SCHNEIDER MESSTECHNIK

SIEMENS

SITRANS F

Coriolis flowmeters SITRANS MASS 2100 & FC300 (FCT010)

Compact Operating Instructions

7ME481 (MASS 2100/FC300 with FCT010)

05/2020
A5E40504094-AB

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it, as well as service and maintenance engineers.

1.1 Document history

The following table shows major changes in the documentation compared to the previous edition.

The most important changes in the documentation when compared with the respective previous edition are given in the following table.

Edition	Note
05/2020	First edition

1.2 Nameplate layout

1.2.1 Device identification

Each part of the FC Coriolis flowmeter has three nameplate types showing the following information:

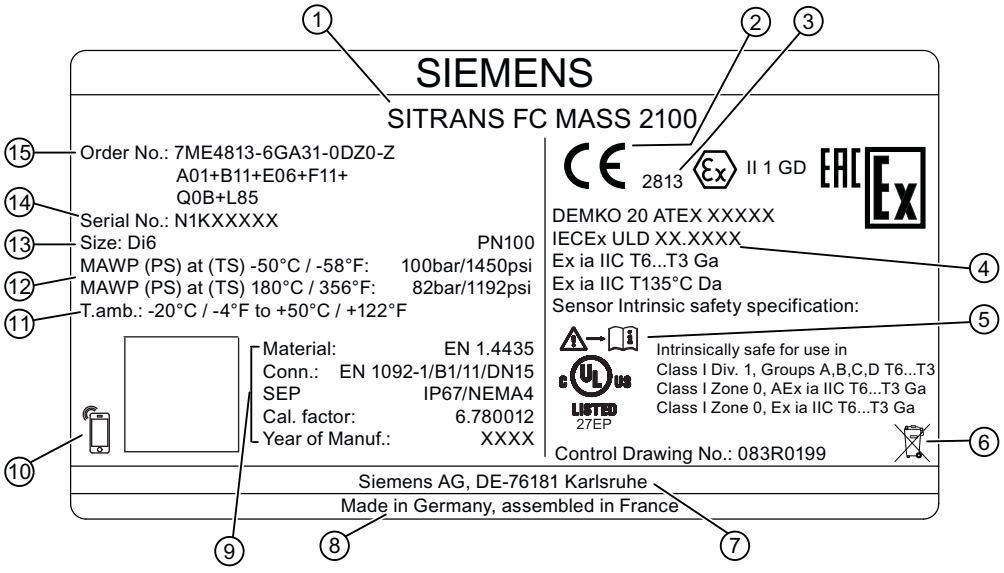
- product identification
- product specifications
- certificates and approvals

Note

Identification

Identify your device by comparing your ordering data with the information on the product and specification nameplates.

1.2.2 MASS 2100 Sensor nameplate



①	SITRANS FC MASS 2100	Product name
②	CE	CE mark
③	2813	Notified Body ID (ATEX example)
④	Ex approvals	Classification for hazardous locations
⑤	⚠	Consult the operating instructions
⑥		WEEE symbol, see Disposal (Page 45)
⑦	Manufacturer	Manufacturer name and location
⑧	Country	Manufacturing country
⑨	Material	Material of pipe
	Conn.	Process connector
	SEP	Degree of protection
	Cal. factor	Calibration factor
	Year of Manuf.	Manufacturing year
⑩	QR code	Product-specific QR code
⑪	T.amb.	Range of ambient temperature
⑫	MAWP	Maximum allowable working pressure
⑬	Size	Size
⑭	Serial No.	Device specific serial number
⑮	Order No.	Device specific order number

Figure 1-1 MASS 2100 nameplate example

Flowmeter serial number construction

The flowmeter serial number is constructed as follows:

