**Introduction**

The Sensyflow FMT500-IG thermal mass flowmeter is a digital mass flowmeter for air, gas and gas mixtures in process applications. The measuring system is equipped with a LCD display, integrated gas temperature measurement and counter functions.

**Additional Information**

Additional documentation on Sensyflow FMT500-IG is available for download free of charge at www.abb.com/flow. Alternatively simply scan this code:
Commissioning Instruction - EN
CI/FMT500-IG-EN

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Rev. C

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 stated values on the name plate and in the technical 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 measurement media, the operator must check the level of resistance of all parts coming into contact with the wetted parts. 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 Plates and symbols

1.4.1 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 Name plates

#### 1.5.1 Standard

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Manufacturer</td>
<td>ABB Automation Products GmbH</td>
</tr>
<tr>
<td>2</td>
<td>Serial number</td>
<td>Göttingen, Germany</td>
</tr>
<tr>
<td>3</td>
<td>Internal model number</td>
<td>240123456X001</td>
</tr>
<tr>
<td>4</td>
<td>Serial number</td>
<td>00000234</td>
</tr>
<tr>
<td>5</td>
<td>Hardware version</td>
<td>1.20</td>
</tr>
<tr>
<td>6</td>
<td>ID number (internal calibration number)</td>
<td>56789</td>
</tr>
<tr>
<td>7</td>
<td>Year of manufacture, country of manufacture</td>
<td>2012</td>
</tr>
<tr>
<td>8</td>
<td>Power supply</td>
<td>24V AC/DC ±20%</td>
</tr>
<tr>
<td>9</td>
<td>Protection</td>
<td>Class IP67</td>
</tr>
<tr>
<td>10</td>
<td>Maximum power</td>
<td>-25...+50°C</td>
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<tr>
<td>11</td>
<td>Protection class</td>
<td>-25...+150°C</td>
</tr>
<tr>
<td>12</td>
<td>Permissible ambient temperature</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Measured medium temperature</td>
<td></td>
</tr>
</tbody>
</table>

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

#### 1.5.2 Transmitter with remote mount design

<table>
<thead>
<tr>
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<th>Description</th>
<th>Value</th>
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</tr>
<tr>
<td>2</td>
<td>Manufacturing number</td>
<td>Göttingen, Germany</td>
</tr>
<tr>
<td>3</td>
<td>Internal type designation</td>
<td>240123456X001</td>
</tr>
<tr>
<td>4</td>
<td>Serial number</td>
<td>00000234</td>
</tr>
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<td>5</td>
<td>Hardware Level</td>
<td>1.20</td>
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<tr>
<td>6</td>
<td>ID number (internal calibration number)</td>
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</tr>
<tr>
<td>7</td>
<td>Year of manufacture, country of manufacture</td>
<td>2012</td>
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<tr>
<td>8</td>
<td>Full type designation</td>
<td>Protection: Class IP66</td>
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<td>9</td>
<td>IP rating</td>
<td>-20...+50°C</td>
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<td>10</td>
<td>Permissible ambient temperature</td>
<td>-20...+150°C</td>
</tr>
<tr>
<td>11</td>
<td>Measured medium temperature</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2

1. Manufacturer
2. Manufacturing number
3. Internal type designation
4. Serial Number
5. Hardware Level
6. ID number (internal calibration number)
7. Explosion protection labeling, e.g., ATEX
1.5.3 Sensor with remote mount design

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer</td>
<td>ABB Automation Products GmbH</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Göttlingen, Germany</td>
</tr>
<tr>
<td>3</td>
<td>F-No.</td>
<td>240123456X001</td>
</tr>
<tr>
<td>4</td>
<td>Type-Code</td>
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<tr>
<td>5</td>
<td>Serial-No.</td>
<td>00000234</td>
</tr>
<tr>
<td>6</td>
<td>HW</td>
<td>1.20</td>
</tr>
<tr>
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<td>ID</td>
<td>56987</td>
</tr>
<tr>
<td>8</td>
<td>Protection</td>
<td>Class IP66</td>
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<td>9</td>
<td>T.amb.</td>
<td>-20... +50°C</td>
</tr>
<tr>
<td>10</td>
<td>T.med.</td>
<td>-20... +150°C</td>
</tr>
<tr>
<td>11</td>
<td>Protection labeling, e.g., ATEX</td>
<td>Ex 2G Ex ia IIC T4 Ga</td>
</tr>
<tr>
<td>12</td>
<td>Year of manufacture, country of manufacture</td>
<td>2012</td>
</tr>
<tr>
<td>13</td>
<td>Full type designation</td>
<td>11 Gb</td>
</tr>
<tr>
<td>14</td>
<td>Measuring medium temperature</td>
<td>200°C oder 300°C Db</td>
</tr>
</tbody>
</table>

