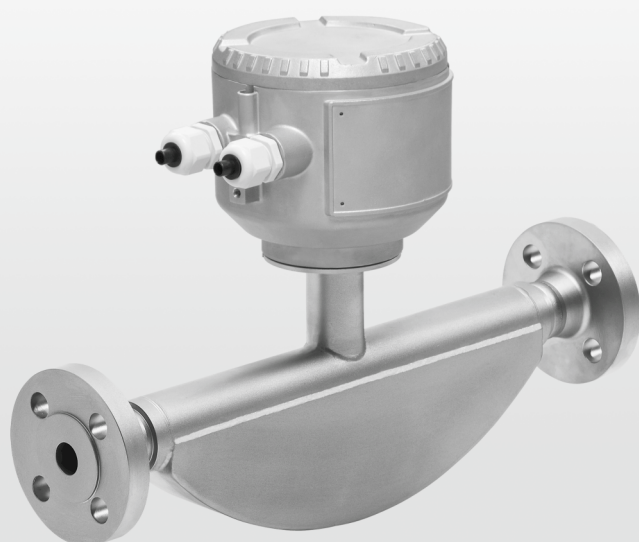


CoriolisMaster FCB100, FCH100

Coriolis mass flowmeter



Device firmware version:
≥ 01.09.02

Measurement made easy

—
FCB130 / FCB150
FCH100 / FCH150

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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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 flowmeter 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.

... 1 Safety

Cyber security disclaimer

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 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.

Software downloads

By visiting the web pages indicated below, you will find notifications about newly found software vulnerabilities and options to download the latest software. It is recommended that you visit this web pages regularly:

www.abb.com/cybersecurity

[ABB-Library – CoriolisMaster FCx100 – Software Downloads](#)



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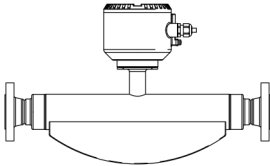
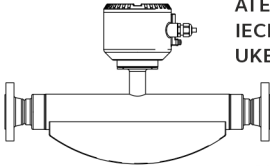
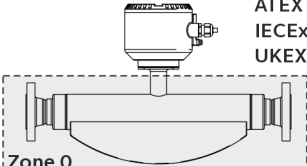
2 Use in potentially explosive atmospheres

Note

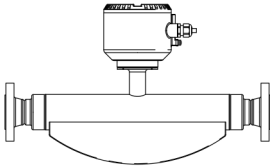
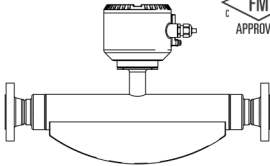
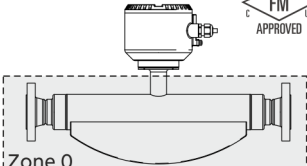
Further information on the approval of devices for use in potentially explosive atmospheres can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

Device overview

ATEX, IECEx and UKEX

	Standard / No explosion protection	Zone 2, 21, 22	Zone 1, 21 (Zone 0)
Model number	FCx1xx Y0	FCx1xx A2, U2	FCx1xx A1, U1
<ul style="list-style-type: none"> Standard Zone 2, 21, 22 Zone 1, 21 Zone 0 		 <div>ATEX IECEX UKEX</div>	 <div>ATEX IECEX UKEX</div> <div>Zone 0</div>

cFMus

	Standard / No explosion protection	Class I Div. 2 Zone 2, 21	Class I Div. 1 Zone 0, 1, 20, 21
Model number	FCx1xx Y0	FCx1xx F2	FCx1xx F1
<ul style="list-style-type: none"> Standard Class I Div. 2 Class I Div. 1 Zone 2, 21 Zone 1, 21 Zone 0, 20 		 <div>FM APPROVED</div>	 <div>FM APPROVED</div> <div>Zone 0</div>

... 2 Use in potentially explosive atmospheres

Ex marking

Note

- A specific marking applies, depending on the design.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

ATEX, IECEx and UKEX

Model FCx1xx-A2, U2... in Zone 2, 21, 22

ATEX

Certificate (ATEX): FM 14 ATEX0017X

Certificate (UKEX): FM22UKEX0041X

II 3 G Ex ec mc IIC T6 ... T2 Gc

FM 14 ATEX0016X

II 2 D Ex tb IIIC T85°C ... T_{medium} Db

IECEx

Certificate: IECEx FME 14.0003X

Ex ec mc IIC T6 ... T2 Gc

Ex tb IIIC T85°C ... T_{medium} Db

Model FCx1xx-A1, U1... in Zone 1, 21 (Zone 0)

ATEX

Certificate (ATEX): FM 14 ATEX0016X

Certificate (UKEX): FM22UKEX0042X

II 1/2 G Ex eb ia mb IIC T6 ... T2 Ga/Gb

II 2 D Ex ia tb IIIC T85°C ... T_{medium} Db

IECEx

Certificate: IECEx FME 14.0003X

Ex eb ia mb IIC T6 ... T2 Ga/Gb T_{amb,max}= 70°C

Ex ia tb IIIC T85°C ... T_{medium} Db

cFMus

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

FM (marking US)

Certificate: FM16US0201X

NI: CL I, DIV2, GPS ABCD, T6 ... T2

NI: 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 T6 ... T2 Gc

ZN 21 AEx tb IIIC T85°C ... T165°C Db

See Instructions for temperature class information

FM (marking Canada)

Certificate: FM16CA0104X

NI: CL I, DIV2, GPS ABCD, T6 ... T2

NI: 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)

Certificate: 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 IIIC T85°C to T165°C Db

See Instructions for temperature class information and Installation Drawing

No. 3KXF000014G0009

FM (marking Canada)

Certificate: 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_{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.

$T_{\text{amb.}}$	Temperature resistance for the connecting cable
$\leq 50\text{ °C}$ ($\leq 122\text{ °F}$)	$\geq 105\text{ °C}$ ($\geq 221\text{ °F}$)
$\leq 60\text{ °C}$ ($\leq 140\text{ °F}$)	$\geq 110\text{ °C}$ ($\geq 230\text{ °F}$)
$\leq 70\text{ °C}$ ($\leq 158\text{ °F}$)	$\geq 120\text{ °C}$ ($\geq 248\text{ °F}$)

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

Environmental and process conditions for model FCx1xx...

Ambient temperature $T_{\text{amb.}}$	-20 to 70 °C (-4 to 158 °F)
	-40 to 70 °C* (-40 to 158 °F)*
Measuring medium temperature	-40 to 205 °C
T_{medium}	(-40 to 400 °F)
IP rating / NEMA rating	IP 65, IP 67 / NEMA 4X, Type 4X

* Optional, with order code 'Ambient temperature range – TA9'

... 2 Use in potentially explosive atmospheres

... Temperature data

Measuring medium temperature (Ex data) for model FCx1xx-A1, U1... in Zone 1

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

Ambient temperature T _{amb.}	Temperature class					
	T1	T2	T3	T4	T5	T6
≤ 30 °C (≤ 86 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 40 °C (≤ 104 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 50 °C (≤ 122 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 60 °C (≤ 140 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 70 °C (≤ 158 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)

Measuring medium temperature (Ex data) for model FCx1xx-A2, U2... in Zone 2

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

Ambient temperature T _{amb.}	Temperature class					
	T1	T2	T3	T4	T5	T6
≤ 30 °C (≤ 86 °F)	205 °C (400 °F)*	205 °C (400 °F)*	195 °C (383 °F)*	130 °C (266 °F)*	95 °C (203 °F)*	80 °C (176 °F)
	195 °C (383 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	
≤ 40 °C (≤ 104 °F)	205 °C (400 °F)*	205 °C (400 °F)*	195 °C (383 °F)*	130 °C (266 °F)*	95 °C (203 °F)*	—
	180 °C (356 °F)	180 °C (356 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	
≤ 50 °C (≤ 122 °F)	205 °C (400 °F)*	205 °C (400 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	80 °C (176 °F)*	—
	140 °C (284 °F)	140 °C (284 °F)	130 °C (266 °F)	95 °C (203 °F)	60 °C (140 °F)	
≤ 60 °C (≤ 140 °F)	205 °C (400 °F)*	205 °C (400 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	—	—
	120 °C (248 °F)	120 °C (248 °F)	120 °C (248 °F)	95 °C (203 °F)		
≤ 70 °C (≤ 158 °F)	180 °C (356 °F)*	180 °C (356 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	—	—
	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)		

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

Measuring medium temperature (Ex data) for model FCx1xx-A1, U1... in Zone 21 and FCx1xx-A2, U2... in Zone 22

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

Ambient temperature T _{amb.}	Temperature class				
	T210 °C	T200 °C	T135 °C	T100 °C	T85 °C
≤ 30 °C (≤ 86 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	80 °C (176 °F)
≤ 50 °C (≤ 122 °F)	140 °C (284 °F)	130 °C (266 °F)	95 °C (203 °F)	60 °C (140 °F)	—
≤ 60 °C (≤ 140 °F)	120 °C (248 °F)	120 °C (248 °F)	95 °C (203 °F)	—	—
≤ 70 °C (≤ 158 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	—	—

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.