PPYMDDxxxxxx

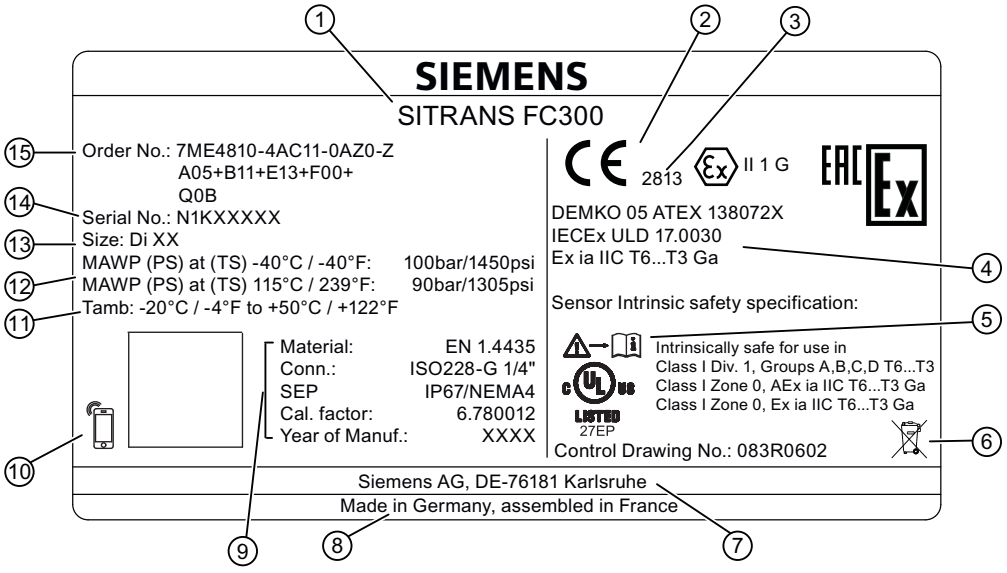
where
PP = Production factory (Siemens S.A.S. Haguenau: N1)

Y = Production year (for encryption, see below)
M = Production month (for encryption, see below)
DD = Production date (for encryption, see below)
xxxxxx = Sequential number

Encryption:

Calendar year (Y)	**Code**
1950, 1970, 1990, 2010	A
1951, 1971, 1991, 2011	B
1952, 1972, 1992, 2012	C
1953, 1973, 1993, 2013	D
1954, 1974, 1994, 2014	E
1955, 1975, 1995, 2015	F
1956, 1976, 1996, 2016	H (G)
1957, 1977, 1997, 2017	J
1958, 1978, 1998, 2018	K
1959, 1979, 1999, 2019	L
1960, 1980, 2000, 2020	M
1961, 1981, 2001, 2021	N
1962, 1982, 2002, 2022	P
1963, 1983, 2003, 2023	R
1964, 1984, 2004, 2024	S
1965, 1985, 2005, 2025	T
1966, 1986, 2006, 2026	U
1967, 1987, 2007, 2027	V
1968, 1988, 2008, 2028	W
1969, 1989, 2009, 2029	X
Month (M)	**Code**
January	1
February	2
March	3
April	4
May	5
June	6
July	7
August	8
September	9
October	O
November	N
December	D
Date (DD)	**Code**
Day 1 to 31	01 to 31 (corresponding to the actual date)

1.2.3 FC300 Sensor nameplate

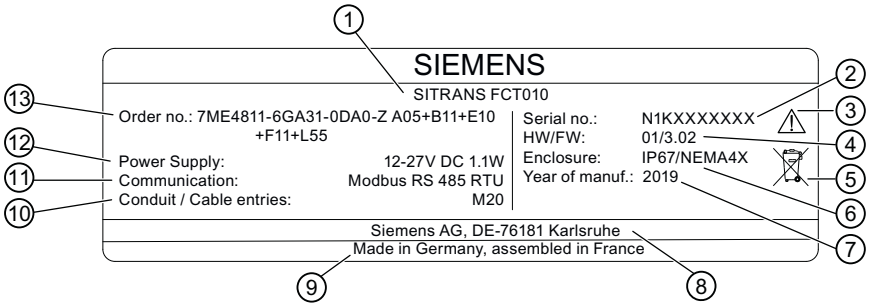


①	SITRANS FC300	Product name
②	CE	CE mark
③	2813	Notified Body ID (ATEX example)
④	Ex approvals	Classification for hazardous locations
⑤	⚠	Consult the operating instructions
⑥		WEEE symbol, see Disposal (Page 45)
⑦	Manufacturer	Manufacturer name and location
⑧	Country	Manufacturing country
⑨	Material	Material of pipe
	Conn.	Process connector
	SEP	Degree of protection
	Cal. factor	Calibration factor
	Year of Manuf.	Manufacturing year
⑩	QR code	Product-specific QR code
⑪	Tamb.	Range of ambient temperature
⑫	MAWP	Maximum allowable working pressure
⑬	Size	Size
⑭	Serial No.	Device specific serial number
⑮	Order No.	Device specific order number