Fig. 3

- Manufacturer
- Manufacturing number
- Internal type designation
- Serial Number
- Hardware Level
- ID number (internal calibration number)
- Explosion protection labeling, e.g., ATEX
- Year of manufacture, country of manufacture
- Full type designation
- Measuring medium temperature

1.5.4 Integral mount design

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer</td>
<td>ABB Automation Products GmbH</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Göttlingen, Germany</td>
</tr>
<tr>
<td>3</td>
<td>F-No.</td>
<td>240123456X001</td>
</tr>
<tr>
<td>4</td>
<td>Type-Code</td>
<td>1 0 1 0</td>
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<tr>
<td>5</td>
<td>Serial-No.</td>
<td>00000234</td>
</tr>
<tr>
<td>6</td>
<td>HW</td>
<td>1.20</td>
</tr>
<tr>
<td>7</td>
<td>ID</td>
<td>56789</td>
</tr>
<tr>
<td>8</td>
<td>Voltage</td>
<td>24 V AC/DC ±20%</td>
</tr>
<tr>
<td>9</td>
<td>Power</td>
<td>20 VA</td>
</tr>
<tr>
<td>10</td>
<td>Protection</td>
<td>Class IP67</td>
</tr>
<tr>
<td>11</td>
<td>T.amb.</td>
<td>-20... +50°C</td>
</tr>
<tr>
<td>12</td>
<td>T.med.</td>
<td>-20... +150°C</td>
</tr>
<tr>
<td>13</td>
<td>Year of manufacture, country of manufacture</td>
<td>2012</td>
</tr>
<tr>
<td>14</td>
<td>Full type designation</td>
<td>11 Gb</td>
</tr>
<tr>
<td>15</td>
<td>Power supply</td>
<td>20 VA</td>
</tr>
<tr>
<td>16</td>
<td>Maximum power consumption</td>
<td>11 Gb</td>
</tr>
<tr>
<td>17</td>
<td>IP rating</td>
<td>12</td>
</tr>
<tr>
<td>18</td>
<td>Permissible ambient temperature</td>
<td>13 Permissible ambient temperature</td>
</tr>
<tr>
<td>19</td>
<td>Measuring medium temperature</td>
<td>14 Measuring medium temperature</td>
</tr>
</tbody>
</table>

Fig. 4

- Manufacturer
- Manufacturing number
- Internal type designation
- Serial Number
- Hardware Level
- ID number (internal calibration number)
- Explosion protection labeling, e.g., ATEX
- Year of manufacture, country of manufacture
- Full type designation
- Power supply
- Maximum power consumption
- IP rating
- Permissible ambient temperature
- Measuring medium temperature
1.6 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.

1.6.1 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.

1.7 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 1 for nearest service location.
1.8 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 minimum impact on the environment and on people during manufacturing, storage, transport, use, and disposal. This includes the environmentally-friendly use of natural resources. We conduct an open dialog with the public through our publications.

1.9 Disposal

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

1.9.1 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.
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 (Electrical apparatus for explosive gas atmospheres).

2.1 Approvals

Data relating to the approvals for use in potentially explosive atmospheres can be found in the chapter 'Ex relevant specification'.

2.2 Ex relevant specifications

See chapter 'Ex relevant specifications' on page 50.
### 3 Design and function

**Integral mount design with display**
- Type 1 pipe component in wafer type design
  - DN 40 ... DN 200 / ASME 1 1/2 ... 8"
- Integrated hot tap fitting in wafer type design
  - DN 50 ... DN 200 / ASME 2 ... 8"
  - Not approved for use in a potentially explosive atmosphere

**Remote mount design with transmitter in field mount housing**
- Type 2 pipe component as a measuring section
  - DN 25 ... DN 80 / ASME 1 ... 2"
- Weld-on adapter
  - DN 100 / ASME 4" and above
  - Not approved for use in a potentially explosive atmosphere
- Weld-on adapter with ball valve
  - DN 100 / ASME 4" and above
  - Not approved for use in a potentially explosive atmosphere

---

**Fig. 5**

1. Centering pin outflow side
2. FMT500-IG Sensor
3. Transmitter
4. Terminal box
4 Mounting

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Steadying Length X (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion</td>
<td>15</td>
</tr>
<tr>
<td>Reducer</td>
<td>15</td>
</tr>
<tr>
<td>90° elbow</td>
<td>20</td>
</tr>
<tr>
<td>Two 90° elbow</td>
<td>25</td>
</tr>
<tr>
<td>Two 90° elbow</td>
<td>40</td>
</tr>
<tr>
<td>Valve / slide</td>
<td>50</td>
</tr>
</tbody>
</table>

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 Fig. 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)
   \[
   L = h - \frac{1}{2} \times \varnothing D_{\text{external}}
   \]
   where \( h = 263 \text{ mm (10.35 inches), 425 mm (16.73 inches) or 775 mm (30.51 inches)} \) (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.
**Mounting**

**Fig. 7: Dimensions in mm (inch)**

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

<table>
<thead>
<tr>
<th>Flowmeter sensor length h in mm (inch)</th>
<th>Outer pipe diameter min. / max. in mm (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>263 (10.35)</td>
<td>100 ... 350 (3.94 ... 13.78)</td>
</tr>
<tr>
<td>425 (16.73)</td>
<td>&gt; 350 ... 700 (13.78 ... 27.56)</td>
</tr>
<tr>
<td>775 (30.51)</td>
<td>&gt; 700 ... 1400 (27.56 ... 55.12)</td>
</tr>
</tbody>
</table>

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.