Ambient temperature T _{amb.}	Temperature class					
	T1	T2	T3	T4	T5	T6
≤ 30 °C (≤ 86 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 40 °C (≤ 104 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 50 °C (≤ 122 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 60 °C (≤ 140 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
≤ 70 °C (≤ 158 °F)	205 °C (400 °F)	205 °C (400 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)

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.

Ambient temperature T _{amb.}	Temperature class					
	T1	T2	T3	T4	T5	T6
≤ 30 °C (≤ 86 °F)	205 °C (400 °F)*	205 °C (400 °F)*	195 °C (383 °F)*	130 °C (266 °F)*	95 °C (203 °F)*	80 °C (176 °F)
	195 °C (383 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	
≤ 40 °C (≤ 104 °F)	205 °C (400 °F)*	205 °C (400 °F)*	195 °C (383 °F)*	130 °C (266 °F)*	95 °C (203 °F)*	—
	180 °C (356 °F)	180 °C (356 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	
≤ 50 °C (≤ 122 °F)	205 °C (400 °F)*	205 °C (400 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	80 °C (176 °F)*	—
	140 °C (284 °F)	140 °C (284 °F)	130 °C (266 °F)	95 °C (203 °F)	60 °C (140 °F)	
≤ 60 °C (≤ 140 °F)	205 °C (400 °F)*	205 °C (400 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	—	—
	120 °C (248 °F)	120 °C (248 °F)	120 °C (248 °F)	95 °C (203 °F)		
≤ 70 °C (≤ 158 °F)	180 °C (356 °F)*	180 °C (356 °F)*	130 °C (266 °F)*	130 °C (266 °F)*	—	—
	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)		

* 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.

Ambient temperature T _{amb.}	Temperature class				
	T210 °C	T200 °C	T135 °C	T100 °C	T85 °C
≤ 30 °C (≤ 86 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)	80 °C (176 °F)
≤ 50 °C (≤ 122 °F)	140 °C (284 °F)	130 °C (266 °F)	95 °C (203 °F)	60 °C (140 °F)	—
≤ 60 °C (≤ 140 °F)	120 °C (248 °F)	120 °C (248 °F)	95 °C (203 °F)	—	—
≤ 70 °C (≤ 158 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	—	—

... 2 Use in potentially explosive atmospheres

Electrical data – ATEX, IECEx, UKEX and cFMus

Modbus outputs and digital outputs

Modell ATEX, IECEx, UKCA: FCx1xx-A1, U1..., FCx1xx-A2, U2...

Modell: cFMus: FCx1xx-F1..., FCx1xx-F2...

Outputs	Operating values		Type of protection									
	(general)		„ec“ / „NI“		„eb“ / „XP“		„ia“ / „IS“					
	U _N [V]	I _N [mA]	(Zone 2 / Div. 2)		(Zone 1 / Div. 1)		(Zone 1 / Div. 1)					
	U _N [V]	I _N [mA]	U _N [V]	I _N [mA]	U _M [V]	I _M [mA]	U _O [V]	I _O [mA]	P _O [mW]	C _O [nF]	C _{O pa} [nF]	L _O [μH]
Modbus, active	3	30	3	30	30	30	4,2	150	150	13900	—	20
Terminals A / B							U _i [V]	I _i [mA]	P _i [mW]	C _i [nF]	C _{i pa} [nF]	L _i [μH]
							4,2	150	150	13900	—	20
Digital output DO1, passive	30	25	30	25	30	25	30	25	187	2,4	—	200
Terminals 41 / 42												
Digital output DO2, passive	30	25	30	25	30	25	30	25	187	20	—	200
Terminals 51 / 52												

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.

Note

The safety requirements for intrinsically safe circuits in the EC type examination certificate of the device must be complied with.

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 $U_M = 30 \text{ V}$.
- Intrinsic safety is preserved If the rated voltage $U_M = 30 \text{ V}$ 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

ATEX, IECEx and UKEX

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.

Observe the safety instructions for electric apparatus for potentially explosive atmospheres in accordance with Directive 2014/34/EU (ATEX) or British Regulations (UKEX) and for example IEC 60079-14 (installation of electric equipment in potentially explosive atmospheres).

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 7 are observed.

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

cFMus

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 7 are observed.

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

Use in areas exposed to combustible dust

When using the device in areas exposed to combustible dusts (dust ignition), EN 60079-31 as well as 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).
- Approved dust-proof cable glands must be used when operating in Zone 21, 22 or in Class II, Class III.

Sensor insulation

Observe the notes in **Sensor insulation** on page 24 if the sensor should be insulated.

Observe the information in **Temperature data** on page 7 regarding temperature class and cable specification.

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 $t > 20$ 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 27.

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

... Installation instructions

Cable entries in accordance with ATEX/IECEx and UKEX

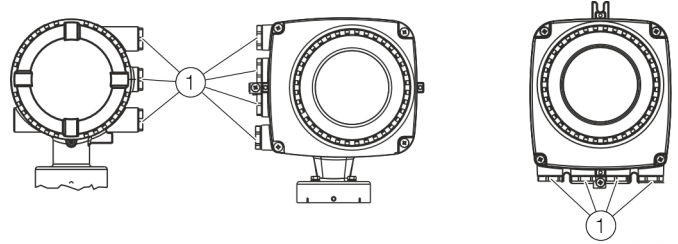
The cable glands supplied are ATEX-, IECEx- or UKEX certified.

- 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.

Cable entries in accordance with cFMus



① Transport protection plugs

Figure 1: Cable entry

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.

Specific Conditions of Use

WARNING

Special conditions for safe use!

- The painted surface of the CoriolisMaster Flowmeters may store electrostatic charge and become a source of ignition in applications with a low relative humidity ($< \sim 30\%$) even where the painted surface is relatively free of surface contamination such as dirt, dust, or oil.
 - Guidance on protection against the risk of ignition due to electrostatic discharge can be found in PD CLC/TR 60079-32-1 and IEC TS 60079-32-1.
 - Cleaning of the painted surface should only be done with a damp cloth.
- The section **Temperature data** on page 7 ff. details the permitted temperature classification and ambient temperature ratings as influenced by the process medium temperature.
- Contact the manufacturer for specific flameproof joint details during repair of flameproof Ex d apparatus.
- For models with option m = C provision shall be made external to the equipment, to provide the transient protection device to be set at a level not exceeding 140 % of the peak rated voltage value of 42 V DC.

Electrical connections

Note

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

For the electric connection of the device, use only cables with sufficient temperature resistance in accordance with the tables at **Temperature resistance for the connecting cable** on page 7.

Perform grounding of the device in accordance with **Terminal assignment** on page 28.

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 **Terminal assignment** on page 28.

Power supply terminal cover

Make sure that the power supply terminal cover is closed tightly, see also **Connection on the device** on page 31.

... 2 Use in potentially explosive atmospheres

... Installation instructions

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:

Limit values

Flange or pipe material	No limitations
Nominal sizes	DN 15 to DN 150 (½ to 6 in)
Operating temperature	-50 °C to 205 °C (-58 °F to 400 °F)
Process pressure	PN 100 / Class 600

Operating instructions

Protection against electrostatic discharges

DANGER

Explosion hazard due to electrostatic charging!

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 / XP' are equipped with flameproof joints in the housing. Contact ABB before commencing repair work.

Changing the type of protection – ATEX, IECEx and UKEX

For installation in Zone 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 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.

Original installation	New installation	Necessary test steps
Zone 1: Modbus interface and digital outputs in non-intrinsically safe design	Zone 1: Modbus interface and digital outputs in intrinsically safe ia / IS design	<ul style="list-style-type: none"> • 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.
Zone 1: Modbus interface and digital outputs in intrinsically safe ia(ib) / IS design	Zone 1: Modbus interface and digital outputs in non-intrinsically safe design	<ul style="list-style-type: none"> • Visual inspection, no damage visible on the threads (cover, ½ in NPT cable glands).

Note

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

... 2 Use in potentially explosive atmospheres

... Operating instructions

Changing the type of protection – cFMus

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.

Original installation	New installation	Necessary test steps
Housing: XP, $U_{\max} = 30\text{ V}$ Outputs non IS	Housing: XP Outputs: IS	<ul style="list-style-type: none"> • 500 V AC/1min or $500 \times 1.414 = 710\text{ V DC/1min}$ 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.
	Housings: Div 2 Outputs: NI	<ul style="list-style-type: none"> • 500 V AC/1min or $500 \times 1.414 = 710\text{ V DC/1min}$ 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.
Outputs: IS Housing: XP	Housing: XP Outputs: non IS	<ul style="list-style-type: none"> • Visual inspection, no damage visible on the threads (cover, $\frac{1}{2}$ in NPT cable glands).
	Housing: XP Outputs: NI	<ul style="list-style-type: none"> • No special measures.
Housing: XP, $U_{\max} = 30\text{ V}$ Outputs: NI	Housing: XP Outputs: IS	<ul style="list-style-type: none"> • 500 V AC/1min or $500 \times 1.414 = 710\text{ V DC/1min}$ 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.
	Housing: XP Outputs: non IS	<ul style="list-style-type: none"> • Visual inspection, no damage visible on the threads (cover, $\frac{1}{2}$ in NPT cable glands).

