CoriolisMaster FCB100, FCH100
Coriolis mass flowmeter

Device firmware version:
≥ 01.06.00

Introduction
The compact CoriolisMaster FCB100, FCH100 series flowmeter for system integration features low pressure drop and highflow rate and offers high-speed communication via RS485 Modbus and two binary outputs.

Additional Information
Additional documentation on CoriolisMaster FCB100, FCH100 is available for download free of charge at www.abb.com/flow. Alternatively simply scan this code:
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<tr>
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<td>42</td>
</tr>
</tbody>
</table>
1 Safety

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.

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.

NOTICE
The signal word ‘NOTICE’ indicates possible material damage.

Note
‘Note’ indicates useful or important information about the product.
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 measuring media, 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 operational security of the materials of the wetted parts of the temperature sensor will not be adversely affected during the operating time.
- 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 is able to perform regular and suitable tests to ensure the safe condition of the device.

Improper use

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

- Operation as a flexible compensating adapter in piping, for example for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
- For use as a climbing aid, for example for mounting purposes.
- For use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding/soldering on parts.
- Material removal, for example by spot drilling the housing.

Notes on data safety

This product is designed to be connected to and to communicate information and data via a network interface. It is operator’s sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and / or theft of data or information. ABB Automation Products GmbH and its affiliates are not liable for damages and / or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and / or theft of data or information.

Warranty provisions

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

Manufacturer’s address

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Measurement & Analytics
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32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

Customer service center
Tel: +49 180 5 222 580
Email: automation.service@de.abb.com
2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Note
Further information on the approval of devices for use in potentially explosive atmospheres can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

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>Standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATEX</td>
<td></td>
<td>ATEX</td>
<td></td>
</tr>
<tr>
<td>FM 14 ATEX0017X</td>
<td>Il 3 G Ex ec mc IIC T6 ... T2 Gc</td>
<td>Il 2 D Ex tb IIIC T85°C ... T_{medium} Db</td>
<td>ATEX</td>
</tr>
<tr>
<td>IECEx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IECEx FME 14.0003X</td>
<td>Ex ec mc IIC T6 ... T2 Gc</td>
<td>Ex tb IIIC T85°C ... T_{medium} Db</td>
<td>IECEx</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

Temperature data

Temperature resistance for the connecting cable
The temperature at the cable entries of the device is dependent on the measuring medium temperature $T_{medium}$ and the ambient temperature $T_{amb}$.

For the electrical connection of the device, use only cables with sufficient temperature resistance in accordance with the table.

<table>
<thead>
<tr>
<th>$T_{amb}$</th>
<th>Temperature resistance for the connecting cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 50 °C (≤ 122 °F)</td>
<td>≥ 105 °C (≥ 221 °F)</td>
</tr>
<tr>
<td>≤ 60 °C (≤ 140 °F)</td>
<td>≥ 110 °C (≥ 230 °F)</td>
</tr>
<tr>
<td>≤ 70 °C (≤ 158 °F)</td>
<td>≥ 120 °C (≥ 248 °F)</td>
</tr>
</tbody>
</table>

From an ambient temperature of $T_{amb} ≥ 60 °C (≥ 140 °F)$ the wires in the terminal boxes must be additionally insulated using the enclosed silicone hoses.

Environmental and process conditions for model FCx1xx...

<table>
<thead>
<tr>
<th>Ambient temperature $T_{amb}$</th>
<th>-20 to 70 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-4 to 158 °F)</td>
</tr>
<tr>
<td>Measuring medium temperature $T_{medium}$</td>
<td>-40 to 205 °C</td>
</tr>
<tr>
<td></td>
<td>(-40 to 400 °F)</td>
</tr>
<tr>
<td>IP rating / NEMA rating</td>
<td>IP 65, IP 67 / NEMA 4X, Type 4X</td>
</tr>
</tbody>
</table>

* Optional, with order code ‘Ambient temperature range – TA9’
Measuring medium temperature (Ex data) for model FCx1xx-A1… in Zone 1
The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{amb.}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 30 , ^\circ C (\leq 86 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 40 , ^\circ C (\leq 104 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 50 , ^\circ C (\leq 122 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 60 , ^\circ C (\leq 140 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 70 , ^\circ C (\leq 158 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$</td>
</tr>
</tbody>
</table>

Measuring medium temperature (Ex data) for model FCx1xx-A2… in Zone 2
The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{amb.}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 30 , ^\circ C (\leq 86 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$ *</td>
</tr>
<tr>
<td>$\leq 50 , ^\circ C (\leq 122 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$ *</td>
</tr>
<tr>
<td>$\leq 60 , ^\circ C (\leq 140 , ^\circ F)$</td>
<td>$205 , ^\circ C (400 , ^\circ F)$ *</td>
</tr>
<tr>
<td>$\leq 70 , ^\circ C (\leq 158 , ^\circ F)$</td>
<td>$180 , ^\circ C (356 , ^\circ F)$ *</td>
</tr>
</tbody>
</table>

* Only with the ‘Extended tower length – TE1, TE2 or TE3’ order option

Measuring medium temperature (Ex data) for model FCx1xx-A1… in Zone 21 and FCx1xx-A2… in Zone 22
The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{amb.}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 30 , ^\circ C (\leq 86 , ^\circ F)$</td>
<td>$195 , ^\circ C (383 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 50 , ^\circ C (\leq 122 , ^\circ F)$</td>
<td>$140 , ^\circ C (284 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 60 , ^\circ C (\leq 140 , ^\circ F)$</td>
<td>$120 , ^\circ C (248 , ^\circ F)$</td>
</tr>
<tr>
<td>$\leq 70 , ^\circ C (\leq 158 , ^\circ F)$</td>
<td>$80 , ^\circ C (176 , ^\circ F)$</td>
</tr>
</tbody>
</table>
... 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Electrical data

Modbus outputs and digital outputs

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Operating values (general)</th>
<th>'ec' (Zone 2)</th>
<th>'eb' (Zone 1)</th>
<th>Type of protection 'ia' (zone 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus, active</td>
<td>3</td>
<td>30</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Terminals A / B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output DO1, passive</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 41 / 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output DO2, passive</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Terminals 51 / 52</td>
<td></td>
<td></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.