**DANGER**

The welding adapter with ball valve is not approved for use in potentially explosive atmospheres.

**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 - component damage!**
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)**

<table>
<thead>
<tr>
<th>1 Centering pin</th>
<th>2 Sealing ring groove</th>
<th>3 Connection flange DN 25 (1&quot;)</th>
<th>D Outer pipe diameter</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Flowmeter sensor length h in mm (inch)</th>
<th>Outer pipe diameter min. / max. in mm (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>263 (10.35)</td>
<td>100 ... 150 (3.94 ... 5.91)</td>
</tr>
<tr>
<td>425 (16.73)</td>
<td>&gt; 150 ... 500 (5.91 ... 19.69)</td>
</tr>
<tr>
<td>775 (30.51)</td>
<td>&gt; 500 ... 1150 (19.69 ... 45.28)</td>
</tr>
</tbody>
</table>

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.
DANGER
The integrated changing device is not approved for use in potentially explosive atmospheres.

Water flange version – sensor unit in exchange position  
Weld-in version – sensor unit in measuring position

Fig. 9: Dimensions in mm (inch)

1 Covers for DN 25 flange  
2 Spigot nut  
3 Bottom edge of spigot nut  
4 Display of sensor unit position, 50 mm (1.97”) stroke  
5 Sealing ring  
6 Sensor elements

<table>
<thead>
<tr>
<th>Flowmeter sensor length h</th>
<th>Water flange version</th>
<th>Weld-in version</th>
</tr>
</thead>
<tbody>
<tr>
<td>h = 263 mm (10.35”)</td>
<td>for DN 50, DN 65 and DN 80 / 2”, 3”</td>
<td>h = always 425 mm (16.73”)</td>
</tr>
<tr>
<td>h = 425 mm (16.73”)</td>
<td>for DN 100, DN 125, DN 150 and DN 200 / 4”, 6”, 8”</td>
<td></td>
</tr>
</tbody>
</table>

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 \( h = 425 \text{ mm} \) (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):

\[
X = h - (\varnothing \text{ pipe exterior} / 2) \\
Y = (\varnothing \text{ pipe exterior} / 2) - 28
\]

**Example:**

Transmitter with overall length \( h = 425 \text{ mm} \)  
Pipe with external diameter of 210 mm  
Hot tap fitting is in measuring position

\[
X = 425 \text{ mm} - (210 \text{ mm} / 2) = 320 \text{ mm}
\]
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 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

Hex-head socket screws (x4) to secure the guide tube

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).
4.6 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. 15:** 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. 16).

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. 16: 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 Zone 0 / 1 / 21, FM und Zone 2/22 versions with constant power method up to 25 m (82 ft.)) can be supported between the 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.

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 ... 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 in accordance with ATEX for Zone 0 / 1 / 21 and FM, comply with drawings and safety instructions in chapter 'Designs for potentially explosive atmospheres in accordance with ATEX and FM' on page 50.

**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

<table>
<thead>
<tr>
<th>Transmitter with integral mount design</th>
<th>Transmitter with remote mount design</th>
<th>Flowmeter sensor with remote mount design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L / +</strong> Phase / + terminal</td>
<td><strong>L / +</strong> Phase / + terminal</td>
<td><strong>Flowmeter sensor</strong></td>
</tr>
<tr>
<td><strong>N / -</strong> Neutral / - terminal</td>
<td><strong>N / -</strong> Neutral / - terminal</td>
<td><strong>Terminals 1 ... 10</strong></td>
</tr>
<tr>
<td><strong>PE</strong> Grounding</td>
<td><strong>PE</strong> Grounding</td>
<td><strong>Cable</strong></td>
</tr>
<tr>
<td>Wide-range power supply unit 110 ... 230 V AC / DC ± 10 % or Low-voltage power supply unit 24 V AC / DC ± 20 %</td>
<td>Wide-range power supply unit 110 ... 230 V AC / DC ± 10 % or Low-voltage power supply unit 24 V AC / DC ± 20 %</td>
<td>Min. 9 wires</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Min. cross section</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min. 0.5 mm² AWG 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Max. cable length</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 m (164 ft.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(25 m [82 ft.] for Zone 2/22 version with constant power method)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned).</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Place one side of the cable shield in the metal cable gland for the terminal box.</strong></td>
</tr>
</tbody>
</table>

