CoriolisMaster FCB130, FCB150, FCH130, FCH150
Coriolis Mass flowmeter

Measurement made easy
Short product description
Coriolis Mass flowmeter
For the measurement of mass and volume flow, the density and the temperature of liquid and gaseous measuring media.

Devices firmware version: ≥ 01.02.01

Further information
Additional documentation on CoriolisMaster FCB130, FCB150, FCH130, FCH150 is available to download free of charge at www.abb.com/flow.
Alternatively simply scan this code:

Manufacturer
ABB Automation Products GmbH
Process Automation
Dransfelder Str. 2
37079 Göttingen
Germany
Tel: +49 551 905-0
Fax: +49 551 905-777

Customer service center
Tel: +49 180 5 222 580
Mail: automation.service@de.abb.com
1 Safety

1.1 General information and instructions
These instructions are an important part of the product and must be retained for future reference. Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
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 nor an amendment to any previous or existing agreement, promise or legal relationship. Modifications and repairs to the product may only be performed if expressly permitted by these instructions. Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

1.2 Warnings
The warnings in these instructions are structured as follows:

⚠️ DANGER
The signal word “DANGER” indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠️ WARNING
The signal word “WARNING” indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠️ CAUTION
The signal word “CAUTION” indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

🔍 NOTE
The signal word “NOTE” indicates useful or important information about the product. The signal word “NOTE” is not a signal word indicating a danger to personnel. The signal word “NOTE” can also refer to material damage.

1.3 Intended use
This device is intended for the following uses:
— To convey liquids and gases (including unstable measuring media).
— To meter mass flow directly.
— To meter volumetric flow (indirectly via mass flow and density).
— To measure the density of the measuring medium.
— To measure the temperature of the measuring medium.

The device has been designed for use exclusively within the technical limit values indicated on the identification plate and in the data sheets.

When using media for measurement the following points must be observed:
— Measuring media may only be used if, based on the state of the art or the operating experience of the user, it can be assured that the chemical and physical properties necessary for safe operation of the materials of flowmeter sensor components coming into contact with these will not be adversely affected during the operating period.
— Media containing chloride in particular can cause corrosion damage to stainless steels which, although not visible externally, can damage wetted parts beyond repair and lead to the measuring medium escaping. It is the operator’s responsibility to check the suitability of these materials for the respective application.
— Measuring media with unknown properties or abrasive measuring media may only be used if the operator can perform regular and suitable tests to ensure the safe condition of the meter.

1.4 Improper use
The following are considered to be instances of improper use of the device:
— For operating as a flexible adapter in piping, e.g. for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
— For use as a climbing aid, e.g. for mounting purposes
— For use as a support for external loads, e.g. as a support for piping, etc.
— Material application, e.g. by painting over the name plate or welding/soldering on parts
— Material removal, e.g. by spot drilling the housing
## 2 Use in potentially explosive atmospheres according to ATEX and IECEx

### 2.1 Device overview

<table>
<thead>
<tr>
<th>Model number</th>
<th>Standard / No explosion protection</th>
<th>Zone 2, 21, 22</th>
<th>Zone 1, 21 (Zone 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCx1xx Y0</td>
<td><img src="image1" alt="G11604A" /></td>
<td><img src="image2" alt="G11604A" /></td>
<td><img src="image3" alt="G11604A" /></td>
</tr>
<tr>
<td>FCx1xx A2</td>
<td><img src="image1" alt="G11604A" /></td>
<td><img src="image2" alt="G11604A" /></td>
<td><img src="image3" alt="G11604A" /></td>
</tr>
<tr>
<td>FCx1xx A1</td>
<td><img src="image1" alt="G11604A" /></td>
<td><img src="image2" alt="G11604A" /></td>
<td><img src="image3" alt="G11604A" /></td>
</tr>
</tbody>
</table>

- **Zone 2, 21, 22**
- **Zone 1, 21 (Zone 0)**

### 2.1.1 Ex-marking

**NOTE**
- Depending on the design, a specific marking in accordance with ATEX or IECEx applies.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

**NOTE**
For further details on explosion protection, types of protection and device models, refer to the installation diagram in the annex!

**Devices with a maximum ambient temperature $T_{amb}\leq 55\, ^\circ C (131\, ^\circ F)$**

The Ex-marking stated in the following tables only apply to devices with a maximum permitted ambient temperature of $T_{amb}\leq 55\, ^\circ C (131\, ^\circ F)$ (order code ambient temperature rangeTA8)!

**Marking for model FCx1xx-A2... in Zone 2, 21, 22**

<table>
<thead>
<tr>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 14 ATEX0017X</td>
<td>IECEx FME 14.0003X</td>
</tr>
<tr>
<td>II 3 G Ex nA mc IIC T6 ... T2 Gc</td>
<td>Ex nA mc IIC T6 ... T2 Gc</td>
</tr>
<tr>
<td>FM 14 ATEX0016X</td>
<td>Ex tb IIC T85°C ... $T_{medium}$ Db</td>
</tr>
<tr>
<td>II 2 D Ex tb IIC T85°C ... $T_{medium}$ Db</td>
<td></td>
</tr>
</tbody>
</table>

**Marking for model FCx1xx-A1 in Zone 1, 21 (Zone 0)**

<table>
<thead>
<tr>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 14 ATEX0016X</td>
<td>IECEx FME 14.0003X</td>
</tr>
<tr>
<td>II 2/1 G Ex e ia mb IIC T5 ... T2 Ga/Gb $T_{amb,max}= 55, ^\circ C$</td>
<td>Ex e ia mb IIC T5 ... T2 Ga/Gb $T_{amb,max}= 55, ^\circ C$</td>
</tr>
<tr>
<td>II 2/1 G Ex e ia mb IIC T6 ... T2 Ga/Gb $T_{amb,max}= 50, ^\circ C$</td>
<td>Ex e ia mb IIC T6 ... T2 Ga/Gb $T_{amb,max}= 50, ^\circ C$</td>
</tr>
<tr>
<td>II 2 D Ex ia tb IIC T85°C ... $T_{medium}$ Db</td>
<td>Ex ia tb IIC T85°C ... $T_{medium}$ Db</td>
</tr>
<tr>
<td>Control Installation Drawing No. 3KXF000014G0009</td>
<td>Control Installation Drawing No. 3KXF000014G0009</td>
</tr>
</tbody>
</table>
### Devices with a maximum ambient temperature $T_{\text{amb.}} \leq 70 \, ^\circ\text{C} (158 \, ^\circ\text{F})$

The Ex-marking stated in the following tables only apply to devices with a maximum permitted ambient temperature of $T_{\text{amb.}} \leq 70 \, ^\circ\text{C} (158 \, ^\circ\text{F})$ (order code ambient temperature range TA3 / TA9).

#### Marking for model FCx1xx-A2... in Zone 2, 21, 22

<table>
<thead>
<tr>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 14 ATEX0017X</td>
<td>IECEx FME 14.0003X</td>
</tr>
<tr>
<td>II 3 G Ex nA mc IIC T6 ... T2 Gc</td>
<td>Ex nA mc IIC T6 ... T2 Gc</td>
</tr>
<tr>
<td>FM 14 ATEX0016X</td>
<td>Ex tb IIIc T85°C ... $T_{\text{medium}} \text{ Db}$</td>
</tr>
<tr>
<td>II 2 D Ex tb IIIc T85°C ... $T_{\text{medium}} \text{ Db}$</td>
<td></td>
</tr>
</tbody>
</table>

#### Marking for model FCx1xx-A1 in Zone 1, 21 (Zone 0)

<table>
<thead>
<tr>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 14 ATEX0016X</td>
<td>IECEx FME 14.0003X</td>
</tr>
<tr>
<td>II 2/1 G Ex e ia mb IIC T6 ... T2 Ga/Gb $T_{\text{amb.}} \text{ max}= 70^\circ\text{C}$</td>
<td>Ex e ia mb IIC T6 ... T2 Ga/Gb $T_{\text{amb.}} \text{ max}= 70^\circ\text{C}$</td>
</tr>
<tr>
<td>II 2 D Ex ia tb IIIc T85°C ... $T_{\text{medium}} \text{ Db}$</td>
<td>Ex ia tb IIIc T85°C ... $T_{\text{medium}} \text{ Db}$</td>
</tr>
<tr>
<td>Control Installation Drawing No. 3KXF000014G0009</td>
<td>Control Installation Drawing No. 3KXF000014G0009</td>
</tr>
</tbody>
</table>

### 2.2 Installation instructions

The installation, commissioning, maintenance and repair of devices in potentially explosive atmospheres must only be carried out by appropriately trained personnel. Works may be carried out only by persons, whose training has included instructions on different types of ignition protection types and installation techniques, concerned rules and regulations as well as general principles of zoning. The person must possess the relevant expertise for the type of works to be executed. When operating with combustible dusts, EN 60079-31 must be complied with.

The safety instructions for electrical apparatus in potentially explosive areas must be complied with, in accordance with the directive 2014/34/EU (ATEX) and e.g. IEC 60079-14 (Installation of equipment in potentially explosive atmospheres).

To ensure safe operation, the respectively applicable requirements must be met for the protection of workers.

It is essential that the temperature classes as per the approvals contained in chapter 2.3 “Temperature data” on page 8 are observed. The information in the installation diagram on page 34 must be observed.

#### 2.2.1 Use in areas exposed to combustible dust

When using the device in areas exposed to combustible dusts (dust ignition), the following points must be observed:

- The maximum surface temperature of the device must not exceed $85 \, ^\circ\text{C} (185 \, ^\circ\text{F})$.
- The process temperature of the attached lead may exceed $85 \, ^\circ\text{C} (185 \, ^\circ\text{F})$.