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.
- Combining intrinsically safe and non-intrinsically safe circuits is not permitted.
- On intrinsically safe circuits, potential equalization should be established along the entire length of the cable used for the signal outputs.
- The rated voltage of the non-intrinsically safe circuits is $U_M = 30$ V.
- Intrinsic safety is preserved if the rated voltage $U_M = 30$ V is not up-scaled when connections are established to non-intrinsically safe external circuits.
- When changing the type of protection, the information in the corresponding chapter Changing the type of protection in operating instruction must be observed.
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 protection and installation techniques, concerned rules and regulations as well as general principles of zoning. The person must possess the appropriate competences for the type of work to be conducted. When operating with combustible dusts, comply with EN 60079-31.

The safety instructions for electrical apparatus in potentially explosive areas must be in accordance with Directive 2014/34/EU (ATEX) and IEC 60079-14 (Installation of electrical equipment in potentially explosive areas). Comply with the applicable regulations for the protection of employees to ensure safe operation.

It is essential that the temperature classes as per the approvals in ‘Temperature data’ on page 6’ are observed.

The information in the installation diagram installation diagram 3KXF000014G0009 on page 42 must be observed.

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 may not up-scale 85 °C (185 °F).
• The process temperature of the attached piping may up-scale 85 °C (185 °F).

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:

- A valid fire permit must be present.
- Make sure that there is no explosion hazard.
- Switch off the power supply and wait for \( t > 10 \) minutes before opening.

⚠️ 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 Opening and closing the terminal box on page 28.

Only original spare parts must be used to seal the housing.

Note

Spare parts can be ordered from ABB Service. www.abb.com/contacts
2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Installation instructions

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 entries must be sealed prior to commissioning, using the seals supplied. The outside diameter of the connection cable must measure between 6 mm (0.24 in) and 12 mm (0.47 in) to guarantee the required tightness. 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
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.

Electrical connections
Grounding
The sensor must be grounded in accordance with the applicable international standards. Perform grounding of the device in accordance with Pin assignment on page 29.

Operating instructions

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 ≤ 30 %.
- The painted surface of the device is thereby relatively free from impurities such as dirt, dust or oil.
- Instructions on avoiding ignition in potentially explosive environments due to electrostatic discharges in accordance with PD CLC/TR 60079-32-1 and IEC TS 60079-32-1 must be complied with!

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

Repair
Devices of type of protection ‘d’ are equipped with flameproof joints in the housing. Contact ABB before commencing repair work.
**Changing the type of protection**

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

| Zone 1 / Div. 1:      | Zone 1 / Div. 1:  |                      |
| Modbus interface and  | Modbus interface  | 500 V AC/1min or 500 |
| digital outputs in    | and digital       | × 1.414 = 710 V DC/1min |
| intrinsically safe    | outputs in        | Test between terminals |
| ia(ib) / IS design    | non-intrinsically | A / B, 41 / 42 as well |
|                       | safe design       | as 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. |

**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
Further information on the approval of devices for use in potentially explosive atmospheres can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

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></td>
<td></td>
</tr>
<tr>
<td>FCx1xx F2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCx1xx F1</td>
<td></td>
<td></td>
<td></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>

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.

Model FCx1xx-F2... in Zone 2, Div. 2

FM (marking US)
FM16US0201X
NP: CL I, DIV2, GPS ABCD, T6 ... T2
NP: CL II, III, DIV2, GPS EFG, T6 ... T3B
DIP: CL II, Div 1, GPS EFG, T6 ... T3B
DIP: CL III, Div 1, 2, T6 ... T3B
CL I, ZN 2, AEx ec IIC T85°C ... T165°C Db
ZN 21 AEx ia tb IIC T85°C ... T165°C Db
See Instructions for temperature class information

FM (marking Canada)
FM16CA0104X
NP: CL I, DIV2, GPS ABCD, T6 ... T2
NP: CL II, III, DIV2, GPS EFG, T6 ... T3B
DIP: CL II, Div 1, GPS EFG, T6 ... T3B
DIP: CL III, Div 1, 2, T6 ... T3B
Ex ec IIC T6 ... T2 Gc
See Instructions for temperature class information

Model FCx1xx-F1... in Zone 1, Div. 1

FM (marking US)
FM16US0201X
XP-IS: CL I, Div 1, GPS BCD, T6 ... T2
DIP: CL II, Div 1, GPS EFG, T6 ... T3B
DIP: CL III, Div 1, 2, T6 ... T3B
CL I, ZN 1, AEx db ia IIB+H2 T6 ... T2 Ga/Gb
ZN 21 AEx ia tb IIC T85°C to T165°C Db
See Instructions for temperature class information and Installation Drawing No. 3KXF000014G0009

FM (marking Canada)
FM16CA0104X
XP-IS: CL I, Div 1, GPS BCD, T6 ... T2
DIP: CL II, Div 1, GPS EFG, T6 ... T2
DIP: CL III, Div 1, 2, T6 ... T3B
Ex db ia IIB+H2 T6 ... T2 Gb
Ex ia INTRINSICALLY SAFE SECURITE INTRINSEQUE
See Instructions for temperature class information and Installation Drawing No. 3KXF000014G0009
Temperature data

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, use only cables with sufficient temperature resistance in accordance with the table.

