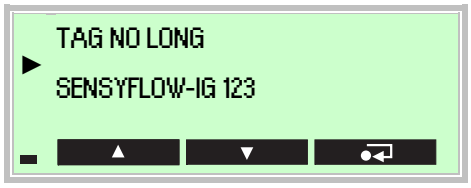
The process will be illustrated on the basis of the TAG NO. This input mask can be found in the PARAMETER MENU and can be accessed from any display mode using ▲ and ▼. Entries and changes can only be made in the SPECIALIST or SERVICE operation modes (see Section 9.1.2, "Operation modes").

▼ Press 3 times.

↵ Press.
▼ Press.



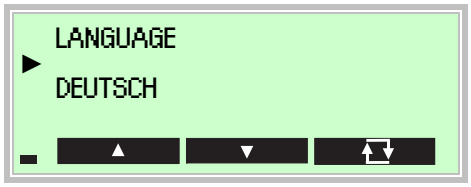
↵ Press.
▼ Press.
↵ Press.



To make the entry, use ▲, ▼ (cursor position) and ↵ (to set the numerical value or required character). To complete the entry process, the cursor must be moved to the right of the input field (16 characters in the example). Only when the cursor is in this position will + change back to ↵ on the display, making it possible to exit change mode by pressing ↵.

The display will revert to the PARAMETER MENU, where you can make additional configuration changes.

Choosing between several options



When presented with several options, you can scroll through them by pressing repeatedly.

The option shown will be applied as soon as you exit the menu.

Use or to exit the menu.

Saving changes

To save any entries and changes you make, remember to confirm SAVE USER CONF. by pressing before you exit the submenu.

IMPORTANT (NOTE)

Unless you remember to save them, any changes will be lost (the same applies if the device should automatically revert to the STANDARD mode because no entries have been made for a period of 2 minutes).

During the save process, "PLEASE WAIT" will appear on the display, followed by "OK".

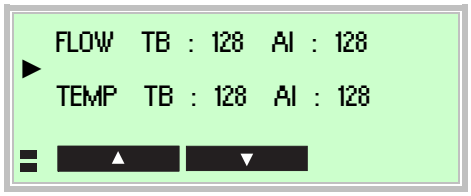
Return to default display

Use to exit the menu.

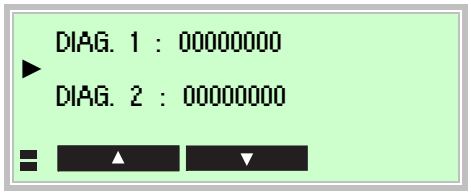
If no entries are made for a period of two minutes, the device will revert to display mode and adopt the STANDARD operation mode.

Any unsaved changes will be lost.

9.1.4 Status signals and diagnostic bytes

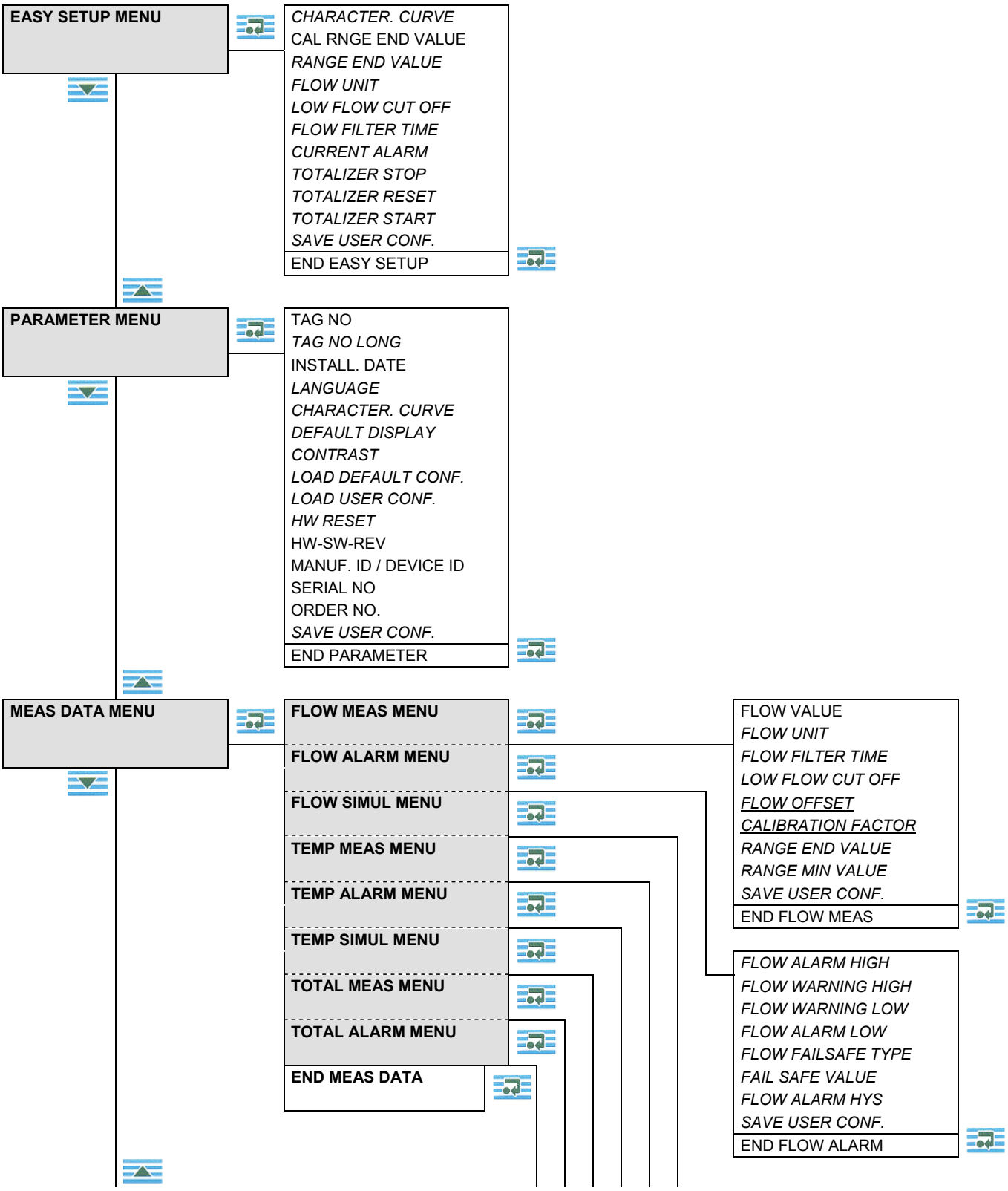


From the SERVICE MENU / STATUS MENU, you can access the status signals for the FLOW, TEMP, and TOT measured variables.

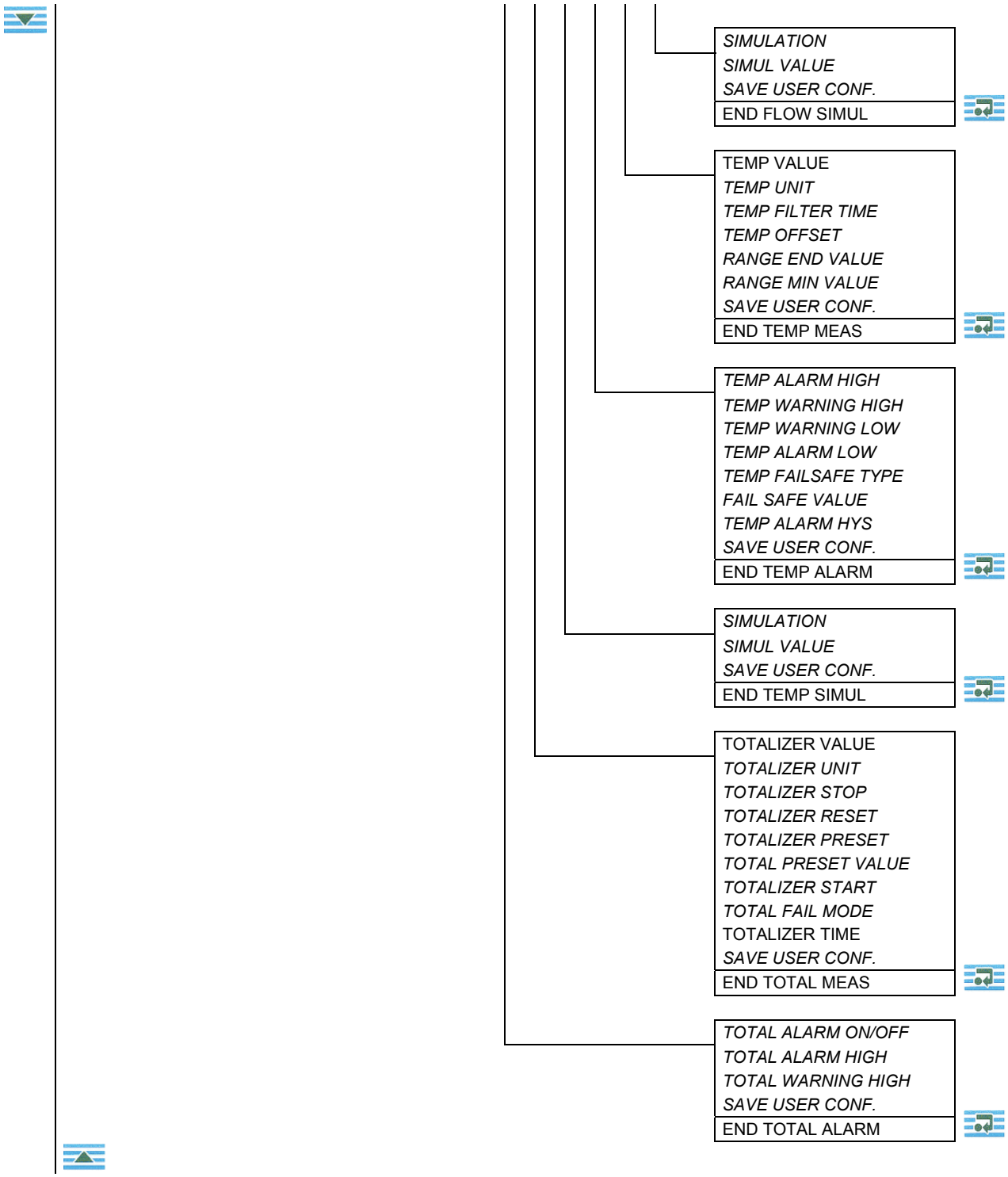


Diagnostic bytes describe possible device errors.