Figure 1-2 FC300 nameplate example

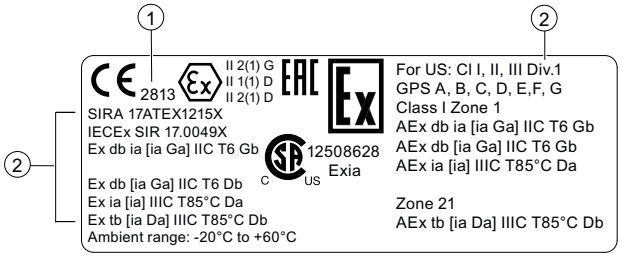
1.2.4 FCT010 Transmitter nameplates

FCT010 transmitter: Nameplate with general information



①	SITRANS FCT010	Transmitter product name
②	Serial no.	Transmitter serial number
③	⚠	Consult the operating instructions
④	HW/FW	System revision numbers; hardware (HW) and firmware (FW)
⑤		WEEE symbol, see Disposal (Page 45)
⑥	Enclosure	Degree of protection
⑦	Year of manuf.	Manufacturing year More detailed manufacturing date information is given in the serial number found on the identification nameplate
⑧	Manufacturer	Manufacturer name and location
⑨	Country	Manufacturing country
⑩	Conduit / cable entries	Type of conduit / cable entries
⑪	Communication	Communication
⑫	Power Supply	Power supply
⑬	Order No.	Order number

FCT010 transmitter: Nameplate with specific information



①	2813	ATEX Notified Body ID (SIRA Certification)
②	Ex approvals	Ex approval specifications for the transmitter (for details on all approvals refer to Disposal (Page 45))

Note

Approval identifications

Approval certificates and notified body identifications are available for download at www.siemens.com (http://www.siemens.com/processinstrumentation/certificates).

1.3 Designated use

Use the device in accordance with the information on the nameplate and in the Technical data (Page 47).

NOTICE
Use in a domestic environment This Class A Group 1 equipment is intended for use in industrial areas. In a domestic environment this device may cause radio interference.

1.4 Product compatibility

Manual edition	Remarks	Device revision	Compatibility of device integration package	
05/2020	First revision	Modbus RS-485 RTU FW: 4.xx.xx-xx HW revision: 3	SIMATIC PDM V8.2 Service Pack 1 or later	EDD: 2.00.01 or later

1.5 Checking the consignment

1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

⚠ WARNING
Using a damaged or incomplete device Risk of explosion in hazardous areas. • Do not use damaged or incomplete devices.

1.6 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/industrialsecurity.

1.7 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE
Insufficient protection during storage The packaging only provides limited protection against moisture and infiltration. • Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 47).

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

Safety notes

2

2.1 Preconditions for use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

Symbol	Explanation
	Consult operating instructions

Observe the safety rules, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)

2.1.1 FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules

Note

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the operating instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at his own expense.

2.1.2 Conformity with European directives

The CE marking on the device symbolizes the conformity with the following European directives:

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
Pressure equipment directive PED 2014/68/EU	Directive of the European Parliament and of the Council on the approximation of the laws of the Member States concerning pressure equipment
2011/65/EU RoHS	Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The applicable directives can be found in the EC conformity declaration of the specific device.

⚠ WARNING

Improper device modifications

Risk to personnel, system and environment can result from modifications to the device, particularly in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

2.2 Requirements for special applications

Due to the large number of possible applications, each detail of the described device versions for each possible scenario during commissioning, operation, maintenance or operation in systems cannot be considered in the instructions. If you need additional information not covered by these instructions, contact your local Siemens office or company representative.

Note

Operation under special ambient conditions

We highly recommend that you contact your Siemens representative or our application department before you operate the device under special ambient conditions as can be encountered in nuclear power plants or when the device is used for research and development purposes.

2.3 Use in hazardous areas

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures, aggressive, and hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

⚠ WARNING

Use in hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.
- Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

See also

Technical data (Page 47)

⚠ WARNING

Loss of safety of device with type of protection "Intrinsic safety Ex i"

If the device or its components have already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a risk of explosion.