#### 2.2.2 Opening and closing the terminal box

**DANGER**

Danger of explosion if the device is operated with the transmitter housing or terminal box open!

Before opening the transmitter housing or the terminal box, note the following points:

- Check that a valid fire permit is available.
- Make sure that there is no explosion hazard.
- Before opening the device, switch off the power supply and wait for $t > 2$ minutes.

**WARNING**

Risk of injury due to live parts!

When the housing is open, contact protection is not provided and EMC protection is limited. Before opening the housing, switch off the power supply.

See also chapter 6.6 "Opening and closing the terminal box" on page 27.

For sealing original spare parts should be used only.

**NOTE**

Spare parts can be ordered from ABB Service: Please contact Customer Center Service acc. to page 2 for nearest service location.
2.2.3 Cable entries

The cable glands supplied are ATEX-/IECEx-certified. The use of standard cable glands and seals is prohibited. The black plugs in the cable fittings are intended to provide protection during transport. Any unused cable entry points must be sealed prior to commissioning, using the seals supplied.

The outer diameter of the connecting cable must measure between 6 mm (0.24 inch) and 12 mm (0.47 inch) to ensure the necessary seal integrity.

Black cable fittings are installed by default when the device is supplied. If signal outputs are connected to intrinsically safe circuits, replace the black cap on the corresponding cable gland with the blue one supplied.

**NOTE**

In order to provide the required temperature resistance, devices in the low-temperature design (optional, ambient temperature down to -40 °C (-40 °F)) are delivered with cable glands made from metal. These are then also to be used in intrinsically safe circuits.

2.2.4 Electrical connections

**Temperature resistance for the connecting cable**

The temperature at the cable entries of the device is dependent on the measuring medium temperature $T_{\text{medium}}$ and the ambient temperature $T_{\text{amb}}$.

For the electrical connection of the device, only use cables with sufficient temperature resistance according to the following diagram or table.

### Devices with a maximum ambient temperature $T_{\text{amb}}$, 55 °C (131 °F)

![Temperature range for the cable](image)

**Fig. 1:** Temperature range for the cable

- **A** Temperature resistance $\geq 70$ °C (158 °F)
- **B** Temperature resistance $\geq 80$ °C (176 °F)

**Devices with a maximum ambient temperature $T_{\text{amb}}$, 70 °C (158 °F)**

<table>
<thead>
<tr>
<th>$T_{\text{amb}}$</th>
<th>Temperature resistance for the connecting cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 50$ °C ($\leq 122$ °F)</td>
<td>$\geq 70$ °C ($\geq 158$ °F)</td>
</tr>
<tr>
<td>$\leq 60$ °C ($\leq 140$ °F)</td>
<td>$\geq 80$ °C ($\geq 176$ °F)</td>
</tr>
<tr>
<td>$\leq 70$ °C ($\leq 158$ °F)</td>
<td>$\geq 90$ °C ($\geq 194$ °F)</td>
</tr>
</tbody>
</table>

Above an ambient temperature of $T_{\text{amb}} \geq 60$ °C ($\geq 140$ °F), the wires in the connection box must be insulated with the enclosed silicone hoses.

**Grounding**

The sensor must be grounded in accordance with the applicable international standards. Ground the device according to chapter "Electrical connection" on page 28.
2.3 Temperature data

Devices with a maximum ambient temperature \( T_{\text{amb.}} \) 55 °C (131 °F)

The temperature data stated on this page only applies to devices with a maximum permitted ambient temperature of \( T_{\text{amb.}} \) 55 °C (131 °F) (order code ambient temperature range TA8)!

Environmental and process conditions for model FCx1xx...

<table>
<thead>
<tr>
<th>Ambient temperature ([T_{\text{amb.}}])</th>
<th>Measuring medium temperature ([T_{\text{medium}}])</th>
<th>IP rating / NEMA rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 ... 55 °C (-4 ... 131 °F)</td>
<td>-40 ... 55 °C (-40 ... 131 °F)</td>
<td>IP 64, IP 65, IP 67, IP 68 and NEMA 4X / type 4X</td>
</tr>
<tr>
<td>-40 ... 205 °C (-40 ... 400 °F)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A1... in Zone 1

<table>
<thead>
<tr>
<th>Ambient temperature ([T_{\text{amb.}}])</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤55 °C (≤131 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature ([T_{\text{medium}}])</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>—</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A2... in Zone 2

<table>
<thead>
<tr>
<th>Ambient temperature ([T_{\text{amb.}}])</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤55 °C (≤131 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature ([T_{\text{medium}}])</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A1... in Zone 21 and FCx1xx-A2 ... in Zone 22

<table>
<thead>
<tr>
<th>Ambient temperature ([T_{\text{amb.}}])</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤55 °C (≤131 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature ([T_{\text{medium}}])</td>
<td></td>
</tr>
<tr>
<td>T210°C</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T200°C</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T135°C</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T100°C</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
</tr>
<tr>
<td>T85°C</td>
<td>80 °C (176 °F)</td>
<td>—</td>
</tr>
</tbody>
</table>
Devices with a maximum ambient temperature $T_{\text{amb.}}$ 70 °C (158 °F)

The temperature data stated on this page only applies to devices with a maximum permitted ambient temperature of $T_{\text{amb.}}$ 70 °C (158 °F) (order code ambient temperature range TA3 / TA9)!

Environmental and process conditions for model FCx1xx...

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb.}}]$</th>
<th>Measuring medium temperature $[T_{\text{medium}}]$</th>
<th>IP rating / NEMA rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 ... 70 °C (-4 ... 158 °F)</td>
<td>-40 ... 205 °C (-40 ... 400 °F)</td>
<td>IP 65, IP 67, IP 68 and NEMA 4X / type 4X</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A1... in Zone 1

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb.}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
<td>—</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A2... in Zone 2

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb.}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A1... in Zone 21 and FCx1xx-A2... in Zone 22

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb.}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T210°C</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T200°C</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T135°C</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T100°C</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>T85°C</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
2.4 Electrical data

2.4.1 Modbus outputs and digital outputs

Devices with a maximum ambient temperature $T_{\text{amb}}$ 55 °C (131 °F)

The electrical data stated in the following tables only applies to devices with a maximum permitted ambient temperature of $T_{\text{amb}}$ 55 °C (131 °F) (order code ambient temperature range TA8).

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Operating values (general)</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;nA&quot; (zone 2)</td>
<td>&quot;e&quot; (zone 1)</td>
</tr>
<tr>
<td></td>
<td>$U_N$ [V]</td>
<td>$I_N$ [mA]</td>
</tr>
<tr>
<td>Modbus, active</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Terminals A / B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>±4.2</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Digital output DO1, passive</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 41 / 42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output DO2, passive</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 51 / 52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All outputs are electrically isolated from each other and from the power supply. Digital outputs DO1 / DO2 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.

Devices with a maximum ambient temperature $T_{\text{amb}}$ 70 °C (158 °F)

The electrical data stated in the following tables only applies to devices with a maximum permitted ambient temperature of $T_{\text{amb}}$ 70 °C (158 °F) (order code ambient temperature range TA3 / TA9).

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Operating values (general)</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;nA&quot; (zone 2)</td>
<td>&quot;e&quot; (zone 1)</td>
</tr>
<tr>
<td></td>
<td>$U_N$ [V]</td>
<td>$I_N$ [mA]</td>
</tr>
<tr>
<td>Modbus, active</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Terminals A / B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>±4.2</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Digital output DO1, passive</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 41 / 42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output DO2, passive</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 51 / 52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All outputs are electrically isolated from each other and from the power supply. Digital outputs DO1 / DO2 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.
2.4.2 Special connection conditions

NOTE

If the protective earth (PE) is connected in the flowmeter’s terminal box, you must ensure that no dangerous potential difference can arise between the protective earth (PE) and the potential equalization (PA) in areas with explosion risk.

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

— It is not permitted to combine intrinsically safe and non-intrinsically safe circuits.
— On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the digital outputs.
— The rated voltage of the non-intrinsically safe circuits is $U_M = 30 \text{ V}$.
— Provided that the rated voltage $U_M = 30 \text{ V}$ is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is preserved.
— When changing the type of ignition protection, chapter 2.5.3 "Change of the type of protection" on page 11 must be adhered to.

2.5 Operating instructions

2.5.1 Protection against electrostatic discharges

DANGER

Risk of explosion!
The painted surface of the device can store electrostatic charges. As a result, the housing can form an ignition source due to electrostatic discharges in the following conditions:

— The device is operated in environments with a relative humidity of $\leq 30 \%$.
— This painted surface of the device is therefore relatively free from impurities such as dirt, dust or oil.

The instructions on avoiding the ignition of hazardous areas due to electrostatic discharges in accordance with the EN TR50404 and IEC 60079-32-1 standards must be observed!

Instructions on cleaning

The painted surface of the device may be cleaned only using a moist cloth.

2.5.2 Repair

Contact the manufacturer for specific flamepath joint details during repair of flameproof Ex d apparatus.

2.5.3 Change of the type of protection

If you are installing in Zone 1 / Div. 1, the Modbus interface and the digital outputs of models FCB130/150 and FCH130/150 can be operated with different types of protection:

— Modbus interface and digital output in intrinsically safe ia / IS design
— Modbus interface and digital output in non-intrinsically safe design

If a device that is already operational is operated with a different type of protection, the following measures must be implemented/insulation checks performed in accordance with applicable standards.