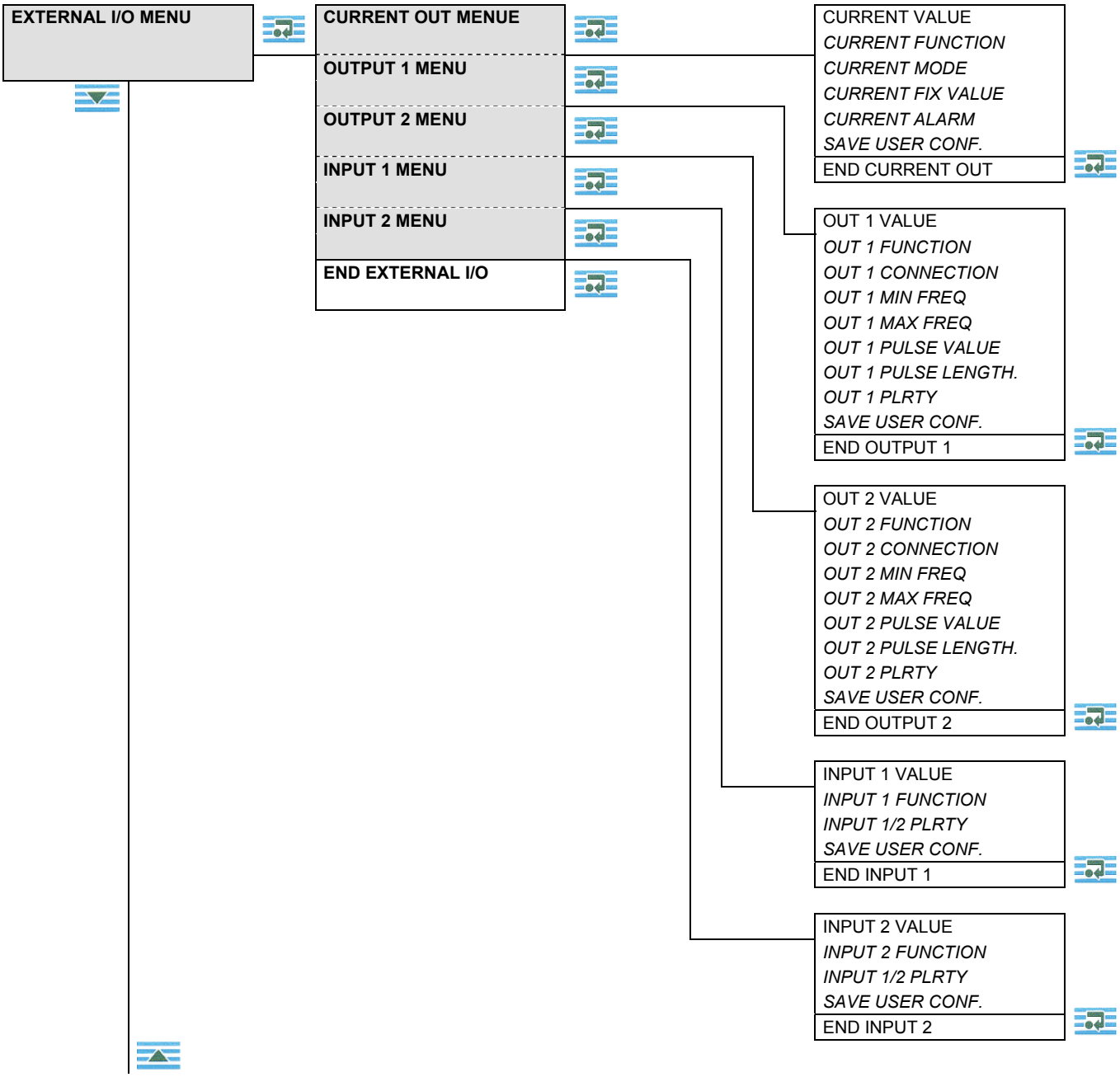
9.2 Parameter overview



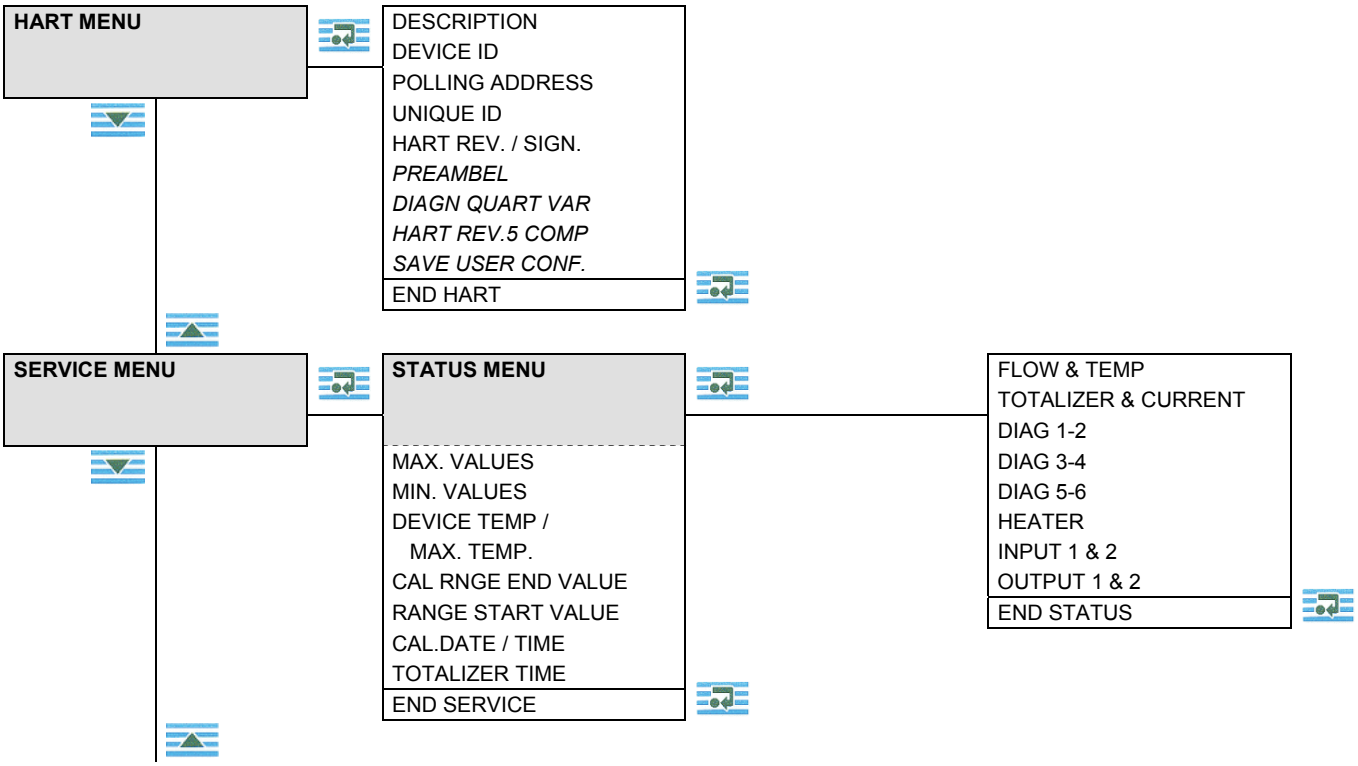
Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.



Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.



Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.



Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

9.3 Description of parameters

Parameterization is performed locally on the display or via DTM in FDT 1.2 frame applications (e.g., ASSET VISION).

9.3.1 Selection of key parameters

Parameter	Value range	Menu
Language selection display *LANGUAGE*	German, English, French, 4th language (currently Portuguese)	PARAMETER MENU
Characteristic curve selection *CHARACTER. CURVE*	Up to 4 characteristic curves for various gases and nominal diameters (optional). Switchover is also possible via digital inputs 1/2.	EASY SETUP MENU PARAMETER MENU
Flow display unit *FLOW UNIT*	kg/h, Nm^3/h, SCFM ...	EASY SETUP MENU FLOW MEAS MENUE
Low flow cut-off suppression *LOW FLOW CUT OFF*	Entered in mass flow units Default = 0	EASY SETUP MENU FLOW MEAS MENUE
Start and end of measuring range *MEASURING RANGE*	Definition of the current and frequency output range	EASY SETUP MENU FLOW MEAS MENUE
Temperature display unit *TEMPERATURE UNIT*	°C, °F, K	TEMP MEAS MENU
Filter time *FLOW FILTER TIME* *TEMP FILTER TIME*	For signal attenuation 0.2 ... 99.999 s	EASY SETUP MENU FLOW MEAS MENUE TEMP MEAS MENU
FLOW, TEMP, TOTALIZER limit values *ALARM HIGH/LOW* *WARNING HIGH/LOW*	Adjustable for mass flow, gas temperature and totalizer value within the measuring ranges	FLOW ALARM MENU TEMP ALARM MENU TOTAL ALARM MENU
Simulation of signals *FLOW SIMULATE* *TEMP SIMULATE*	Simulation of a mass flow or temperature value	FLOW SIMUL MENU TEMP SIMUL MENU
Totalizer functions *TOTALIZER*	START, STOP, RESET, TOTAL PRESET VALUE Switchover is also possible via digital inputs 1/2.	EASY SETUP MENU TOTAL MEAS MENU INPUT 1 MENU INPUT 2 MENU
Current output alarm value *CURRENT ALARM*	MAX (> 22.5 mA) and MIN (0 mA or < 3.5 mA)	EASY SETUP MENU CURRENT OUT MENUE
Definition of digital output 1 / 2 *OUT 1 / 2 FUNCTION*	FREQUENCY, PULSE, SWITCH, OFF	OUTPUT 1 MENU OUTPUT 2 MENU
Assignment of signals to digital output 1 / 2 *OUT 1 / 2 CONNECTION*	Linking of measured-value or limit-value signals to digital outputs	OUTPUT 1 MENU OUTPUT 2 MENU
Definition of digital input 1 / 2 *INPUT 1 / 2 FUNCTION*	CHARACTER. CURVE, TOTAL START/STOP, TOTAL RESET, OFF	INPUT 1 MENU INPUT 2 MENU

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

9.3.2 Easy Set-up menu (submenu level 1)

IMPORTANT (NOTE)

Key or frequently used parameters have been grouped together to enable faster operation. First, activate the SPECIALIST or SERVICE operation modes (see Section 9.1.2).

Menu / Parameter	Value range	Description
EASY SETUP MENUE		
CHARACTER. CURVE	1 ... 4	Selection of up to four factory-set characteristic curves for different gases and / or pipe diameters (option). When characteristic curve switchover is active, configuration via digital inputs 1 and 2 is not possible.
CAL RNGE END VALUE	-	Displays the calibrated measuring range end value
RANGE END VALUE	1 ... 100 %	Calibrated measuring range end value that has been set for the selected characteristic curve. Default = As per characteristic curve, see calibration certificate. Unless specifications are made to the contrary, the calibrated measuring range end value will be set.
FLOW UNIT	t/d, t/h, t/m, t/s kg/d, kg/h, kg/m, kg/s g/h, g/m, g/s lb/d, lb/h, lb/m, lb/s Nm^3/d, Nm^3/h, Nm^3/m, Nm^3/s Nl/d, Nl/h, Nl/m, Nl/s SCFD, SCFH, SCFM, SCFS	The TOTALIZER UNIT is set automatically in accordance with the FLOW UNIT. Default = Depends on the characteristic curve set.
LOW FLOW CUT OFF	-	For entering the low flow cut-off in the set mass flow unit (e.g., 5 kg/h). In the case of measured values below the low flow cut-off point that has been set, a zero signal is output. (Maximum value = 20 % of RANGE END VALUE). Default = 0
FLOW FILTER TIME	0,2 ... 99,999 s	Filter factor for attenuating the measuring signal Default = 0.2 s
CURRENT ALARM	MAXIMUM ≥ 22,5 mA MINIMUM ≤ 3,5 mA MINIMUM 0 mA	The output alarm value depends on the output range set under CURRENT FUNCTION. For 4 … 20 mA For 0 … 20 mA CURRENT ALARM is activated in the event of a serious device error and when the ALARM limits for FLOW and TEMP are exceeded. Default = MAXIMUM

Menu / Parameter	Value range	Description
EASY SETUP MENU (continued)		
TOTALIZER STOP	-	Press  to stop the totalizer ("OK" will appear briefly, then STOPPED will appear on the display).
TOTALIZER RESET	-	Use  to reset the totalizer to zero ("OK" will appear briefly on the display).
TOTALIZER START	-	Press  to start the totalizer ("OK" will appear briefly, then RUNNING will appear on the display).
SAVE USER CONF.	-	Save the current configuration as a new user configuration.
END EASY SETUP	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

IMPORTANT (NOTE)

Changes relating to totalizer functions are only activated once they have been saved and you have returned to display mode.

9.3.3 Parameter menu

Menu / Parameter	Value range	Description
PARAMETER MENU		
TAG NO	-	Displays the first 8 digits of the measuring point identifier (TAG no.).
TAG NO LONG	-	Long version of the measuring point identifier (TAG no.) consisting of 16 digits.
INSTALL. DATE	dd.mm.yyyy	Allows you to enter the installation / commissioning date (can only be set using HART).
LANGUAGE	German, English, French, 4th language (currently Portuguese)	Language selection
CHARACTER. CURVE	1 ... 4	Selection of up to four factory-set characteristic curves for different gases and / or pipe diameters (option). When characteristic curve switchover is active, configuration via digital inputs 1 and 2 is not possible.
DEFAULT DISPLAY	-	Selection of the display screen (default display) to be shown when the device is started up. Default = Character. curve/Temp/Flow.
CONTRAST	0 ... 30	To set the display contrast (dependent on ambient temperature), press  repeatedly. Default = 15.
LOAD DEFAULT CONF.	-	Loads the stored default configuration as a new user configuration. As soon as you save it, all user settings are overwritten. If you exit the menu without saving, the previous user configuration will continue to be active.
LOAD USER CONF.	-	The most recently saved user configuration overwrites the currently set configuration.
HARDWARE RESET	-	Simulates an interruption in the power supply. The device restarts and, provided that there is no error pending, assumes normal operation. On restarting, the most recently saved user configuration is reloaded. The screen selected under DEFAULT DISPLAY appears.
HW-SW-REV	-	Displays the hardware and software revision numbers.
MANUFACTURER ID	-	Displays the manufacturer's ID number.
DEVICE ID	-	Displays the device's ID number.
SERIAL NO	-	Displays the device's serial number.
ORDER NO.	-	Displays the manufacturer's order number.
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END PARAMETER	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

9.3.4 Meas data menu

Menu / Parameter	Value range	Description
MEAS DATA MENU		
FLOW MEAS MENUE		Access to FLOW measuring parameter in submenu level 2
FLOW ALARM MENU		Access to FLOW alarm parameter in submenu level 2
FLOW SIMUL MENU		Access to FLOW simulation in submenu level 2
TEMP MEAS MENU		Access to TEMP measuring parameter in submenu level 2
TEMP ALARM MENU		Access to TEMP alarm parameter in submenu level 2
TEMP SIMUL MENU		Access to TEMP simulation in submenu level 2
TOTAL MEAS MENU		Access to TOTAL measuring parameter in submenu level 2
TOTAL ALARM MENU		Access to TOTAL alarm parameter in submenu level 2
END MEAS DATA	-	For exiting the menu

Menu / Parameter	Value range	Description
... / FLOW MEAS MENUE		
FLOW VALUE	-	Displays the currently measured mass flow value
FLOW UNIT	t/d, t/h, t/m, t/s kg/d, kg/h, kg/m, kg/s g/h, g/m, g/s lb/d, lb/h, lb/m, lb/s Nm^3/d, Nm^3/h, Nm^3/m, Nm^3/s Nl/d, Nl/h, Nl/m, Nl/s SCFD, SCFH, SCFM, SCFS	The TOTALIZER UNIT is set automatically in accordance with the FLOW UNIT. Default = Depends on the characteristic curve set.
FLOW FILTER TIME	0.2 s ... 99.999 s	Filter factor for attenuating the measuring signal. Default = 0.2 s
LOW FLOW CUT OFF	-	For entering the low flow cut-off in the set mass flow unit (e.g., 5 kg/h). In the case of measured values below the low flow cut-off point that has been set, the device outputs a zero signal. (Maximum value = 20 % of RANGE END VALUE). Default = 0
FLOW OFFSET	-	For entering a zero position correction (zeropoint value) in the set mass flow unit (e.g., 1 kg/h). IMPORTANT: With this function, there is a shift in the entire characteristic curve. Default = 0
CALIBRATION FACTOR	0.001 ... 9999999.999	For entering a calibration factor that acts on the measured value as a multiplier. IMPORTANT: This function changes the gradient of the characteristic curve. Default = 1
RANGE END VALUE	1 ... 100 %	Calibrated measuring range end value that has been set for the selected characteristic curve. Default = As per characteristic curve, see calibration certificate. Unless specifications are made to the contrary, the calibrated measuring range end value will be set.
RANGE MIN VALUE	-	Measuring range start value that has been set for the selected characteristic curve. Only values greater than or equal to the calibrated start value are possible (see SERVICE MENU). Default = 0
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END FLOW MEAS	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter	Value range	Description
... / FLOW ALARM MENU		
FLOW ALARM HIGH	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the measured value. (Current signal, outputs 1/2 and HART). Default = Calibrated measuring range end value
FLOW WARNING HIGH	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the measured value (outputs 1/2 and HART). Default = Calibrated measuring range end value
FLOW WARNING LOW	-	Lower warning value (pre-alarm); warning will be triggered if the warning value is undershot by the measured value (outputs 1/2 and HART). Default = 0
FLOW ALARM LOW	-	Lower alarm limit; alarm will be triggered if the limit is undershot by the measured value (current signal, outputs 1/2, and HART). Default = 0
FLOW FAILSAFE TYPE	LAST VALID OUT FAIL SAFE OUT FAIL VALUE	If the device detects an error that makes the measured value uncertain (Uncertain status signal), the following options are available for the FLOW signal that is to be output: Last valid measured value Adjustable substitute value (= fail safe value) Current measured value (default). Serious device errors (Bad status signal) always trigger the current and common alarm.
FAIL SAFE VALUE	-	Any numerical value can be set here to serve as a substitute for a faulty measured value. Will only be output if the FAIL SAFE OUT option has been selected under FLOW FAILSAFE TYPE. Default = 0
FLOW ALARM HYS	-	Hysteresis for limit value monitoring. This is entered in the set mass flow unit (e.g., 1 kg/h). Default = 0
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END FLOW ALARM	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter	Value range	Description
... / FLOW SIMUL MENU		
SIMULATION	ON, OFF	Simulates a FLOW signal for diagnostic purposes IMPORTANT: With ON, an "S" symbol is shown on the display.
SIMUL VALUE	-	For entering a simulated FLOW value in the set mass flow unit. The simulated FLOW value is ignored by the totalizer function.
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END FLOW SIMUL	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

