Commissioning Instruction
Mass Flowmeter
CoriolisMaster FCM2000
Mass Flowmeter
CoriolisMaster FCM2000

Commissioning Instruction - EN
CI/FCM2000-EN

07.2017
Rev. D

Original instruction

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1 Safety

1.1 General information and notes for the reader

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 later use. 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 in case 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 a safe, maintenance-free state. 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 information 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.

Important

• An additional document with Ex safety information is available for measuring systems that are used in potentially explosive areas (Applies to FM / CSA only).
• Ex safety information is an integral part of this manual. As a result, it is crucial that the installation guidelines and connection values it lists are also observed.

The icon on the name plate indicates the following:
1.2 Intended use

This device is intended for the following uses:

- To convey liquids and gases (fluids), including unstable ones
- To meter the mass flow of the fluid directly
- To meter the volumetric flow of the fluid (indirectly via mass flow and density)
- To measure fluid density
- To measure fluid temperature

The following items are included in the intended use:

- Read and follow the instructions in this manual.
- Observe the technical ratings; refer to the section 1.4 “Technical limit values”.
- Use only allowed liquids for measurement; refer to the section 1.5 “Approved media”.

1.3 Improper use

The following are considered to be instances of improper use of the device:

- Operation as a flexible adapter in piping, e.g., to compensate for pipe offsets, pipe vibrations, pipe expansions, etc.
- As a climbing aid, e.g., for mounting purposes
- As a support for external loads, e.g., as a support for piping, etc.
- Adding material, e.g., by painting over the name plate or welding/soldering on parts
- Removing material, e.g., by spot drilling the housing

Repairs, alterations, and enhancements, or the installation of replacement parts, are only permissible insofar as these are described in the manual. Approval by ABB Automation Products GmbH must be sought for any activities beyond this scope. Repairs performed by ABB-authorized specialist shops are excluded from this.

1.4 Technical limit values

The meter has been designed for use exclusively within the values stated on the name plate and within the technical limit values specified on the data sheets.

The following technical limit values must be observed:

- The permissible pressure (PS) and the permissible fluid temperature (TS) must not exceed the pressure/temperature ratings (see the section titled “Specifications”).
- The maximum and minimum operating temperature limits must not be exceeded or undershot.
- The permissible operating temperature must not be exceeded.
- The housing protection type must be observed during operation.
- The flowmeter sensor must not be operated in the vicinity of powerful electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. 1 m (3.28 ft) must be maintained. For installation on steel parts (e.g., steel brackets), a minimum spacing of 100 mm (4”) must be maintained. (These values have been calculated on the basis of IEC 801-2 and IEC TC77B.)
1.5 Approved media

When using media, please note:

- Media (fluids) may only be used if, based on the state of the art or the operating experience of the user, it can be assured that chemical and physical properties of the components coming into contact with the fluids will not be adversely affected during the operating period.
- Specifically chloride media can cause not visible corrosion damages to all media wetted components so that fluid can lead. The suitability of these materials for each application by the operator to examine.
- Media (fluids) with unknown properties or abrasive media may only be used if the operator can perform regular and suitable tests to ensure the safe condition of the meter.
- Observe the information on the name plate.

1.6 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.

1.7 Safety instructions for transport

Observe the following instructions:

- The center of gravity is off center.
- The flow direction must correspond to the direction indicated on the device, if labeled.
- Comply with the maximum torque for all flange connections.
- Install the devices without mechanical tension (torsion, bending).
- Install flange devices with coplanar counter flanges.
- Only install devices for the intended operating conditions and with suitable seals.
- Secure the flange bolts and nuts against pipeline vibrations.
1.8 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.

1.9 Safety instructions for operation

During operation with hot fluids, contact with the surface may result in burns.
Aggressive fluids may result in corrosion or abrasion of the parts that come into contact with the medium. As a result, pressurized fluids may escape prematurely.
Wear to the flange gasket or process connection gaskets (e.g., aseptic threaded pipe connections, Tri-Clamp, etc.) may enable a pressurized medium to escape.
When using internal flat gaskets, these can become embrittled by CIP/SIP processes.
### 2 Design and function

**Important**

An additional document with Ex safety instructions is available for measuring systems that are used in explosion hazardous areas (Applies to FM / CSA only). As a result, it is crucial that the specifications and data it lists are also observed.