<table>
<thead>
<tr>
<th>Original installation</th>
<th>New installation</th>
<th>Necessary test steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1 / Div. 1:</td>
<td>Zone 1 / Div. 1:</td>
<td>— 500 V AC/1min or 500 x 1.414 = 710 V DC/1min</td>
</tr>
<tr>
<td>Modbus interface and digital outputs in non-intrinsically safe design</td>
<td>Modbus interface and digital outputs in intrinsically safe ia / IS design</td>
<td>Test between terminals A / B, 41 / 42 and 51 / 52 and terminals A, B, 41, 42, 51 and the housing. When this test is performed, no voltage flashover is permitted in or on the device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Optical evaluation particularly of the electronic circuit boards, no visible damage or evidence of explosion.</td>
</tr>
</tbody>
</table>

| Zone 1 / Div. 1:      | Zone 1 / Div. 1:  | — Optical evaluation, no damage visible on the threads (cover, 1/2" NPT cable glands). |
| Modbus interface and digital outputs in intrinsically safe ia(ib) / IS design | Modbus interface and digital outputs in non-intrinsically safe design |

NOTE

For further details on explosion protection, types of protection and device models, refer to the installation diagram in the annex!
3 Use in potentially explosive atmospheres in accordance with cFMus

NOTE
For further information on the approval of devices for use in potentially explosive atmospheres, refer to the type-examination certificates or the relevant certificates at www.abb.com/flow.

3.1 Device overview

<table>
<thead>
<tr>
<th>Model number</th>
<th>Standard / No explosion protection</th>
<th>Class I Div. 2 Zone 2, 21</th>
<th>Class I Div. 1 Zone 0, 1, 20, 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCx1xx Y0</td>
<td></td>
<td>FCx1xx F2</td>
<td>FCx1xx F1</td>
</tr>
<tr>
<td>— Standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Class I Div. 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Class I Div. 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Zone 2, 21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Zone 1, 21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Zone 0, 20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1.1 Ex-marking

NOTE
— Depending on the design, a specific marking in accordance with FM applies.
— ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

NOTE
For further details on explosion protection, types of protection and device models, refer to the installation diagram in the annex!

Marking for model FCx1xx-F2... in Zone 2, Div. 2

<table>
<thead>
<tr>
<th>FM (marking for US)</th>
<th>FM (marking for Canada)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI: CL I, DIV2, GPS ABCD, T6 ... T2</td>
<td>NI: CL I, DIV2, GPS ABCD, T6 ... T2</td>
</tr>
<tr>
<td>NI: CL II, III, DIV2, GPS EFG, T6 ... T3B</td>
<td>NI: CL II, III, DIV2, GPS EFG, T6 ... T3B</td>
</tr>
<tr>
<td>DIP: CL II, Div 1, GPS EFG, T6 ... T3B</td>
<td>DIP: CL II, Div 1, GPS EFG, T6 ... T3B</td>
</tr>
<tr>
<td>DIP: CL III, Div 1, 2, T6 ... T3B</td>
<td>DIP: CL III, Div 1, 2, T6 ... T3B</td>
</tr>
<tr>
<td>CL I, ZN 2, AEx na nR IIC T6 ... T2</td>
<td>Ex na IIC T6 ... T2</td>
</tr>
<tr>
<td>ZN 21 AEx tb IIC T85°C ... T165°C</td>
<td>See instructions for T-Class information</td>
</tr>
</tbody>
</table>

Marking for model FCx1xx-F1... in Zone 1, Div. 1

<table>
<thead>
<tr>
<th>FM (marking for US)</th>
<th>FM (marking for Canada)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI: CL I, DIV2, GPS ABCD, T6 ... T2</td>
<td>NI: CL I, DIV2, GPS ABCD, T6 ... T2</td>
</tr>
<tr>
<td>NI: CL II, III, DIV2, GPS EFG, T6 ... T3B</td>
<td>NI: CL II, III, DIV2, GPS EFG, T6 ... T3B</td>
</tr>
<tr>
<td>XP-IS: CL I, Div 1, GPS BCD, T6 ... T2</td>
<td>XP-IS: CL I, Div 1, GPS BCD, T6 ... T2</td>
</tr>
<tr>
<td>DIP: CL II, Div 1, GPS EFG, T6 ... T3B</td>
<td>DIP: CL II, Div 1, GPS EFG, T6 ... T2</td>
</tr>
<tr>
<td>DIP: CL III, Div 1, 2, T6 ... T3B</td>
<td>DIP: CL III, Div 1, 2, T6 ... T3B</td>
</tr>
<tr>
<td>CL I, ZN 1, AEx da IIIB+H2 T6 ... T2</td>
<td>Ex da IIIB+H2 T6 ... T2</td>
</tr>
<tr>
<td>ZN 21 AEx ia tb IIIC T85°C to T165°C</td>
<td>Ex ia INTRINSICALLY SAFE SECURITE INTRINSEQUE</td>
</tr>
<tr>
<td>See instructions for T-Class information</td>
<td>See instructions for T-Class information</td>
</tr>
</tbody>
</table>

Control Installation Drawing No. 3KXF000014G0009

Control Installation Drawing No. 3KXF000014G0009
3.2 Installation instructions
The installation, commissioning, maintenance and repair of devices in areas with explosion hazard must only be carried out by appropriately trained personnel.

The operator must strictly observe the applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices. (e.g. NEC, CEC).

It is essential that the temperature classes as per the approvals contained in chapter 3.3 "Temperature data" on page 15 are observed.

The information in the installation diagram on page 34 must be observed.

3.2.1 Use in areas exposed to combustible dust
When using the device in areas exposed to combustible dusts (dust ignition), the following points must be observed:
— The maximum surface temperature of the device must not exceed 85 °C (185 °F).
— The process temperature of the attached lead may exceed 85 °C (185 °F).

3.2.2 Opening and closing the terminal box

⚠️ DANGER
Danger of explosion if the device is operated with the transmitter housing or terminal box open!
Before opening the transmitter housing or the terminal box, note the following points:
— Check that a valid fire permit is available.
— Make sure that there is no explosion hazard.
— Before opening the device, switch off the power supply and wait for t > 2 minutes.

⚠️ WARNING
Risk of injury due to live parts!
When the housing is open, contact protection is not provided and EMC protection is limited.
Before opening the housing, switch off the power supply.

See also chapter 6.6 "Opening and closing the terminal box" on page 27.

For sealing original spare parts should be used only.

ℹ️ NOTE
Spare parts can be ordered from ABB Service:
Please contact Customer Center Service acc. to page 2 for nearest service location.
3.2.3 Cable entries

**NOTE**

Devices certified in accordance with CSA are only ever supplied with 1/2" NPT threads without glands.

3.2.4 Electrical connections

**Temperature resistance for the connecting cable**

The temperature at the cable entries of the device is dependent on the measuring medium temperature $T_{\text{medium}}$ and the ambient temperature $T_{\text{amb}}$.

For the electrical connection of the device, only use cables with sufficient temperature resistance according to the following diagram or table.

### Devices with a maximum ambient temperature $T_{\text{amb}}$ of 55 °C (131 °F)

![Temperature Range Diagram](chart)

**Fig. 2: Temperature range for the cable**

- **A** Temperature resistance $\geq 70$ °C (158 °F)
- **B** Temperature resistance $\geq 80$ °C (176 °F)

### Devices with a maximum ambient temperature $T_{\text{amb}}$ of 70 °C (158 °F)

<table>
<thead>
<tr>
<th>$T_{\text{amb}}$</th>
<th>Temperature resistance for the connecting cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 50$ °C ($\leq 122$ °F)</td>
<td>$\geq 70$ °C ($\geq 158$ °F)</td>
</tr>
<tr>
<td>$\leq 60$ °C ($\leq 140$ °F)</td>
<td>$\geq 80$ °C ($\geq 176$ °F)</td>
</tr>
<tr>
<td>$\leq 70$ °C ($\leq 158$ °F)</td>
<td>$\geq 90$ °C ($\geq 194$ °F)</td>
</tr>
</tbody>
</table>

Above an ambient temperature of $T_{\text{amb}} \geq 60$ °C ($\geq 140$ °F), the wires in the connection box must be insulated with the enclosed silicone hoses.

**Grounding**

The sensor must be grounded in accordance with the applicable international standards.

In accordance with NEC standards, an internal ground connection is present in the device between the sensor and the transmitter.

Ground the device according to chapter “Electrical connection” on page 28.

3.2.5 Process sealing

In accordance with the "North American Requirements for Process Sealing between Electrical Systems and Flammable or Combustible Process Fluids".

**NOTICE**

The device is suitable for use in Canada.

A maximum surface temperature of 165 °C (329 °F) must not be exceeded when used in Class II, Groups E, F and G.

All cable conduits (conduits) must be sealed within a distance of 18 inches (457 mm) from the device.

ABB flowmeters are designed for the worldwide industrial market and are suitable for functions such as the measuring of flammable and combustible liquids and can be installed in process pipes.

Among other things, the devices with cable conduits (conduits) are connected to the electrical installation which makes it possible for process media to enter electrical systems.

To prevent process media from seeping into the electrical installation, the instruments are equipped with process seals which meet the requirements of ANSI / ISA 12.27.01.

Coriolis mass flowmeters are designed as "single seal devices".

With the TE2 "Extended tower length - dual seal" option, the devices can be used as "dual seal devices".