... / TEMP MEAS MENU		
TEMP VALUE	-	Displays the currently measured gas temperature value.
TEMP UNIT	°C, °F, K	Default = °C
TEMP FILTER TIME	0.2 ... 99.999 s	Filter factor for attenuating the measuring signal. Default = 0.2 s
TEMP OFFSET	-	For entering a zero position correction (zeropoint value) in the set temperature unit (e.g., 3 °C). Default = 0 IMPORTANT: With this function, there is a shift in the entire characteristic curve.
RANGE END VALUE	-	Measuring range end value for temperature measurement. Default = 400 °C (752 °F)
RANGE MIN VALUE	-	Start value for the temperature measuring range. Default = -40 °C
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END TEMP MEAS	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter	Value range	Description
... / TEMP ALARM MENU		
TEMP ALARM HIGH	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the measured value. Default = 400 °C (752 °F)
TEMP WARNING HIGH	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the measured value. Default = 400 °C (752 °F)
TEMP WARNING LOW	-	Lower warning value (pre-alarm); warning will be triggered if the warning value is undershot by the measured value. Default = -40 °C
TEMP ALARM LOW	-	Lower alarm limit; alarm will be triggered if the limit is undershot by the measured value. Default = -40 °C
TEMP FAILSAFE TYPE	LAST VALID OUT FAIL SAFE OUT FAIL VALUE	If the device detects an error that makes the measured value uncertain (Uncertain status signal), the following options are available for the TEMP signal that is to be output: Last valid measured value Adjustable substitute value (= fail safe value) Current measured value (default). Serious device errors (Bad status signal) always trigger the current and common alarm.
FAIL SAFE VALUE	-	Any numerical value can be set here to serve as a substitute for a faulty measured value. Will only be output if the FAIL SAFE OUT option has been selected under FLOW FAILSAFE TYPE. Default = 0
TEMP ALARM HYS	-	Hysteresis for limit value monitoring. This is entered in the set temperature unit (e.g., 1 °C [33.8 °F]). Default = 0
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END FLOW ALARM	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

... / TEMP SIMUL MENU		
SIMULATION	ON, OFF	Simulates a TEMP signal for diagnostic purposes IMPORTANT: With ON, an "S" symbol is shown on the display.
SIMUL VALUE	-	For entering a simulated TEMP value in the set mass flow unit.
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END FLOW SIMUL	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter	Value range	Description
... / INTEG MESS MENUE		
TOTALIZER VALUE	-	Displays the totalizer value in the selected unit. Above "9,999,999": displayed as an exponential value with 3-digit exponent.
TOTALIZER UNIT	t, kg, g, lb, Nm^3, Nl, SCF	Unit used for totalizer value.
TOTALIZER STOP	-	Press to stop the totalizer ("OK" will appear briefly, then STOPPED will appear on the display).
TOTALIZER RESET	-	Use to reset the totalizer to zero ("OK" will appear briefly on the display)
TOTALIZER PRESET	-	Activates the totalizer's TOTAL PRESET VALUE function (PRESET). Any totalization process that is currently in progress will be stopped. The totalizer must be restarted using TOTALIZER START. It will then start totaling from the specified preset value.
TOTAL PRESET VALUE	-	Start value for the totalizer (entered manually) Default = 0
TOTALIZER START	-	Press to start the totalizer ("OK" will appear briefly, then RUNNING will appear on the display).
TOTAL FAIL MODE	RUN MEMORY HOLD	In the event of a serious device error (Bad status signal), the totalizer will be stopped automatically. In the case of errors that make the measured value uncertain (Uncertain status signal), the following options are available in terms of the totalizer's response: Continue with faulty measured value (default) Continue with last valid mass flow value Totalizer remains stopped
TOTALIZER TIME	-	Totalizer runtime since the last RESET command. Use TOTALIZER RESET to reset it to zero.
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END TOTAL MEAS	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

In the event of a voltage dip or power interruption, the totalizer value is retained. If the totalizer was already running prior to this, totalizing will continue automatically when the device power is restored.

IMPORTANT (NOTE)
Any changes relating to totalizer functions are only activated once they have been saved and you have returned to display mode.

Menu / Parameter	Value range	Description
... / TOTAL ALARM MENU		
TOTAL ALARM ON/OFF	ON, OFF	Activates the alarm and warning functions. Default = OFF
TOTAL ALARM HIGH	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the totalizer value. Default = 9,999,999
TOTAL WARNING HIGH	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the totalizer value. Default = 9,999,999
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END TOTAL ALARM	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

9.3.5 External I/O menu

Menu / Parameter	Value range	Description
EXTERNAL I/O MENU		
CURRENT OUT MENUE		Access to the parameters of the analog mA output in submenu level 2
OUTPUT 1 MENU		Access to the parameters of digital output 1 in submenu level 2
OUTPUT 2 MENU		Access to the parameters of digital output 2 in submenu level 2
INPUT 1 MENU		Access to the parameters of digital input 1 in submenu level 2
INPUT 2 MENU		Access to the parameters of digital input 2 in submenu level 2
END EXTERNAL I/O	-	For exiting the menu

... / CURRENT OUT MENUE		
CURRENT VALUE	-	Displays the mA value currently being output for the mass flow signal
CURRENT FUNCTION	0 ... 20 mA 4 … 20 mA (HART)	The measuring range output via the current output is set in the FLOW MEAS MENUE. The RANGE MIN VALUE is 0 or 4 mA and the RANGE END VALUE is 20 mA (can also be changed in the EASY SETUP MENU). Default = 4 ... 20 mA
CURRENT MODE	ON OFF FIX VALUE	Output signal set as in CURRENT FUNCTION. Current output inactive. Fixed current signal, can be set under CURRENT FIX VALUE. Default = ON
CURRENT FIX VALUE	0 ... 25 mA	Option for setting a fixed current value, e.g., for testing and simulation purposes. Can be activated by selecting FIX VALUE under CURRENT MODE. Default = 4 mA
CURRENT ALARM	MAXIMUM ≥ 22.5 mA MINIMUM ≤ 3.5 mA MINIMUM 0 mA	The output alarm value depends on the output range set under CURRENT FUNCTION. For 4…20 mA.. For 0…20 mA. CURRENT ALARM is activated in the event of a serious device error and when the ALARM limits for FLOW and TEMP are exceeded. Default = MAXIMUM
SAVE USER CONF.	-	Saves the current configuration as a new user configuration
END CURRENT OUT	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter	Value range	Description
... / OUTPUT 1 MENU		
OUT 1 VALUE	-	Displays the value currently being output at output 1.
OUT 1 FUNCTION	FREQUENCY PULSE SWITCH OFF	Frequency signal (for mass flow or gas temperature only) Pulse output (for totalizer only) Switching signal Output 1 inactive Important: You may only ever select either output 1 or output 2 as a frequency output. Default = OFF
OUT 1 CONNECTION	 TEMP FLOW TOTALIZER ALARM FLOW ALARM TEMP ALARM TOTALIZER WARNING FLOW WARNING TEMP WARNING TOTAL	Linking of output 1 to a measuring or limit-value signal. Temperature signal is output as a frequency Mass flow signal is output as a frequency Outputs mass flow counting pulses Switching contact for FLOW alarm Switching contact for TEMP alarm Switching contact for TOTAL alarm Switching contact for FLOW warning Switching contact for TEMP warning Switching contact for TOTAL warning Default = FLOW
OUT 1 MIN FREQ	Min. 1 Hz	Lower limit for output frequency signal, corresponds to RANGE MIN VALUE. Default = 1 Hz
OUT 1 MAX FREQ	Max.1500 Hz	Upper limit for output frequency signal, corresponds to RANGE END VALUE. Default = 1,500 Hz
OUT 1 PULSE VALUE	-	For entering the pulse value, i.e., the quantity recorded by the totalizer that corresponds to an output pulse (e.g., 10 kg / pulse).
OUT 1 PULSE LENGTH.	1 ... 255 ms	Adjustable pulse length. (In terms of the pulse value and pulse length, choose a combination that makes sense from a technical perspective.) Default = 20 ms
OUT 1 PLRTY	HIGH, LOW	Polarity of the output pulses and switching signals. Default = LOW
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END OUTPUT 1	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

IMPORTANT (NOTE)

In accordance with what you select under OUT 1 FUNCTION, any parameters that you do not need will be hidden. For example, if you select SWITCH, you will not be able to make any frequency and pulse settings.

Menu / Parameter	Value range	Description
... / OUTPUT 2 MENU		
OUT 2 VALUE	-	Displays the value currently being output at output 2.
OUT 2 FUNCTION	FREQUENCY PULSE SWITCH OFF	Frequency signal (for mass flow or gas temperature only) Pulse output (for totalizer only) Switching signal Output 2 inactive Important: You may only ever select either output 1 or output 2 as a frequency output. Default = OFF
OUT 2 CONNECTION	 TEMP FLOW TOTALIZER ALARM FLOW ALARM TEMP ALARM TOTALIZER WARNING FLOW WARNING TEMP WARNING TOTAL COMMON ALARM	Linking of output 2 to a measuring or limit-value signal. Temperature signal is output as a frequency Mass flow signal is output as a frequency Outputs mass flow counting pulses Switching contact for FLOW alarm Switching contact for TEMP alarm Switching contact for TOTAL alarm Switching contact for FLOW warning Switching contact for TEMP warning Switching contact for TOTAL warning Switching contact for alarms and device errors Default = FLOW
OUT 2 MIN FREQ	Min. 1 Hz	Lower limit for output frequency signal, corresponds to RANGE MIN VALUE Default = 1 Hz
OUT 2 MAX FREQ	Max.1500 Hz	Upper limit for output frequency signal, corresponds to RANGE END VALUE Default = 1,500 Hz
OUT 2 PULSE VALUE	-	For entering the pulse value, i.e., the quantity recorded by the totalizer that corresponds to an output pulse (e.g., 10 kg / pulse).
OUT 2 PULSE LENGTH.	1 .... 255 ms	Adjustable pulse length. (In terms of the pulse value and pulse length, choose a combination that makes sense from a technical perspective.) Default = 20 ms
OUT 2 PLRTY	HIGH, LOW	Polarity of the output pulses and switching signals. Default = LOW
SAVE USER CONF..	-	Saves the current configuration as a new user configuration.
END OUTPUT 2	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

IMPORTANT (NOTE)

In accordance with what you select under OUT 2 FUNCTION, any parameters that you do not need will be hidden. For example, if you select SWITCH, you will not be able to make any frequency and pulse settings.

Menu / Parameter	Value range	Description
... / INPUT 1 MENU		
INPUT 1 VALUE	-	Displays the value that currently applies at INPUT 1. The voltage values 0 V and 24 V are represented by means of a logical 0 or 1 (depending on the setting made under INPUT 1/2 PLRTY)
INPUT 1 FUNCTION	CHARACTER. CURVE TOTAL START / STOP TOTAL RESET OFF	Switches over the characteristic curve. Start the totalizer using a continuous logical 1 as the input signal and stop it with a logical 0. Stop the totalizer and use a logical 1 to reset it to zero. Input 1 inactive. Default = OFF
INPUT 1/2 PLRTY	HIGH, LOW	Polarity of the input signals. Can only be changed for the two inputs as a pair. Example: Polarity HIGH with 24 V at input 1 results in a logical 1 as the INPUT 1 VALUE. Default = HIGH
SAVE USER CONF.	-	Saves the current configuration as a new user configuration
END INPUT 1	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

... / INPUT 2 MENU		
INPUT 2 VALUE	-	Displays the value that currently applies at INPUT 2. The voltage values 0 V and 24 V are represented by means of a logical 0 or 1 (depending on the setting made under INPUT 1/2 PLRTY).
INPUT 2 FUNCTION	CHARACTER. CURVE TOTAL START / STOP TOTAL RESET OFF	Switches over the characteristic curve, see page 82. Start the totalizer using a continuous logical 1 as the input signal and stop it with a logical 0. Stop the totalizer and use a logical 1 to reset it to zero. Input 2 inactive Default = OFF
INPUT 1/2 PLRTY	HIGH, LOW	The polarity of the input signals can be set to HIGH or LOW, Can only be changed for the two inputs as a pair. Example: Polarity HIGH with 24 V at input 1 results in a logical 1 as the INPUT 1 VALUE. Default = HIGH
SAVE USER CONF.	-	Saves the current configuration as a new user configuration.
END INPUT 2	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Switch logic for switching over the characteristic curve via INPUT 1 and INPUT 2

Switchover with 2 characteristic curves

If you have 2 characteristic curves, you can use either INPUT 1 or INPUT 2 to switch from one to the other. If you decide to use INPUT 1, a logical 0 (= LOW) for INPUT 1 VALUE will always result in selection of characteristic curve 1 and a logical 1 (= HIGH) will always result in selection of characteristic curve 2 (the same principle applies when using INPUT 2 to perform the switchover).

Example with INPUT 1 being used to perform the switchover:

- Set INPUT 1 FUNCTION to CHARACTER. CURVE.
- Do not set INPUT 2 FUNCTION to CHARACTER. CURVE.
- Set INPUT 1/2 PLRTY to HIGH.
  - 0 V at input 1 generates a logical 0 and characteristic curve 1 is activated.
  - If there is a 24 V continuous signal at input 1, this generates a logical 1 and characteristic curve 2 is activated.

Switchover with 3 or 4 characteristic curves

If there are 3 or 4 characteristic curves, you will need to use both inputs for switchover, i.e., both INPUT 1 FUNCTION and INPUT 2 FUNCTION have to be set to CHARACTER. CURVE. The INPUT 1/2 VALUES in the table correspond to logical 0/1.

Characteristic curve	INPUT 1 VALUE	INPUT 2 VALUE
1	0	0
2	1	0
3	0	1
4	1	1

IMPORTANT (NOTE)

If CHARACTER. CURVE is active at INPUT 1 or INPUT 2, you will not be able to select the characteristic curves via the keypad / magnetic pen in the EASY SETUP or PARAMETER MENU.