#### 2.1 ATEX and IECEx device overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard/Non-Ex</th>
<th>Zone 1/21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remote mount design (small nominal diameters)</td>
<td>ME22 A, U ...</td>
<td>ME27/28 B, E</td>
</tr>
<tr>
<td>Transmitter and flowmeter sensor</td>
<td>MS21 A, U</td>
<td></td>
</tr>
<tr>
<td>- Standard/non-Ex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ex Zone 2/21, 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ex Zone 1/21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1: FCM2000 overview
3 Transport

3.1 Inspection

Check the devices for possible damage that may have occurred during transport. Damages in transit must be recorded on the transport documents. All claims for damages must be claimed without delay against the shipper and before the installation.

3.2 General information on transport

Observe the following when transporting the device to the measurement site:

• The center of gravity is off center.

• Flanged units may not be lifted by the converter housing or terminal box.
4 Installation

4.1 Electrical connection

4.1.1 Electrical connections between the transmitter and the flowmeter sensor

Connecting transmitter ME2 to flowmeter sensor MS2

![Diagram of electrical connections]

91 / 92 Driver
93 / 94 / 95 / 96 Temperature
85 / 86 Sensor 1
87 / 88 Sensor 2

1 Red
2 Brown
3 Green
4 Blue
5 Gray
6 Violet
7 White
8 Black
9 Orange
10 Yellow
11 "PA" equipotential bonding. When connecting transmitter to flowmeter sensor MS26, transmitter also has to be connected to "PA".
### 4.1.2 Electrical connections between the transmitter and the peripherals

#### Input and output signals, supply power ME2/MS2

#### Fig. 3

1. **Supply power**
   - Line voltage: $U_{AC}$ 100 ... 230 V AC, frequency 50/60 Hz, terminals L, N, φ
   - Low voltage: $U_{AC}$ 24 V, frequency 50/60 Hz, terminals 1+, 2- $U_{DC}$ 24 V

2. **Current output 1**: can be selected via software
   - 2a: function: active
     - Terminals: 31, 32, 0/4 ... 20 mA ($0 \leq R_B \leq 560 \Omega$, ME27/28: $0 \leq R_B \leq 300 \Omega$)
     - Source voltage $12 \leq U_i \leq 30 V$
   - 2b: alternate function: passive (option D)
     - Terminals: 31, 32, 4 ... 20 mA ($0 \leq R_B \leq 600 \Omega$)
     - Source voltage $12 \leq U_i \leq 30 V$

3. **Current output 2**: can be selected via software
   - Function: passive
     - Terminals: 33, 34, 4 ... 20 mA ($0 \leq R_B \leq 600 \Omega$)
     - Source voltage $12 \leq U_i \leq 30 V$

4. **Passive pulse output**, terminals: 51, 52
   - $f_{max} = 5 kHz$, pulse width 0.1 ... 2,000 ms
   - Setting range: $0.001 ... 1,000$ pulses/unit
   - "Closed": $0 \leq U_{CEL} \leq 2 V$, $2 mA \leq I_{CEL} \leq 65 mA$
   - "Open": $16 V \leq U_{CEH} \leq 30 V$, $0 mA \leq I_{CEH} \leq 0.2 mA$

4a **Active pulse output**
   - $U = 16 ... 30 V$, load $\geq 150 \Omega$, $f_{max} = 5 kHz$

5. **Contact output**, passive
   - Terminals: 41, 42
     - "Closed": $0 \leq U_{KCL} \leq 2 V$, $2 mA \leq I_{KCL} \leq 65 mA$
     - "Open": $16 V \leq U_{KCH} \leq 30 V$, $0 mA \leq I_{KCH} \leq 0.2 mA$

6. **Contact input**, passive
   - Terminals: 81, 82
     - "On": $16 V \leq U_{KL} \leq 30 V$
     - "Off": $0 V \leq U_{KL} \leq 2 V$

7. "PA" equipotential bonding. When transmitter ME2 is connected to flowmeter sensor MS26, transmitter ME2 also has to be connected to "PA".