<table>
<thead>
<tr>
<th>$T_{\text{amb}}$</th>
<th>Temperature resistance for the connecting cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 50 , ^\circ\text{C}$ ($\leq 122 , ^\circ\text{F}$)</td>
<td>$\geq 105 , ^\circ\text{C}$ ($\geq 221 , ^\circ\text{F}$)</td>
</tr>
<tr>
<td>$\leq 60 , ^\circ\text{C}$ ($\leq 140 , ^\circ\text{F}$)</td>
<td>$\geq 110 , ^\circ\text{C}$ ($\geq 230 , ^\circ\text{F}$)</td>
</tr>
<tr>
<td>$\leq 70 , ^\circ\text{C}$ ($\leq 158 , ^\circ\text{F}$)</td>
<td>$\geq 120 , ^\circ\text{C}$ ($\geq 248 , ^\circ\text{F}$)</td>
</tr>
</tbody>
</table>

From an ambient temperature of $T_{\text{amb}} \geq 60 \, ^\circ\text{C}$ ($\geq 140 \, ^\circ\text{F}$) the wires in the terminal boxes must be additionally insulated using the enclosed silicone hoses.

Environmental and process conditions for model FCx1xx...

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

* Optional, with order code ‘Ambient temperature range – TA9’
... 3 Use in potentially explosive atmospheres in accordance with cFMus

... Temperature data

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

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{\text{amb}}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
</tr>
<tr>
<td>$\leq 30$ °C (≤ 86 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>$\leq 40$ °C (≤ 104 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>$\leq 50$ °C (≤ 122 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>$\leq 60$ °C (≤ 140 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
<tr>
<td>$\leq 70$ °C (≤ 158 °F)</td>
<td>205 °C (400 °F)</td>
</tr>
</tbody>
</table>

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

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{\text{amb}}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
</tr>
<tr>
<td>$\leq 30$ °C (≤ 86 °F)</td>
<td>205 °C (400 °F)*</td>
</tr>
<tr>
<td>$\leq 40$ °C (≤ 104 °F)</td>
<td>205 °C (400 °F)*</td>
</tr>
<tr>
<td>$\leq 50$ °C (≤ 122 °F)</td>
<td>205 °C (400 °F)*</td>
</tr>
<tr>
<td>$\leq 60$ °C (≤ 140 °F)</td>
<td>205 °C (400 °F)*</td>
</tr>
<tr>
<td>$\leq 70$ °C (≤ 158 °F)</td>
<td>205 °C (400 °F)*</td>
</tr>
</tbody>
</table>

* Only with the 'Extended tower length – TE1, TE2 or TE3' order option

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

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class.

<table>
<thead>
<tr>
<th>Ambient temperature $T_{\text{amb}}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T210 °C</td>
</tr>
<tr>
<td>$\leq 30$ °C (≤ 86 °F)</td>
<td>195 °C (383 °F)</td>
</tr>
<tr>
<td>$\leq 50$ °C (≤ 122 °F)</td>
<td>140 °C (284 °F)</td>
</tr>
<tr>
<td>$\leq 60$ °C (≤ 140 °F)</td>
<td>120 °C (248 °F)</td>
</tr>
<tr>
<td>$\leq 70$ °C (≤ 158 °F)</td>
<td>80 °C (176 °F)</td>
</tr>
</tbody>
</table>
# Electrical data

## Modbus outputs and digital outputs

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Operating values</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(general)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Div. 2, Zone 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Div. 1, Zone 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Div. 1, Zone 1)</td>
<td></td>
</tr>
<tr>
<td>Modbus, active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals A / B</td>
<td>U_N [V] I_N [mA]</td>
<td>U_O [V] I_O [mA]</td>
</tr>
<tr>
<td></td>
<td>3 30</td>
<td>4,2 150</td>
</tr>
<tr>
<td></td>
<td>3 30</td>
<td>30 30</td>
</tr>
<tr>
<td>Digital output DO1, passive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals 41 / 42</td>
<td>U_i [V] I_i [mA]</td>
<td>P_i [mW] C_i [nF]</td>
</tr>
<tr>
<td></td>
<td>30 25</td>
<td>187 2,4</td>
</tr>
<tr>
<td>Digital output DO2, passive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals 51 / 52</td>
<td>U_O [V] I_O [mA]</td>
<td>P_O [mW] C_O [nF]</td>
</tr>
<tr>
<td></td>
<td>30 25</td>
<td>187 20</td>
</tr>
<tr>
<td></td>
<td>U_M [V] I_M [mA]</td>
<td>L_O [µH]</td>
</tr>
<tr>
<td></td>
<td>30 25</td>
<td>13900 20</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.

## 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.

- Combining intrinsically safe and non-intrinsically safe circuits is not permitted.
- On intrinsically safe circuits, potential equalization should be established along the entire length of the cable used for the signal outputs.
- The rated voltage of the non-intrinsically safe circuits is \(U_M = 30\) V.
- Intrinsic safety is preserved if the rated voltage \(U_M = 30\) V is not up-scaled when connections are established to non-intrinsically safe external circuits.
- When changing the type of protection, the information in the corresponding chapter Changing the type of protection in operating instruction must be observed.
... 3 Use in potentially explosive atmospheres in accordance with cFMus

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 in 'Temperature data on page 13' are observed.

The information in the installation diagram Installation diagram 3KXF000014G0009 on page 42 must be observed.

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 may not up-scale 85 °C (185 °F).
- The process temperature of the attached lead may up-scale 85 °C (185 °F).

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:

- A valid fire permit must be present.
- Make sure that there is no explosion hazard.
- Switch off the power supply and wait for \( t > 10 \) minutes before opening.

⚠️ 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 Opening and closing the terminal box on page 28.