[Diagram of electrical connections]
### Analog / HART module

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Shield</td>
</tr>
<tr>
<td>12</td>
<td>+ $I_{\text{out}}$ analog output / HART</td>
</tr>
<tr>
<td>13</td>
<td>- $I_{\text{out}}$ analog output / HART</td>
</tr>
<tr>
<td>14</td>
<td>+ 24 V DC for external supply, 30 mA max.</td>
</tr>
<tr>
<td>15</td>
<td>GND 24 V</td>
</tr>
<tr>
<td>16</td>
<td>$D_{\text{out}}$ 1</td>
</tr>
<tr>
<td>17</td>
<td>$D_{\text{out}}$ 2</td>
</tr>
<tr>
<td>18</td>
<td>GND $D_{\text{out}}$ ($D_{\text{out}}$ 1 + 2)</td>
</tr>
<tr>
<td>19</td>
<td>$D_{\text{in}}$ 1</td>
</tr>
<tr>
<td>20</td>
<td>$D_{\text{in}}$ 2</td>
</tr>
<tr>
<td>21</td>
<td>GND $D_{\text{in}}$ ($D_{\text{in}}$ 1 + 2)</td>
</tr>
<tr>
<td>22</td>
<td>Shield</td>
</tr>
</tbody>
</table>

#### 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).

---

**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 mm²).

**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)

#### Active direct current 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. 18). 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 (NOTICE)**

The connection area for the explosion-proof designs in accordance with ATEX Zone 0 / 1 / 21 and FM is described in chapter ‘Ex relevant specifications’ on page 50.

**IMPORTANT (NOTICE)**

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.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VP</td>
<td>+ 5 V</td>
</tr>
<tr>
<td>2</td>
<td>Rx/D/Tx-D-N</td>
<td>Receive / transmit data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>line A (green wire)</td>
</tr>
<tr>
<td>3</td>
<td>DGND</td>
<td>Data transmission potential</td>
</tr>
<tr>
<td>4</td>
<td>Rx/D/Tx-D-P</td>
<td>Receive / transmit data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>line B (red wire)</td>
</tr>
<tr>
<td>5</td>
<td>Shield</td>
<td>Shield / protective earth</td>
</tr>
<tr>
<td>Thread</td>
<td>Shield</td>
<td>Shield / protective earth</td>
</tr>
</tbody>
</table>
5.2 Designs for potentially explosive atmospheres in accordance with ATEX and FM

**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, $U_{\text{max}} = 250$ V or

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

Type of protection for power supply connection Ex e (ATEX), XP (FM)

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, $U_{\text{max}} = 250$ V or

Low-voltage power supply unit 24 V AC / DC ± 20 %, 20 VA 48 ... 62 Hz, $U_{\text{max}} = 29$ 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 sensor connection Ex ia (ATEX), IS (FM)

**Flowmeter sensor with remote mount design**

- **Type of protection** Ex ia (ATEX), IS (FM)
- **Sensor** Terminal 1 ... 10
- **Cable** min. 9 wires
- **Minimum cross-section** min. 0.5 mm² 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)
## Electrical connections

### Analog / HART module

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>+ I_{out} analog output / HART</td>
</tr>
<tr>
<td>32</td>
<td>- I_{out} analog output / HART</td>
</tr>
<tr>
<td>33</td>
<td>D_{out} 1</td>
</tr>
<tr>
<td>34</td>
<td>GND D_{out} (D_{out} 1)</td>
</tr>
<tr>
<td>35</td>
<td>D_{out} 2</td>
</tr>
<tr>
<td>36</td>
<td>GND D_{out} (D_{out} 2)</td>
</tr>
<tr>
<td>37</td>
<td>D_{in} 1</td>
</tr>
<tr>
<td>38</td>
<td>GND D_{in} (D_{in} 1)</td>
</tr>
<tr>
<td>39</td>
<td>D_{in} 2</td>
</tr>
<tr>
<td>40</td>
<td>GND D_{in} (D_{in} 2)</td>
</tr>
</tbody>
</table>

**Type of protection:** Ex ib or Ex e (ATEX), IS or XP, NI (FM)

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

### PROFIBUS module

- **Type of protection:** Ex ib (ATEX), IS (FM)
- Connect to intrinsically safe PROFIBUS DP only (integral and remote mount designs)
- Bus termination internally via 150 \( \Omega \) resistor or externally in accordance with the RS485 IS specification
- When connecting the fieldbus/signal lines, the safety-related parameters in the relevant certificates must be observed.

**IMPORTANT (NOTICE)**

For ATEX designs, cable entries and sealing pieces in the increased safety type of protection ‘e’ and suited for operating conditions should be implemented and properly installed. Close unused cable entry in accordance with EN 60079.

**IMPORTANT (NOTICE)**

For FM versions, the electric connection can be made via an approved cable gland or an approved suited flame-resistant pipe fitting (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.