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 47).

Installing/mounting 3

3.1 Basic safety notes

CAUTION

Hot surfaces resulting from hot process media

Risk of burns resulting from surface temperatures above 65 °C (149 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Technical data (Page 47).

WARNING

Wetted parts unsuitable for the process media

Risk of injury or damage to device.

Hot, toxic and corrosive media could be released if the wetted parts are unsuitable for the process medium.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical data (Page 47).

Note

Material compatibility

Siemens can provide you with support concerning selection of sensor components wetted by process media. However, you are responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

See also

Technical data (Page 47)

⚠ DANGER

Pressure applications

Danger to personnel, system and environment will result from improper disassembly.

- Never attempt to loosen, remove, or disassemble process connection while vessel contents are under pressure.

⚠ WARNING

Exceeded maximum permissible operating pressure

Risk of injury or poisoning.

The maximum permissible operating pressure depends on the device version, pressure limit and temperature rating. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 47).

3.1.1 Incorrect mounting at Zone 0

⚠ WARNING

Incorrect mounting at Zone 0

Risk of explosion in hazardous areas.

- Ensure sufficient tightness at the process connection.
- Observe the standard IEC/EN 60079-14.

⚠ CAUTION

External stresses and loads

Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released.

- Prevent severe external stresses and loads from acting on the device.

3.1.2 Installation location requirements

NOTICE

Strong vibrations

Damage to device.

- In installations with strong vibrations, mount the transmitter in a low vibration environment.

NOTICE

Aggressive atmospheres

Damage to device through penetration of aggressive vapors.

- Ensure that the device is suitable for the application.

NOTICE

Direct sunlight

Damage to device.

The device can overheat or materials become brittle due to UV exposure.

- Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical data (Page 47).

WARNING

Insufficient air supply

The device may overheat if there is an insufficient supply of air.

- Install the device so that there is sufficient air supply in the room.
- Observe the maximum permissible ambient temperature. Refer to the information in the section Technical data (Page 47).

3.1.3 Proper mounting

NOTICE
Incorrect mounting The device can be damaged, destroyed, or its functionality impaired through improper mounting. • Before installing ensure there is no visible damage to the device. • Make sure that process connectors are clean, and suitable gaskets and glands are used. • Mount the device using suitable tools. Refer to the information in Technical data (Page 47).

3.2 Sensor installation

3.2.1 Determining a location

⚠ CAUTION
Electromagnetic fields Do not install the flowmeter in the vicinity of strong electromagnetic fields, for example near motors, variable frequency drives, transformers etc.

Upstream / downstream

- No pipe run requirements, that is straight inlet/outlet sections, are necessary.
- Avoid long drop lines downstream from the sensor to prevent process media separation causing air / vapor bubbles in the tube (min. back pressure: 0.2 bar).
- Avoid installing the flowmeter immediately upstream of a free discharge in a drop line.

Location in the system

The optimum location in the system depends on the application:

- Liquid applications
  Gas or vapor bubbles in the fluid may result in erroneous measurements, particularly in the density measurement.
  - Do not install the flowmeter at the highest point in the system, where bubbles will be trapped.
  - Install the flowmeter in low pipeline sections, at the bottom of a U-section in the pipeline.

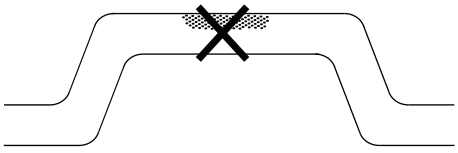


Figure 3-1 Liquid applications, wrong location with trapped air/gas

- Gas applications
  Vapor condensation or oil traces in the gas may result in erroneous measurements.
  - Do not install the flowmeter at the lowest point of the system.
  - Install a filter.

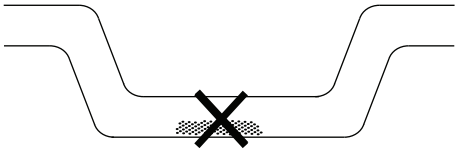


Figure 3-2 Gas applications, wrong location with trapped oil

3.2.2 Orientation of the sensor

Flow direction

The calibrated flow direction is indicated by the arrow on the sensor. Flow in this direction will be indicated as positive by default. The sensitivity and the accuracy of the sensor do not change with reverse flow.