In accordance with the requirements of standard ANSI/ISA 12.27.01, the existing operating limits of temperature, pressure and pressure bearing parts must be reduced to the following limit values:

<table>
<thead>
<tr>
<th>Limit values</th>
<th>All materials of the present model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange or pipe material</td>
<td>DN 15 ... 150 (1/2&quot; ... 6&quot;)</td>
</tr>
<tr>
<td>Nominal sizes</td>
<td>Operating temperature</td>
</tr>
<tr>
<td>Nominal sizes</td>
<td>-50 °C ... 205 °C (-58 °F ... 400 °F)</td>
</tr>
<tr>
<td>Nominal sizes</td>
<td>Process pressure</td>
</tr>
<tr>
<td>Nominal sizes</td>
<td>PN 100 / Class 600</td>
</tr>
</tbody>
</table>
### 3.3 Temperature data

**Devices with a maximum ambient temperature $T_{\text{amb.}}$, 55 °C (131 °F)**

The temperature data stated on this page only applies to devices with a maximum permitted ambient temperature of $T_{\text{amb.}}$, 55 °C (131 °F) (order code ambient temperature range TA8)

#### Environmental and process conditions for model FCx1xx...

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>Measuring medium temperature $[T_{\text{medium}}]$, °C</th>
<th>IP rating / NEMA rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 °C (-4 °F) to 55 °C (131 °F)</td>
<td>-40 °C (-40 °F) to 205 °C (400 °F)</td>
<td>4X / type 4X</td>
</tr>
</tbody>
</table>

**NOTICE**

All cable conduits (conduits) must be sealed within a distance of 18 inches (450 mm) from the device.

#### Measuring medium temperature (Ex data) for model FCx1xx-F1... in Class I Div. 1, Class I Zone 1

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$, °C</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤50 °C (≤122 °F)</td>
<td>≤55 °C (≤131 °F)</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>T1</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>T2</td>
</tr>
<tr>
<td>T3</td>
<td>205 °C (400 °F)</td>
<td>T3</td>
</tr>
<tr>
<td>T4</td>
<td>195 °C (383 °F)</td>
<td>T4</td>
</tr>
<tr>
<td>T5</td>
<td>195 °C (383 °F)</td>
<td>T5</td>
</tr>
<tr>
<td>T6</td>
<td>195 °C (383 °F)</td>
<td>T6</td>
</tr>
</tbody>
</table>

#### Measuring medium temperature (Ex data) for model FCx1xx-F2... in Class I Div. 2, Class I Zone 2

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$, °C</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤50 °C (≤122 °F)</td>
<td>≤55 °C (≤131 °F)</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>T1</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>T2</td>
</tr>
<tr>
<td>T3</td>
<td>205 °C (400 °F)</td>
<td>T3</td>
</tr>
<tr>
<td>T4</td>
<td>195 °C (383 °F)</td>
<td>T4</td>
</tr>
<tr>
<td>T5</td>
<td>195 °C (383 °F)</td>
<td>T5</td>
</tr>
<tr>
<td>T6</td>
<td>195 °C (383 °F)</td>
<td>T6</td>
</tr>
</tbody>
</table>

#### Measuring medium temperature (Ex data) for model FCx1xx-F1... in Zone 21, Class II / III and FCx1xx-F2... in Zone 22, Class II / III

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$, °C</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>165 °C</td>
<td>160 °C (320 °F)</td>
<td>T165°C</td>
</tr>
<tr>
<td>135 °C</td>
<td>130 °C (266 °F)</td>
<td>T135°C</td>
</tr>
<tr>
<td>100 °C</td>
<td>95 °C (203 °F)</td>
<td>T100°C</td>
</tr>
<tr>
<td>85 °C</td>
<td>80 °C (176 °F)</td>
<td>T85°C</td>
</tr>
</tbody>
</table>
Devices with a maximum ambient temperature $T_{\text{amb}}$, 70 °C (158 °F)
The temperature data stated on this page only applies to devices with a maximum permitted ambient temperature of $T_{\text{amb}}$, 70 °C (158 °F) (order code ambient temperature range TA3 / TA9)!

**Environmental and process conditions for model FCx1xx...**

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Measuring medium temperature</th>
<th>IP rating / NEMA rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[T_{\text{amb}}]$</td>
<td>$[T_{\text{amb, optional}}]$</td>
<td>$[T_{\text{medium}}]$</td>
</tr>
<tr>
<td>-20 ... 70 °C (-4 ... 158 °F)</td>
<td>-40 ... 70 °C (-40 ... 158 °F)</td>
<td>-40 ... 205 °C (-40 ... 400 °F)</td>
</tr>
</tbody>
</table>

**NOTICE**

All cable conduits (conduits) must be sealed within a distance of 18 inches (450 mm) from the device.

**Measuring medium temperature (Ex data) for model FCx1xx-F1... in Class I Div. 1, Class I Zone 1**

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
<td>80 °C (176 °F)</td>
<td>—</td>
</tr>
</tbody>
</table>

**Measuring medium temperature (Ex data) for model FCx1xx-F2... in Class I Div. 2, Class I Zone 2**

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T2</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T3</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T4</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T5</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>T6</td>
<td>80 °C (176 °F)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Measuring medium temperature (Ex data) for model FCx1xx-F1... in Zone 21, Class II / III and FCx1xx-F2... in Zone 22, Class II / III**

<table>
<thead>
<tr>
<th>Ambient temperature $[T_{\text{amb}}]$</th>
<th>≤30 °C (≤86 °F)</th>
<th>≤50 °C (≤122 °F)</th>
<th>≤60 °C (≤140 °F)</th>
<th>≤70 °C (≤158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Maximum permissible measuring medium temperature $[T_{\text{medium}}]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T210°C</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>T200°C</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>T135°C</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>T100°C</td>
<td>95 °C (203 °F)</td>
<td>95 °C (203 °F)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>T95°C</td>
<td>80 °C (176 °F)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
### Electrical data

#### 3.4.1 Modbus outputs and digital outputs

**Devices with a maximum ambient temperature \( T_{\text{amb}} = 55 \ ^\circ\text{C} \) (131 \ ^\circ\text{F})**

The electrical data stated in the following tables only applies to devices with a maximum permitted ambient temperature of \( T_{\text{amb}} = 55 \ ^\circ\text{C} \) (131 \ ^\circ\text{F}) (order code ambient temperature range TA8)

<table>
<thead>
<tr>
<th>Model: FCx1xx-F1, FCx1xx-F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Modbus, active Terminals A / B</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>±4.2</td>
</tr>
<tr>
<td>Digital output DO1, passive Terminals 41 / 42</td>
</tr>
<tr>
<td>Digital output DO2, passive Terminals 51 / 52</td>
</tr>
</tbody>
</table>

All outputs are electrically isolated from each other and from the power supply. Digital outputs DO1 / DO2 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.

---

**Devices with a maximum ambient temperature \( T_{\text{amb}} = 70 \ ^\circ\text{C} \) (158 \ ^\circ\text{F})**

The electrical data stated in the following tables only applies to devices with a maximum permitted ambient temperature of \( T_{\text{amb}} = 70 \ ^\circ\text{C} \) (158 \ ^\circ\text{F}) (order code ambient temperature range TA3 / TA9)

<table>
<thead>
<tr>
<th>Model: FCx1xx-F1, FCx1xx-F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Modbus, active Terminals A / B</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>±4.2</td>
</tr>
<tr>
<td>Digital output DO1, passive Terminals 41 / 42</td>
</tr>
<tr>
<td>Digital output DO2, passive Terminals 51 / 52</td>
</tr>
</tbody>
</table>

All outputs are electrically isolated from each other and from the power supply. Digital outputs DO1 / DO2 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.
3.4.2 Special connection conditions
The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.
— It is not permitted to combine intrinsically safe and non-intrinsically safe circuits.
— On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the digital outputs.
— The rated voltage of the non-intrinsically safe circuits is $U_M = 30 \, \text{V}$.
— Provided that the rated voltage $U_M = 30 \, \text{V}$ is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is preserved.
— When changing the type of ignition protection, chapter 3.5.3 "Change of the type of protection" on page 19 must be adhered to.

---

### NOTE
If the protective earth (PE) is connected in the flowmeter’s terminal box, you must ensure that no dangerous potential difference can arise between the protective earth (PE) and the potential equalization (PA) in areas with explosion risk.

3.5 Operating instructions

3.5.1 Protection against electrostatic discharges

⚠️ **DANGER**
Risk of explosion!
The painted surface of the device can store electrostatic charges. As a result, the housing can form an ignition source due to electrostatic discharges in the following conditions:
— The device is operated in environments with a relative humidity of $\leq 30 \, \%$.
— This painted surface of the device is therefore relatively free from impurities such as dirt, dust or oil.
The instructions on avoiding the ignition of hazardous areas due to electrostatic discharges in accordance with the EN TR50404 and IEC 60079-32-1 standards must be observed!

Instructions on cleaning
The painted surface of the device may be cleaned only using a moist cloth.

3.5.2 Repair
Contact the manufacturer for specific flamepath joint details during repair of flameproof "XP" apparatus.
3.5.3 Change of the type of protection
The Modbus interface and the digital outputs of the models FCB130/150 and FCH130/150 can be operated with different types of protection:
— When connecting to an intrinsically safe circuit in Div. 1 as an intrinsically safe device (IS).
— When connecting to a non-intrinsically safe circuit in Div. 1 as a device with flameproof enclosure (XP).
— When connecting to a non-intrinsically safe circuit in Div. 2 as a non-sparking device (NI).

If a device that is already operational is operated with a different type of protection, the following measures must be implemented/insulation checks performed in accordance with applicable standards.