Note

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

3 Use in hazardous areas in accordance with EAC TR-CU-012

Note

- An additional document with information on EAC-Ex certification is available for measuring systems that are used in potentially explosive atmospheres in accordance with EAC TR-CU-012.
- The information on EAC-Ex certification is an integral part of this instruction. As a result, it is crucial that the installation guidelines and connection values it lists are also observed. The icon on the name plate indicates the following:



Information on EAC-Ex certification is available for free download at the following link. Alternatively simply scan the QR code.



[INF/FCX100/FCX400/EAC-Ex-X8](https://www.endress.com/INF/FCX100/FCX400/EAC-Ex-X8)

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.

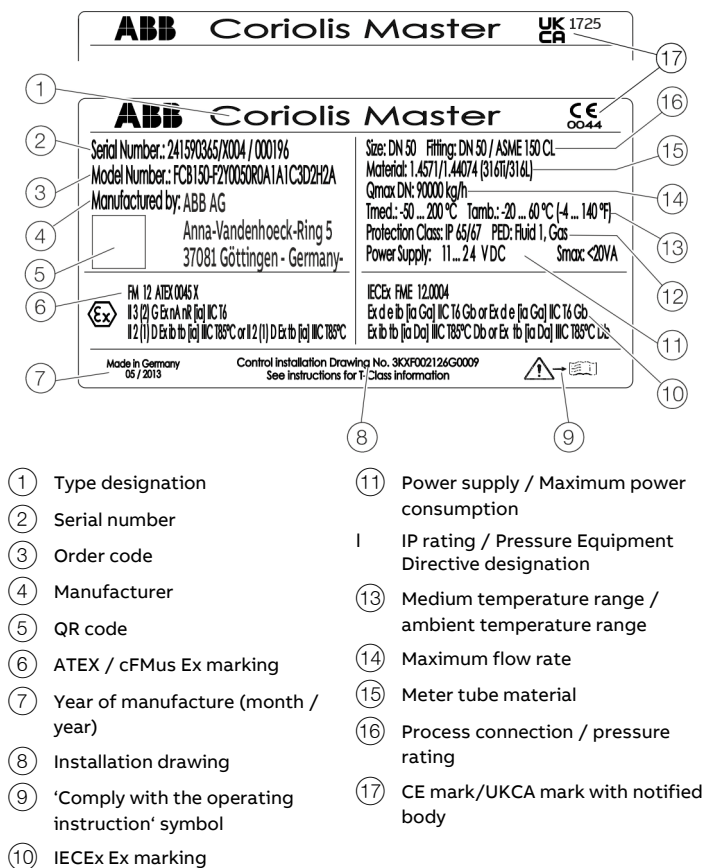


Figure 2: Name plate (sample)

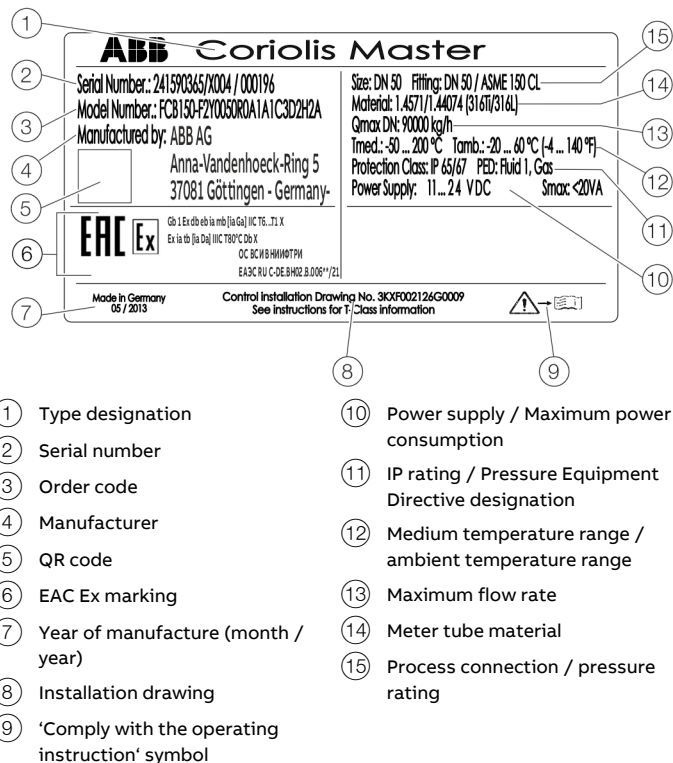
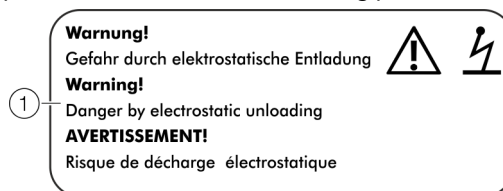


Figure 3: EAC-Ex name plate (example)

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



1 **WARNING!** – Danger due to electrostatic discharge.

Figure 4: Additional warning plate

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

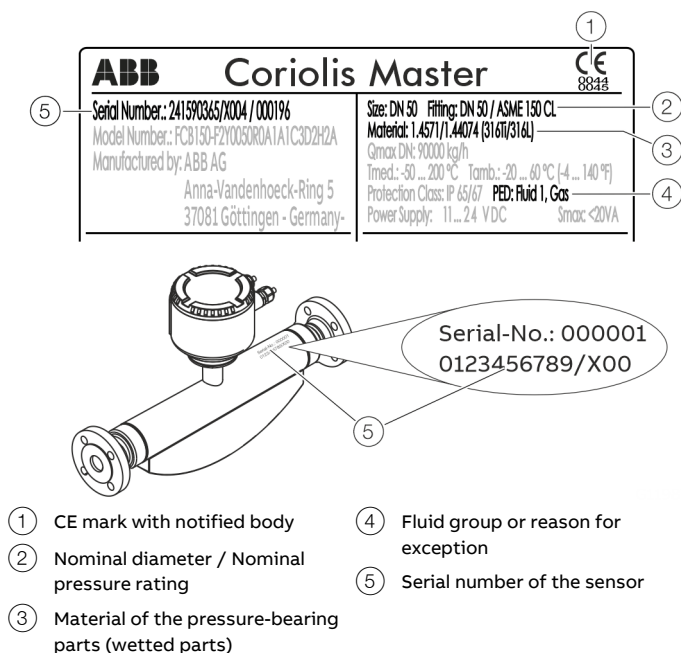


Figure 5: PED marking (example)

The marking is dependent on the nominal diameter ($> \text{DN } 25$ or $\leq \text{DN } 25$) 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 39) 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 4 for nearest service location.

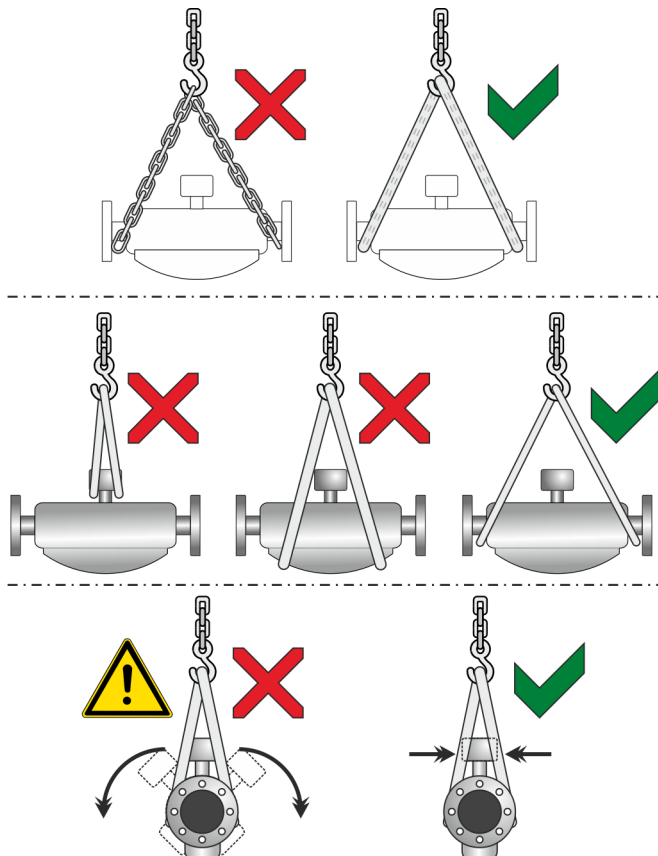


Figure 6: Transport instructions

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_{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_{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).