---

**Important**

An additional document with Ex safety instructions is available for measuring systems that are used in explosion hazardous areas (Applies to FM / CSA only).

As a result, it is crucial that the specifications and data it lists are also observed.
4.2 Ex relevant specifications

**Important**
An additional document with Ex safety instructions is available for measuring systems that are used in explosion hazardous areas (Applies to FM / CSA only).
As a result, it is crucial that the specifications and data it lists are also observed.

**Overview of the different output options**

<table>
<thead>
<tr>
<th>Output option A/B in the order number</th>
<th>ATEX/IECEx Zone 2</th>
<th>ATEX/IECEx Zone 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>- Current output 1: active</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Current output 2: passive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pulse output: active/passive, switchable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Contact input and output: passive</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>- Current output 1: passive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Current output 2: passive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pulse output: active/passive, switchable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Contact input and output: passive</td>
<td></td>
</tr>
</tbody>
</table>

**Version I: Active/Passive current outputs**

<table>
<thead>
<tr>
<th>Types: ME21/ME22/ME23/ME24 and ME25</th>
<th>Protection type &quot;nA&quot; (Zone 2)</th>
<th>General operating values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U (V)</td>
<td>I (mA)</td>
</tr>
<tr>
<td>Current output 1 Active Terminals 31/32</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Current output 2 Passive Terminals 33/34</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Pulse output Active or passive Terminals 51/52</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Contact output Passive Terminals 41/42</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Contact input Passive Terminals 81/82</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

All inputs and outputs are electrically isolated from each other and from the supply power.
## Installation

### Types: ME26/ME27 and ME28

<table>
<thead>
<tr>
<th>Protection type &quot;nA&quot; (Zone 2)</th>
<th>General operating values</th>
<th>Protection type &quot;e&quot; (Zone 1)</th>
<th>Protection type &quot;ib&quot; (Zone 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection type &quot;nA&quot; (Zone 2)</td>
<td>Protection type &quot;e&quot; (Zone 1)</td>
<td>Protection type &quot;ib&quot; (Zone 1)</td>
<td></td>
</tr>
<tr>
<td>Protection type &quot;nA&quot; (Zone 2)</td>
<td>Protection type &quot;e&quot; (Zone 1)</td>
<td>Protection type &quot;ib&quot; (Zone 1)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current output 1</th>
<th>Active Terminals 31/32</th>
<th>Terminal 32 is connected to &quot;PA&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
<td>Uᵦ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
<td>(V)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current output 2</th>
<th>Passive Terminals 33/34</th>
<th>Terminal 34 is connected to &quot;PA&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
<td>Uᵦ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
<td>(V)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current output 2</th>
<th>Passive Terminals 33/34</th>
<th>Terminal 34 is connected to &quot;PA&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
<td>Uᵦ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
<td>(V)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact output 2</th>
<th>Passive Terminals 41/42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact input 2</th>
<th>Passive Terminals 81/82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

All inputs and outputs are electrically isolated from each other and from the supply power. Only current outputs 1 and 2 are not electrically isolated from one another.

### Version II: Passive/Passive current outputs

<table>
<thead>
<tr>
<th>Protection type &quot;nA&quot; (Zone 2)</th>
<th>General operating values</th>
<th>Protection type &quot;e&quot; (Zone 1)</th>
<th>Protection type &quot;ia&quot; (Zone 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection type &quot;nA&quot; (Zone 2)</td>
<td>Protection type &quot;e&quot; (Zone 1)</td>
<td>Protection type &quot;ia&quot; (Zone 1)</td>
<td></td>
</tr>
<tr>
<td>Protection type &quot;nA&quot; (Zone 2)</td>
<td>Protection type &quot;e&quot; (Zone 1)</td>
<td>Protection type &quot;ia&quot; (Zone 1)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current output 1</th>
<th>Passive Terminals 31/32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current output 2</th>
<th>Passive Terminals 33/34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulse output 2</th>
<th>Passive Terminals 51/52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact output 2</th>
<th>Passive Terminals 41/42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact input 2</th>
<th>Passive Terminals 81/82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ</td>
<td>Iᵢ</td>
</tr>
<tr>
<td>(V)</td>
<td>(mA)</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

All inputs and outputs are electrically isolated from each other and from the supply power.