<table>
<thead>
<tr>
<th>Original installation</th>
<th>New installation</th>
<th>Necessary test steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing: XP, $U_{\text{max}} = 30$ V Outputs non IS</td>
<td>Housing: XP Outputs: IS</td>
<td>— 500 V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 and 51 / 52 and terminals A, B, 41, 42, 51 and the housing. When this test is performed, no voltage flashover is permitted in or on the device. — Optical evaluation particularly of the electronic circuit boards, no visible damage or evidence of explosion.</td>
</tr>
<tr>
<td>Housings: Div 2 Outputs: NI</td>
<td>— 500 V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 and 51 / 52 and terminals A, B, 41, 42, 51 and the housing. When this test is performed, no voltage flashover is permitted in or on the device. — Optical evaluation particularly of the electronic circuit boards, no visible damage or evidence of explosion.</td>
<td></td>
</tr>
<tr>
<td>Outputs: IS Housing: XP</td>
<td>Housing: XP Outputs: non IS</td>
<td>— Optical evaluation, no damage visible on the threads (cover, 1/2&quot; NPT cable glands).</td>
</tr>
<tr>
<td>Housing: XP Outputs: NI</td>
<td>— No special measures.</td>
<td></td>
</tr>
<tr>
<td>Housing: XP, $U_{\text{max}} = 30$ V Outputs: NI</td>
<td>Housing: XP Outputs: IS</td>
<td>— 500 V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 and 51 / 52 and terminals A, B, 41, 42, 51 and the housing. When this test is performed, no voltage flashover is permitted in or on the device. — Optical evaluation particularly of the electronic circuit boards, no visible damage or evidence of explosion.</td>
</tr>
<tr>
<td>Housing: XP Outputs: non IS</td>
<td>— Optical evaluation, no damage visible on the threads (cover, 1/2&quot; NPT cable glands).</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
For further details on explosion protection, types of protection and device models, refer to the installation diagram in the annex!
4 Product identification

4.1 Name plate

The name plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

The marking is provided on the name plate and on the sensor itself in accordance with the Pressure Equipment Directive (PED).

Pressure equipment within the scope of the Pressure Equipment Directive

The number of the notified body is specified underneath the CE mark to confirm that the device meets the requirements of the Pressure Equipment Directive.

According to the PED, the fluid group to be taken into account is specified in accordance with the Pressure Equipment Directive.

Example: Fluid Group 1 = hazardous fluids, gaseous.

Pressure equipment beyond the scope of the Pressure Equipment Directive

The reason for exception according to article 4, paragraph 3 of the Pressure Equipment Directive is specified under the PED.

The pressure equipment is categorized in SEP (= Sound Engineering Practice).
5 Transport

5.1 Inspection
Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents. All claims for damages must be submitted to the shipper without delay and before installation.

5.2 Transport

⚠️ DANGER
Life-threatening danger due to suspended loads.
In the case of suspended loads, a danger of the load falling exists.
Remaining under suspended loads is prohibited.

⚠️ WARNING
Risk of injury due to device slipping.
The device’s center of gravity may be higher than the harness suspension points.
— Make sure that the device does not slip or turn during transport.
— Support the device laterally during transport.

Observe the following when transporting the device to the measuring location:
— Pay attention to the device weight details in the data sheet.
— Use only approved hoisting slings for crane transport.
— Do not lift devices by the transmitter housing or terminal box.
— The center of gravity of the device may be located above the harness suspension points.

5.3 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. Include the return form once it has been properly filled out (see appendix in operating instructions) with the device. According to the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes: All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

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

![Transport instructions](G11560)
6  Installation

6.1  General installation conditions

6.1.1  Installation location and assembly

Note the following points when selecting the installation location and when mounting the sensor:

— The ambient conditions (IP rating, ambient temperature range $T_{\text{amb}}$) of the device must be adhered to at the installation location.

— Sensors and transmitters must not be exposed to direct sunlight. If necessary, provide a suitable means of sun protection on site. The limit values for the ambient temperature $T_{\text{amb}}$ must be observed.

— On flange devices, ensure that the counterflanges of the piping are aligned plane parallel. Only install flange devices with suitable gaskets.

— Prevent the sensor from coming into contact with other objects.

— The device is designed for industrial applications. No special EMC protective measures are required if the electromagnetic fields and interference at the installation location of the device comply with "Best Practice" guidelines (in accordance with the standards referred to in the declaration of conformity).

Maintain a suitable distance from electromagnetic fields and interference that extend beyond the usual dimensions.

Gaskets

Users are responsible for selecting and mounting suitable gaskets (material, shape).

Note the following points when selecting and mounting gaskets:

— Only gaskets made from a material that is compatible with the measuring medium and measuring medium temperature may be used

— Gaskets must not extend into the flow area, since possible turbulence may influence the accuracy of the device.

Calculating pressure loss

Pressure loss is determined by the properties of the medium and the flow.

Documents to help with the calculation of pressure loss can be accessed from www.abb.com/flow-selector.

Brackets and supports

No special supports or damping are required for the device when the device is used and installed as intended.

In systems designed in accordance with "Best Practice" guidelines, the forces acting on the device are already sufficiently absorbed. This is also true of devices installed in series or in parallel.

For heavier devices, it is advisable to use additional supports / brackets on site. Doing this prevents damage to the process connections and piping from lateral forces.

Please observe the following points:

— Mount two supports or brackets symmetrically in the immediate vicinity of the process connections.

— Do not attach any supports or brackets to the flowmeter sensor housing.

Inlet section

The sensor does not require any inlet section.

The devices can be installed directly before/after manifolds, valves or other equipment, provided that no cavitation is caused by this equipment.

6.2  Mounting position

The flowmeter operates in any mounting position.

Depending on the measuring medium (liquid or gas) and the measuring medium temperature, certain mounting positions are preferable to others. For this purpose, consider the following examples.

The preferred flow direction is indicated by the arrow on the sensor. The flow will be displayed as positive.

The specified measuring accuracy can be achieved only in the calibrated flow direction (for forward flow calibration, this is only in the direction of the arrow; for the optional forward flow and reverse flow calibration, this can be in both flow directions).
6.2.1 Liquid measuring media
Observe the following points to avoid measuring errors:
— The meter tubes must always be completely filled with the measuring medium.
— The gases dissolved in the measuring medium must not leak out. To safeguard this, a minimum back pressure of 0.2 bar (2.9 psi) is recommended.
— The minimum vapor pressure of the measuring medium must be maintained when there is negative pressure in the meter tube or when liquids are gently simmering.
— During operation, there must be no phase transitions in the measuring medium.

Vertical installation

Fig. 6: Vertical installation

A  Vertical installation in a riser
For vertical installation in a riser, no special measures are required.

B  Vertical installation in a downpipe
For vertical installation in a downpipe, a piping constriction or an orifice plate must be installed below the sensor. Doing this prevents the sensor from draining during the measurement.

Horizontal installation

Fig. 7: Horizontal installation

A  For liquid measuring media and horizontal installation, the transmitter and terminal box must point upward.
B  Installing the sensor at the highest point of the piping leads to an increased number of measuring errors due to the accumulation of air or the formation of gas bubbles in the meter tube.

---

Vertical installation

4. Turn-off device  5. Filling tank

A  Vertical installation in a riser
For vertical installation in a riser, no special measures are required.

B  Vertical installation in a downpipe
For vertical installation in a downpipe, a piping constriction or an orifice plate must be installed below the sensor. Doing this prevents the sensor from draining during the measurement.

Horizontal installation

A  For liquid measuring media and horizontal installation, the transmitter and terminal box must point upward.
B  Installing the sensor at the highest point of the piping leads to an increased number of measuring errors due to the accumulation of air or the formation of gas bubbles in the meter tube.
6.2.2 Gaseous measuring media
Observe the following points to avoid measuring errors:
— Gases must be dry and free of liquids and condensates.
— Avoid the accumulation of liquids and the formation of condensate in the meter tube.
— During operation, there must be no phase transitions in the measuring medium.

If there is a risk of condensate formation when using gaseous measuring media, note the following:
Ensure that condensates cannot accumulate in front of the sensor.
If this cannot be avoided, we recommend that the sensor is installed vertically with a downward flow direction.

**Vertical installation**
For vertical installation, no special measures are required.

**Horizontal installation**

![Diagram](image)

**Fig. 8: Horizontal installation**

A) For gaseous measuring media and horizontal installation, the transmitter and terminal box must point downward.
B) Installing the sensor at the lowest point of the piping leads to an increased number of measuring errors due to the accumulation of liquid or the formation of condensates in the meter tube.

6.2.3 Mounting position dependent on the measuring medium temperature

![Diagram](image)

**Fig. 9: Mounting positions when $T_{\text{medium}}$ is -50 ... 120 °C (-58 ... 248 °F)**

1 Sensor with option TE1 "extended tower length"

In conjunction with option TE1 "extended tower length", the sensor can also be used at measuring medium temperatures of -50 ... 205 °C (-58 ... 401 °F) with the terminal box pointing upward.

6.2.4 Sensor insulation

![Diagram](image)

**Fig. 11: Installation when $T_{\text{medium}}$ is -50°... 205 °C (-58 °... 400 °F)**

1 Insulation

The sensor may be insulated only in conjunction with option TE1 "Tower length extension - meter insulation capability" or TE2 "Tower length extension - meter insulation capability with double sealing", as shown in Fig. 11.
6.2.5 Turn-off devices for zero point adjustment

To guarantee the conditions for zero point adjustment under operating conditions, turn-off devices are required in the piping:
- A At least on the outlet side when the transmitter is mounted in horizontal position.
- B At least on the inlet side when the transmitter is mounted in vertical position.
- C In order to perform adjustment during an ongoing process, it is advisable to mount a bypass pipe as shown.