... 6 Installation

... General installation conditions

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

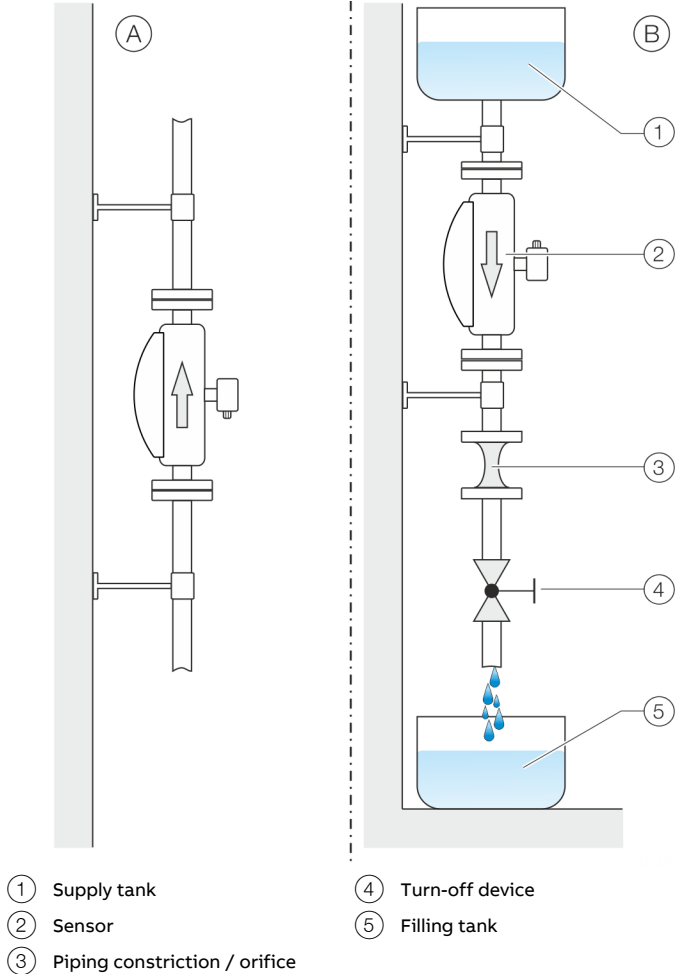


Figure 7: Vertical installation

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

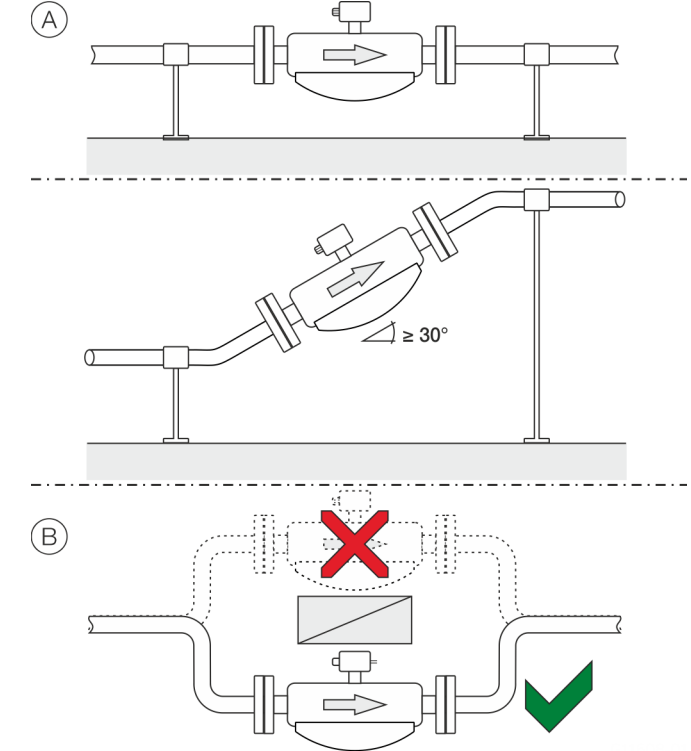


Figure 8: Horizontal installation

- Ⓐ 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 $\geq 30^\circ$.
- Ⓑ 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.

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

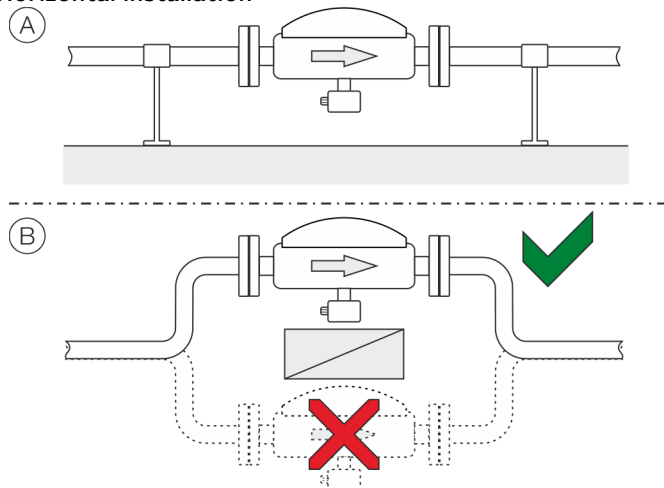
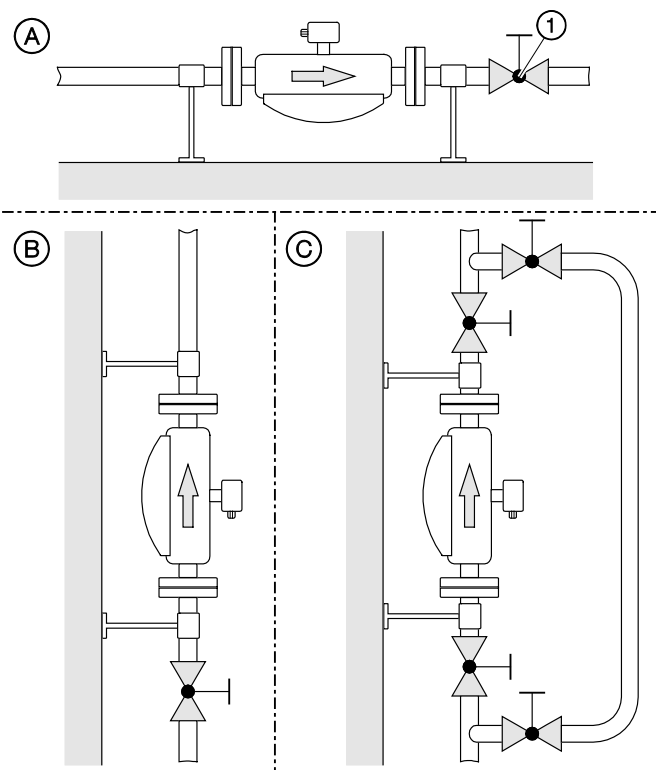


Figure 9: Horizontal installation

- (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.

Turn-off devices for the zero point adjustment



① Turn-off device

Figure 10: 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:

- (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 balancing during an ongoing process, it is advisable to mount a bypass pipe.

... 6 Installation

... General installation conditions

Sensor insulation

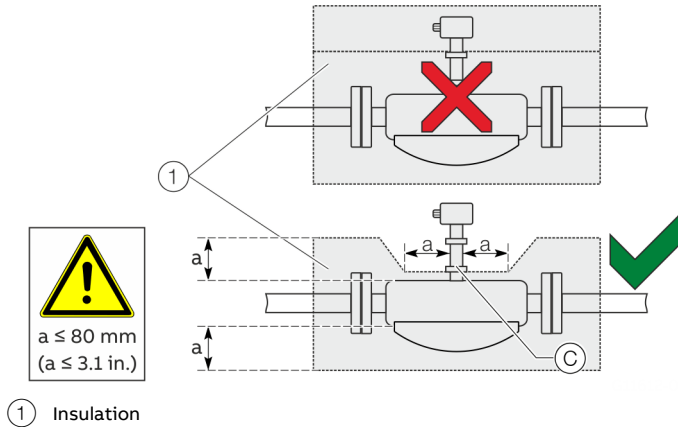


Figure 11: Installation at T_{medium} -50°C to 205 °C (-58 to 400 °F)

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 11.

Heat tracing of the sensor

When operating the sensor in conjunction with heat tracing, the temperature at point © (Figure 11) 100 °C (212 °F) may not be exceeded at any time!

Installation in EHEDG-compliant installations

WARNING

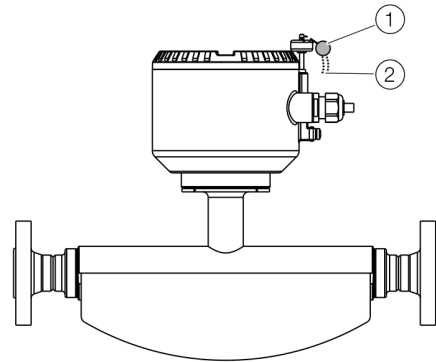
Risk of poisoning!

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 22.
- 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.

Devices for legal metrology



① Lead seal

② Lead seal wire

Figure 12: Sealing in accordance with MID / OIML R117 (example)

On devices for legal metrology, the hardware write protection must be activated after commissioning in many cases. This prevents a change in the parameterization of the devices.