Only original spare parts must be used to seal the housing.

Note

Spare parts can be ordered from ABB Service.

www.abb.com/contacts
Cable entries

The devices are delivered with ½ in NPT threads with transport protection plugs.

- Unused cable entries must be sealed off prior to commissioning using either approved pipe fittings or cable glands in accordance with national regulations (NEC, CEC).
- Make sure that the pipe fittings, cable glands and, if applicable, sealing plugs are installed properly and are leak-tight.
- If the device is to be operated in areas with combustible dusts, a threaded pipe connection or cable gland with suitable approval must be used.
- The use of standard cable glands and closures is prohibited.

Note
Devices which are certified for use in North America are supplied with a ½ in. NPT thread only and without cable glands.

Electrical connections

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.

Perform grounding of the device in accordance with Pin assignment on page 29.

Process sealing

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

Note
The device is suitable for use in Canada.

- For use in Class II, Groups E, F and G, a maximum surface temperature of 165 °C (329 °F) may not be up-scaled.
- All cable (conduits) should be sealed from the device within a distance of 18 in (457 mm).

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

Connecting devices with cable (conduits) to the electric installation makes it possible for measuring media to reach the electric system.

To prevent measuring media from seeping into the electric installation, the devices are equipped with process gaskets which meet requirements in accordance with ANSI / ISA 12.27.01.

Coriolis mass flowmeters are designed as ‘Single Seal Devices’. With the TE2 order option, ‘Extended tower length - insulation capacity with dual gasket’, the devices can be used as a ‘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>Flange or pipe material</th>
<th>Nominal sizes</th>
<th>Operating temperature</th>
<th>Process pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No limitations</td>
<td>DN 15 to DN 150 (½ to 6 in)</td>
<td>-50 °C to 205 °C (-58 °F to 400 °F)</td>
<td>PN 100 / Class 600</td>
</tr>
</tbody>
</table>
3 Use in potentially explosive atmospheres in accordance with cFMus

Operating instructions

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 ≤ 30%.
- The painted surface of the device is thereby relatively free from impurities such as dirt, dust or oil.
- Instructions on avoiding ignition in potentially explosive environments due to electrostatic discharges in accordance with PD CLC/TR 60079-32-1 and IEC TS 60079-32-1 must be complied with!

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

Repair
Contact the manufacturer for specific flamepath joint details during repair of flameproof “XP” apparatus.
Changing 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, $U_{\text{max}} \leq 30$ V</td>
<td>Housing: XP</td>
<td>$500$ V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 as well as 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>Outputs non IS</td>
<td>Outputs: IS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Housings: Div 2</td>
<td>$500$ V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 as well as 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></td>
<td>Outputs: NI</td>
<td></td>
</tr>
<tr>
<td>Outputs: IS</td>
<td>Housing: XP</td>
<td>$500$ V AC/1min or $500 \times 1.414 = 710$ V DC/1min Test between terminals A / B, 41 / 42 as well as 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</td>
<td>Outputs: non IS</td>
<td>Visual inspection, no damage visible on the threads (cover, ½ in NPT cable glands).</td>
</tr>
<tr>
<td>Outputs: non IS</td>
<td>Housing: XP</td>
<td>No special measures.</td>
</tr>
<tr>
<td>Housing: XP</td>
<td>Outputs: NI</td>
<td>Visual inspection, no damage visible on the threads (cover, ½ in NPT cable glands).</td>
</tr>
<tr>
<td>Housing: XP, $U_{\text{max}} \leq 30$ V</td>
<td>Outputs: IS</td>
<td>Test between terminals A / B, 41 / 42 as well as 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>Outputs: NI</td>
<td>Housing: XP</td>
<td>Visual inspection, no damage visible on the threads (cover, ½ in NPT cable glands).</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

Name plate

Note
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).

Devices which are approved for use in potentially explosive atmospheres have an additional warning plate.

WARNING!
Gefahr durch elektrostatische Entladung
Danger by electrostatic unloading
AVERTISSEMENT!
Risque de décharge électrostatique

Devices which are approved for use in potentially explosive atmospheres have an additional warning plate.

The marking is dependent on the nominal diameter (> DN 25 or ≤ DN 25) of the sensor (also refer to article 4, paragraph 3, Pressure Equipment Directive 2014/68/EU).

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.

The respective fluid group in accordance with the Pressure Equipment Directive is indicated under PED.

Example: Fluid Group 1 = hazardous fluids, gaseous.

Pressure equipment beyond the scope of the Pressure Equipment Directive
The reason for exception in accordance with article 4 paragraph 3 of the Pressure Equipment Directive is specified under PED.

The pressure equipment is classified in the SEP (= Sound Engineering Practice) ‘Good Engineering Practice’ category.
5 Transport and storage

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.

Transport

⚠️ DANGER
Life-threatening danger due to suspended loads.
In the case of suspended loads, a danger of the load falling exists.
• Standing 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:
• Observe the weight details of the device 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.

Storage
Bear the following points in mind when storing devices:
• Store the device in its original packaging in a dry and dust-free location.
• Observe the permitted ambient conditions for transport and storage.
• Avoid storing the device in direct sunlight.
• In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device. Adhere to the device data sheet!

Returning devices
Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see Return form on page 41) and include this with the device.
In accordance with 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.).

Address for returns:
Please contact Customer Center Service according to page 5 for nearest service location.

---

Figure 5: Transport instructions
6 Installation

General installation conditions

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 $T_{\text{ambient}}$) 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 ambient temperature $T_{\text{ambient}}$ must be adhered to.
- 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' (in accordance with the standards listed in the declaration of conformity).
  Maintain a suitable distance from electromagnetic fields and interference that extend beyond the usual dimensions.