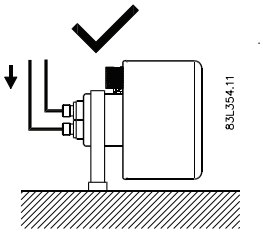
The indicated flow direction (positive/negative) is configurable.

⚠ CAUTION
Accurate measurement The sensor must always be completely filled with process media in order to measure accurately.

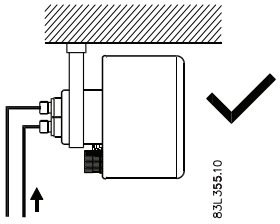
Orienting the sensor

The sensor operates in any orientation. The optimal orientation depends on the process fluid and the process conditions. Siemens recommends orienting the sensor in one of the following ways:

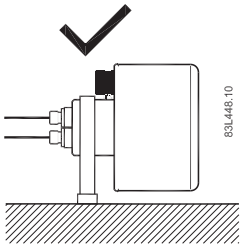
3.2.3 MASS 2100 DI 1.0 - 2.1



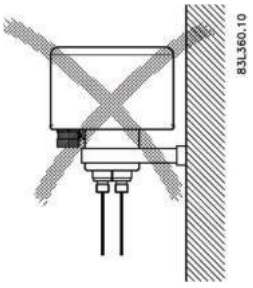
Horizontal installation, correct



Horizontal installation, correct



Vertical installation, correct (liquids without solid particles only)



Vertical installation, wrong

Note

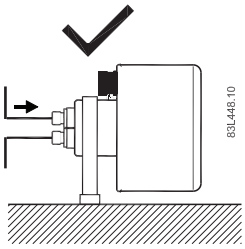
Air / gas bubbles in the liquid

Install the flowmeter horizontally

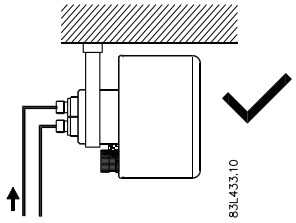
Note

Solid particles in the liquid

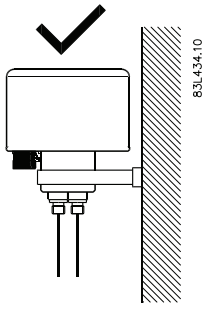
Install the flowmeter horizontally



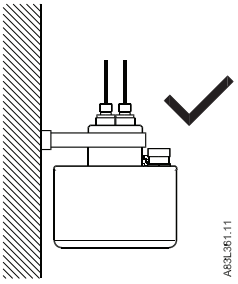
Horizontal installation 1



Horizontal installation 2

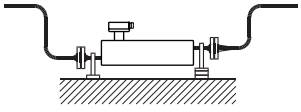


Vertical installation 1

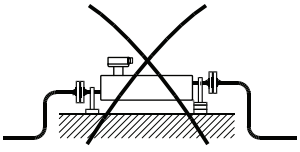


Vertical installation 2

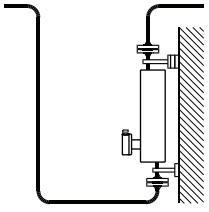
3.2.4 MASS 2100 DI 3 - 15



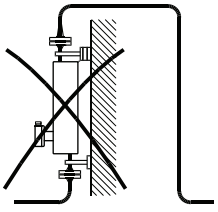
Horizontal installation, correct



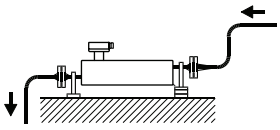
Horizontal installation, wrong



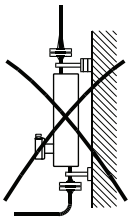
Vertical installation, correct



Vertical installation, wrong



Horizontal installation

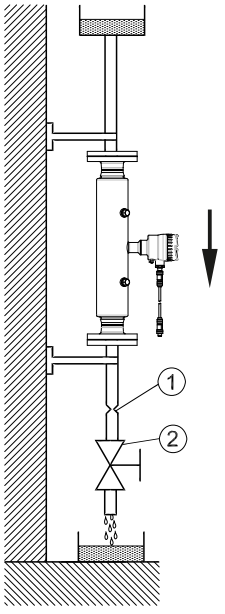


Vertical installation (not recommended)

3.2.5 Installation in a drop line

Installation in a drop line

Installation in a dropline is only possible if a pipeline reduction or orifice with a smaller cross-section can be installed to prevent the sensor from being partially drained during the measurements.