**Important**

If the protective conductor (PE) is connected in the flowmeter’s terminal box, you must ensure that no dangerous potential difference can arise between the protective conductor (PE) and the equipotential bonding (PA) in the potentially explosive area.

### 4.2.1 ATEX/IECEx Ex approval

EC type-examination certificate in accordance with ATEX and IECEx

KEMA ATEX 08ATEX0150 X, KEMA 08 ATEX 0151X, or IECEx KEM 08.0034X
4.2.1.1 Flowmeter sensor MS2 in accordance with ATEX

<table>
<thead>
<tr>
<th>Model</th>
<th>MS2 Zone 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>-20 ... 50 °C (-4 ... 122 °F)</td>
</tr>
</tbody>
</table>

**Temperature class**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>180 °C (356 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>180 °C (356 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>180 °C (356 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>125 °C (257 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>80 °C (176 °F)</td>
</tr>
<tr>
<td>T6</td>
<td>-</td>
</tr>
</tbody>
</table>

**Ambient and process conditions:**

- **T<sub>amb</sub>** -20 ... 50 °C (-4 ... 122 °F)
- **T<sub>medium</sub>** -50 ... 180 °C (-58 ... 356 °F)

**Protection class** IP 65, IP 67, and NEMA 4X/type 4X

Specific coding applies for ATEX and IECEx, depending on the design of the flowmeter sensor (compact or separate); see the overview on page 7.

### Design MS26

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX</td>
<td>II 2 G Ex ib IIC T5 ... T3</td>
</tr>
</tbody>
</table>

4.2.1.2 Transmitter ME2, separate design, in accordance with ATEX and IECEx

**Ambient and process conditions:**

- **T<sub>amb</sub>** -40 ... 60 °C (-40 ... 140 °F)

**Protection class** IP 65, IP 67, and NEMA 4X/type 4X

Specific coding applies for ATEX and IECEx, depending on the design of the flowmeter sensor (compact or separate); see the overview on page 7.

### Design ME21 / ME24 / ME25 M, N

<table>
<thead>
<tr>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX</td>
</tr>
<tr>
<td>I 3 G Ex nR II T6</td>
</tr>
<tr>
<td>I 3 G Ex nR [nL] IIC T6</td>
</tr>
<tr>
<td>I 2 D Ex ID A21 IP6X T115 °C</td>
</tr>
<tr>
<td>FNICO field device</td>
</tr>
</tbody>
</table>

| IECEx        |
| Ex nR II T6 |
| Ex nR [nL] IIC T6 |
| Ex ID A21 IP6X T115 °C |
| FNICO field device |

### Design ME27/ME28 for flowmeter sensor MS2

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX</td>
<td></td>
</tr>
<tr>
<td>Version II/III</td>
<td>II 2 G Ex d e [ia] [ib] IIC T6</td>
</tr>
<tr>
<td>Version I</td>
<td>II 2 G Ex d e [ib] IIC T6</td>
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<td>Version II/III</td>
<td>II 2 D Ex ID [iaD] A21 IP6X T115 °C</td>
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<tr>
<td>Version I</td>
<td>II 2 D Ex ID [ibD] A21 IP6X T115 °C</td>
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<tr>
<td>FISCO field device</td>
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**Important**

When using the device in explosion hazardous areas, the additional temperature specifications in the section titled "Ex relevant specifications" on the data sheet or in the the separate Ex safety instructions (SM/FCM2000/FM/CSA) must be observed.
5 Commissioning

Important
An additional document with Ex safety instructions is available for measuring systems that are used in explosion hazardous areas (Applies to FM / CSA only). As a result, it is crucial that the specifications and data it lists are also observed.