9.3.6 HART menu

Menu / Parameter	Value range	Description
HART MENU		
DESCRIPTION	-	Device description
DEVICE ID	-	Displays the device's ID number
POLLING ADDRESS	000 ... 063	Displays the POLLING ADDRESS
UNIQUE ID	-	Displays the UNIQUE ID no.
HART REV. / SIGN.	-	Displays the HART revision number, displays the signal code used
PREAMBEL	1 ... 20	Signal for synchronizing HART communication with the data receiver. If you select "5", 5 preambles (0xFF) will be sent. In the event of communication problems, this value can be increased. Default = 5
DIAGN QUART VAR	ON, OFF	Activates quarternary variable diagnostics, i.e., status signals. Default = OFF
HART REV.5 COMP	ON, OFF	Compatibility byte for communicating with masters that do not conform to the standard protocol. Default = ON
SAVE USER CONF.	-	Saves the current configuration as a new user configuration
END HART	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

9.3.7 Service menu

Menu / Parameter	Value range	Description
SERVICE MENU		
STATUS MENU		Access to all available diagnostic signals in submenu level 2
MAX. VALUES	-	Displays the maximum mass flow and gas temperature values since commissioning
MIN. VALUES	-	Displays the minimum mass flow and gas temperature values since commissioning
DEVICE TEMP MAX TEMP	-	Displays the current housing temperature. Displays the maximum housing temperature values since commissioning
CAL RNGE END VALUE	-	Displays the calibrated measuring range end value
RANGE START VALUE	-	Displays the start value for the calibrated measuring range
CAL.DATE TIME:	-	Displays the date of the last calibration procedure. Displays the number of device operating hours (hours-run meter). Display format: Years : Days : Hours : Minutes
TOTALIZER TIME	-	Accumulated totalizer runtime since the last RESET command
END SERVICE	-	For exiting the menu

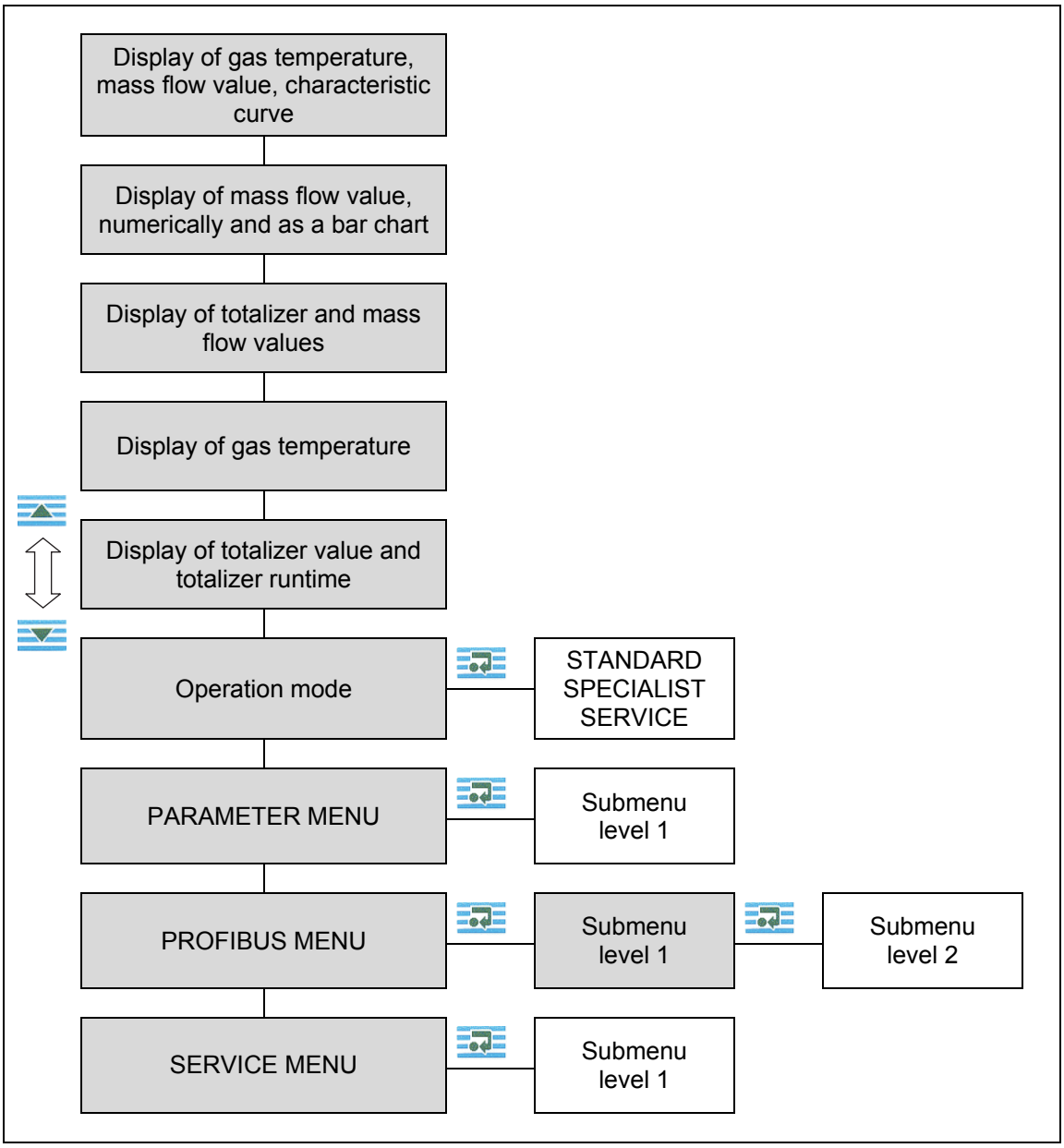
... / STATUS MENU		
FLOW & TEMP	-	Displays the status signals for mass flow and gas temperature
TOT & CUR	-	Displays the status signals for the totalizer and current signal
DIAG 1-2	-	Displays the status signals for diagnostic bytes 1 ... 2
DIAG 3-4	-	Displays the status signals for diagnostic bytes 3 ... 4
DIAG 5-6	-	Displays the status signals for diagnostic bytes 5 ... 6
HEATER	-	Displays the status signal for the heated resistor
IN 1/2	-	Displays the status signals for input 1 and input 2
OUT 1/2	-	Displays the status signals for output 1 and output 2
END STATUS	-	For exiting the menu

9.4 Software history

Software version	Type of changes	Operating instructions
Version 1.00	First release	42/14-40 Rev. 00/01
Version 1.79	Correction of totalizer status and totalizer pulse display	42/14-40 Rev. B
Version 1.85	Introduction of Easy Setup and bugfix	42/14-40 Rev. C/D
Version 1.85 ... 1.87	Bugfix	OI/FMT500-IG 07.2017

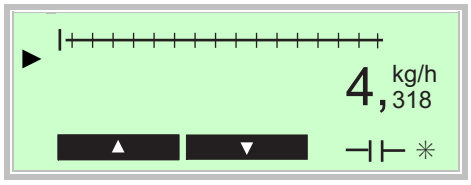
10 PROFIBUS DPV1 parameterization

10.1 Menu levels

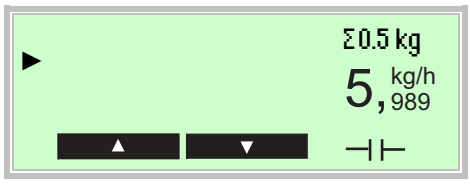


10.1.1 Process display

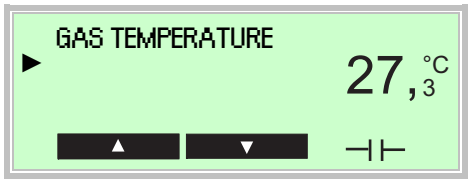
Characteristic curve, gas temperature and mass flow value



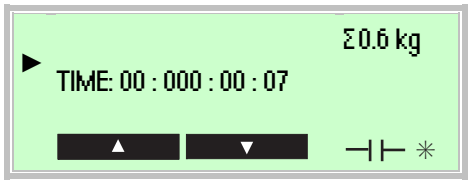
Mass flow value, numerically and as a bar chart



Totalizer and mass flow values



Gas temperature



Totalizer value and totalizer runtime

10.1.2 Operation modes

Display of parameters, cannot be changed.

Changes can only be made in the SPECIALIST and SERVICE modes, which are password-protected.

To access these, use .

(When PROFIBUS communication is active, it is not possible to make parameter changes on the device).

Use and to select the required mode: STANDARD, SPECIALIST or SERVICE.

Use to confirm your selection.

(PASSWORD SPECIALIST: 2000)

Use and to position the cursor.

Use to set the numerical value.

Use to complete password entry.

(Cursor must be positioned on the far right).

OK will appear to confirm that the password is correct.

Use and to access additional menus.

IMPORTANT (NOTE)

When the SPECIALIST or SERVICE (for manufacturer's Service department only) modes are activated, the outputs and totalizer will be frozen (i.e., the last value will be retained) when the menu is opened. As soon as you return to the STANDARD operation mode or one of the display modes, the outputs will be re-enabled and the totalizer will start running again.
If no entries are made for a period of 2 minutes, the device will automatically revert to display mode and the STANDARD operation mode. If this happens, any unsaved changes will be lost.

10.1.3 Parameter changes

To save parameter changes, you need to perform 3 separate operations:

1. Enter password (OPERATION MODE)
2. Make changes to parameters in the menus
3. Save

Changing text and values

The process will be illustrated on the basis of the PROFIBUS SLAVE ADDRESS. This input mask can be found in the PARAMETER MENU and can be accessed from any display mode using ▲ and ▼. Entries and changes can only be made in the SPECIALIST or SERVICE operation modes (see Section 10.1.2, "Operation modes").

Press 6 times.

Press.

Press 3 times.

Press.

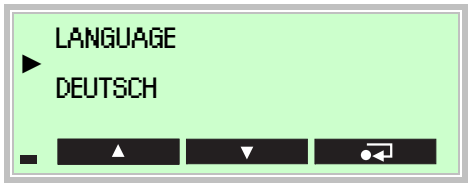
Press.

Press.

To make the entry, use ▲, ▼ (cursor position) and ↵ (to set the numerical value or required character). To complete the entry process, the cursor must be moved to the right of the input field (16 characters in the example). Only when the cursor is in this position will + change back to ↵ on the display, making it possible to exit change mode by pressing ↵.

The display will revert to the PARAMETER MENU, where you can make additional configuration changes.

Choosing between several options



When presented with several options, you can scroll through them by pressing repeatedly.

The option shown will be applied as soon as you exit the menu.

Use or to exit the menu.

Saving changes

To save any entries and changes you make, remember to confirm SAVE USER CONF. by pressing before you exit the submenu.

IMPORTANT (NOTE)

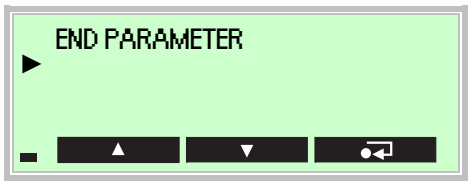
Unless you remember to save them, any changes will be lost (the same applies if the device should automatically revert to the STANDARD mode because no entries have been made for a period of 2 minutes).

During the save process, "PLEASE WAIT" will appear on the display, followed by "OK".

Hardware reset

After changing the communication parameters (PROFIBUS address, baud rate), you need to perform a hardware reset by pressing . This logs the device on to the master using the new data.

Return to default display

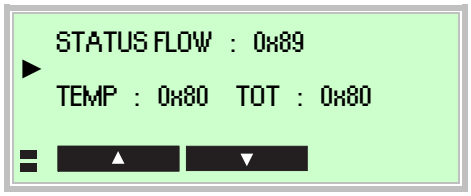


Use to exit the menu.

If no entries are made for a period of two minutes, the device will revert to display mode and adopt the STANDARD operation mode.

Any unsaved changes will be lost.

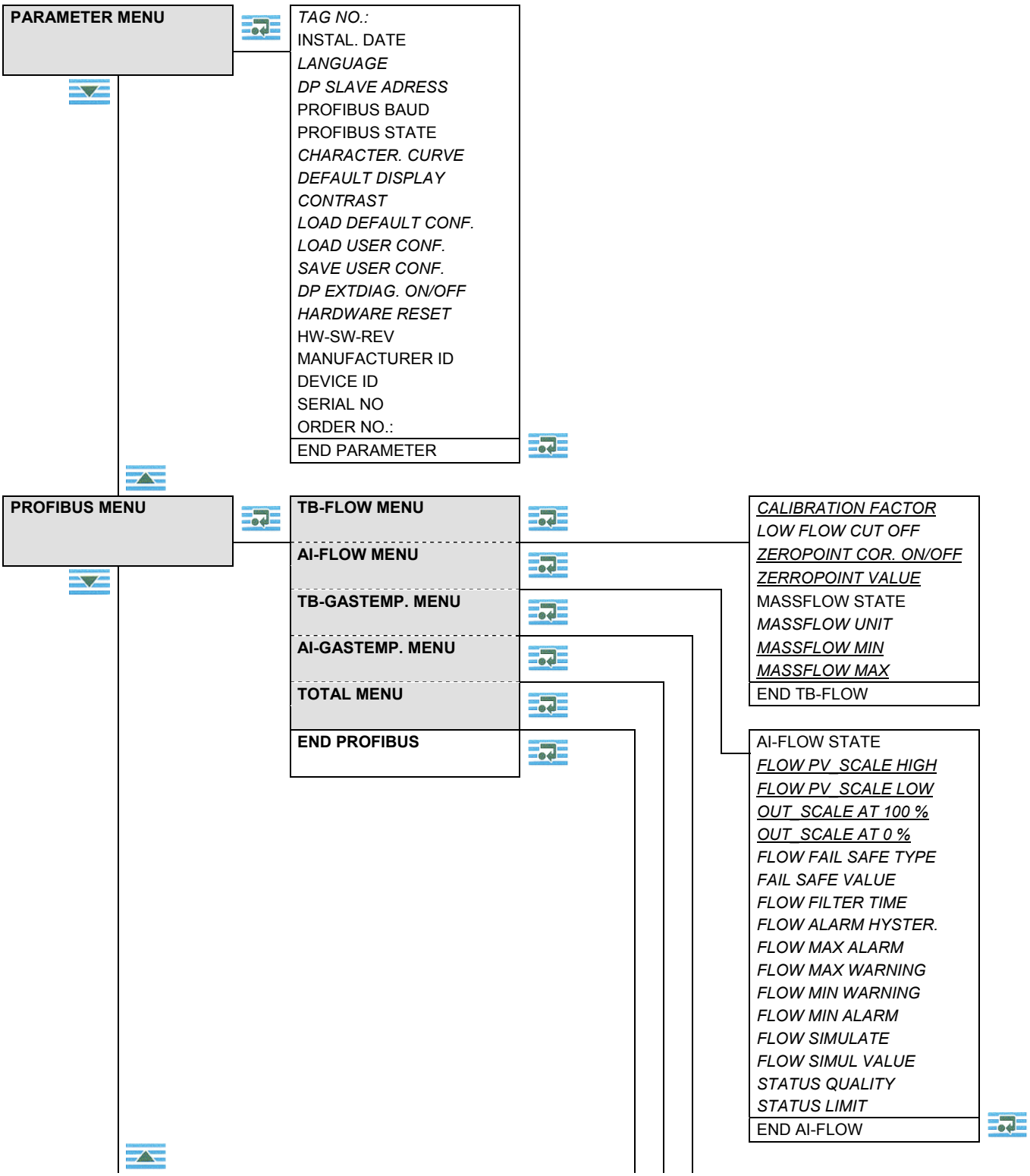
10.1.4 Status signals and diagnostic bytes