Seals
Users are responsible for selecting and mounting suitable gaskets (material, shape).
Note the following points when selecting and mounting gaskets:

- Use gaskets made from a material that is compatible with the measuring medium and measuring medium temperature.
- Gaskets must not extend into the flow area, since possible turbulence may influence the accuracy of the device.

Calculating pressure loss
Pressure loss depends on the properties of the medium and the flow rate.
A good aid for pressure loss calculation is the Online ABB Product Selection Assistant (PSA) for flow at 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', 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 fasten any supports or brackets to the housing of the flowmeter sensor.

Note
For increased vibration load, such as for example on ships, the use of the 'CL1' marine design is recommended.

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.

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).
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

A For vertical installation in a riser, no special measures are required.
B For vertical installation in a downpipe, a piping constriction or an orifice 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. If a self-draining installation is required, the sensor must be mounted at an incline of ≥ 30°.
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 Installation

#### General installation conditions

**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**

- For gaseous measuring media and horizontal installation, the transmitter and terminal box must point downward.
- 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.

---

**Figure 8: Horizontal Installation**

**Turn-off devices for the zero point adjustment**

**Figure 9: Mounting options for turn-off devices (example)**

To guarantee the conditions for zero point balancing under operating conditions, turn-off devices are required in the piping:

- At least on the outlet side when the transmitter is mounted in horizontal position
- At least on the inlet side when the transmitter is mounted in vertical position.
- In order to perform balancing during an ongoing process, it is advisable to mount a bypass pipe.
Sensor insulation

The sensor may only be insulated in conjunction with the option TE1 ‘Extended tower length for sensor insulation’ or TE2 ‘Extended tower length — insulation capacity with dual gasket,’ as shown in Figure 10.

Heat tracing of the sensor
When operating the sensor in conjunction with heat tracing, the temperature at point C (Figure 10) 100 °C (212 °F) may not be exceeded at any time!

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 or horizontal mounting position at a 30° incline is used. Refer to Liquid measuring media on page 23.

- The combination of process connections and gaskets selected by the operator may comprise only EHEDG-compliant components. Please note the information in the latest version of the EHEDG Position Paper: ‘Hygienic Process connections to use with hygienic components and equipment’ in this regard.

- The pipe fitting in accordance with DIN 11851 is approved for use in conjunction with an EHEDG-compliant gasket.

Devices for legal metrology in accordance with MID / OIML R117

The Coriolis mass flowmeters CoriolisMaster FCBx50 / FChx50 are type-tested for legal metrology in accordance with MID / OIML R117 in accuracy class 0.3.

Additional information can be found on the corresponding certificate. The certificate is available in the download area at www.abb.com/flow.

On devices for legal metrology in accordance with MID / OIML R117, the hardware write protection must be activated after commissioning.

This prevents a change in the parameterization of the devices.

To prevent deactivation of the hardware write protection or other manipulations during operation, the transmitter housing and the sensor housing connection box (with remote mount design) must be sealed.

For this purpose, a seal kit is available at ABB.

For the assembly of the seal, please observe the separate ‘IN/FCX100/FCX400/MID/OIML-XA’ instructions.
... 6 Installation

Temperature data

Note
When using the device in potentially explosive atmospheres, note the additional data in Use in potentially explosive atmospheres in accordance with ATEX and IECEx on page 6 and Use in potentially explosive atmospheres in accordance with cFMus on page 12!

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

Ambient temperature \( T_{\text{amb.}} \)
−40 to 70 °C (−40 to 158 °F)

Note
In devices with order code ‘Extended tower length – TE3’, from an ambient temperature of \( \geq 65 \) °C (149 °F), the measuring medium temperature must be limited to a maximum of 140 °C (284 °F).

Material load for process connections

Note
You can reference the availability of the different process connections in the Online ABB Product Selection Assistant (PSA) for flow www.abb.com/flow-selector.

- Not all connections shown here are available in all the devices and designs.
- The permissible material load of the device can additionally differ from the material load of the connection. The permissible limit values (pressure rating / measuring medium temperature \( T_{\text{medium}} \)) can be found on the name plate.

<table>
<thead>
<tr>
<th>Design</th>
<th>Nominal diameter</th>
<th>( P_{\text{max}} )</th>
<th>( T_{\text{max}} )</th>
<th>( T_{\text{min}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe fitting</td>
<td>DN 15 to DN 40</td>
<td>40 bar (290 psi)</td>
<td>140 °C (284 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td>(DIN 11851)</td>
<td>(½ to 1⅛ in)</td>
<td>(580 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN 50 to DN 100</td>
<td>25 bar (290 psi)</td>
<td>140 °C (284 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td></td>
<td>(2 to 4 in)</td>
<td>(363 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe fitting</td>
<td>DN 25 to DN 80</td>
<td>6 bar (290 psi)</td>
<td>140 °C (284 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td>(SMS 1145)</td>
<td>(1 to 3 in)</td>
<td>(87 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tri-Clamp</td>
<td>DN 15 to DN 50</td>
<td>16 bar (290 psi)</td>
<td>120 °C (248 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td>(DIN 32676)</td>
<td>(½ to 2 in)</td>
<td>(232 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN 65 to DN 100</td>
<td>10 bar (290 psi)</td>
<td>120 °C (248 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td></td>
<td>(2⅝ to 4 in)</td>
<td>(145 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASME BPE Clamp</td>
<td>&lt; DN 80 (&lt; 3 in)</td>
<td>17.1 bar (290 psi)</td>
<td>121 °C (249.8 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(248 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN 80 (&lt; 3 in)</td>
<td>15.5 bar (290 psi)</td>
<td>121 °C (249.8 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(224.8 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN 100 (&lt; 4 in)</td>
<td>12.9 bar (290 psi)</td>
<td>121 °C (249.8 °F)</td>
<td>−40 °C (−40 °F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(187.1 psi)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Material load curves for flange devices

Figure 12: Stainless steel DIN flange 1.4571 / 1.4404 (316Ti / 316L) to DN 200 (8 in.)