5.1 General information

Inspection prior to switching on supply power
The following points must be checked before commissioning the device:
• The assignment of the flowmeter sensor to the transmitter must be correct.
• The wiring must be correct according to the electrical connections.
• The flowmeter sensor must be correctly grounded.
• The external data memory module (FRAM) must have the same serial number as the flowmeter sensor.
• The external data memory module (FRAM) must be inserted at the correct location (see the section titled "Transmitter replacement" in the operating instructions).
• The ambient conditions must meet the specifications.
• The supply power must match the information on the name plate.

Inspection after switching on supply power
The following points must be checked after commissioning the device:
• The parameter configuration must correspond to the operating conditions.
• The system zero adjustment must have been made.

General information
• If the flow direction indicated on the display is incorrect, it could mean that the signal lead connections have been accidentally reversed.
• The locations and the sizes of the fuses can be found in the section titled "Replaceable parts list" in the operating instructions.
5.2 Information for safe operation – ATEX, IECEx

5.2.1 Inspection

Before installing the flowmeter sensor, check whether it has been damaged due to improper transport. All claims for damages must be submitted to the shipper without delay and before installation. You must comply with the installation conditions. Flowmeter sensors must be commissioned and operated according to ElexV (German ordinance on electrical installations in potentially explosive atmospheres), EN 60079-14 (setting up electrical installations in potentially explosive atmospheres), and relevant national standards. In potentially explosive atmospheres, installation, commissioning, maintenance, and servicing must only be performed by properly trained personnel. The commissioning activities described here are performed after the flowmeter has been installed and the electrical connection has been made. The supply power is switched off. When operating the flowmeter in areas containing combustible dusts, comply with EN 61241-0:2006.

Warning - General risks!
Comply with the following instructions when opening the housing:
• Make sure there is no explosion hazard.
• A fire permit is required.
• Power to all connecting cables must be switched off.
• When the housing is open, EMC protection is suspended.
• The surface temperature of the flowmeter sensor may exceed 70 °C (158 °F), depending on the fluid temperature.

5.2.2 Output Circuits

Installation of Intrinsically Safe "i" or Increased Safety "e"
The output circuits are designed to be connected to either intrinsically safe or non-intrinsically safe circuits. A combination of intrinsically safe and non-intrinsically circuits is not permissible. For intrinsically safe output current circuits Potential Equalization must be maintained along the entire circuit. The test voltage for the non-intrinsically safe circuits is Um = 60 V. When shipped the black cable connectors are installed. If the signal outputs are to be connected to intrinsically safe circuits, it is recommended that the included light blue caps be used for the corresponding cable connectors.
5.2.3 NAMUR Contact

The switching output and the pulse output (terminals 41, 42 / 51, 52) can be wired internally as a NAMUR contact for the purpose of connecting to a NAMUR amplifier; this is achieved by setting the jumpers accordingly. The standard wiring shown below is the factory default. The switchover is performed via jumpers (Fig. 4). See also the section titled "Electrical connections".

- Standard configuration preferred for Ex "e" (default configuration)
- NAMUR configuration preferred for Ex "i"

Fig. 4: Positions of jumpers

![Diagram of NAMUR positions](image)

The safety specifications for intrinsically safe circuits can be found on the EC type-examination certificate.

- Make sure that the cover over the voltage supply connection is tightly closed. With intrinsically safe output circuits, the terminal box can be opened.
- It is recommended that you use the cable glands supplied (not for the -40 °C [-40 °F] version) for the output circuits as appropriate for the relevant type of protection:
  - Intrinsically safe: Blue
  - Non-intrinsically safe: Black
- The sensor and the transmitter housing must be connected via the equipotential bonding. For intrinsically safe current outputs, equipotential bonding needs to be in place all the way along the circuits.
- If the sensor is insulated, the maximum insulation thickness is 100 mm (4"). The transmitter housing must not be insulated.
- After switching off the flowmeter, wait t > 2 minutes before opening the transmitter housing.
- When commissioning the flowmeter, refer to EN 61241-1:2004 regarding use in areas containing combustible dust.
- The operator must ensure that, when connecting the protective conductor (PE), no potential differences exist between the protective conductor and the equipotential bonding (PA), even in the event of a fault.