Fig. 12: Mounting options for turn-off devices (example)
1 Turn-off device

6.2.6 Installation in EHEDG-compliant installations

WARNING
Risk of poisoning!
Bacteria and chemical substances can contaminate or pollute pipeline systems and the materials they are made of. In EHEDG-compliant installations, the instructions below must be observed.

- The required self-draining functionality of the sensor can only be guaranteed when the vertical mounting position is used (see also Fig. 6 on page 23).
- The combination of process connections and gaskets selected by the operator may comprise only EHEDG-compliant components. Note the information in the current version of the EHEDG Position Paper entitled "Hygienic Process connections to use with hygienic components and equipment".
- The pipe fitting in accordance with DIN 11851 is approved for use in conjunction with an EHEDG-compliant gasket.

6.3 Temperature data

NOTICE
When using the device in potentially explosive atmospheres, note the additional data in chapter "Use in potentially explosive atmospheres according to ATEX and IECEx" on page 5 and in chapter "Use in potentially explosive atmospheres in accordance with cFMus" on page 12!

Measuring medium temperature $T_{\text{medium}}$
- FCx130: -50 ... 160 °C (-58 ... 320 °F)
- FCx150: -50 ... 205 °C (-58 ... 401 °F)

Ambient temperature $T_{\text{amb}}$
The permissible ambient temperature range depends on the order code "ambient temperature range" (TA3, TA8, TA9).
- TA3: -20 ... 70 °C (-4 ... 158 °F)
- TA8: -40 ... 55 °C (-40 ... 131 °F)
- TA9: -40 ... 70 °C (-40 ... 158 °F)
6.4 Material load

6.4.1 Material load for process connections

<table>
<thead>
<tr>
<th>Design</th>
<th>Nominal diameter</th>
<th>$P_{S \text{max}}$</th>
<th>$T_{S_{\text{max}}}$</th>
<th>$T_{S_{\text{min}}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threaded pipe connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DIN 11851)</td>
<td>DN 15 … 40</td>
<td>40 bar (580 psi)</td>
<td>140 °C (284 °F)</td>
<td>-40 °C (-40 °F)</td>
</tr>
<tr>
<td>(1/2 … 1 1/2&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN 50 … 100</td>
<td>25 bar (363 psi)</td>
<td>140 °C (284 °F)</td>
<td>-40 °C (-40 °F)</td>
<td></td>
</tr>
<tr>
<td>(2 … 4&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tri-Clamp</td>
<td>DN 15 … 50</td>
<td>16 bar (232 psi)</td>
<td>120 °C (248 °F)</td>
<td>-40 °C (-40 °F)</td>
</tr>
<tr>
<td>(DIN 32676)</td>
<td>(1/2 … 2&quot;)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN 65 … 100</td>
<td>10 bar (145 psi)</td>
<td>120 °C (248 °F)</td>
<td>-40 °C (-40 °F)</td>
<td></td>
</tr>
<tr>
<td>(2 1/2 … 4&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.4.2 Material load curves for flange devices

Fig. 13: Stainless steel DIN flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

Fig. 14: Stainless steel ASME flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

Fig. 15: DIN flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")

Fig. 16: ASME flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")
6.5 Installing the sensor
Before installation in the piping, observe the installation conditions and instructions on the mounting position!
1. Insert the sensor into the piping centrally and positioned coplanar. Use suitable gaskets to seal the process connections.
2. Tighten flange screws by working on each in a crosswise manner with the maximum permissible torque.
3. Check the seal integrity of the process connections.

6.6 Opening and closing the terminal box

⚠️ DANGER
Danger of explosion if the device is operated with the transmitter housing or terminal box open!
Before opening the transmitter housing or the terminal box, note the following points:
— Check that a valid fire permit is available.
— Make sure that there is no explosion hazard.
— Before opening the device, switch off the power supply and wait for t > 2 minutes.

Fig. 17: Cover safety device (example)

In order to open the housing, release the cover safety device by screwing in the Allen screw 1.
After closing the housing, lock the housing cover by unscrewing the Allen screw 1.

⚠️ NOTICE
Potential adverse effect on the IP rating
— Make sure that the cover of the power supply terminals is mounted correctly.
— Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
— Check that the O-ring gasket is properly seated when closing the housing cover.

6.7 Electrical connections

⚠️ WARNING
Risk of injury due to live parts.
Improper work on the electrical connections can result in electric shock.
— Connect the device only with the power supply switched off.
— Observe the applicable standards and regulations for the electrical connection.

⚠️ NOTICE
This is a class A device (industrial sector). This device can cause high frequency interferences in residential areas.
In this case, the operator may be required to take appropriate measures to remedy the interference.

The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.
The electrical connection information in the manual must be observed; otherwise, the type of electrical protection may be adversely affected.
Ground the measurement system according to requirements.

6.7.1 Installing the connecting cables

Ensure that a drip loop (water trap) is used when installing the connecting cables for the sensor.

Fig. 18: Laying of the connecting cable
1 Drip loop
### 6.7.2 Electrical connection

Models FCB130, FCB150, FCH130 and FCH150

![Fig. 19: Electrical connection](image)

**Connections for the power supply**

<table>
<thead>
<tr>
<th>DC voltage supply</th>
<th>Terminal</th>
<th>Function / comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>2-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Connections for the outputs**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function / comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A / B</td>
<td>Modbus RTU (RS485)</td>
</tr>
<tr>
<td>41 / 42</td>
<td>Passive digital output DO1</td>
</tr>
<tr>
<td></td>
<td>The output can be configured as a pulse output, frequency output or switch output.</td>
</tr>
<tr>
<td>51 / 52</td>
<td>Passive digital output DO2</td>
</tr>
<tr>
<td></td>
<td>The output can be configured as a pulse output or switch output.</td>
</tr>
</tbody>
</table>

### 6.7.3 Electrical data for inputs and outputs

**NOTE**

When using the device in potentially explosive atmospheres, follow the additional connection data in chapter "Use in potentially explosive atmospheres according to ATEX and IECEx" on page 5 and chapter "Use in potentially explosive atmospheres in accordance with cfMus" on page 12!

**Power supply**

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>11 ... 30 V DC (ripple: ≤ 5 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>S ≤ 5 VA</td>
</tr>
</tbody>
</table>

**Digital output 41 / 42, 51 / 52**

Can be configured via Modbus.

**NOTE**

- Digital output 51 / 52 cannot be configured as a frequency output.
- Terminals 42 / 52 have the same potential. Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other.
- If you are using a mechanical counter, we recommend setting a pulse width of ≥ 30 ms and a maximum frequency of $f_{\text{max}} \leq 3$ kHz.

![Fig. 20: Passive digital outputs (I = internal, E = external)](image)

**A** Passive digital output 41 / 42 as pulse or frequency output,

**B** Passive digital output 51 / 52 as pulse output

**Passive digital output 51 / 52 as binary output**

### Pulse / frequency output (passive)

<table>
<thead>
<tr>
<th>Terminals</th>
<th>41 / 42 (pulse / frequency output)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51 / 52 (pulse output)</td>
</tr>
<tr>
<td>Output <em>closed</em></td>
<td>0 V ≤ $U_{\text{CEL}}$ ≤ 3 V</td>
</tr>
<tr>
<td>For $f &lt; 2.5$ kHz: 2 mA &lt; $I_{\text{CEL}}$ &lt; 30 mA</td>
<td></td>
</tr>
<tr>
<td>For $f &gt; 2.5$ kHz: 10 mA &lt; $I_{\text{CEL}}$ &lt; 30 mA</td>
<td></td>
</tr>
<tr>
<td>Output <em>open</em></td>
<td>16 V ≤ $U_{\text{CEH}}$ ≤ 30 V DC</td>
</tr>
<tr>
<td>0 mA ≤ $I_{\text{CEH}}$ ≤ 0.2 mA</td>
<td></td>
</tr>
<tr>
<td>$f_{\text{max}}$</td>
<td>10.5 kHz</td>
</tr>
<tr>
<td>Pulse width</td>
<td>0.1 ... 2000 ms</td>
</tr>
</tbody>
</table>

### Binary output (passive)

<table>
<thead>
<tr>
<th>Terminals</th>
<th>41 / 42, 51 / 52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output <em>closed</em></td>
<td>0 V ≤ $U_{\text{CEL}}$ ≤ 3 V</td>
</tr>
<tr>
<td>2 mA ≤ $I_{\text{CEL}}$ ≤ 30 mA</td>
<td></td>
</tr>
<tr>
<td>Output <em>open</em></td>
<td>16 V ≤ $U_{\text{CEH}}$ ≤ 3 V DC</td>
</tr>
<tr>
<td>0 mA ≤ $I_{\text{CEH}}$ ≤ 0.2 mA</td>
<td></td>
</tr>
<tr>
<td>Switching function</td>
<td>Can be configured via Modbus.</td>
</tr>
</tbody>
</table>
6.7.4 Modbus protocol

Modbus is an open standard owned and administrated by an independent group of device manufacturers styled the Modbus Organization (www.modbus.org).

Using the Modbus protocol allows devices made by different manufacturers to exchange information via the same communication bus, without the need for any special interface devices to be used.