![Diagram of bus termination](image)

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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DP, cable type A, shielded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge impedance in Ω</td>
<td>135 … 165 at a frequency of 3 … 20 MHz</td>
</tr>
<tr>
<td>Effective capacitance (pF / m)</td>
<td>30</td>
</tr>
<tr>
<td>Loop resistance (Ω / km)</td>
<td>≤ 110</td>
</tr>
<tr>
<td>Solid conductor</td>
<td>AWG 22/1</td>
</tr>
<tr>
<td>Flexible conductor</td>
<td>&gt; 0.32 mm²</td>
</tr>
</tbody>
</table>

**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.
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

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>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).</td>
</tr>
<tr>
<td>2.</td>
<td>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.</td>
</tr>
<tr>
<td>3.</td>
<td>Connect the power cord to the power supply.</td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

#### Connecting the 24 V power supply

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>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).</td>
</tr>
<tr>
<td>2.</td>
<td>Connect the supply line to the supply power.</td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
</tbody>
</table>

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

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- is displayed instead.
In the event of an error, the error symbol "E" appears (see Section 8, "Operation").
7 PROFIBUS DPV1 communication

7.1 SLAVE address settings

Up to 127 nodes can be addressed on the PROFIBUS network, with a maximum of 32 nodes connected in each segment. If more than \( n \times 32 \) 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 10.1.2).

**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.
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. 16).

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. 20: 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.

<table>
<thead>
<tr>
<th>ENTER button</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![ENTER button](image1) | - For accessing submenus and input fields  
                          - For confirming entries |
| ![ENTER button](image2) | - For returning to the previous menu level |
| ![SCROLL button](image3) | - For navigating and making selections in the value range |
| ![+ button](image4) | - For increasing numerical values (increment)  
                          - For changing letters and special characters |

<table>
<thead>
<tr>
<th>ARROW keys</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Vertical ARROW keys](image5) | - For navigating within a menu level  
                                  (main menu, submenu level 1, submenu level 2) |
| ![Horizontal ARROW keys](image6) | - 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Connect symbol](image7) | Connect | HART communication active.  
                           No changes can be made to parameters directly on the device. |
| ![Disconnect symbol](image8) | Disconnect | HART communication not active. |
| ![Overflow symbol](image9) | Overflow | The measured value cannot be displayed (you may need to change the display unit), output values are not affected. |
| ![Flashing asterisk symbol](image10) | Flashing asterisk | Indicates normal operation (measuring mode). |
| ![Simulation symbol](image11) | Simulation | Simulated values and status signals are output instead of measured values. |
| ![Alarm symbol](image12) | Alarm | Indicates that limit values have been exceeded. |
| ![Error symbol](image13) | 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

- Display of gas temperature
- Display of totalizer value and totalizer runtime
- Display of mass flow value, numerically and as a bar chart
- Display of totalizer and mass flow values
- Display of characteristic curve, gas temperature, mass flow value

Operation mode

STANDARD
SPECIALIST
SERVICE

EASY SETUP MENU

PARAMETER MENU

MEAS DATA MENU

EXTERNAL I/O MENU

HART MENU

SERVICE MENU

Submenu level 1
Submenu level 1
Submenu level 1
Submenu level 2
Submenu level 2
Submenu level 1
Submenu level 1
Submenu level 2
Submenu level 2
9.1.1 Operation modes

**OPERATION MODE**

- **STANDARD**
  - 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).

**SPECIALIST**

- **PASSWORD**
  - Use \( \uparrow \) and \( \downarrow \) to select the required mode: STANDARD, SPECIALIST or SERVICE.
  - Use \( \rightarrow \) to confirm your selection.
  - (PASSWORD SPECIALIST: 2000)

- **000_**
  - Use \( \uparrow \) and \( \downarrow \) to position the cursor.
  - Use \( \rightarrow \) to set the numerical value.
  - Use \( \rightarrow \) to complete password entry.
  - (Cursor must be positioned on the far right).

- **2000**
  - OK will appear to confirm that the password is correct.
  - Use \( \uparrow \) and \( \downarrow \) 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.
9.1.2 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 9.1.1, "Operation modes").

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

► LANGUAGE
  ► DEUTSCH

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

► SAVE USER CONF.

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

► END PARAMETER

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.

IMPORTANT (NOTE)

For detailed information on the menu structure, a description of the parameters and a list of possible diagnostic messages, please consult the operating instructions.
10 PROFIBUS DPV1 parameterization

10.1 Menu levels

- Display of gas temperature, mass flow value, characteristic curve
- Display of mass flow value, numerically and as a bar chart
- Display of totalizer and mass flow values
- Display of gas temperature
- Display of totalizer value and totalizer runtime
- Operation mode

Parameter menu

- SUBMENU level 1

Profibus menu

- Submenu level 1
- Submenu level 2

Service menu

- Submenu level 1
10.1.1 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.
10.1.2 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 10.1.1, "Operation modes").

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

► LANGUAGE
  ➤ DEUTSCH

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

► LANGUAGE
  ➤ ENGLISH

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

Saving changes

► SAVE USER CONF.
  ➤ ?