① Orifice Pipe
② Valve

Figure 3-3 Installation in drop line

3.3 Disassembly

⚠ WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- Injury through electric shock
- Risk through emerging media when connected to the process
- Risk of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains hazardous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

Connecting

4

4.1 Basic safety notes

⚠ WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Technical data (Page 47).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.

⚠ WARNING

Incorrect conduit system

Risk of explosion in hazardous areas as result of open cable inlet or incorrect conduit system.

- In the case of a conduit system, mount a spark barrier at a defined distance from the device input. Observe national regulations and the requirements stated in the relevant approvals.

See also

Technical data (Page 47)

NOTICE

Condensation in the device

Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F).

- Before taking the device into operation, let the device adapt for several hours in the new environment.

NOTICE

Ambient temperature too high

Damage to cable sheath.

- At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

⚠ WARNING

Improper power supply

Risk of explosion in hazardous areas as result of incorrect power supply.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Technical data (Page 47) or on the nameplate.

⚠ WARNING

Lack of equipotential bonding

Risk of explosion through compensating currents or ignition currents through lack of equipotential bonding.

- Ensure that the device is potentially equalized.

Exception: It may be permissible to omit connection of the equipotential bonding for devices with type of protection "Intrinsic safety Ex i".

⚠ WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

⚠ WARNING

Improper laying of shielded cables

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

WARNING

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas.

- When connecting intrinsically safe and non-intrinsically safe circuits ensure that isolation is carried out properly in accordance with local regulations for example IEC 60079-14.
- Ensure that you observe the device approvals applicable in your country.

WARNING

Connecting or disconnecting device in energized state

Risk of explosion in hazardous areas.

- Connect or disconnect devices in hazardous areas only in a de-energized state.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.

WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

1. Decide in favor of one type of protection.
2. Connect the device in accordance with the selected type of protection.
3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

Note

Electromagnetic compatibility (EMC)

You can use this device in industrial environments, households and small businesses.

For metal enclosures there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the enclosure.

See also

Basic safety notes (Page 27)

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical data (Page 47).
- Use shielded cables to guarantee the full specification according to HART/PA/FF/Modbus/ EIA-485/Profibus DP.

4.2 Connecting MASS 2100/FC300

4.2.1 Setting the EOL termination DIP switches

It is important to terminate the Modbus RS-485 line correctly at the start and end of the bus segment. Impedance mismatch results in reflections on the line which can cause faulty communication transmission.
If the device is at the end of the bus segment, it is recommended to terminate the device. The following table shows the relation between the DIP switch settings and the permissible communication interface set-ups.

Note

End Of Line (EOL) termination

The FCT010 EOL termination DIP switch is default set to EOL non-active. If the installation requires active termination resistors, the DIP switches should be set to the EOL Active state.

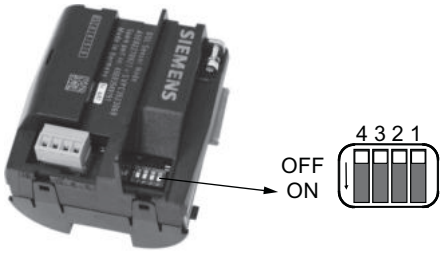
⚠ CAUTION

Hazardous areas

Only change the DIP switches in hazardous areas when the device is deenergized.

Location of DIP switch

The DIP switch is located in the electronic as shown below.



DIP switch settings for communication set-up

DIP switch Communication set-up	Switch 1	Switch 2	Switch 3	Switch 4
EOL active	On	On	On	On
EOL not active	On	On	Off	Off

NOTICE

Avoid DIP switch settings not mentioned in the table

DIP switch settings not mentioned in the table preceding are not allowed and may reduce communication interface reliability.

⚠ WARNING

Improper handling

The sensor connected to this device can be operated with high pressure and corrosive media. Therefore improper handling of the device can lead to serious injuries and/or considerable material damage.