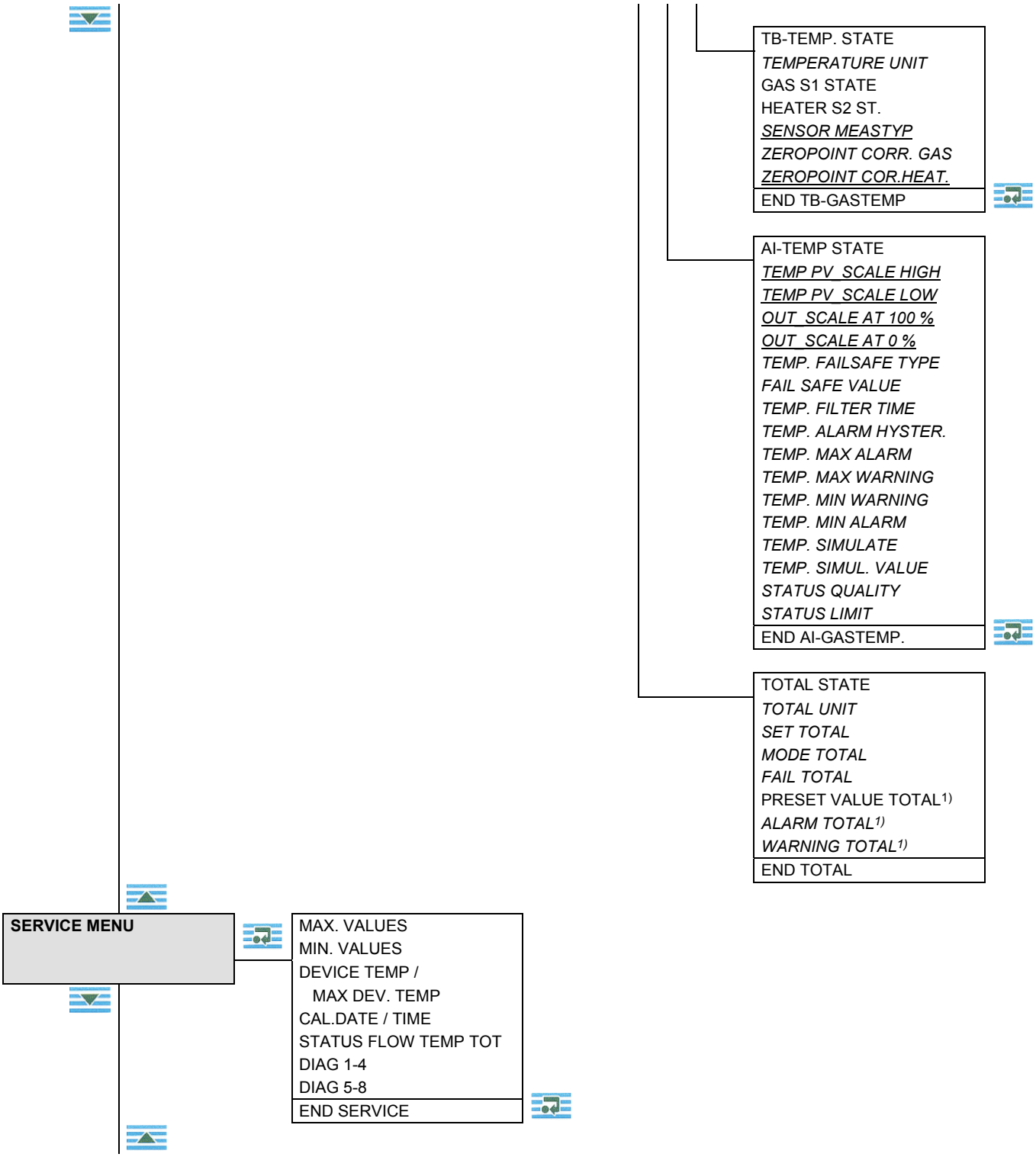
From the SERVICE MENU, you can access the status signals for the FLOW, TEMP, and TOT measured variables.

Diagnostic bytes describe possible device errors.

10.2 Parameter overview



Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.



Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

1) Configurable via DTM only.

10.3 Description of parameters

Parameterization is performed locally on the display or via DTM in FDT 1.2 frame applications (e.g., ASSET VISION).

10.3.1 Selection of key parameters

Parameter	Value range	Menu
Language selection display *LANGUAGE*	German, English, French, 4th language (currently Portuguese)	PARAMETER MENU
Device address *DP SLAVE ADRESS*	0 … 126	PARAMETER MENU
Characteristic curve selection *CHARACTER. CURVE*	Up to 4 characteristic curves for various gases and nominal diameters (optional).	PARAMETER MENU
Flow display unit *MASSFLOW UNIT*	t/d, t/h, t/m, t/s kg/d, kg/h, kg/m, kg/s g/h, g/m, g/s lb/d, lb/h, lb/m, lb/s Nm^3/d, Nm^3/h, Nm^3/m, Nm^3/s Nl/d, Nl/h, Nl/m, Nl/s SCFD, SCFH, SCFM, SCFS	TB-FLOW MENU
Low flow cut-off suppression *LOW FLOW CUT OFF*	Entered in mass flow units. Default = 0	TB-FLOW MENU
Temperature display unit *TEMPERATURE UNIT*	°C, °F, K	TB-GASTEMP. MENU
Zero shift for gas temperature *ZEROPOINT CORR. GAS*	Allows you to enter a temperature offset	TB-GASTEMP. MENU
Output in the event of an error for *FLOW FAIL SAFE TYPE* *TEMP. FAILSAFE TYPE FAIL SAFE VALUE*	LAST VALID VALUE (outputs the last valid measured value). BAD FAIL VALUE (faulty measured value). FAIL SAFE OUT (outputs the selected FAIL SAFE VALUE).	AI-FLOW MENU AI-GASTEMP. MENU
Filter time *FLOW FILTER TIME* *TEMP. FILTER TIME*	For signal attenuation. 0.2 ... 99.999 s	AI-FLOW MENU AI-GASTEMP. MENU
Limit values *FLOW, TEMP,* *MIN. / MAX. ALARM* *MIN. / MAX. WARNING*	Adjustable for mass flow and gas temperature within the measuring ranges	AI-FLOW MENU AI-GASTEMP. MENU
Hysteresis limit value *FLOW ALARM HYSTER.* *TEMP. ALARM HYSTER.*	Hysteresis function for warning and alarm	AI-FLOW MENU AI-GASTEMP. MENU

Continued on next page

Parameter	Value range	Menu
Simulation of signals *FLOW SIMULATE,* *TEMP. SIMULATE,* *SIMUL VALUE,* *STATUS QUALITY,* *STATUS LIMIT*	Simulation of a mass flow or temperature value. Simulation of a STATUS signal, simulation of a STATUS limit value.	AI-FLOW MENU AI-GASTEMP. MENU
Activate and reset totalizer *SET TOTAL*	Activate with TOTAL Reset with RESET TOTAL	TOTAL MENU
Stop totalizer *MODE TOTAL*	Stop with HOLD Activate with TOTAL	TOTAL MENU
Totalizer response in the event of an error *FAIL TOTAL*	RUN (totalizer continues running with a faulty measured value) HOLD (totalizer stops) MEMORY (totalizer continues running with the last valid measured value)	TOTAL MENU

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

10.3.2 Parameter menu

Menu / Parameter	Value range	Description
PARAMETER MENU		
TAG NO.:	-	Displays the first 8 digits of the measuring point identifier (TAG no.).
INSTAL. DATE	dd.mm.yyyy	Allows you to enter the installation / commissioning date (can only be set using HART).
LANGUAGE	German, English, French, 4th language (currently Portuguese)	Language selection
DP SLAVE ADRESS	0 … 126	For entering the PROFIBUS address (do not use addresses 0 and 126). Default = 126
PROFIBUS BAUD	-	Displays the current PROFIBUS data transmission rate
PROFIBUS STATE	-	Displays the current PROFIBUS status
CHARACTER. CURVE	1 ... 4	Maximum of 4 factory-set characteristic curves (option).
DEFAULT DISPLAY	-	Selection of the display screen to be shown when the device is started up. Changes become effective only after a HARDWARE RESET. Default: Display of characteristic curve, gas temperature, mass flow value.
CONTRAST	-	To set the display contrast (dependent on ambient temperature), press the button repeatedly.
LOAD DEFAULT CONF.	-	Default configuration overwrites the currently set user configuration.
LOAD USER CONF.	-	Saved user configuration overwrites the currently set configuration.
SAVE USER CONF.	-	Saves the current configuration
DP EXTDIAG. ON/OFF	ON, OFF	For activating the extended diagnostic functions. Default = OFF
HARDWARE RESET	-	Simulates an interruption in the power supply. The device restarts and, provided that there is no error pending, assumes normal operation. On restarting, the most recently saved user configuration is reloaded. The screen selected under DEFAULT DISPLAY appears.
HW-SW-REV	-	Displays the hardware and software revision numbers.
MANUFACTURER ID	-	Displays the manufacturer's ID number.
DEVICE ID	-	Displays the device's ID number.
SERIAL NO.:	-	Displays the device's serial number.
ORDER NO.:	-	Displays the manufacturer's order number.
END PARAMETER	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

10.3.3 PROFIBUS menu

Menu / Parameter	Value range	Description
PROFIBUS MENU		
TB-FLOW MENU		Access to flow transducer block in submenu level 2
AI-FLOW MENU		Access to flow analog input function block in submenu level 2
TB-GASTEMP. MENU		Access to gas-temperature transducer block in submenu level 2
AI-GASTEMP. MENU		Access to gas-temperature analog input function block in submenu level 2
TOTAL MENU		Access to totalizer function block in submenu level 2
END PROFIBUS MENU	-	For exiting the menu

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / TB-FLOW MENU		
CALIBRATION FACTOR (CALIBR_FACTOR)	-	For entering a calibration factor that acts on the measured value as a multiplier. Default = 1. Note: This function changes the gradient of the characteristic curve.
LOW FLOW CUT OFF (LOW_FLOW_CUTOFF)	-	For entering the low flow cut-off in the set mass flow unit (e.g., 5 kg/h). In the case of measured values below the low flow cut-off point that has been set, a zero signal is output. Default = 0
ZEROPOINT COR. ON/OFF (ZERO_POINT_ADJUST)	ON, OFF	For activating the set zero position correction (zeropoint value) Default = OFF
ZERROPOINT VALUE (ZERO_POINT)	-	For entering a zero position correction (zeropoint value) in the set mass flow unit (e.g., 1 kg/h). Default = 0 Note: With this function, there is a shift in the entire characteristic curve.
MASS FLOW STATE (MASS_FLOW)	-	Displays the mass-flow value and status in hexadecimal format Display of 0x80 ... 0x83 → OK
MASSFLOW UNIT (MASS_FLOW_UNIT)	t/d, t/h, t/m, t/s kg/d, kg/h, kg/m, kg/s g/h, g/m, g/s lb/d, lb/h, lb/m, lb/s Nm^3/d, Nm^3/h, Nm^3/m, Nm^3/s Nl/d, Nl/h, Nl/m, Nl/s SCFD, SCFH, SCFM, SCFS	Default: Depends on the characteristic curve selected
MASSFLOW MIN (MASS_FLOW_LO_LIM)	-	Start value for measuring range Default = 0
MASSFLOW MAX (MASS_FLOW_HI_LIM)	-	Measuring range end value for selected characteristic curve
END TB-FLOW MENU	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / AI-FLOW MENU		
AI-FLOW STATE (AI-FLOW)	-	Displays the mass-flow value and status in hexadecimal format (status acc. to AI flow block) Display of 0x80 … 0x83 → OK
FLOW PV_SCALE HIGH (PV_SCALE_HIGH)	-	Internal 100 % value, generally measuring range end value x 1.3.
FLOW PV_SCALE LOW (PV_SCALE_LOW)	-	Internal 0 % value, generally measuring range start value
OUT SCALE AT 100% (OUT_SCALE_AT 100%)	-	External 100 % value x 1.3.
OUT SCALE AT 0% (OUT_SCALE_AT 0%)	-	External 0 % value
FLOW FAIL SAFE TYPE (FSAFE_TYPE)	LAST VALID VALUE BAD FAIL VALUE FAIL SAFE OUT	If the device detects an error on the basis of the status signal, the following options are available for the FLOW signal that is to be output: Last valid measured value Current measured value Adjustable substitute value (= fail safe value) (default)
FAIL SAFE VALUE (FSAFE_VALUE)	-	Any numerical value can be set here to serve as a substitute for a faulty measured value. Will only be output if the FAIL SAFE OUT option has been selected under FLOW FAIL SAFE TYPE. Default = 0
FLOW FILTER TIME (PV_FTIME)	0.2 ... 99.999 s	Filter factor for signal attenuation. Default = 0.4 s
FLOW ALARM HYSTER. (ALARM_HYS)	-	Hysteresis for limit value monitoring. This is entered in the set mass flow unit (e.g., 1 kg/h). Default = 0
FLOW MAX ALARM (HI_HI_LIM)	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the measured value. Default = measuring range end value x 1.2
FLOW MAX WARNING (HI_LIM)	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the measured value. Default = measuring range end value.
FLOW MIN WARNING (LO_LIM)	-	Lower warning value (pre-alarm); warning will be triggered if the warning value is undershot by the measured value. Default = 0
FLOW MIN ALARM (LO_LO_LIM)	-	Lower alarm limit; alarm will be triggered if the limit is undershot by the measured value. Default = 0

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / AI-FLOW MENU (continued)		
FLOW SIMULATE (SIMULATE)	ON, OFF	For activating / deactivating output of the FLOW simulation value by switching it ON or OFF (incl. STATUS QUALITY and STATUS LIMIT) (Note: With ON, an "S" symbol is shown on the display. If a limit value is exceeded or a status signal is classed as BAD or UNCERTAIN, the "E" symbol is displayed.) Default = OFF
FLOW SIMUL. VALUE	-	For entering a FLOW simulation value.
STATUS QUALITY	GOOD OK GOOD UPDATE EVENT	Simulates the STATUS signal.
STATUS LIMIT	OK LOW_LIMIT HIGH_LIMIT CONSTANT	Simulates the STATUS limit value.
END AI-FLOW	-	For exiting the menu.