Figure 13: Stainless steel ASME flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8 in.)

Figure 14: Nickel alloy DIN flange C4 (2.4610) or nickel alloy C22 (2.4602) up to DN 200 (8 in.)

Figure 15: Nickel alloy ASME flange C4 (2.4610) or nickel alloy C22 (2.4602) up to DN 200 (8 in.)

Figure 16: Stainless steel JIS B2220 flange 1.4435 or 1.4404 (AISI 316L) , nickel alloy C4 (2.4610) or nickel alloy C22 (2.4602)
6 Installation

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.

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:
- A valid fire permit must be present.
- Make sure that there is no explosion hazard.
- Switch off the power supply and wait for t > 10 minutes before opening.

Figure 17: Cover lock (example)

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.

To open the housing, release the cover lock by screwing in the Allen screw 1.
After closing the housing, lock the housing cover by unscrewing the Allen screw 1.

7 Electrical connections

Safety instructions

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.

Note

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 this manual must be observed; otherwise, the IP rating may be adversely affected. Ground the measurement system according to requirements.
Installing the connection cables
Ensure that a drip loop (water trap) is used when installing the connecting cables for the sensor.

Figure 18: Laying the connection cable

Pin assignment
Models FCB130, FCB150, FCH130 and FCH150

![Pin assignment diagram]

<table>
<thead>
<tr>
<th>PA</th>
<th>Potential equalization</th>
</tr>
</thead>
</table>

Figure 19: Electrical connection

Connections for the power supply

<table>
<thead>
<tr>
<th>DC voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</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>
</tbody>
</table>
| 41 / 42 | Passive digital output DO1
The output can be configured as a pulse output, frequency output or switch output. |
| 51 / 52 | Passive digital output DO2
The output can be configured as a pulse output or switch output. |
... 7 Electrical connections

Electrical data for inputs and outputs

**Note**
When using the device in potentially explosive atmospheres, observe the additional connection data in *Use in potentially explosive atmospheres in accordance with ATEX and IECEx* on page 6 and *Use in potentially explosive atmospheres in accordance with cFMus* on page 12!

**Power supply**

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

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

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

Can be configured via Modbus.

**Figure 20:** Maximum cable lengths (examples)

**Figure 21:** Passive digital outputs (I = internal, E = external)

**Pulse / frequency output (passive)**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 / 42</td>
<td>Pulse / frequency</td>
<td></td>
</tr>
<tr>
<td>51 / 52</td>
<td>Pulse</td>
<td></td>
</tr>
</tbody>
</table>

**Output ‘closed’**

- 0 V ≤ \( U_{CEL} \) ≤ 3 V
- \( f < 2.5 \text{ kHz} \): 2 mA < \( I_{CEL} \) ≤ 30 mA
- \( f > 2.5 \text{ kHz} \): 10 mA < \( I_{CEL} \) ≤ 30 mA

**Output ‘open’**

- 16 V ≤ \( U_{CEH} \) ≤ 30 V DC
- 0 mA ≤ \( I_{CEH} \) ≤ 0.2 mA
- \( f_{\text{max}} \) = 10.5 kHz
- Pulse width = 0.1 to 2000 ms
Binary output (passive)

<table>
<thead>
<tr>
<th>Terminals</th>
<th>41 / 42, 51 / 52</th>
</tr>
</thead>
</table>
| Output 'closed' | $0 \leq U_{CEL} \leq 3\,V$  
| | $2\,mA \leq I_{CEL} \leq 30\,mA$ |
| Output 'open' | $16\,V \leq U_{CEH} \leq 30\,V\,DC$  
| | $0\,mA \leq I_{CEH} \leq 0.2\,mA$ |
| Switching function | Configurable |

**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 $\geq 30\,ms$ and a maximum frequency of $f_{\text{max}} \leq 3\,kHz$.

---

**Modbus® communication**

**Note**
The Modbus® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

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.

### Modbus protocol

<table>
<thead>
<tr>
<th>Terminals</th>
<th>V1 / V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Via the Modbus interface or via the local operating interface in connection with Asset Vision Basic (DAT200) and a corresponding Device Type Manager (DTM)</td>
</tr>
<tr>
<td>Transmission</td>
<td>Modbus RTU - RS485 serial connection</td>
</tr>
</tbody>
</table>
| Baud rate | 2400, 4800, 9600, 19200, 38400, 56000, 57600, 115200 baud  
| | Factory setting: 9600 baud |
| Parity | None, even, odd  
| | Factory setting: odd |
| Stop bit | One, two  
| | Factory setting: One |
| IEEE format | Little endian, big endian  
| | Factory setting: Little endian |
| Typical response time | $< 100\,ms$ |
| Response delay time | 0 to 200 milliseconds  
| | Factory setting: 10 milliseconds |
## 7 Electrical connections

### Modbus® communication

![Modbus connection diagram](image)

**Figure 22: Communication with the Modbus protocol**

**1.** Modbus master  
**2.** Terminating resistor  
**3.** Modbus slave 1  
**4.** Modbus slave n to 32

#### 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, a 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 19200 and above.
Connection on the device

---

**NOTICE**

**Potential 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.

---

Connecting integral mount design
Perform steps A to 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. 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.

Observe the following points when connecting to the power supply:
- Adhere to the limit values of the power supply in accordance with the information on the device name plate.
- The cables must comply with IEC 227 or IEC 245.
- Complete the electrical connection in accordance with the electrical connection diagram.
8 Commissioning and operation

Write-protection switch, service LED and local operator interface

![Figure 24: Operating elements in the terminal box]

1. Write protection switch 
2. Service LED 
3. Local operating interface

Write-protect 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 function, while turning the switch counterclockwise activates it. The power supply to the transmitter must be briefly interrupted in order for the modified setting to take effect.