**Fig. 21: Communication via the Modbus protocol**

1. Modbus master
2. Terminating resistor
3. Modbus slave 1
4. Modbus slave n ...

<table>
<thead>
<tr>
<th>Modbus protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
</tr>
<tr>
<td><strong>Baud rate</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Stop bit</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>IEEE format</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Typical response time</strong></td>
</tr>
<tr>
<td><strong>Response delay time</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Cable specification**

The maximum permissible length is dependent on the baud rate, the cable (diameter, capacity and surge impedance), the number of loads in the device chain, and the network configuration (2-core or 4-core).

- At a baud rate of 9600 and with a conductor cross section of at least 0.14 mm² (AWG 26), the maximum length is 1000 m (3280 ft).
- When using a 4-core cable as a 2-wire wiring system, the maximum length must be halved.
- The spur lines must be short (maximum of 20 m [66 ft]).
- When using a distributor with n connections, each branch must have a maximum length of 40 m (131 ft) divided by n.

The maximum cable length depends on the type of cable used. The following standard values apply:

- Up to 6 m (20 ft): cable with standard shielding or twisted-pair cable.
- Up to 300 m (984 ft): double twisted-pair cable with overall foil shielding and integrated earth cable.
- Up to 1200 m (3937 ft): double twisted-pair cable with individual foil shielding and integrated earth cables.

Example: Belden 9729 or equivalent cable.

A category 5 cable can be used for Modbus RS485 up to a maximum length of 600 m (1968 ft). For the symmetrical pairs in RS485 systems, a surge impedance of more than 100 Ω is preferred, especially at a baud rate of 19,200 and above.

**Modbus response time**

The typical response time of the device is normally less than 100 ms (minimum response time). The response time is calculated from the end of the request telegram from the master to the beginning of the response telegram from the slave.

The response time can be increased via the parameter "modbusResponseDelayTime".

The length of the response telegram is dependent upon the number of bytes read and the baud rate configured.
6.7.5 Connection on the device

Connect the compact design: Perform steps A ... C.

During the process, observe the following instructions:

— Lead the cable for the power supply into the terminal box through the left cable entry.
— Lead the cables for the modbus outputs and digital outputs into the terminal box through the right cable entry.
— Connect the cables in accordance with the electrical connection diagram. Connect the cable shields to the designated grounding clamp in the terminal box.
— Connect the potential equalization (PE) on the ground terminal to the terminal box.
— Use wire end ferrules when connecting.

**NOTICE**

If the O-ring gasket is seated incorrectly or is damaged, this may have an adverse effect on the IP rating.

Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.

Check that the O-ring gasket is properly seated when closing the housing cover.

Observe the following points when connecting to the power supply:

— Adhere to the limit values of the power supply according to the information on the device identification plate.
— The leads must comply with IEC 227 and/or IEC 245.
— Complete the electrical connection according to the electrical plan.

When connecting the devices, note the voltage drop on the cable. The operating voltage on the device must not be less than 11 V.

---

**Fig. 22: Connection on the device (example), dimensions in mm (inch)**

PA = potential equalization

---

**Fig. 23: Maximum cable lengths (examples)**

$U_B$ = supply voltage, $L$ = cable length
7 Commissioning and operation

7.1 Write-protection switch, service LED and local operating interface

Fig. 24

1 Write protection switch  2 Service LED  3 Local operating interface

Write protection switch
The write protection switch is located in the sensor terminal box.

If write protection is active, the parameterization of the device cannot be changed via Modbus or the local operating interface.

Turning the write protection switch clockwise deactivates the write protection while turning the switch counter-clockwise activates it.

For the change to the setting to take effect, the energy supply to the transmitter must be temporarily interrupted.

Service LED
The service LED, which indicates the operating condition of the device, is located in the sensor terminal box.

<table>
<thead>
<tr>
<th>Service LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashes rapidly (100 ms)</td>
<td>Starting sequence, device not yet ready for operation</td>
</tr>
<tr>
<td>Lit up continuously</td>
<td>Device operating, no critical error</td>
</tr>
<tr>
<td>Flashes slowly (1 second)</td>
<td>A critical error has occurred, see chapter &quot;Diagnosis&quot; in the device operating instructions (OI/FCB100/FCH100)</td>
</tr>
</tbody>
</table>

Local operating interface
The sensor can also be parameterized without a Modbus connection via the local operating interface, see chapter 7.4.3 "Parameterization via the local operating interface" on page 33.

7.2 Checks prior to commissioning
The following points must be checked before commissioning the device:
— The wiring must have been completed as described in the chapter 3.2.4 "Electrical connections" on page 14.
— The correct grounding of the sensor.
— The ambient conditions must meet the requirements set out in the technical data.
— The power supply must meet the requirements set out on the identification plate.

NOTE
Damage of the device due to undervoltage!
In case of lower voltage than defined on the type plate, the current draw of the device device increases.
Thus, the internal fuses may be damaged.

7.3 Switching on the power supply
1. Switch on the power supply.
2. Perform flowmeter parameterization (see chapter 7.4 "Parameterization of the device* on page 32).

The flowmeter is now ready for operation.

7.3.1 Inspection after switching on the power supply
The following points must be checked after commissioning the device:
— The parameter configuration must correspond to the operating conditions.
— The system zero point has been adjusted (see chapter 7.5 "Zero point adjustment under operating conditions" on page 33).
7.4 Parameterization of the device

**NOTE**
The device does not have operating elements for parameterization on site. The parameterization is performed either via the Modbus interface or the local operating interface of the device.

Usually at least the following parameters must be set during commissioning:
- The Modbus slave ID, baud rate, and parity,
- The units for the mass flow, density, temperature, and the volume flow rate,
- The pulse width and the pulse factor for the pulse output,
- Massflow cutoff.

The settings for the Modbus interface and the pulse output are only necessary if the corresponding outputs are also used.

**NOTE**
For detailed information on the operation and parameterization of the device, consult the associated operating instructions (OI)!

### 7.4.1 Parameterization via the Modbus interface

In case of parameterization via the Modbus interface, refer to the interface description in the device operating instructions (OI/FCB100/FCH100).

#### Factory setting for the Modbus slave ID (address)

The Modbus Slave ID of the device is preset at the factory. The Modbus Slave ID corresponds to the last two digits of the serial number of the device on the name plate.

The Modbus registers must now be sent from the Modbus master to the broadcast address "0". All of the devices connected to the bus receive the message, but only the device addressed via the manufacturer code and the Sensor ID sets the Modbus Slave ID to the new required value.

### 7.4.2 Changing an unknown Modbus slave ID

The Modbus Slave ID (address) of the device must be known for Modbus communication. Upon delivery, the Modbus Slave ID corresponds to the last two digits of the serial number of the device (see chapter "Parameterization via the Modbus interface" on page 32). If the Modbus address is not known, the Modbus Slave ID can be reset via a Modbus broadcast message. To do this, the following three Modbus registers must be sent to the bus together with the function code 16 (0x10) "Write Multiple Registers".

<table>
<thead>
<tr>
<th>Address / data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>65521 TUSIGN32 [2]</td>
<td>manufacturerDeviceID</td>
</tr>
<tr>
<td></td>
<td>The manufacturer code (ABB = 0x1A) and the device code (FCB1xx = 0xA0) must be written to the register 65522.</td>
</tr>
<tr>
<td>65523 TUSIGN32 [2]</td>
<td>sensorSerialID</td>
</tr>
<tr>
<td></td>
<td>The Sensor ID of the device (on the name plate; see chapter &quot;Factory setting for the Modbus slave ID (address)&quot; on page 32). The information must first be written in the high-byte (65524) of the register.</td>
</tr>
<tr>
<td>65525 TUSIGN32 [2]</td>
<td>slaveID</td>
</tr>
<tr>
<td></td>
<td>The new Modbus Slave ID must be written in the high byte (65526) of the register.</td>
</tr>
</tbody>
</table>

Fig. 25: Modbus address on the name plate (example)

![Modbus address on the name plate (example)](example)

Fig. 26: Write Multiple Registers (example)
7.4.3 Parameterization via the local operating interface

**DANGER**

Risk of explosion during operation of the device with open terminal box!

Only perform parameterization of the device via the local operating interface outside the potentially explosive area!

A PC / notebook and the USB interface cable (3KXS310000L0001) are required to configure the device via the device’s local operating interface.

In conjunction with the HART-DTM and the software "ABB AssetVision" available at www.abb.com/flow, all parameters can also be set without a Modbus connection.

![Diagram of connection to the local operating interface](image)

**Fig. 27: Connection to the local operating interface**

1. Local operating interface
2. Programming plug
3. PC / notebook
4. USB interface cable

1. Open device terminal box.
2. Connect programming plug to the local operating interface of the device.
3. Insert USB interface cable into a free USB female connector on the PC / notebook.
4. Switch on the device power supply.
5. Start ABB AssetVision and perform the parameterization of the equipment.

Detailed information on operating the software is available in the relevant operating instructions and the DTM online help.

7.5 Zero point adjustment under operating conditions

Devices in the CoriolisMaster series do not necessarily require zero point adjustment. Performing a zero point adjustment is only recommended in the following cases:

- For measurements in the lower flow range (below 10 % of \(Q_{\text{maxDN}}\)).
- If particularly high accuracies are required (0.1 % or better).
- If the operating conditions (pressure and temperature) deviate greatly from the reference conditions (see data sheet).

For zero point adjustment under operating conditions, make sure the following conditions are present:

- The measuring tube is completely filled with the measuring medium.
- For liquid measuring media, no gas bubbles or air pockets may be present in the measuring tube.
- For gaseous measuring media, no liquid components or condensates may be present in the measuring tube.
- The pressure and the temperature in the measuring tube correspond to the normal operating conditions and are stable.