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

... / TB-GASTEMP. MENU		
TB-TEMP STATE (PRIMARY_VALUE)	-	Displays the gas-temperature value and status in hexadecimal format Display of 0x80 … 0x83 → OK
TEMPERATURE UNIT (PRIMARY_VALUE_UNIT)	°C, °F, K.	For selecting the temperature unit to be displayed. Default = °C
GAS S1 STATE (SECONDARY_VALUE_1)	-	Displays the gas-temperature status message in hexadecimal format Display of 0x80 … 0x83 → OK
HEATER S2 STATE (SECONDARY_VALUE_2)	-	Displays the heater-temperature status message in hexadecimal format Display of 0x80 … 0x83 → OK
SENSOR MEASTYP (SENSOR_MEAS_TYPE)	TB-TEMP = SV1, TB-TEMP = SV2, TB-TEMP = SV2 - SV1	(SV1 = gas temperature, SV2 = heater temperature). Default = SV1
ZEROPOINT CORR. GAS (BIAS_1)	-	For entering a zero position correction for the gas temperature in the set unit (e.g., - 3 °C). Note: With this function, there is a shift in the entire characteristic curve. Default = 0
ZEROPOINT COR.HEAT. (BIAS_2)	-	For entering a zero position correction for the heater temperature in the set unit (e.g., 5 °C). Note: With this function, there is a shift in the entire characteristic curve. Default = 0
END TB-GASTEMP	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / AI-GASTEMP. MENU		
AI-TEMP STATE (AI-TEMP)	-	Displays the gas-temperature value and status in hexadecimal format (status acc. to AI GASTEMP block). Display of 0x80 … 0x83 → OK
TEMP PV_SCALE HIGH (PV_SCALE_HIGH)	-	Internal 100 % value, generally measuring range end value. Default = 400 °C (752 °F)
TEMP PV_SCALE LOW (PV_SCALE_LOW)	-	Internal 0 % value, generally measuring range start value. Default = -40 °C
OUT SCALE AT 100% (OUT_SCALE_AT 100%)	-	External 100 % value x 1.3. Default = 400 °C (752 °F)
OUT SCALE AT 0% (OUT_SCALE_AT 0%)	-	External 0 % value Default = -40 °C
TEMP. FAILSAFE TYPE (FSAFE_TYPE)	LAST VALID VALUE BAD FAIL VALUE FAIL SAFE OUT	If the device detects an error on the basis of the status signal, the following options are available for the TEMP signal that is to be output: Last valid measured value Current measured value Adjustable substitute value (= fail safe value) (default)
FAIL SAFE VALUE (FSAFE_VALUE)	-	Any numerical value can be set here to serve as a substitute for a faulty measured value. Will only be output if the FAIL SAFE OUT option has been selected under TEMP. FAILSAFE TYPE. Default = 0
TEMP. FILTER TIME (PV_FTIME)	0.2 ... 99.999 s	Filter factor for signal attenuation. Default = 0.2 s
TEMP. ALARM HYSTER. (ALARM_HYS)	-	Hysteresis for limit value monitoring. This is entered in the set temperature unit (e.g., 5 °C). Default = 0
TEMP. MAX ALARM (HI_HI_LIM)	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the measured value. Default = 280 °C (536 °F)
TEMP. MAX WARNING (HI_LIM)	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the measured value. Default = 275 °C (527 °F)
TEMP. MIN WARNING (LO_LIM)	-	Lower warning value (pre-alarm); warning will be triggered if the warning value is undershot by the measured value. Default = -20 °C (-4 °F)
TEMP. MIN ALARM (LO_LO_LIM)	-	Lower alarm limit; alarm will be triggered if the limit is undershot by the measured value. Default = -20 °C (-4 °F)

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / AI-GASTEMP. MENU (continued)		
TEMP. SIMULATE (SIMULATE)	ON, OFF	For activating / deactivating output of the TEMP simulation value by switching it ON or OFF (incl. STATUS QUALITY and STATUS LIMIT). (Note: With ON, an "S" symbol is shown on the display. If a limit value is exceeded or a status signal is classed as BAD or UNCERTAIN, the "E" symbol is displayed.) Default = OFF
TEMP. SIMUL. VALUE	-	For entering a TEMP simulation value.
STATUS QUALITY	GOOD OK GOOD UPDATE EVENT	Simulates the STATUS signal.
STATUS LIMIT	OK LOW_LIMIT HIGH_LIMIT CONSTANT	Simulates the STATUS limit value.
END AI-GASTEMP.	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

Menu / Parameter (acc. to PA Profile 3.0)	Value range	Description
... / TOTAL MENUE		
TOTAL STATE (TOTAL_STATUS)	-	Displays the totalizer value and status in hexadecimal format (status acc. to TOTAL block). Display of 0x80 … 0x83 → OK
TOTAL UNIT (UNIT_TOT)	t, kg, g, lb, Nm^3, Nl, SCF	Unit used for totalizer value. Default: Depends on the characteristic curve selected.
SET TOTAL (SET_TOT)	TOTAL RESET TOTAL PRESET TOTAL	Standard totalizer function Resets the totalizer value to 0 For specifying a start value Default = TOTAL
MODE TOTAL (MODE_TOT)	HOLD TOTAL	Stops the totalizer Standard function Default = HOLD
FAIL TOTAL (FAIL_TOT)	RUN HOLD MEMORY	Continue with faulty measured value Totalizer remains stopped Continue with last valid mass flow value Default = RUN
PRESET VALUE TOTAL (PRESET_TOT)[1)]	-	Start value for the totalizer (entered manually). Default = 0
ALARM TOTAL (HI_HI_LIM)[1)]	-	Upper alarm limit; alarm will be triggered if the limit is exceeded by the measured value.
WARNING TOTAL (HI_LIM)[1)]	-	Upper warning value (pre-alarm); warning will be triggered if the warning value is exceeded by the measured value.
END TOTAL	-	For exiting the menu

Italics = Can only be changed in SPECIALIST MODE and SERVICE MODE.
Italics = Can only be changed in SERVICE MODE.

IMPORTANT (NOTE)

In the event of a voltage dip or power interruption, the totalizer value is retained. Totalizing will continue automatically when the device power is restored.

10.3.4 Service menu

Menu / Parameter	Value range	Description
SERVICE MENU		
MAX. VALUES	-	Displays the maximum mass flow and gas temperature values since commissioning.
MIN. VALUES	-	Displays the minimum mass flow and gas temperature values since commissioning.
DEVICE TEMP MAX. TEMP.	-	Displays the current housing temperature. Displays the maximum housing temperature values since commissioning.
CAL.DATE TIME:	-	Displays the date of the last calibration procedure. Displays the number of device operating hours (hours-run meter). (Display format: Years : Days : Hours : Minutes).
STATUS FLOW TEMP TOT	-	Displays status messages for mass flow, gas temperature, and totalizer in hexadecimal format. Display of 0x80 … 0x83 → OK
DIAG 1…4	-	Displays diagnostic bytes 1 ... 4. Display of 0x00 → OK
DIAG 5…8	-	Displays diagnostic bytes 5 ... 8. Display of 0x00 → OK
END SERVICE MENU	-	For exiting the menu

10.4 Software history

Software version	Type of changes	Operating instructions
Version 1.02 ... 1.04	First release / bugfix	42/14-39 Rev. 00
Version 1.11	Bugfix	42/14-39 Rev. B
Version 1.11 ... 1.12	Bugfix	OI/FMT500-IG 07.2017

11 Maintenance / Service

All measuring systems are calibrated precisely for the application concerned using in-house calibration equipment for which the manufacturer is associated with the Deutscher Kalibrierdienst (German association of calibration laboratories). Extensive calibration procedures, state-of-the-art production and testing methods and constant enhancements are the key to ensuring that these measuring systems can run for an extended period of time with practically no need for maintenance. The only factor that may result in the flowmeter sensor needing to be cleaned occasionally (depending on the degree of contamination) is if the product is used in conjunction with gases containing moist impurities.

Cleaning the flowmeter sensor

Follow these steps to clean the flowmeter sensor or its sensor unit:

1. Switch off power supply and disconnect flowmeter sensor. After that, the device will be de-energized; the sensor will stop being heated.
2. Remove the flowmeter sensor from the pipe component / weld-on adapter (refer to Section 4.2).

WARNING

The mounting screws must not be released at operating pressure and without the pipeline first being flushed out.
This can lead to the measuring medium escaping in an uncontrolled manner.
This can result in severe injuries or death.
Reduce the pipeline pressure to the level of atmospheric pressure and flush it out.

3. Carefully clean the sensor unit with warm water or alcohol-based solution. We recommend that you use a soft brush or cotton bud.

WARNING

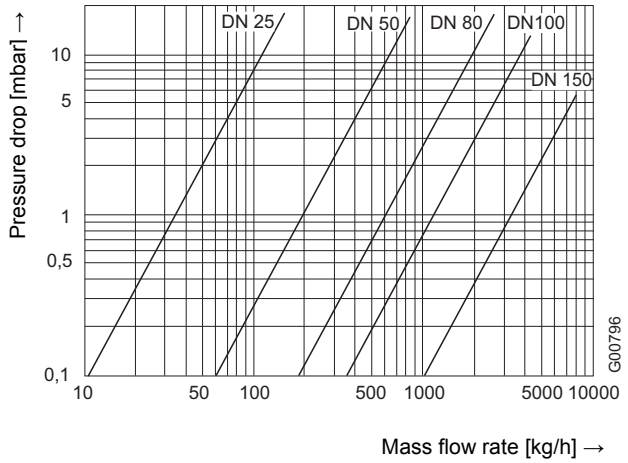
Cleaning the product in an ultrasonic bath or using hard objects such as screwdrivers, tweezers, or wire brushes can result in irreparable mechanical damage to the sensor unit.
Use the prescribed cleaning method.

4. Allow the sensor unit to dry for a few minutes or carefully dry with warm air.
5. Check that the gasket between the flowmeter sensor and pipe component / weld-on adapter is clean and in good condition; if necessary replace it with a new one.

   Standard design: O-ring (Ø 55 mm x 3 mm [2.16 x 0.12 inches])
6. Fit the flowmeter sensor in the pipe component / weld-on adapter.
7. Reconnect the flowmeter sensor. Always comply with the start-up procedures described in Section 6 and remember to observe all safety instructions.

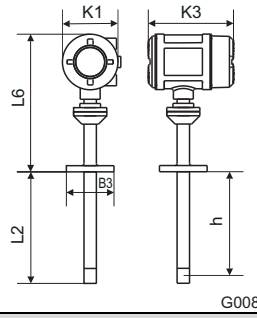
12 Specifications

Type	FMT500-IG						FMT500-IG Hazardous area design					
Measured variable (measured gases)	Flow of gases and gas mixtures with known composition											
Measuring ranges Nominal diameters (DN)	q_{min} **kg/h**		q_{max} **kg/h**	q_{min} **Nm³/h** For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)		q_{max} **Nm³/h**	q_{min} **kg/h**		q_{max} **kg/h**	q_{min} **Nm³/h** For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)		q_{max} **Nm³/h**
DN 25	0	...	180	0	...	140	0	...	160	0	...	120
DN 40	0	...	450	0	...	350	0	...	430	0	...	330
DN 50	0	...	750	0	...	580	0	...	700	0	...	540
DN 65	0	...	1,400	0	...	1,100	0	...	1,200	0	...	920
DN 80	0	...	2,000	0	...	1,500	0	...	1,700	0	...	1,300
DN 100	0	...	3,200	0	...	2,500	0	...	3,000	0	...	2,300
DN 125	0	...	5,600	0	...	4,300	0	...	5,100	0	...	3,900
DN 150	0	...	9,000	0	...	7,000	0	...	8,000	0	...	6,200
DN 200	0	...	15,000	0	...	12,000	0	...	13,000	0	...	10,000
Up to 3000 mm	0	...	3,000,000	0	...	2,300,000	0	...	2,700,000	0	...	2,100,000
(rectangular ducts and larger diameters on request)												
Measuring ranges Nominal diameters (inch)	q_{min} **lbs/h**		q_{max} **lbs/h**	q_{min} **SCFM** For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)		q_{max} **SCFM**	q_{min} **lbs/h**		q_{max} **lbs/h**	q_{min} **SCFM** For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)		q_{max} **SCFM**
1.0	0	...	350	0	...	75	0	...	310	0	...	65
1.5	0	...	880	0	...	190	0	...	860	0	...	185
2.0	0	...	1,500	0	...	330	0	...	1,400	0	...	310
3.0	0	...	4,000	0	...	860	0	...	3,300	0	...	720
4.0	0	...	6,400	0	...	1,400	0	...	6,000	0	...	1,300
6.0	0	...	18,500	0	...	4,000	0	...	16,500	0	...	3,600
8.0	0	...	32,000	0	...	6,900	0	...	27,500	0	...	6,000
120.0	0	...	6,600,000	0	...	1,400,000	0	...	6,000,000	0	...	1,300,000
(rectangular ducts and larger diameters on request)												
Notes regarding measuring ranges	The above values are reference values for applications involving air or nitrogen under atmospheric conditions (other gases available upon request). The values for q_{max} can be increased by approx. 10 % upon request (with lower accuracy in the extended range). For hydrogen and helium, the measuring range lower limit is typically approx. 10 % of the upper limit.											
Measuring errors Air, nitrogen, other gases	Under calibration conditions in specified measuring range ≤ ± 0.9 % of the measured value ± 0.05 % of the possible end value in this nominal diameter (see measuring ranges) ≤ ± 1.8 % of the measured value ± 0.10 % of the possible end value in this nominal diameter (see measuring ranges) Special calibration on request											
Reproducibility	< 0.2 % of the measured value, t_{meas} = 10 s											
Effect of the temperature of the measured medium	< 0.05 % / K of the measured value (depending on the type of gas)											
Effect of the pressure of the measured medium	< 0.2 % / 100 kPa (/ bar) of the measured value (depending on the type of gas)											
Response time	T_{63} = 0.5 s T_{63} = 2 s for zone 2/22 version with constant power method						T_{63} = 2 s					

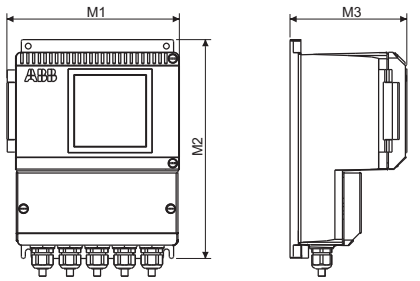
Type	FMT500-IG	FMT500-IG Ex version
Operating conditions		
Recommended inlet and outlet runs	According to DIN EN ISO 5167-1 Minimum inlet run 15 x pipe diameter D, outlet run 5 x pipe diameter D	
Environmental conditions		
Ambient temperature Transmitter Flowmeter sensor remote design	-25 ... 50 °C (-13 ... 122 °F) for zone 2/22 versionen: -20...50 °C (-4 ... 122 °F) -25 ... 80 °C (-13 ... 176 °F) for zone 2/22 versionen: -20 ... 80 °C (-4 ... 176 °F)	-20 ... 50 °C (-4 ... 122 °F) -20 ... 80 °C (-4 ... 176 °F)
	Other ambient temperatures on reques	
Storage temperature	-25 ... 85 °C (-13 ... 185 °F)	
Type of protection	IP 67 (IP 66 for flowmeter sensor remote design)	
Process conditions		
Operating temperature Measuring medium (flowmeter sensor)	Standard range: -25 ... 150 °C (-13 ... 302 °F) Extended range: -25 ... 300 °C (-13 ... 572 °F) Zone 2/22 version: -20 ... 150 °C (-4 ... 302 °F)	acc. to temperature classes of Ex certificates max. -20 ... 150 °C (-4 ... 302 °F) (-40 °C version on request)
Operating pressure	4 x 10^6 Pa (40 bar [580 psi])	
Pressure loss (logarithmic diagram)	< 1.0 kPa (10 mbar [0.1450 psi]), typical value 0.1 kPa (1 mbar [0.0145 psi])  	
Power supply		
Voltage	Universal power supply unit: 110 ... 230 V AC/DC ± 10 % (f = 48 ... 62 Hz) Low-voltage power supply unit: 24 V AC/DC ± 20 % (f = 48 ... 62 Hz)	
Power consumption	20 VA, current consumption 800 mA, slow-blow fuse of at least 2 A required	
Cable entry	M20 x 1.5 or 1/2“ NPT	
Output		
Analog- / HART version Analog output Digital outputs Digital inputs	 0/4 ... 20 mA, load < 600 Ω (IG-Ex < 400 Ω), electrical isolated, alert < 3.5 or > 22 mA 2 x passive optocoupler (approx. 100 mA) can be used as frequency, pulse or contact output 2 x 24 V lin typ. 10 mA (low < 2 mA, high > 10 mA) contact input	
Installation class	Overvoltage category III, degree of pollution 2	