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, refer to &quot;Diagnosis&quot; in the device operating instruction (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 Parameterization via the local operating interface on page 36.

Checks prior to commissioning

The following points must be checked before commissioning the device:
- Correct wiring in accordance with Electrical connections on page 28.
- Correct grounding of the device.
- The ambient conditions must meet the requirements set out in the specification.
- The power supply must meet the requirements set out on the name plate.

**NOTICE**
Damage to the device due to undervoltage.
In the event that lower voltage is supplied than indicated on the name plate, the current consumption of the device increases. The internal fuses can be damaged as a result.
- Make sure that the minimum operating voltage of the device is not down-scaled (see also Electrical data for inputs and outputs on page 30).

Switching on the power supply
1. Switch on the power supply.
2. Perform parameterization of the flowmeter (see Parameterization of the device on page 35).
The flowmeter is now ready for operation.

Inspection after power-up of the power supply
The following points must be checked after commissioning the device:
- Parameter configuration must correspond to the operating conditions.
- The system zero point has been balanced (see Zero point balance under operating conditions on page 38).
Parameterization of the device

Note
- The device does not have the 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)!

Parameterization via the Modbus interface
In case of parameterization via the Modbus interface, refer to the interface description in the device operating instruction (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.

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 Parameterization via the Modbus interface on page 35).
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 [register length]</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 Factory setting for the Modbus slave ID (address) on page 35). 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>

The three 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.
8 Commissioning and operation

Parameterization of the device

Parameterization via the local operating interface

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

![Diagram of connection to the local operating interface]

**Figure 27:** Connection to the local operating interface

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.

**Note**
Any required drivers are automatically installed by Windows®. If installation of the drivers does not start automatically, search for the drivers using the Windows driver search. If you do not have an Internet connection, use the ‘Prolific Driver’ software packages.

4. Switch on the device power supply.
5. Perform parameterization of the device.

Installation of ABB AssetVision Basic and ABB Field Information Manager (FIM)

There are two different software packages available for configuration:

- **ABB AssetVision Basic with the ABB CoriolisMaster Device Type Manager (DTM)**
  
  The required software and drivers can be downloaded using the adjacent download link.

  **Installation of the software and connection to the flowmeter:**
  1. Unpack the downloaded archive file to the c:\temp folder.
  2. AssetVision Basic (DAT200) install ‘3KXD151200S0000_Tool_DAT200_Asset_Vision_Basic’.
  3. HART Communication DTM install ‘ABB DTM HART Communication ServicePort’.
  5. Connect the flowmeter with the PC / laptop, see Connection on the device on page 36.
  6. Power-up the power supply for the flowmeter and start AssetVision Basic on the PC / laptop
     - Select HART and ‘ABB HART Communication ServicePort’.
     - Select the corresponding COM port.
     - Baud rate 19200
     - The flowmeter is detected and the CoriolisMaster DTM starts automatically.
     - Confirm the dialog field ‘Upload parameters’ by selecting ‘yes’.

- **ABB Field Information Manager (FIM)**

Field Information Manager (FIM) with the ABB CoriolisMaster Field Device Information Package

1. Download the ABB Field Information Manager (FIM) using the adjacent download link.

2. Download the ABB FDI package using the following download link.

Installation of the software and connection to the flowmeter:
1. Install ABB Field Information Manager (FIM).
2. Unpack the ABB FDI package into the c:\temp folder.
3. Connect the flowmeter with the PC / laptop, see Connection on the device on page 36.
4. Power-up the power supply for the flowmeter and start the ABB Field Information Manager (FIM).
5. Drag and drop the ‘ABB.FCXxxx.02.00.00.HART.fdix’ file (or a newer version) to the ABB Field Information Manager (FIM). No special view is needed for this.
6. Right-click  as shown in Figure 28.
7. Select ‘DEVICE SETTINGS’  as shown in Figure 28.
8. Select the corresponding COM port. Close the menu by clicking on “send”.
9. By using the  menu button on the left side, the flowmeter is displayed under ‘TOPOLOGY’.

All the submenus can be accessed by clicking the three points below the tag name of the flowmeter with the left mouse button 1.
... 8 Commissioning and operation

Zero point balance 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<sub>max,DN</sub>).
- 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 meter tube is completely filled with the measuring medium.
- For liquid measuring media, no gas bubbles or air pockets may be present in the meter tube.
- For gaseous measuring media, no liquid components or condensates may be present in the meter tube.
- The pressure and the temperature in the meter tube correspond to standard operating conditions and are stable.

In case of an increased zero point (>0.1%), check the installation for ‘best praxis’ and make sure that no gas content is contained in liquids, or that there are no liquids or particles in gases. See also Turn-off devices for the zero point adjustment on page 24.

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

9 Maintenance

Safety instructions

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:

- A valid fire permit must be present.
- Make sure that there is no explosion hazard.
- Switch off the power supply and wait for t > 10 minutes before opening.

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.

NOTICE

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.

Note

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

Operating instructions

When operating the device, please note the following:

- Aggressive or corrosive media can lead to damage of wetted parts. As a result, pressurized media may escape prematurely.
- Wear to the flange gasket or process connection gaskets (such as aseptic pipe fittings, Tri-Clamp, etc.) can cause pressurized media to escape.
- When using internal flat gaskets, these can become brittle as a result of 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.
10 Dismounting and disposal

Dismounting

**WARNING**

Risk of injury due to process conditions.
The process conditions, for example high pressures and
temperatures, toxic and aggressive measuring media, can
give rise to hazards when dismantling the device.
- If necessary, wear suited personal protective equipment
during disassembly.
- Before disassembly, make sure that the process
conditions do not pose any safety risks.
- Depressurize and empty the device / piping, allow to cool
and purge if necessary.