Special information for use in Category 1:
- The inside of the meter tube or nominal sizes ≥ DN 50 (2") may correspond to Category 1 (Zone 0). The corrosion resistance of the materials must be taken into account.


Models ME26, ME27, and ME28 can be operated in various applications:

- When connected to an intrinsically safe circuit in Zone 1, as an intrinsically safe device (Ex ia)
- When connected to a non-intrinsically safe circuit in Zone 1, as an explosion-proof device (Ex d)
- When connected to a non-intrinsically safe circuit in Zone 2, as a "non-sparking" device (Ex nA)

If a device which is already installed is to be used in a different application, i.e., its use is to be changed, the following measures must be taken/checks must be made in accordance with the applicable standards.

### Models ME26/ME27/ME28

<table>
<thead>
<tr>
<th>1st application</th>
<th>2nd application</th>
<th>Measures</th>
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| Zone 1: Ex d, non-intrinsically safe circuits | Zone 1: Intrinsically safe circuits | • 500 VAC/1 min or 500 x 1.414 = 710 VDC/1 min test between terminals 31 / 32, 33 / 34, 41 / 42, 51 / 52, 81 / 82, and/or 97 / 98 and terminals 31, 32, 33, 34, 41, 42, 51, 52, 81, 82, 97, 98, and the housing  
  • Visual inspection, particularly of the electronic circuit boards  
  • Visual inspection: no damage or explosion can be detected |
| Zone 2: Non-sparking (nA) | Zone 1: Ex d, non-intrinsically safe circuits | • 500 VAC/1 min or 500 x 1.414 = 710 VDC/1 min test between terminals 31/32, 33/34, 41 / 42, 51 / 52, 81 / 82, and/or 97 / 98 and terminals 31, 32, 33, 34, 41, 42, 51, 52, 81, 82, 97, 98, and the housing |
| Zone 1: Intrinsically safe circuits | Zone 2: Non-sparking (nA) | • Visual inspection: no damage to the threads (cover, 1/2" NPT cable glands) |
| Zone 2: Non-sparking (nA) | Zone 1: Intrinsically safe circuits | • 500 VAC/1 min or 500 x 1.414 = 710 VDC/1 min test between terminals 31 / 32, 33 / 34, 41 / 42, 51 / 52, 81 / 82, and/or 97 / 98 and terminals 31, 32, 33, 34, 41, 42, 51, 52, 81, 82, 97, 98, and the housing  
  • Visual inspection, particularly of the electronic circuit boards  
  • Visual inspection: no damage or explosion can be detected |
| Zone 1: Ex d, non-intrinsically safe circuits | Zone 1: Ex d, non-intrinsically safe circuits | • Visual inspection: no damage to the threads (cover, 1/2" NPT cable glands) |
Cables and cable entries
The devices are supplied either with cable glands or with 1/2" NPT threads; you specify which you require in the order number. The cable glands supplied are ATEX-/IECEEx-certified. In order to achieve the required tightness, the outer cable diameter must be between 5 mm (0.2") and 9 mm (0.35").

Warning – Risk to persons!
Devices certified in accordance with CSA are only ever supplied with 1/2" NPT threads without glands.
However, it is also possible to supply devices certified in accordance with ATEX or IECEEx with 1/2" NPT threads without glands. In such cases, the user is responsible for ensuring that the cable piping/glands are installed in accordance with the relevant national standards (e.g., NEC, CEC, ATEX 137, IEC 60079-14, etc.).

Special requirements of models ME2 / M, N (Zone 2 devices)
The transmitter housing (rectangular or round, compact or separate) can be operated in Zone 2 with protection class "restricted breathing" (nR). In such cases, please take note of the following:

Warning – Risk to persons!
The user must check the device in accordance with IEC 60079-15 each time installation or maintenance has been performed, or each time the housing has been opened.