In case of an increased zero point (> 0.1 %), check the installation for "best practice" and make sure that no gas content is contained in liquids, or liquids or particles in gases. See also chapter 6.2.5 "Turn-off devices for zero point adjustment" on page 25.

To perform zero point adjustment via the Modbus interface, consult the associated operating instruction "OI/FCB100/FCH100".

7.6 Operating instructions

Observe the following points when operating the device:

- Aggressive media may result in corrosion and abrasion of the parts that come into contact with the medium. As a result, pressurized media 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 through CIP/SIP processes.

If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.
8 Maintenance

8.1 Safety instructions

⚠️ WARNING
Risk of injury due to live parts!
When the housing is open, contact protection is not provided and EMC protection is limited.
Before opening the housing, switch off the power supply.

⚠️ CAUTION
Risk of burns due to hot measuring media.
The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!
Before starting work on the device, make sure that it has cooled sufficiently.

ℹ️ NOTE
Damage to components!
The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines).
Make sure that the static electricity in your body is discharged before touching electronic components.

ℹ️ NOTE
For detailed information on the maintenance of the device, consult the associated operating instructions (OI)!

9 Declaration of conformity

ℹ️ NOTE
All documentation, declarations of conformity, and certificates are available in ABB’s download area.
www.abb.com/flow

---

Trademark

® Modbus is a registered trademark of the Modbus Organization
™ Hastelloy C-4 is a Haynes International trademark
™ Hastelloy C-22 is a Haynes International trademark
10 Appendix

10.1 Return form

Statement on the contamination of devices and components

Repair and / or maintenance work will only be performed on devices and components if a statement form has been completed and submitted. Otherwise, the device / component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:
Company:
Address:
Contact person: Telephone:
Fax: E-Mail:

Device details:
Typ: Serial no.:
Reason for the return / description of the defect:

Was this device used in conjunction with substances which pose a threat or risk to health?
☐ Yes ☐ No

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

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

Which substances have come into contact with the device?
1.
2.
3.

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

Town / city, date Signature and company stamp
10.2 Installation diagram 3KXF000014G0009

T<sub>amb</sub>. 55 °C (131 °F), Order-Code TA8

Page 1 of 4
CoriolisMaster FCB130, FCB150, FCH130, FCH150

**POWER SUPPLY**
- Non IS
- Terminals
- max 30V DC

**SIGNAL DATA INPUT/OUTPUT**
- Intrinsically safe IS, ia
- Connected to FM / CSA
- LISTED BARRIER
  - Ui=4.2V
  - Ui=30V

**ORDINARY LOCATION**
- GENERAL PURPOSE

**HAZARDOUS LOCATION**
- Div 2 & ZN 2/21/22
- US and Canadian application

**HAZARDOUS LOCATION**
- Div 1 & ZN 0/1/20/21
- US and Canadian application

**Alternative to**
- SIGNAL DATA INPUT/OUTPUT
  - U_{max}=3V
  - U_{max}=30V
  - max 30Vrms

Installation diagram FCB
Notes: ATEX & IECEx application

1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO ATEX/IECEx APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:
   \( U_0 \) OR \( V_0 \) OR \( V < V_{MAX} \), \( I_0 \) OR \( I < I_{MAX} \);
   \( C_0 \) OR \( C > C_{MAX} \), \( L_0 \) OR \( L > L_{MAX} \), \( P < P_{max} \).

2. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN ZONE 21/22 ENVIRONMENTS.

3. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 \( V_{rms} \) OR \( V_{dc} \) WITH RESPECT TO EARTH.

4. INSTALLATION SHOULD BE IN ACCORDANCE WITH THE RELEVANT INTERNATIONAL OR NATIONAL REGULATIONS, INSTALLATION OF INTRINSICALLY SAFE FOR HAZARDOUS LOCATIONS REGULATIONS.

5. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE ATEX or IECEx APPROVED UNDER ENTITY CONCEPT.

6. ASSOCIATED APPARATUS MANUFACTURER’S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

7. THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURER’S INSTALLATION DIAGRAM.

8. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION. IT MUST MEET THE REQUIREMENTS LISTED IN TABLE OF THIS INSTALLATION DIAGRAM.

Notes: US and Canadian application

1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO FM AND/OR CSA APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:
   \( U_0 \) OR \( V_0 \) OR \( V < V_{MAX} \), \( I_0 \) OR \( I < I_{MAX} \);
   \( C_0 \) OR \( C > C_{MAX} \), \( L_0 \) OR \( L > L_{MAX} \), \( P < P_{max} \).

2. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND III ENVIRONMENTS.

3. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 \( V_{rms} \) OR \( V_{dc} \) WITH RESPECT TO EARTH.


5. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE FM AND/OR CSA APPROVED UNDER ENTITY CONCEPT.

6. ASSOCIATED APPARATUS MANUFACTURER’S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

7. THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURER’S INSTALLATION DIAGRAM.

8. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION. IT MUST MEET THE REQUIREMENTS LISTED IN TABLE OF THIS INSTALLATION DIAGRAM.
POWER SUPPLY
- General purpose
- Non IS
- Terminals
- max 30V DC

SIGNAL DATA INPUT/OUTPUT
- Intrinsically safe ia
- Connected to ATEX / IECEx certified BARRIER
- UI=4.2V
- UI=30V
- max 30Vrms

ORDINARY LOCATION

HAZARDOUS LOCATION ZN 2/21/22
- ATEX & IECEx application

HAZARDOUS LOCATION ZN 0/1/20/21
- ATEX & IECEx application

Alternative to SIGNAL DATA INPUT/OUTPUT
- max 30Vrms
<table>
<thead>
<tr>
<th><strong>HAZARDOUS LOCATION</strong></th>
<th><strong>ORDINARY LOCATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Div 1 &amp; ZN 01/20/21</td>
<td>Div 2 &amp; ZN 22/1/22</td>
</tr>
<tr>
<td>US and Canadian</td>
<td>US and Canadian</td>
</tr>
<tr>
<td>application</td>
<td>application</td>
</tr>
</tbody>
</table>

### POWER SUPPLY

- **Non IS**
- **Terminals** max 30V DC

### SIGNAL DATA INPUT/OUTPUT

- **Intrinsically safe I_s, ia**
- **Connected to** FM / CSA LISTED BARRIER

### Alternative to SIGNAL DATA INPUT/OUTPUT

- **Non Intrinsically Safe**
- max 30 V RMS
Notes: ATEX & IECEx application

1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO ATEX/IECEx APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:
   \[ U_o \text{ OR } U_{oc} \text{ OR } V_I < V_{MAX}, \text{ Io OR Io}_{oc} < I_{MAX}; \]
   \[ C_a \text{ OR } C_{oc} > C_{IECEx}, L_a \text{ OR } L_{oc} > L_{IECEx}, P_o < P_{IECEx}. \]

2. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN Zone 21/22 ENVIRONMENTS.

3. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Watts OR Vdc WITH RESPECT TO EARTH.

4. INSTALLATION SHOULD BE IN ACCORDANCE WITH THE RELEVANT INTERNATIONAL OR NATIONAL REGULATIONS, INSTALLATION OF INTRINSICALLY SAFE FOR HAZARDOUS LOCATIONS REGULATIONS.

5. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE ATEX or IECEx APPROVED UNDER ENTITY CONCEPT.

6. ASSOCIATED APPARATUS MANUFACTURER’S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

7. THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURER’S INSTALLATION DIAGRAM.

8. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION. IT MUST MEET THE REQUIREMENTS LISTED IN TABLE OF THIS INSTALLATION DIAGRAM.

Notes: US and Canadian application

1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO FM AND/OR CSA APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:
   \[ U_o \text{ OR } U_{oc} \text{ OR } V_I < V_{MAX}, \text{ Io OR Io}_{oc} < I_{MAX}; \]
   \[ C_a \text{ OR } C_{oc} > C_{IECEx}, L_a \text{ OR } L_{oc} > L_{IECEx}, P_o < P_{IECEx}. \]

2. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND III ENVIRONMENTS.

3. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Watts OR Vdc WITH RESPECT TO EARTH.


5. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE FM AND/OR CSA APPROVED UNDER ENTITY CONCEPT.

6. ASSOCIATED APPARATUS MANUFACTURER’S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

7. THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURER’S INSTALLATION DIAGRAM.

8. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION. IT MUST MEET THE REQUIREMENTS LISTED IN TABLE OF THIS INSTALLATION DIAGRAM.
<table>
<thead>
<tr>
<th>Modbus communication variants</th>
<th>Ex e / XP</th>
<th>Operating Value</th>
<th>Ex nA / NI</th>
<th>Ex ia / IS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$U_M$ [V]</td>
<td>$I_M$ [mA]</td>
<td>$U_N$ [V]</td>
<td>$I_N$ [mA]</td>
</tr>
<tr>
<td>Modbus active</td>
<td>4.2</td>
<td>150</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>Terminal A / B</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>4.2</td>
<td>150</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>Digital DO1 Output passive</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminal 41/42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital DO2 Output passive</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminal 51/52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ABB Limited
Process Automation
Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK
Tel: +44 (0)870 600 6122
Fax: +44 (0)1480 213 339
Mail: enquiries.mp.uk@gb.abb.com

ABB Inc.
Process Automation
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Process Automation
Dransfelder Str. 2
37079 Goettingen
Germany
Tel: +49 551 905-0
Fax: +49 551 905-777

www.abb.com/flow

Note
We reserve the right to make technical changes or modify the contents of this document without prior notice.
With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.

Copyright© 2016 ABB
All rights reserved

3KXF411009R4401
Original instruction