12.1 Dimensions

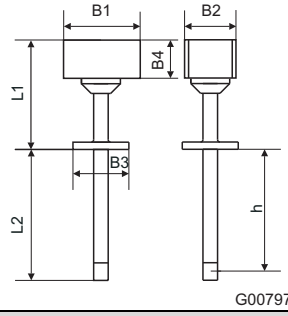
Flowmeter sensor (integral mount design)



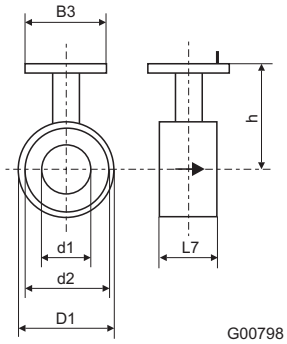
Transmitter (remote mount design)



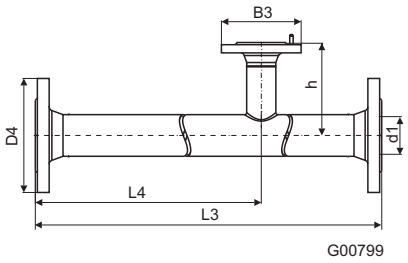
Flowmeter sensor (remote mount design)



Type 1 pipe component: Wafer type

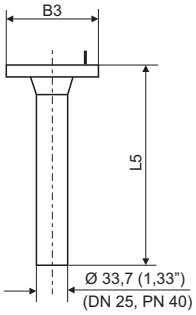


Type 2 pipe component: Measuring section



optional with integrated flow straightener

Weld-on adapter DN 100 (4") and higher



EN 1092-1 form B1, PN 40										
Nominal diameter			L2	h	D1	d1	d2	D4	L3	L4
DN 25	B1 = 125	(4.92)	269 (10.59)	263 (10.35)	-	28.5 (1.12)	-	115 (4.53)	600 (23.62)	486 (19.13)
DN 40	B2 = 80	(3.15)			94 (3.70)	43.1 (1.70)	88 (3.46)	150 (5.91)	860 (33.86)	731 (28.78)
DN 50	B3 = Ø115	(4.53)			109 (4.29)	54.5 (2.15)	102 (4.02)	165 (6.50)	1000 (39.37)	837 (32.95)
DN 65	B4 = 58	(2.28)			129 (5.08)	70.3 (2.77)	122 (4.80)	185 (7.28)	1400 (55.12)	1190 (46.85)
DN 80	K1 = 150	(5.91)			144 (5.67)	82.5 (3.25)	138 (5.43)	200 (7.87)	1700 (66.93)	1450 (57.09)
DN 100	K3 = 206	(8.11)			170 (6.69)	107.1 (4.22)	162 (6.38)	235 (9.25)	2200 (86.61)	1870 (73.62)
DN 125	L1 = 188	(7.40)			196 (7.72)	131.7 (5.19)	188 (7.40)	270 (10.63)	2700 (106.3)	2300 (90.55)
DN 150	L5 = 450	(17.72)			226 (8.90)	159.3 (6.27)	218 (8.58)	300 (11.81)	3200 (125.98)	2720 (107.09)
DN 200	L6 = 310	(12.20)			293 (11.54)	206.5 (8.13)	285 (11.22)	375 (14.76)	4200 (165.35)	3580 (140.94)
> 350	L7 = 65	(2.56)	431 (16.97)	425 (16.73)						
> 700	M1 = 208	(8.19)	781 (30.75)	775 (30.51)						
	M2 = 265	(10.43)								
	M3 = 139	(5.47)								
ASME B 16.5, Cl. 150 (ANSI), Sch 40 S										
1“	B1= 125	4.92)	269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	108 (4.25)	560 (22.05)	454 (17.87)
1 1/2“	B2 = 80	(3.15)			85 (3.35)	40.9 (1.61)	73 (2.87)	127 (5.00)	864 (34.02)	741 (29.17)
2“	B3 = Ø115	(4.53)			103 (4.06)	52.6 (2.07)	92 (3.62)	154 (6.06)	1003 (39.49)	846 (33.31)
3“	B4 = 58	(2.28)			135 (5.31)	78.0 (3.07)	127 (5.00)	-	-	-
4“	K1 = 150	(5.91)			173 (6.81)	102.4 (4.03)	157 (6.18)	-	-	-
6“	K3 = 206	(8.11)			221 (8.70)	154.2 (6.07)	216 (8.50)	-	-	-
8“	L1 = 188	(7.40)			278 (10.94)	202.7 (7.98)	270 (10.63)	-	-	-
> 14“	L5 = 450	(17.72)	431 (16.97)	425 (16.73)						
> 28“	L6 = 310	(12.20)	781 (30.75)	775 (30.51)						
	L7 = 65	(2.56)								
	M1 = 208	(8.19)								
	M2 = 265	(10.43)								
	M3 = 139	(5.47)								

Dimensions in mm (inch)

ASME B 16.5, Cl. 300 (ANSI), Sch 40 S										
1“	B1= 125	(4.92)	269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	123.9 (4.88)	560 (22.05)	454 (17.87)
1 1/2“	B2 = 80	(3.15)			94 (3.70)	40.9 (1.61)	73 (2.87)	155.4 (6.12)	864 (34.02)	741 (29.17)
2“	B3 = Ø115	(4.53)			110 (4.33)	52.6 (2.07)	92 (3.62)	165.1 (6.50)	1003 (39.49)	846 (33.31)
3“	B4 = 58	(2.28)			148 (5.83)	78.0 (3.07)	127 (5.00)	-	-	-
4“	K1 = 150	(5.91)			180 (7.09)	102.4 (4.03)	157 (6.18)	-	-	-
6“	K3 = 206	(8.11)			249 (9.80)	154.2 (6.07)	216 (8.50)	-	-	-
8“	L1 = 188	(7.40)			307 (12.09)	202.7 (7.98)	270 (10.63)	-	-	-
> 14“	L5 = 450	(17.72)	431 (16.97)	425 (16.73)						
> 28“	L6 = 310	(12.20)	781 (30.75)	775 (30.51)						
	L7 = 65	(2.56)								
	M1 = 208	(8.19)								
	M2 = 265	(10.43)								
	M3 = 139	(5.47)								

Dimensions in mm (inch)

13 Ex relevant specifications

13.1 Zone 2/22 version

13.1.1 Designation

Transmitter with remote mount design	Flowmeter sensor with remote mount design	Integral mount design
II 3G EEx nA II T4 **II 3D IP 67 T 115 °C** T_{amb} = -20 ... 50 °C (-4 ... 122 °F)	**II 3G EEx nA II T4** **II 3D IP 66 T 150 °C** T_{amb} = -20 ... 80 °C (-4 ... 176 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F)	**II 3G EEx nA II T4** **II 3D IP 67 T 150 °C** T_{amb} = -20 ... 50 °C (-4 ... 122 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F)

13.1.2 Safety specifications for inputs and outputs

Supply circuit		
	Non-sparking type of protection EEx nA II	U_n = 24 V AC / DC ± 20 %, P_n < 20 VA U_n = 110 ... 230 V AC / DC ± 10 %, P_n < 20 VA
Analog / HART		
Output circuit (active):	Non-sparking type of protection EEx nA II	U_n = 30 V
Digital output (passive):	Non-sparking type of protection EEx nA II	U_n = 30 V I_{max} ≤ 100 mA
Digital input (passive):	Non-sparking type of protection EEx nA II	U_n = 30 V
PROFIBUS DP RS 485		
	Non-sparking type of protection EEx nA II	U_n = < 8 V
PE circuit:	Non-sparking type of protection EEx nA I	
Pot. equal. circuit:	Non-sparking type of protection EEx nA II	

13.2 Versions for potentially explosive atmospheres according to ATEX, GOST Russia and FM / CSA

This section includes important information that must be observed when using the device in potentially explosive atmospheres (devices compliant with ATEX Cat. 1/2 G and 2 D (Zone 1/21, Zone 0/21), GOST R Zone 1/21, Zone 0/21, and FM / CSA Cl.1, Div.1/2).

This applies specifically to the mandatory safety instructions, the wiring of the signal and supply power lines, and the safety specifications from the valid certificates.

Please also remember to comply with the other information in this manual.

Information for safe operation

ATEX

Meters must be installed, commissioned and operated according to ElexV (Standard on electrical equipment in potentially explosive atmospheres) and EN 60079-14 (Installation of electrical equipment in potentially explosive atmospheres).

GOST Russia

Meters must be installed, commissioned and operated according to national regulations, specifically GOST R 51330. 13-99, GOST R 51330. 16-99, GOST R 51330. 18-99, GOST R MEK6124-1-2-99, and they must comply with the requirements listed in the certificate of conformity.

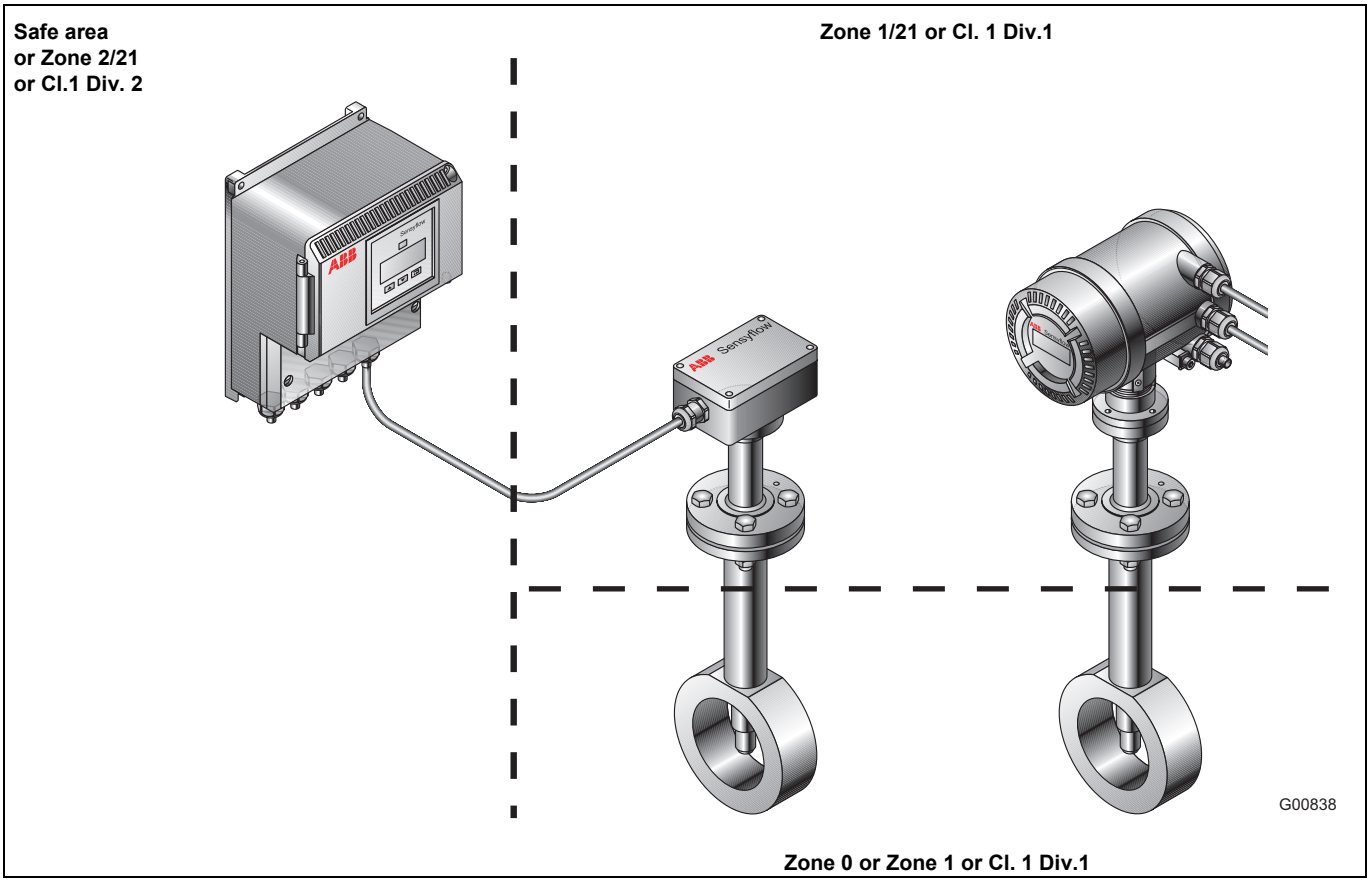
FM

Installations must conform to "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" (ANSI / ISA RP 12.6) and "National Electric Code" (ANSI / NFPA 70 Sections 504 and 505). Comply with the relevant control drawings.

CSA

Installations must conform to the Canadian Electrical Code, specifically, the regulations CAN / CSA -C22.2 and CAN / CSA -E60079 listed in the certificate of conformity. Comply with the relevant control drawings.