Write-protect switch on page 32

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.

Process conditions

Note

When using the device in potentially explosive atmospheres, note the additional temperature data in **Temperature data** on page 7!

Temperature limits °C (°F)

Measuring medium temperature T_{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 ≥ 65 °C (149 °F), the measuring medium temperature must be limited to a maximum of 140 °C (284 °F).

Pressure ratings

The maximum permissible operating pressure is determined by the respective process connection, the temperature of the medium to be measured, the screws, and the gasket material. For an overview of available pressure ratings, see Device overview in the data sheet.

Housing as a protective device (optional)

Order code PR5

Maximum burst pressure 60 bar (870 psi)

Optional order code PR6 and PR7 on request

- Increased burst pressures up to 100 bar (1450 psi), possible for nominal diameters DN 15 to 100 (½ to 4 in.).
- Increased burst pressures up to 150 bar (2175 psi), possible for nominal diameters DN 15 to 80 (½ to 3 in.).
- Purge connections are available on request.

Pressure Equipment Directive

Conformity assessment in accordance with Category III, fluid group 1, gas. The pressure equipment is designed for load changes in accordance with the AD2000 specification sheet S1 Chapter 1.4 a) and b).

Note the corrosion resistance of the meter tube materials in relation to the measuring medium.

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_{medium}) can be found on the name plate.

Design	Nominal diameter	PS _{max}	TS _{max}	TS _{min}
Pipe fitting (DIN 11851)	DN 15 to DN 40 (½ to 1½ in)	40 bar (580 psi)	140 °C (284 °F)	-40 °C (-40 °F)
	DN 50 to DN 100 (2 to 4 in)	25 bar (363 psi)	140 °C (284 °F)	-40 °C (-40 °F)
Pipe fitting (SMS 1145)	DN 25 to DN 80 (1 to 3 in)	6 bar (87 psi)	140 °C (284 °F)	-40 °C (-40 °F)
Tri-Clamp (DIN 32676)	DN 15 to DN 50 (½ to 2 in)	16 bar (232 psi)	140 °C (284 °F)	-40 °C (-40 °F)
	DN 65 to DN 100 (2½ to 4 in)	10 bar (145 psi)	140 °C (284 °F)	-40 °C (-40 °F)
ASME BPE Clamp	< DN 80 (< 3 in)	17,1 bar (248 psi)	121 °C (249,8 °F)	-40 °C (-40 °F)
	DN 80 (< 3 in)	15,5 bar (224,8 psi)	121 °C (249,8 °F)	-40 °C (-40 °F)
	DN 100 (< 4 in)	12,9 bar (187,1 psi)	121 °C (249,8 °F)	-40 °C (-40 °F)
NPT female thread	DN15 stainless steel 1.4404	179 bar (2596,2 psi)	150 °C (302 °F)	-40 °C (-40 °F)
	DN15 stainless steel 1.4404	163 bar (2364,1 psi)	205 °C (401 °F)	-40 °C (-40 °F)
	DN15 HC22 2.4602	267 bar (3872,5 psi)	150 °C (302 °F)	-40 °C (-40 °F)
	DN15 HC22 2.4602	243 bar (3524,4 psi)	205 °C (401 °F)	-40 °C (-40 °F)

... 6 Installation

... Material load for process connections

Material load curves for flange devices

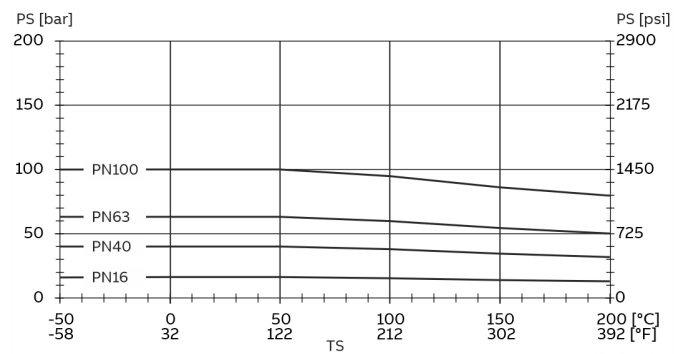


Figure 13: Stainless steel DIN flange 1.4404 (316L) up to DN 200 (8 in.)

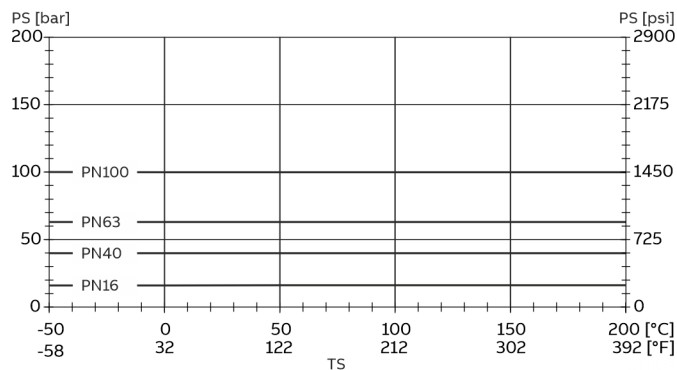


Figure 15: Nickel alloy DIN flange up to DN 200 (8 in.)

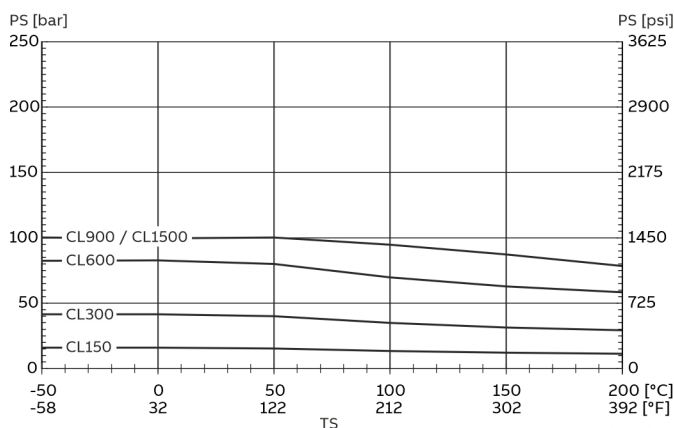


Figure 14: Stainless steel ASME flange 1.4404 (316L) up to DN 200 (8 in.)

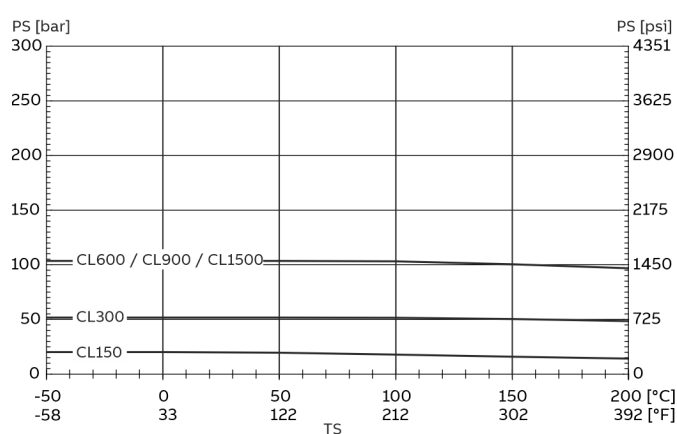


Figure 16: Nickel alloy ASME flange up to DN 200 (in.)

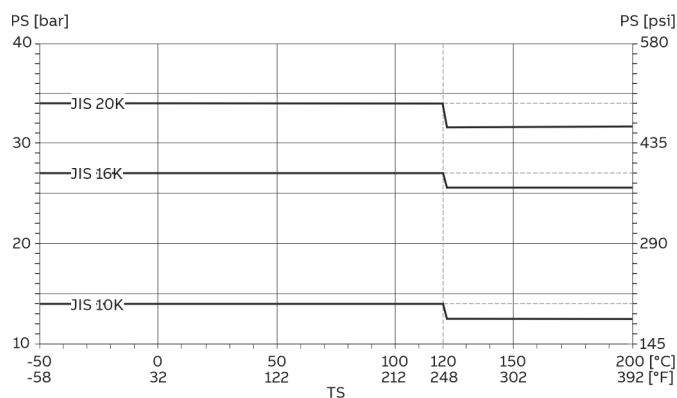


Figure 17: Stainless steel JIS B2220 flange 1.4435 or 1.4404 (AISI 316L) or nickel alloy

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 $t > 20$ minutes before opening.

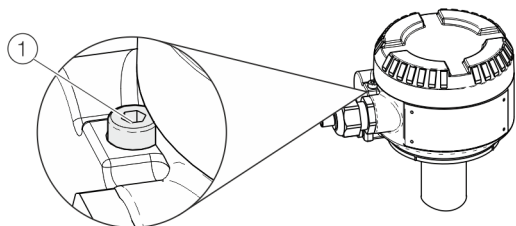


Figure 18: Cover lock (example)

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.