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

► 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

► END PARAMETER

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.

IMPORTANT (NOTE)

For detailed information on the menu structure, a description of the parameters and a list of possible diagnostic messages, please consult the operating instructions.
11 Ex relevant specifications

11.1 Zone 2/22 version

11.1.1 Marking

<table>
<thead>
<tr>
<th>Transmitter with remote mount design</th>
<th>Flowmeter sensor with remote mount design</th>
<th>Integral mount design</th>
</tr>
</thead>
<tbody>
<tr>
<td>II 3G Ex ec IIC T4 Gc</td>
<td>II 3G Ex ec IIC T4 Gc</td>
<td>II 3G Ex ec IIC T4 Gc</td>
</tr>
<tr>
<td>II 3D Ex tb IIIC T115°C Dc</td>
<td>II 3D Ex tb IIIC T150°C Dc</td>
<td>II 3D Ex tb IIIC T150°C Dc</td>
</tr>
<tr>
<td>$T_{\text{amb}} = -20 \ldots 50 , ^\circ\text{C} , (-4 \ldots 122 , ^\circ\text{F})$</td>
<td>$T_{\text{amb}} = -20 \ldots 80 , ^\circ\text{C} , (-4 \ldots 176 , ^\circ\text{F})$</td>
<td>$T_{\text{amb}} = -20 \ldots 50 , ^\circ\text{C} , (-4 \ldots 122 , ^\circ\text{F})$</td>
</tr>
<tr>
<td>$T_{\text{medium}} = -20 \ldots 150 , ^\circ\text{C} , (-4 \ldots 302 , ^\circ\text{F})$</td>
<td>$T_{\text{medium}} = -20 \ldots 150 , ^\circ\text{C} , (-4 \ldots 302 , ^\circ\text{F})$</td>
<td>$T_{\text{medium}} = -20 \ldots 150 , ^\circ\text{C} , (-4 \ldots 302 , ^\circ\text{F})$</td>
</tr>
</tbody>
</table>

11.1.2 Safety specifications for inputs and outputs

<table>
<thead>
<tr>
<th>Power supply circuit</th>
<th>Non-sparking type of protection Ex ec II</th>
<th>$U_n = 24 , \text{V AC/DC} \pm 20 , %$, $P_n &lt; 20 , \text{VA}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$U_n = 110 \ldots 230 , \text{V AC/DC} \pm 10 , %$, $P_n &lt; 20 , \text{VA}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog / HART</th>
<th>Non-sparking type of protection Ex ec II</th>
<th>$U_n = 30 , \text{V}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output circuit (active):</td>
<td></td>
<td>$U_n = 30 , \text{V}$</td>
</tr>
<tr>
<td>Digital output (passive):</td>
<td>Non-sparking type of protection Ex ec II</td>
<td>$U_n = 30 , \text{V}$</td>
</tr>
<tr>
<td>Digital input (passive):</td>
<td>Non-sparking type of protection Ex ec II</td>
<td>$I_{\text{max}} = 100 , \text{mA}$</td>
</tr>
</tbody>
</table>

| PROFIBUS DP RS 485 | Non-sparking type of protection Ex ec II | $U_n = < 8 \, \text{V}$ |

| PE current circuit: | Non-sparking type of protection Ex ec II |

| PA current circuit: | Non-sparking type of protection Ex ec II |

11.2 Designs for potentially explosive atmospheres in accordance with ATEX and FM

This chapter includes information that must be observed when using the devices in potentially explosive atmospheres (devices in accordance with ATEX Cat. 1/2 G and 2 D (Zone 1/21, Zone 0/21), FM CL1, 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).

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.
11.2.1 Options regarding installation in potentially explosive atmospheres

<table>
<thead>
<tr>
<th>Safe area or Zone 2/21 or Zone 1/21 or Cl.1 Div.2</th>
<th>Zone 1/21 or Cl. 1 Div.1</th>
</tr>
</thead>
</table>

11.2.2 ATEX Marking

<table>
<thead>
<tr>
<th>Transmitter, remote mount design</th>
<th>Flowmeter sensor, remote mount design</th>
<th>Integral mount design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 2/21</td>
<td>Terminal box Zone 1, flowmeter sensor Zone 0</td>
<td>Transmitter Zone 1, flowmeter sensor Zone 0</td>
</tr>
<tr>
<td>II3(1)G Ex ec [ia][ib] IIC T4 Gc</td>
<td>II 1/2G Ex ia IIC T4 Ga</td>
<td>II 1/2G Ex db eb [ia][ib] IIC T4 Ga</td>
</tr>
<tr>
<td>II 2D Ex tb IIIIC T115°C Db</td>
<td>II 2D Ex tb IIIIC T80°C Db</td>
<td>II 2D Ex tb IIIIC T115°C Db</td>
</tr>
<tr>
<td>Tamb = -20 ... 50 °C (-4 ... 122 °F)</td>
<td>Tamb = -20 ... 50 °C (-4 ... 122 °F)</td>
<td>Tamb = -20 ... 50 °C (-4 ... 122 °F)</td>
</tr>
</tbody>
</table>