13.2.1 Options regarding installation in potentially explosive atmospheres



13.2.2 ATEX designations

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
Zone 2/21 **II 3(1) G EEx nA [ia] [ib] IIC T4** **II 2 D T 115 °C** T_{amb} = -20 ... 50 °C (-4 ... 122 °F) Optional -40 °C for ambient temperature	Terminal box Zone 1, flowmeter sensor Zone 0 **II 1/2 G EEx ia IIC T4** **II 2 D T 80 °C** Terminal box and flowmeter sensor Zone 1 **II 2 G EEx ia IIC T4...T1** **II 2 D T 100 °C or 200 °C or 300 °C** T_{amb} = -20 ... 80 °C (-4 ... 176 °F) Optional -40 °C for ambient temperature	Transmitter Zone 1, flowmeter sensor Zone 0 **II 1/2 G EEx de [ia] [ib] IIC T4** **II 2 D T 115 °C** Transmitter and flowmeter sensor Zone 1 **II 2 G EEx de [ia] [ib] IIC T4...T1** **II 2 D T 115 °C or 200 °C or 300 °C** T_{amb} = -20 ... 50 °C (-4 ... 122 °F) Optional -40 °C for ambient temperature

13.2.3 GOST R designations (Russia)

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
2Ex nA [ia] [ib] IIC T4 or **2Ex nA [ia] IIC T4** **DIP A21 T_A115 °C, IP 67** T_{amb} = -20 ... 50 °C (-4 ... 122 °F)	Terminal box Zone 1, flowmeter sensor Zone 0 **Ex ia IIC T4** **DIP A21 T_A80 °C, IP 66** Terminal box and flowmeter sensor Zone 1 **Ex ia IIC T4...T1** **DIP A21 T_A100 / 200 / 300 °C, IP 66** T_{amb} = -20 ... 80 °C (-4 ... 176 °F)	Transmitter Zone 1, flowmeter sensor Zone 0 **2Ex de [ia] [ib] IIC T4 or** **2Ex de [ia] IIC T4** **DIP A21 T_A115 °C, IP 67** Transmitter and flowmeter sensor Zone 1 **2Ex de [ia] [ib] IIC T4...T1 or** **2Ex de [ia] IIC T4...T1** **DIP A21 T_A100 / 200 / 300 °C, IP 67** T_{amb} = -20 ... 50 °C (-4 ... 122 °F)

13.2.4 Temperature table for ATEX and GOST R versions (Russia)

Sensyflow FMT500-IG, integral mount design				
Temperature class	Surface temperature	Process temperature	Flowmeter sensor	Transmitter
T4	T 115 °C	-20 ... 80 °C (-4 ... 176 °F)	Cat. 1G / Zone 0	Cat. 2G/2D / Zone 1/21
T4	T 115 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T3	T 115 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T2	T 200 °C[1)]	-20 ... 200 °C (-4 ... 392 °F)[1)]	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T1	T 300 °C[1)]	-20 ... 300 °C (-4 ... 572 °F)[1)]	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
Sensyflow FMT500-IG transmitter, remote mount design				
Temperature class	Surface temperature			Transmitter
T4	T 115 °C			Cat. 3G/2D / Zone 2/21
Sensyflow FMT500-IG flowmeter sensor, remote mount design				
Temperature class	Surface temperature	Process temperature	Flowmeter sensor	Terminal box
T4	T 80 °C	-20 ... 80 °C (-4 ... 176 °F)	Cat. 1G / Zone 0	Cat. 2G/2D / Zone 1/21
T4	T 100 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T3	T 100 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T2	T 200 °C[1)]	-20 ... 200 °C (-4 ... 392 °F)[1)]	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T1	T 300 °C[1)]	-20 ... 300 °C (-4 ... 572 °F)[1)]	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21

[1)] Temperatures correspond to ATEX and GOST R temperature classes, max. process temperature for flowmeter sensor -20 ... 150 °C (-4 ... 302 °F)

13.2.5 FM designations with temperature information

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
NI CLASS I DIV2 Group: A,B,C,D, CLASS I Zone 2 AEx nA IIC T4...T1 **DIP CLASS II, III DIV1 and 2 Group: E,F,G** **IS Circuits for CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC** T_{amb} = -20 ... 50 °C (-4 ... 122 °F)	**IS CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC T4...T1** **DIP CLASS II, III DIV1 and 2 Group: E,F,G** **NI CLASS I, II, III DIV2, Group: A,B,C,D, CLASS I Zone 2 Group: IIC T4...T1** T_{amb} = -20 ... 80 °C (-4 ... 176 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F) $T4/T3_{medium}$ = -20 … 100 °C (-4 ... 212 °F) $T2_{medium}$ = -20 … 200 °C (-4 ... 392 °F) $T1_{medium}$ = -20 … 300 °C (-4 ... 572 °F)	**XP CLASS I DIV1 Group: B,C,D, CLASS I, Zone 1 II B T4...T1** **IS Circuits for CLASS I DIV1 Group: B,C,D, CLASS I Zone 0 AEx ia IIC** **DIP CLASS II,III DIV1 and 2 Group: E,F,G** **NI CLASS I, II, III DIV2, Group: A,B,C,D,F,G, CLASS I Zone 2 Group: IIC T4...T1** T_{amb} = -20 ... 50 °C (-4 ... 122 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F) $T4/T3_{medium}$ = -20 … 100 °C (-4 ... 212 °F) $T2_{medium}$ = -20 … 200 °C (-4 ... 392 °F) $T1_{medium}$ = -20 … 300 °C (-4 ... 572 °F)

13.2.6 CSA designations with temperature information

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
CLASS I DIV2, Group: A,B,C,D, CLASS I Zone 2 Ex nA II T4...T1 **CLASS II, III DIV1 and 2 Group: E,F,G** **Associated Equipment [Ex ia] CLASS I DIV1 Group: A,B,C,D [Ex ia] IIC** T_{amb} = -20 ... 50 °C (-4 ... 122 °F)	**Intrinsically safe Exia CLASS I DIV1 Group: A,B,C,D, Ex ia IIC T4...T1** **CLASS II, III DIV1 and 2 Group: E,F,G** **CLASS I DIV2, Group: A,B,C,D, Ex nA II T4...T1** T_{amb} = -20 ... 80 °C (-4 ... 176 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F) $T4/T3_{medium}$ = -20 … 100 °C (-4 ... 212 °F) $T2_{medium}$ = -20 … 200 °C (-4 ... 392 °F) $T1_{medium}$ = -20 … 300 °C (-4 ... 572 °F)	**CLASS I DIV1 Group: B,C,D,F,G, CLASS I, Zone 1 II B T4...T1** **CLASS I Zone 1/0 Ex d [ia] [ib] IIC T4...T1 or Ex d [ia] IIC T4...T1** **CLASS II, III DIV1 and 2 Group: E,F,G** **CLASS I, II, III DIV2, Group: A,B,C,D,F,G, CLASS I Zone 2 Ex nA II T4...T1** T_{amb} = -20 ... 50 °C (-4 ... 122 °F) T_{medium} = -20 ... 150 °C (-4 ... 302 °F) $T4/T3_{medium}$ = -20 … 100 °C (-4 ... 212 °F) $T2_{medium}$ = -20 … 200 °C (-4 ... 92 °F) $T1_{medium}$ = -20 … 300 °C (-4 ... 572 °F)

13.2.7 Safety specifications for inputs and outputs

Analog / HART communication

<table>
<tr><td>Output circuit</td><td colspan="4">ATEX and GOST versions: Intrinsically safe EEx ib IIC / IIB

FM / CSA versions:
IS acc. to control drawings
V14224-6 ... 1212 ... IS, V14224-6 ... 2212 ... IS,
V14224-7 ... 1112 ... IS, V14224-7 ... 2112 ... IS</td><td>ATEX and GOST versions: Non-intrinsically safe
U_{max} = 60 V

FM / CSA versions:
XP, NI, DIP acc. to control drawings
V14224-6 ... 1212 ..., V14224-6 ... 2212 ...,
V14224-7 ... 1112 ..., V14224-7 ... 2112 ...
U_{max} = 90 V</td></tr>
<tr><td rowspan="4">Current output
Active
Terminal 31 + 32</td><td>U_o = 17.2 V</td><td>U_i = 30 V</td><td colspan="2">I_i = 100 mA</td><td>U_B = 30 V</td></tr>
<tr><td>I_o</td><td>P_o</td><td colspan="2">EEx ib IIC</td><td>I_B = 30 mA</td></tr>
<tr><td>[mA]</td><td>[mW]</td><td>C_i [nF]</td><td>L_i [mH]</td><td></td></tr>
<tr><td>78.3</td><td>337</td><td>2.0</td><td>0.25</td><td></td></tr>
<tr><td></td><td colspan="4">Characteristic curve: Linear
C_o = 353 nF, L_o = 4 mH
Connect to passive, intrinsically safe circuits only.
Terminal 32 is connected to potential equalization (PA).
Use only approved separators / barriers.</td><td></td></tr>
<tr><td>Digital output
Passive
$D_{out}1$: Terminal 33 + 34
D_{out2}: Terminal 35 + 36</td><td colspan="2">U_i = 15 V
I_i = 30 mA
P_i = 115 mW</td><td colspan="2">C_i = 2.0 nF
L_i = 0.250 mH</td><td>U_B = 30 V
I_B = 100 mA</td></tr>
<tr><td>Digital input
Passive
$D_{in}1$: Terminal 37 + 38
$D_{in}2$: Terminal 39 + 40</td><td colspan="2">U_i = 30 V
I_i = 250 mA
P_i = 1.1 W</td><td colspan="2">C_i = 2.0 nF
L_i = 0.250 mH</td><td>U_B = 30 V
I_B = 100 mA</td></tr>
</table>

Special requirements:
The output current circuits are designed such that they can be connected to either intrinsically safe or non-intrinsically safe current circuits. However, intrinsically safe and non-intrinsically safe circuits must not be mixed or combined.

The rated voltage of non-intrinsically safe current circuits is:
- for ATEX and GOST versions U_m = 60 V
- for FM and CSA versions U_m = 90 V (XP, NI, DIP).

- Make sure that the cover of the power terminal box is always closed properly. When using the device with intrinsically safe output current circuits it is permissible to open the terminal box.
- It is recommended to use the enclosed cable glands for the output current circuits, according the type of explosion protection: intrinsically safe = blue; non-intrinsically safe = black.
- The flowmeter sensor and the transmitter housing must be connected to an equipotential bonding system. When using intrinsically safe current outputs proper equipotential bonding must be ensured along the current circuits.
- Make sure that the measuring pipe materials are resistant to possible corrosive substances in the measuring medium. This is the user's responsibility.

Notice:
The values indicated here are taken from the respective approval certificates. Always observe the specifications and supplements in the approvals (ATEX, FM, CSA, GOST Russia).

PROFIBUS DPV1 communication

<table>
<tr><td>Output circuit</td><td colspan="4">ATEX and GOST versions: Intrinsically safe EEx ib IIC / IIB

FM/CSA versions:
IS acc. to control drawings
V14224-6 ... 1222 ..., V14224-6 ... 2222 ...,
V14224-7 ... 1122 ..., V14224-7 ... 2122 ...</td></tr>
<tr><td rowspan="4">PROFIBUS DP
RS 485_IS interface
Terminals X2, X3
Terminal A/B</td><td colspan="4">U_o = ± 3.72 V</td></tr>
<tr><td>I_o</td><td>P_o</td><td colspan="2">EEx ib IIC/IIB</td></tr>
<tr><td>[mA]</td><td>[mW]</td><td>C’[nF/km]</td><td>L’/R’[mH/Ω]</td></tr>
<tr><td>± 155</td><td>± 144.2</td><td>≤ 250</td><td>≤ 28.5</td></tr>
<tr><td></td><td colspan="4">Min. cable cross section 0.2 mm
Max. input voltage U_i: ± 4.20 V C_i: 0 nF
Max. input current I_i: ± 2.66 A L_i: 0 mH
Electrical isolation of RS 485_IS PROFIBUS fieldbus signals A and B
Cable shield is connected to potential equalization
Use approved RS 485_IS interface / barriers only to disconnect intrinsically safe and non-intrinsically safe PROFIBUS connections</td></tr>
</table>

14 Appendix

14.1 Decommissioning and packaging

Packaging the device ready for transport or return to the manufacturer

If the original packaging material is no longer available, wrap the device in bubble wrap or corrugated cardboard and place it in a box of sufficient size lined with a shock-absorbing material (e.g., foam rubber). The thickness of the padding should be appropriate for the device weight and type of shipment. The box must be handled with care and labeled accordingly.

For overseas shipment, always add a desiccant (e.g., silica gel) and hermetically seal the device plus desiccant in a layer of polythene that is 0.2 mm thick. Use an amount of desiccant that is appropriate for the packing volume and the expected transport time (at least sufficient for 3 months). You should also line the box with a layer of union paper.

All devices returned to the manufacturer must be accompanied by a completed and signed decontamination certificate (see Appendix). Without this, ABB will not be able to process the return.

14.2 Approvals and certifications

CE mark	CE	The version of the device as provided by us meets the requirements of the following European directives: - EMC Directive 2014/30/EU - Low Voltage Directive 2014/35/EU - ATEX Directive 2014/34/EU
Explosion protection	Ex FM APPROVED CSA	Designation relating to intended use in potentially explosive atmospheres in compliance with: - ATEX Directive - FM Approvals (US) - CSA International (Canada)
Calibration	DAkkS	DAkkS- / ILAC-accredited calibration equipment D-K-15081-01-00 - Example certificate

IMPORTANT (NOTE)

All documentation, declarations of conformity and certificates are available in ABB's download area.

www.abb.com/flow

Calibration Certificate

for Characteristic No. 1

		F-No.	123456789 X002
Customer	Muster	Serial-No.	00123456

Object of Calibration

Flowmeter	Sensyflow FMT500-IG	Insertion Length/Version	263 mm Compact
Supply Voltage	24 V AC/DC	Output Signal	4...20mA, HART
ID	34154034	Software Version	1.87

Application Data

			Gas Composition	Volume%
Inside Pipe Diameter	54.5 mm (DN50 PN40)		Air	100.0
Operating Temperature	20	°C		
Operating Pressure	1	bar/abs.		
Customer Measuring Range	0 ... 800	kg/h		
Maximum Measuring Range	0 ... 800	kg/h		
Standard Conditions	0 °C, 1013 mbar/abs.			

Calibration

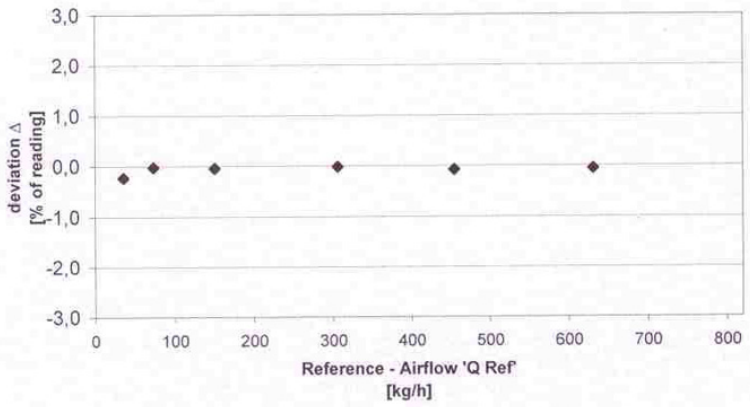
Best measurement capability of the testrig PS0051 U = 0,3% and PS0052 U = 0,4%.
The measurement standards used for the calibration (critically operated venturi nozzles) are traceable to the representation of the SI-units.

Test Stand	DN50/filter+pipe design2	Testrig	PS0051
Calibration Medium	Air		
Calibration Temperature	20 °C	Calibration Pressure	989 mbar/abs.

With the calibration data the adaption to the customer application was performed.

Final Test

We herewith certify that the instrument mentioned above has been calibrated in air in accordance with DIN ISO 9001:2008.
The specifications according to the data sheet were fulfilled.



Q Ref. [kg/h]	Δ [%]
36.61	-0.2
73.45	0.0
150.7	-0.1
306	0.0
454.8	-0.1
631.2	-0.1

This certificate was generated automatically and is valid without signature.

37079 Göttingen, 02/17/2012 Inspector:

ABB Automation Products GmbH 37070 Göttingen Telefon 05 51/90 5-0 Telefax 05 51/90 57 77

D184B040U01

Statement on the contamination of devices and components

Repair and / or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.

Otherwise, the device / component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:	
Address:	
Contact person:	Telephone:
Fax:	E-mail:

Device details:

Type:	Serial no.:
Reason for the return/description of the defect:	

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items)?

Biological	☐	Corrosive / irritating	☐	Combustible (highly / extremely combustible)	☐
Toxic	☐	Explosive	☐	Other toxic substances	☐
Radioactive	☐				

Which substances have come into contact with the device?

1.

2.

3.

We hereby state that the devices / components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date	Signature and company stamp

ABB has Sales & Customer Support expertise in over 100 countries worldwide.

www.abb.com/flow

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

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OI/FMT500-IG-EN Rev. B

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