... 7 Electrical connections

Installing the connection cables

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

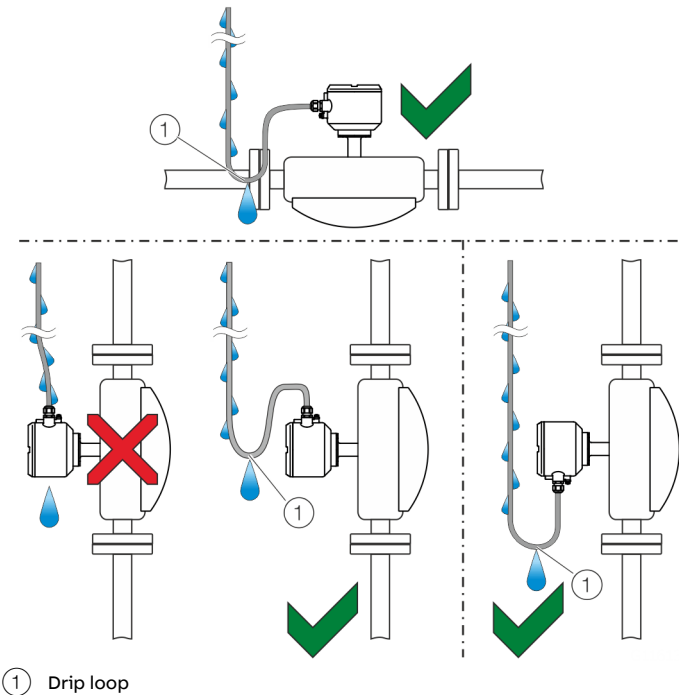
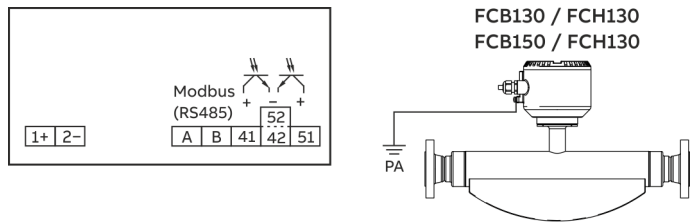


Figure 19: Laying the connection cable

Terminal assignment

Models FCB130, FCB150, FCH130 and FCH150



PA Potential equalization

Figure 20: Electrical connection

Connections for the power supply

DC voltage	
Terminal	Function / comments
1+	+
2-	-

Connections for the outputs

Terminal	Function / comments
A / B	Modbus® RTU (RS485)
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.

Electrical data for inputs and outputs

Note

When using the device in potentially explosive atmospheres, note the additional connection data in **Use in potentially explosive atmospheres** on page 5!

Power supply

Supply voltage	11 to 30 V DC (ripple: $\leq 5\%$)
Power consumption	$S \leq 5\text{ VA}$

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

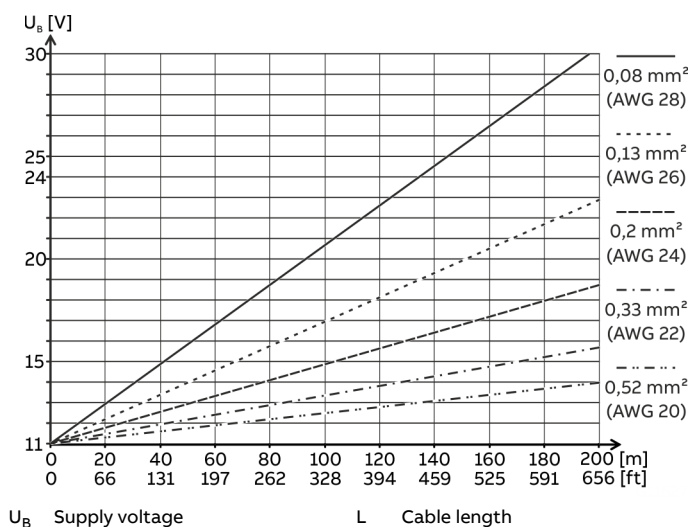
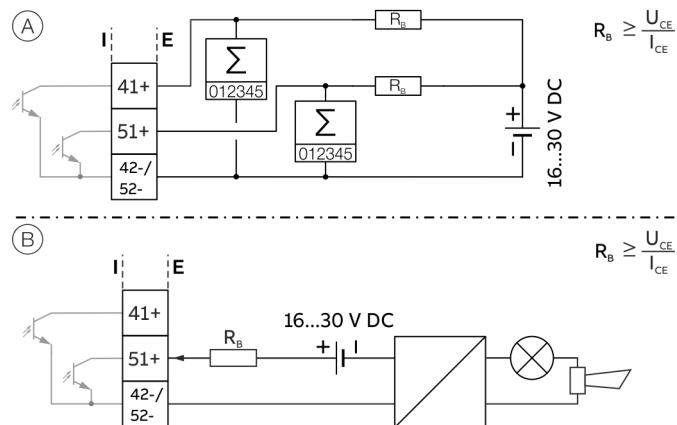


Figure 21: Maximum cable lengths (examples)

Digital output 41 / 42, 51 / 52

Can be configured via Modbus.



- (A) Passive digital output 41 / 42 as pulse or frequency output, Passive digital output 51 / 52 as pulse output
(B) Passive digital output 51 / 52 as binary output

Figure 22: Passive digital outputs (I = internal, E = external)

Pulse / frequency output (passive)

Terminals	41 / 42 (pulse / frequency output) 51 / 52 (pulse output)
Output 'closed'	$0\text{ V} \leq U_{CE} \leq 3\text{ V}$ For $f < 2.5\text{ kHz}$: $2\text{ mA} < I_{CE} < 30\text{ mA}$ For $f > 2.5\text{ kHz}$: $10\text{ mA} < I_{CE} < 30\text{ mA}$
Output 'open'	$16\text{ V} \leq U_{CEH} \leq 30\text{ V DC}$ $0\text{ mA} \leq I_{CEH} \leq 0.2\text{ mA}$
f_{max}	10.5 kHz
Pulse width	0.1 to 2000 ms

Binary output (passive)

Terminals	41 / 42, 51 / 52
Output 'closed'	$0\text{ V} \leq U_{CE} \leq 3\text{ V}$ $2\text{ mA} \leq I_{CE} \leq 30\text{ mA}$
Output 'open'	$16\text{ V} \leq U_{CEH} \leq 30\text{ V DC}$ $0\text{ mA} \leq I_{CEH} \leq 0.2\text{ mA}$
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 $\geq 30\text{ ms}$ and a maximum frequency of $f_{\text{max}} \leq 3\text{ kHz}$.

... 7 Electrical connections

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	
Terminals	V1 / V2
Configuration	Via the Modbus interface or via the local operating interface in connection with a corresponding Device Type Manager (DTM)
Transmission	Modbus RTU - RS485 serial connection
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

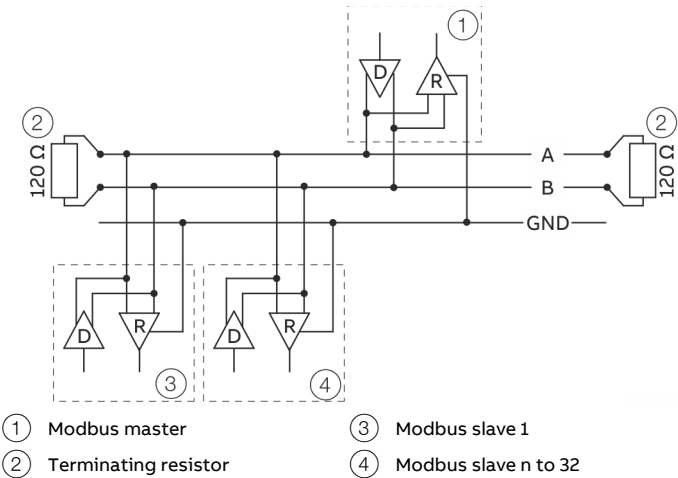


Figure 23: Communication with the Modbus protocol

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.