Optional -40 °C for ambient temperature

Terminal box and flowmeter sensor Zone 1

| IIC T4 Gb                        | II 2G Ex ia IIIIC T100°C or 200°C or 300°C Db |
| Tamb = -20 ... 80 °C (-4 ... 176 °F) |

Optional -40 °C for ambient temperature

Transmitter and flowmeter sensor Zone 1

| II 2G Ex db eb [ia][ib] IIIIC T4...T1 Gb |
| Tamb = -20 ... 50 °C (-4 ... 122 °F) |

Optional -40 °C for ambient temperature
### 11.2.3 Temperature table for ATEX designs

<table>
<thead>
<tr>
<th>Sensyflow FMT500-IG, integral mount design</th>
<th>Temperature class</th>
<th>Surface temperature</th>
<th>Process temperature</th>
<th>Sensor</th>
<th>Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>115 °C</td>
<td>-20 ... 80 °C (-4 ... 176 °F)</td>
<td>Cat. 1G / Zone 0</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>115 °C</td>
<td>-20 ... 100 °C (-4 ... 212 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>115 °C</td>
<td>-20 ... 100 °C (-4 ... 212 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>200 °C (1)</td>
<td>-20 ... 200 °C (-4 ... 392 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>300 °C (1)</td>
<td>-20 ... 300 °C (-4 ... 572 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensyflow FMT500-IG transmitter, remote mount design</th>
<th>Temperature class</th>
<th>Surface temperature</th>
<th>Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>115 °C</td>
<td></td>
<td>Cat. 3G/2D / Zone 2/21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensyflow FMT500-IG flowmeter sensor, remote mount design</th>
<th>Temperature class</th>
<th>Surface temperature</th>
<th>Process temperature</th>
<th>Sensor</th>
<th>Terminal box</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>80 °C</td>
<td>-20 ... 80 °C (-4 ... 176 °F)</td>
<td>Cat. 1G / Zone 0</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>100 °C</td>
<td>-20 ... 100 °C (-4 ... 212 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>100 °C</td>
<td>-20 ... 100 °C (-4 ... 212 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>200 °C (1)</td>
<td>-20 ... 200 °C (-4 ... 392 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>300 °C (1)</td>
<td>-20 ... 300 °C (-4 ... 572 °F)</td>
<td>Cat. 2G / Zone 1</td>
<td>Cat. 2G/2D / Zone 1/21</td>
<td></td>
</tr>
</tbody>
</table>

1) Temperatures in accordance with ATEX temperature classes, max. process temperature for the sensor -20 ... 150 °C (-4 ... 302 °F)

### 11.2.4 FM designations with temperature information

<table>
<thead>
<tr>
<th>Transmitter, remote mount design</th>
<th>Flowmeter sensor, remote mount design</th>
<th>Integral mount design</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI CLASS I DIV2 Group: A,B,C,D, CLASS I Zone 2 AE nA IIC T4...T1</td>
<td>IS CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC T4...T1</td>
<td>XP CLASS I DIV1 Group: B,C,D, CLASS I, Zone 1 II B T4...T1</td>
</tr>
<tr>
<td>DIP CLASS II, III DIV1 and 2 Group: E,F,G</td>
<td>DIP CLASS II, III DIV1 and 2 Group: E,F,G</td>
<td>IS Circuits for CLASS I DIV1 Group: B,C,D, CLASS I Zone 0 AEx ia IIC</td>
</tr>
<tr>
<td>IS Circuits for CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC</td>
<td>NI CLASS I, II, III DIV1 and 2 Group: E,F,G</td>
<td>DIP CLASS II,III DIV1 and 2 Group: E,F,G</td>
</tr>
</tbody>
</table>

T<sub>amb</sub> = -20 ... 50 °C (-4 ... 122 °F)
## 11.2.5 Safety specifications for inputs and outputs

### Analog / HART communication

<table>
<thead>
<tr>
<th>Circuit Type</th>
<th>ATEX Design</th>
<th>FM Design</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Output</td>
<td>Ex ib IIC / IIB</td>
<td>IS acc. to control drawings</td>
<td>U_{max} = 60 V</td>
</tr>
<tr>
<td>Active</td>
<td>V14224-6 ... 1212 ... IS, V14224-7 ... 2112 ... IS</td>
<td>XP, NI, DIP acc. to control drawings</td>
<td>Use only approved separators / barriers.</td>
</tr>
<tr>
<td>Terminal 31 + 32</td>
<td></td>
<td></td>
<td>Connect to passive, intrinsically safe circuits only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Terminal 32 is connected to potential equalization (PA).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The rated voltage of the non-intrinsically-safe circuits is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- for ATEX versions U_{m} = 60 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- for FM versions U_{m} = 90 V (XP, NI, DIP).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Make sure that the terminal cover over the power supply connection is tightly closed. With intrinsically safe output circuits, the terminal box can be opened.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• For ATEX designs, use of the enclosed cable glands for the output circuits in accordance with the type of protection: intrinsically safe = blue; non-intrinsically safe = black.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The sensor and the transmitter housing must be connected to the potential equalization. For intrinsically safe current outputs, equipotential bonding needs to be in place all the way along the circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Take into consideration the corrosion resistance of the meter tube materials to the measuring medium. This is the user’s responsibility.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: The values indicated here are taken from the respective certificates. The specification and supplements to the respective valid approval (ATEX, FM) are decisive.</td>
</tr>
</tbody>
</table>