Bear the following points in mind when dismantling the device:
- Switch off the power supply.
- Disconnect electrical connections.
- Allow the device / piping to cool and depressurize and
empty. Collect any escaping medium and dispose of it in
accordance with environmental guidelines.
- Use suited tools to disassemble the device, taking the
weight of the device into consideration.
- If the device is to be used at another location, the device
should preferably be packaged in its original packing so
that it cannot be damaged.
- Observe the notices in Returning devices on page 21.

Disposal

**Note**

Products that are marked with the adjacent symbol
may not be disposed of as unsorted municipal waste (domestic waste).
They should be disposed of through separate
collection of electric and electronic devices.

This product and its packaging are manufactured from materials
that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:
- As of 8/15/2018, this product will be under the open
scope of the WEEE Directive 2012/19/EU and relevant
national laws (for example, ElektroG - Electrical
Equipment Act - in Germany).
- The product must be supplied to a specialist recycling
company. Do not use municipal waste collection points.
These may be used for privately used products only in
accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment
properly, our Service can take care of its pick-up and
disposal for a fee.
11 Specification

Note
The device data sheet is available in the ABB download area at www.abb.com/flow.

12 Additional documents

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

Trademarks

Modbus is a registered trademark of Schneider Automation Inc.
Hastelloy C-4 is a trademark of Haynes International
Hastelloy C-22 is a trademark of Haynes International
Windows is a registered trademark of Microsoft Corporation
13 Appendix

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: Email:

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

Was this device used in conjunction with substances which pose a threat or risk to health?
☐ Yes ☐ No
If yes, which type of contamination (please place an X next to the applicable items):
☐ biological ☐ corrosive / irritating ☐ combustible (highly / extremely combustible)
☐ toxic ☐ explosive ☐ other toxic substances
☐ radioactive

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

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

Town/city, date Signature and company stamp
Installation diagram 3KXF000014G0009
<table>
<thead>
<tr>
<th>HAZARDOUS LOCATION</th>
<th>INSTALLATION DIAGRAM FCB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Div 1 &amp; ZN 0/12/21</td>
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<tr>
<td>US and Canadian application</td>
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<td>HAZARDOUS LOCATION</td>
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<tr>
<td>ORDINARY LOCATION</td>
<td>SIGNAL DATA INPUT/OUTPUT</td>
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<tr>
<td>GENERAL PURPOSE</td>
<td></td>
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<tr>
<td>POWER SUPPLY</td>
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<td>Non IS Terminals</td>
<td>max 30V DC</td>
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<tr>
<td>SIGNAL DATA INPUT/OUTPUT</td>
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<tr>
<td>Intrinsic Safety IS, la</td>
<td>Up to 2V</td>
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<tr>
<td>Connected to FIM, CSA, LISTED BARRIER</td>
<td>Up to 30V</td>
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<tr>
<td>ALTERNATIVE TO</td>
<td>SIGNAL DATA INPUT/OUTPUT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Non Intrinsically Safe</td>
<td>max 30V/m s</td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>
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:
   \[ U_o \text{ OR } V_o < V_{\text{MAX}}, \quad I_o \text{ OR } I_c < I_{\text{MAX}}, \]
   \[ C_o \text{ OR } C_i > C_{\text{max}}, \quad L_o \text{ OR } L_i < L_{\text{MAX}}. \]

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 Vrms OR Vdc WITH RESPECT TO EARTH.

4. Installation should be in accordance with the relevant international or national regulations including the installation of intrinsically safe systems for hazardous (classified) locations.

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:
   \[ U_o \text{ OR } V_o < V_{\text{MAX}}, \quad I_o \text{ OR } I_c < I_{\text{MAX}}, \]
   \[ C_o \text{ OR } C_i > C_{\text{max}}, \quad L_o \text{ OR } L_i < L_{\text{MAX}}. \]

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 Vrms OR Vdc WITH RESPECT TO EARTH.

4. Installation for U.S. and Canadian approved equipment should be in accordance with ANSI/ISA RP12.6 „Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations“: The National Electrical Code (ANSI/NFPA 70) Sections 504, 505 and the Canadian Electrical Code (C22.1-02).

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>MINT</th>
<th>Modbus communication variants</th>
<th>Modbus active</th>
<th>Digital DO1 Output</th>
<th>Digital DO2 Output</th>
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<tr>
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<td>Terminal 41/42</td>
<td>Terminal 51/52</td>
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<tr>
<td>F_a1cA1fleghiB2</td>
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<td></td>
<td></td>
<td></td>
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<td>F_a1cF1fleghiB1</td>
<td></td>
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<table>
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<tr>
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<th>Ex/NI</th>
<th>Operating Value</th>
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<td>C2</td>
<td>C3</td>
<td>C4</td>
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<td>Po</td>
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<tr>
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<td>U2</td>
<td>U3</td>
<td>U4</td>
</tr>
<tr>
<td>I0</td>
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<td>I2</td>
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<td>[mF]</td>
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<td>[mV]</td>
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<td>150 150 13900</td>
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</table>

| L0       | L1     | L2             | L3      | L4      |
| [μH]    | [μH]   | [μH]           | [μH]    | [μH]    |
| 20      | 20     | 20             | 20      | 20      |

Installation diagram FCB

Note: The diagram and table provide specific technical details for the CoriolisMaster FCB100, FCH100 Coriolis Mass Flowmeter. For detailed specifications, refer to the CI/FCB100/FCH100-EN REV. E manual.
ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/flow

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