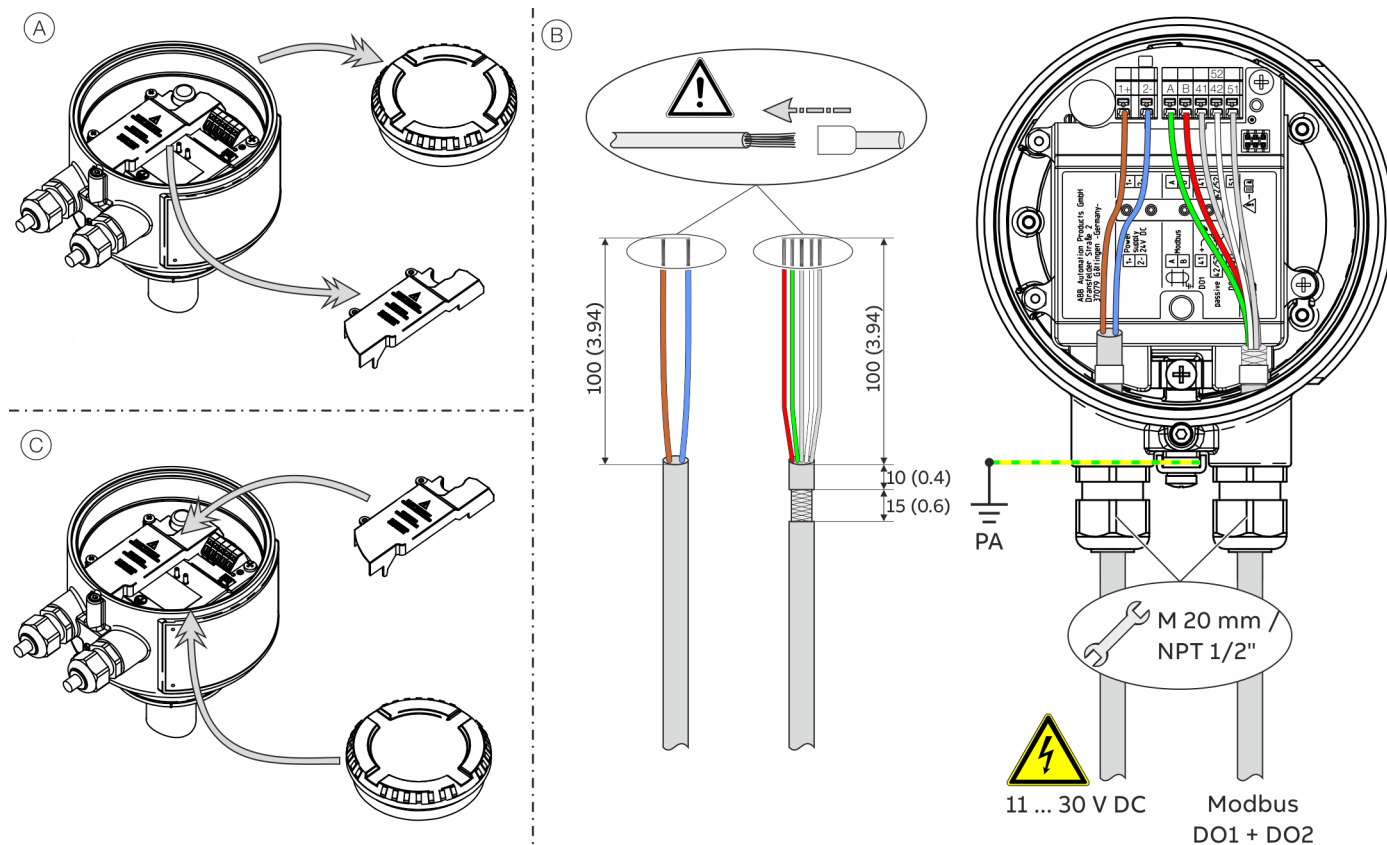
Cable specification

- 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



PA Potential equalization

Figure 24: Connection to 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


Safety instructions



DANGER

Explosion hazard
Improper installation and commissioning of the device carries a risk of explosion.

- For use in potentially explosive atmospheres, observe the information in **Use in potentially explosive atmospheres** on page 5!



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.

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.

Write-protection switch, service LED and local operator interface

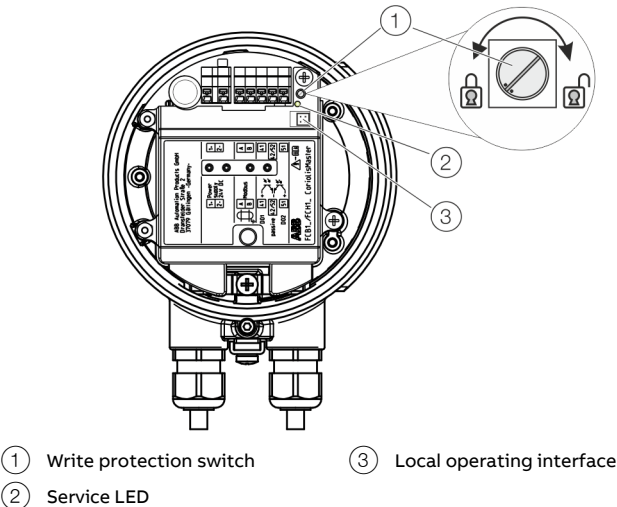


Figure 25: Operating elements in the terminal box

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 counter-clockwise 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.

Service LED	Description
Flashes rapidly (100 ms)	Starting sequence, device not yet ready for operation
Lit up continuously	Device operating, no critical error
Flashes slowly (1 second)	A critical error has occurred, refer to "Diagnosis" in the device operating instruction (OI/FCB100/FCH100)

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 34.

Checks prior to commissioning

The following points must be checked before commissioning the device:

- Correct wiring in accordance with **Electrical connections** on page 27.
- 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 29).

Switching on the power supply

1. Switch on the power supply.
2. Perform parameterization of the flowmeter (see

Parameterization of the device on page 33).

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 36).

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)!

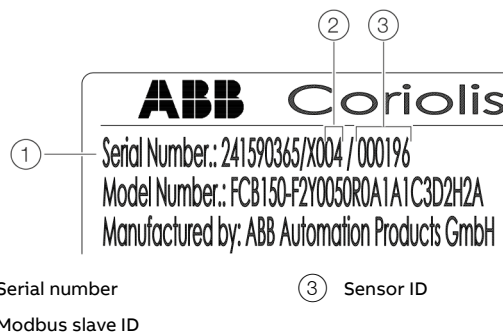
Parameterization via the Modbus interface

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.



- (1) Serial number
- (2) Modbus slave ID
- (3) Sensor ID

Figure 26: Modbus-address on the name plate (example)

... 8 Commissioning and operation

... Parameterization of the device

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 33).

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".

Address / data type	Description
[register length]	
65521 TUSIGN32 [2]	manufacturerDeviceID The manufacturer code (ABB = 0x1A) and the device code (FCB1xx = 0xA0) must be written to the register 65522.
65523 TUSIGN32 [2]	sensorSerialID The Sensor ID of the device (on the name plate, see Factory setting for the Modbus slave ID (address) on page 33). The information must first be written in the high-byte (65524) of the register.
65525 TUSIGN32 [2]	slaveID The new Modbus Slave ID must be written in the high byte (65526) of the register.

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.

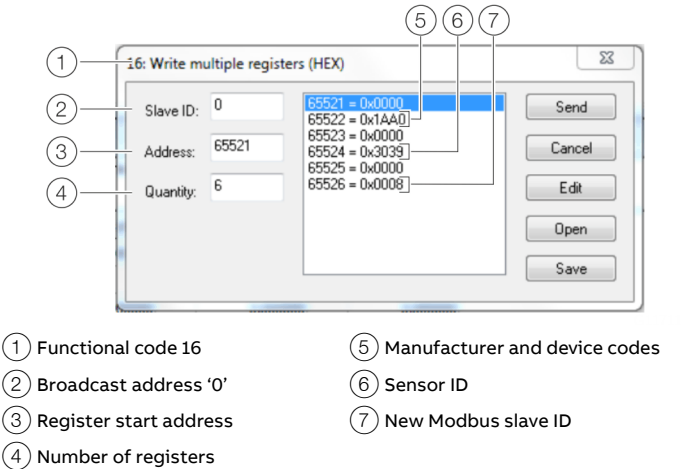


Figure 27: Write Multiple Registers (example)

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.

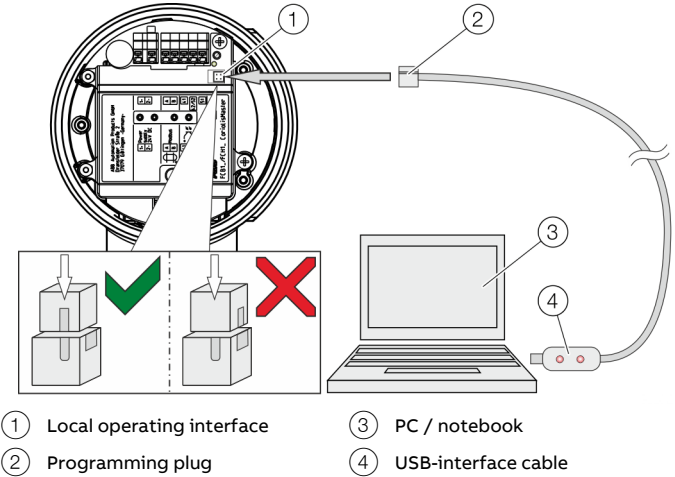


Figure 28: Connection to the local operating interface

Connection on the device

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 Field Information Manager (FIM)



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



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 34.
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.fdi' file (or a newer version) to the ABB Field Information Manager (FIM). No special view is needed for this.
6. Right-click ① as shown in Figure 29.