### PROFIBUS DPV1 communication

<table>
<thead>
<tr>
<th>Circuit Type</th>
<th>ATEX Design</th>
<th>FM Design</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Ex ib IIC / IIB</td>
<td>IS acc. to control drawings</td>
<td>U_{max} = 60 V</td>
</tr>
<tr>
<td></td>
<td>V14224-6 ... 1212 ... IS, V14224-7 ... 2112 ... IS</td>
<td>XP, NI, DIP acc. to control drawings</td>
<td>Use only approved separators / barriers.</td>
</tr>
<tr>
<td>PROFIBUS DP</td>
<td></td>
<td></td>
<td>Connect to passive, intrinsically safe circuits only.</td>
</tr>
<tr>
<td>RS 485 IS-Interface</td>
<td></td>
<td></td>
<td>Terminal 32 is connected to potential equalization (PA).</td>
</tr>
<tr>
<td>Terminals X2, X3</td>
<td></td>
<td></td>
<td>The rated voltage of the non-intrinsically-safe circuits is:</td>
</tr>
<tr>
<td>Terminal A/B</td>
<td></td>
<td></td>
<td>- for ATEX versions U_{m} = 60 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- for FM versions U_{m} = 90 V (XP, NI, DIP).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Make sure that the terminal cover over the power supply connection is tightly closed. With intrinsically safe output circuits, the terminal box can be opened.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• For ATEX designs, use of the enclosed cable glands for the output circuits in accordance with the type of protection: intrinsically safe = blue; non-intrinsically safe = black.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The sensor and the transmitter housing must be connected to the potential equalization. For intrinsically safe current outputs, equipotential bonding needs to be in place all the way along the circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Take into consideration the corrosion resistance of the meter tube materials to the measuring medium. This is the user’s responsibility.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: The values indicated here are taken from the respective certificates. The specification and supplements to the respective valid approval (ATEX, FM) are decisive.</td>
</tr>
</tbody>
</table>
12 Appendix

12.1 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.

12.2 Approvals and certifications

| CE mark | The version of the device marketed 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**

Designation relating to intended use in potentially explosive atmospheres in compliance with:

|             | - ATEX Directive  
|             | - FM Approvals (US)  |

**Calibration**

DAkkS / ILAC - accredited calibration equipment D-K-15081-01-00

- Sample 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

<table>
<thead>
<tr>
<th>Customer</th>
<th>Muster</th>
<th>F-No.</th>
<th>123456789 X002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial-No.</td>
<td></td>
<td></td>
<td>00123456</td>
</tr>
</tbody>
</table>

### Object of Calibration

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

### Application Data

- **Inside Pipe Diameter**: 54.5 mm (DN50 PN40)
- **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.
- **Gas Composition**: Air
- **Volume %**: 100.0

### Calibration

Best measurement capability of the testing PS0051 U = 0.3% and PS0052 U = 0.4%

The measurements standards used for the calibration (critically operated venturi nozzles) are traceable to the representation of the SI-units.

- **Test Stand**: DN50/Filter+pipe design/2
- **Test Stand Temperature**: Air
- **Test Stand Temperature**: 20 °C
- **Test Stand Temperature**: 986 mbar/abs.

With the calibration data the adoption 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 9001:2006.

The specifications according to the data sheet were fulfilled.

<table>
<thead>
<tr>
<th>Reference 'Q Ref' [kg/h]</th>
<th>[% of reading]</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.61</td>
<td>-0.2</td>
<td></td>
</tr>
<tr>
<td>73.45</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>150.7</td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>398</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>454.8</td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>631.3</td>
<td>-0.1</td>
<td></td>
</tr>
</tbody>
</table>

This certificate was generated automatically and is valid without signature.

37079 Göttingen, 02/17/2012

Inspector:
Introduction

The Sensyflow FMT500-IG thermal mass flowmeter is a digital mass flowmeter for air, gas and gas mixtures in process applications. The measuring system is equipped with a LCD display, integrated gas temperature measurement and counter functions.

Additional Information

Additional documentation on Sensyflow FMT500-IG is available for download free of charge at www.abb.com/flow. Alternatively, simply scan this code:

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