Switch off the voltage supply and wait for at least two minutes before opening the housing. Then remove a cable gland which is not being used. Cable glands certified to ATEX or IECEEx are usually used, e.g., M20 x 1.5 or 1/2" NPT thread. The device being used to test the pressure is then attached to this gland. The user is responsible for ensuring that the device is sealed and installed correctly.
Re-insert the gland following the pressure test.
Before the supply power is switched on again, the housing, seals, thread, and cable entries must be subjected to a visual inspection. There must be no signs of any damage.

Notice - Potential damage to parts!
When selecting the installation site, ensure that the housing will not be exposed to direct sunlight. The ambient temperature limits must be observed. If direct sunlight cannot be avoided, appropriate sun protection equipment must be installed.
For FNICO or FISCO installations, the number of devices must be limited as per the applicable standard.
6 Parameterization

After the power to the device is switched on, a number of self-check routines are executed automatically. Subsequently, the standard display (process information) appears. The configuration of the display can be defined by the user.

6.1 Data entry

Data can be entered in various languages using three keys on the transmitter.

![Transmitter keypad and display](image)

The magnet stick can be used to configure the device even when the housing cover is closed.

**Warning – General risks!**

When the transmitter housing is open, EMC protection and protection against accidental contact are suspended.

When entering data, the transmitter remains online, i.e., current and pulse outputs still show the current operating mode. The functions of the individual keys are explained below:

- **C/CE** Toggle between operating mode and menu.
- **STEP** The STEP key is one of two arrow keys. Use STEP to scroll forward through the menu. All the required parameters can be called up.
- **DATA** The DATA key is one of two arrow keys. Use DATA to scroll backward through the menu. All the required parameters can be called up.
- **ENTER** The ENTER function requires that both arrow keys, STEP and DATA, be pressed simultaneously. ENTER has the following functions:
  - Access the parameter to be changed and set the new, selected, or default parameter.
  - The ENTER function is effective for approx. 10 s only. If a new value is not entered within 10 s, the transmitter display reverts to the old value.
Initiating the ENTER function when using the magnet stick for operation
The ENTER function is initiated when the DATA/ENTER sensor is activated for longer than 3 seconds. The display flashes to indicate that the function is active.
There are two different methods of entering data:
• Numeric entry
• Entry from predefined table

Important
When entering data, the values are checked for plausibility and, if necessary, rejected with an appropriate message.
6.2 Entering data in short form

**Task**
Starting point for "Process information"

**Entry**

**Display information**

1. Example: QmMax nominal size (table)

2. Select the programming level

3. Programming level

**Direct numeric entry**
Example: Setting the "QmMax" measuring range limit value

4. Find parameter "QmMax"

5. Change parameter "QmMax"

6. Enter the desired sequence of digits

7. Set new "QmMax" value

8. Exit "QmMax" or nominal size

9. Starting point for "Process information" (transmitter remains online)
Appendix

7 Appendix

7.1 Other applicable documents

- Data sheet (DS/FCM2000)
- Operating Instruction (OI/FCM2000)
- Ex safety instructions (SI/FCM2000/FM/CSA)
- Interface description for devices with HART communication (D184B108U07 / 08)

7.2 Approvals and certifications

| CE mark | The version of the device in your possession meets the requirements of the following European directives:
|         | - EMC Directive 2014/30/EU
|         | - Low Voltage Directive 2014/35/EU
|         | - Pressure Equipment Directive (PED) 2014/68/EU
|         | - RoHS Directive 2011/65/EU
|         | Pressure equipment does **not** feature a CE mark indicating PED compliance on the factory tag if the following conditions prevail:
|         | - The maximum permissible pressure (PS) is less than 0.5 bar.
|         | - Due to insignificant pressure risks (nominal size ≤ DN 25/1"), no approval procedures are required.

| Explosion protection | Designation relating to intended use in potentially explosive atmospheres in compliance with:
|                      | - ATEX Directive (marking in addition to CE marking)
|                      | - IEC standards
|                      | - cFMus Approvals for Canada and United States

**IMPORTANT (NOTE)**

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

www.abb.com/flow