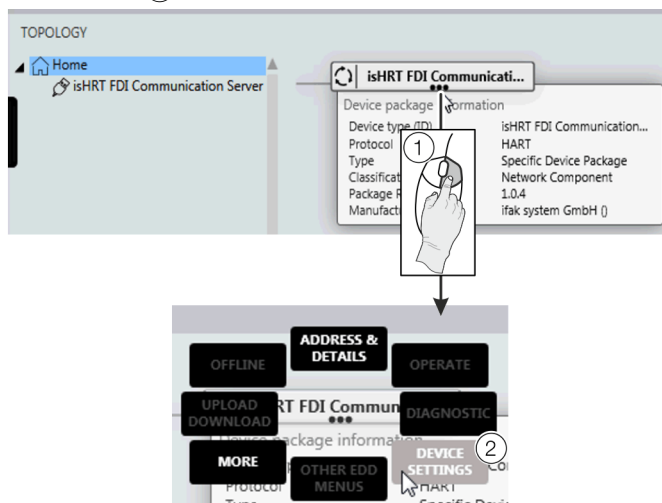


Figure 29: Select FIM – 'Device Settings'

7. Select 'DEVICE SETTINGS' ② as shown in Figure 29.

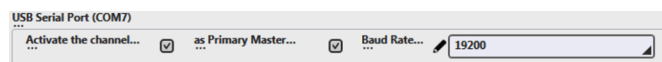



Figure 30: Select FIM – COM-Port

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'.

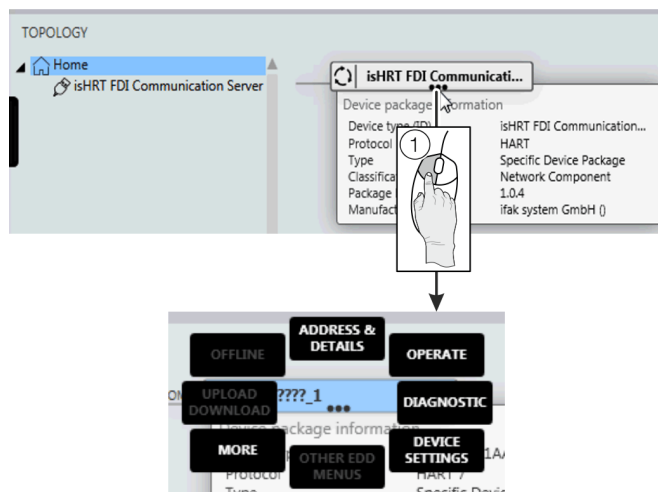


Figure 31:

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 $Q_{\max DN}$).
- 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 23.

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)!

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 20.

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.de/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.

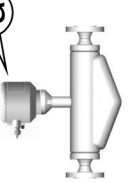
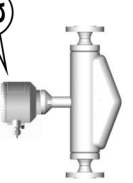
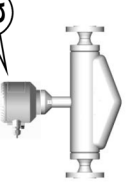
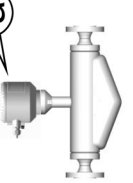
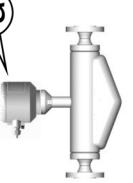
We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date

Signature and company stamp

Installation diagram 3KXF000014G0009

Page 1 of 4

ORDINARY LOCATION GENERAL PURPOSE	HAZARDOUS LOCATION ZN 2/21/22 ATEX & IECEx application	HAZARDOUS LOCATION ZN 01/1/20/21 ATEX & IECEx application
<p>a</p> <p>POWER SUPPLY</p> <p>Non IS</p> <p>Terminals</p> <p>max 30V DC</p>	<p>a</p> <p>FCa1cY0e..</p> 	<p>a</p> <p>FCa1cA2e..</p> 
<p>b</p> <p>SIGNAL DATA INPUT/OUTPUT</p> <p>Intrinsically safe ia</p> <p>UI=4,2V</p> <p>Connected to ATEX / IECEx certified BARRIER</p> <p>UI=30V</p>	<p>a</p> <p>FCa1cY0e..</p> 	<p>a</p> <p>FCa1cA1e..</p> 
<p>c</p> <p>Alternative to</p> <p>SIGNAL DATA INPUT/OUTPUT</p> <p>Umax=3V</p> <p>Non Intrinsically Safe</p> <p>Umax=30V</p> <p>max 30Vrms</p>		<p>c</p> <p>FCa1cA1e..</p> 

For Model

FC_

Projection method 1

ABB

ABB Automation Products GmbH

Date

29.01.2014

Name

FBu

08

23.10.2018

FBu

General tolerances:

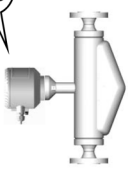
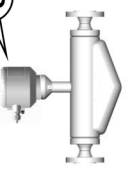


Work piece edges:

Tolerancing Surface:

Installation diagram FCB

3KXF000014G0009

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ORDINARY LOCATION GENERAL PURPOSE		HAZARDOUS LOCATION Div 2 & ZN 2/21/22 US and Canadian application	HAZARDOUS LOCATION Div 1 & ZN 01/20/21 US and Canadian application
<div><div>a</div><div>POWER SUPPLY Non IS Terminals max 30V DC</div></div>	<div><div>a</div><div>FCa1cY0e.. </div></div>	<div><div>a</div><div>FCa1cF2e.. </div></div>	<div><div>a b c</div><div>FCa1cF1e.. </div></div>
<div><div>b</div><div>SIGNAL DATA INPUT/OUTPUT Intrinsically safe IS, ia UI=4.2V Connected to FM / CSA LISTED BARRIER UI=30V</div></div>			
<div><div>c</div><div>Alternative to SIGNAL DATA INPUT/OUTPUT Non Intrinsically Safe max 30Vrms Umax=3V Umax=30V Umax=30V</div></div>			
PAGE 2 OF 4			
For Model: FCB_		Projection method 1: 	General tolerances: Work piece edges: Tolerancing: Surface:
		ABB Automation Products GmbH	
		Date: 29.01.2014	Name: FBu
		Checked per Sht.	
08 23.10.2018 FBu		Checked per Sht.	
Rev. Date Number Name Replaces:			
		Installation diagram FCB	
		3KXF000014G0009	
		Rev. Date Number Name Replaces:	

... Installation diagram 3KXF000014G0009

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Notes: ATEX & IECEx application		Notes: US and Canadian 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: Uo OR Voc OR Vt < V MAX, Io OR Ioc OR It < I MAX; Ca OR Co > Ci + Ccable; La OR Lo > Li + Lcable; Po < Pi.	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: Uo OR Voc OR Vt < V MAX, Io OR Ioc OR It < I MAX; Ca OR Co > Ci + Ccable; La OR Lo > Li + Lcable; Po < Pi.
2.	DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN Zone 21/22 ENVIROMENTS.	2.	DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND III ENVIROMENTS.
3.	CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc WITH Vrms OR Vdc WITH RESPECT TO EARTH.	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 "INSTALLATION OF INTRINSICALLY SAFE FOR HAZARDOUS LOCATIONS" REGULATIONS.	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 ATEX or IECEx APPROVED UNDER ENTITY CONCEPT.	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.	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 MANUFACTURE'S INSTALLATION DIAGRAM	7.	THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURE'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.	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.
<div>REVISIONS ONLY WITH APPROVAL OF THE NOTIFIED BODY THIS IS A CERTIFIED DRAWING Änderungen nur mit Zustimmung der Prüfstelle Dieses ist eine zertifizierte Zeichnung agreement that this document. Without our previous third parties or utilized in any other manner. Violations will be subject to penalties and may be punishable by law.</div>		<div>ABB ABB Automation Products GmbH Date: 29.01.2014 Name: FBu Checked per: Sdp 08 23.10.2018 FBu</div>	
Installation diagram FCB		Installation diagram FCB	
General tolerances: Work piece edges:		General tolerances: Work piece edges:	
Tolerancing: Surface:		Tolerancing: Surface:	
PAGE 3 OF 4		PAGE 3 OF 4	

MINT F_a1cA1efghijB_ F_a1cA1efghijT_ F_a1cF1efghijB_ F_a1cF1efghijT_ Modbus communication variants	Ex e / XP		Operating Value		Ex nA / NI		Ex ia / IS					
	U _M [V]	I _M [mA]	U _N [V]	I _N [mA]	U _N [V]	I _N [mA]	U _O [V]	I _O [mA]	P _O [mW]	C _O [nF]	C _{OPA} [nF]	L _O [µH]
Modbus active Terminal A / B	30	30	3	30	3	30	4,2	150	150	13900	---	20
							U _I [V]	I _I [mA]	P _I [mW]	C _I [nF]	C _{IPA} [nF]	L _I [µH]
							+/- 4,2	150	150	13900	---	20
Digital DO1 Output passive	30	25	30	25	30	25*	30	25	187	20	---	200
Digital DO2 Output passive	30	25	30	25	30	25*	30	25	187	20	---	200

ABB Automation Products GmbH

Date: 29.01.2014

Drawn by: FBu

Checked per Site: FBu

08 23.10.2018

General tolerances:
work piece edges:

Tolerancing:
Surface:

Installation diagram FCB

3KXF000014G0009

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ABB Measurement & Analytics

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