- Only use cables with at least the same degree of protection as the sensor to install the sensor.
  It is recommended to use cables supplied by Siemens.
- Siemens supplied cables can be ordered with M12 plug on both ends or without plug.
- To guarantee the IP67 degree of protection, ensure that both ends of the cables are given equivalent protection from ingress of moisture.
- For further information on Siemens-supplied cables, see Technical data (Page 47).

WARNING

Cable requirements

Cables must be suitable for the temperature (at least 70 °C) and be flammability-rated to at least V-2.

A: Prepare the cable by stripping it at both ends.

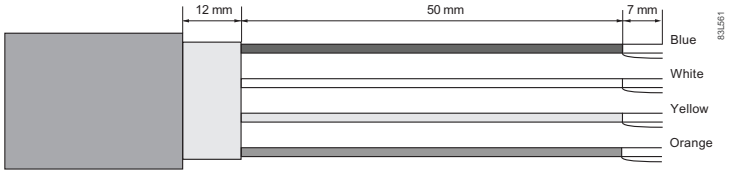


Figure 4-1 Cable end

B: Connect wires within the sensor terminal compartment

1. Remove the lock screw and remove the lid.
2. Undo the flexible strap.
3. Disconnect the sensor connection (white plug) from the electronic.
4. Loosen the mounting screw using a TX10 Torx driver and remove the electronic from the housing.
5. Remove the cap and the ferrule from the cable gland and slide onto the cable.
6. Push the cable through the open gland and anchor the cable shield and the wires with the clamp bar.
7. Remove the terminal block from the electronic.

8. Connect the wires to the terminals according to the list below.

Terminal number	Description	Wire color (Siemens cable)
1	15 V	Orange
2	0 V	Yellow
3	RS-485 / B	White
4	RS-485 / A	Blue

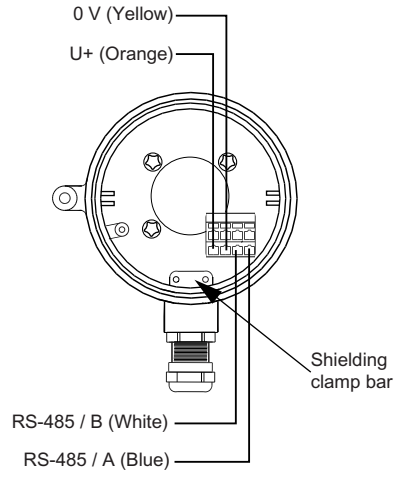
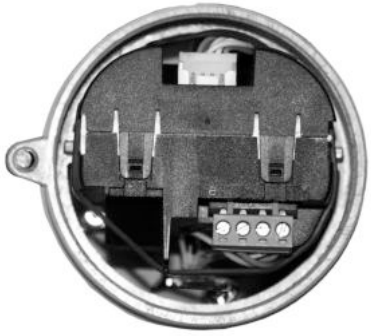


Figure 4-2 Sensor terminal compartment

9. Reinstall the electronic including the mounting screw.
10. Connect the sensor connection and the sensor cable.
11. Restore the flexible strap around all wires.



12. Assemble and tighten the cable gland.
13. Remove the O-ring from lid.
14. Reinstate the lid and screw in until the mechanical stop. Wind back the lid by one turn.
15. Mount the O-ring by pulling it over the lid and tighten the lid until you feel friction from the O-ring on both sides. Wind the lid by one quarter of a turn to seal on the O-ring.
16. Reinstate and tighten the lid lock screw.

⚠ WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

It is important to terminate the Modbus RS-485 line correctly at the start and end of the bus segment. Impedance mismatch results in reflections on the line which can cause faulty communication transmission.
If the device is at the end of the bus segment, it is recommended to terminate the device. The following table shows the relation between the DIP switch settings and the permissible communication interface set-ups.

Note

End Of Line (EOL) termination

The FCT010 EOL termination DIP switch is default set to EOL non-active. If the installation requires active termination resistors, the DIP switches should be set to the EOL Active state.

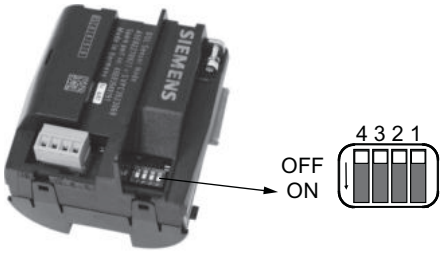
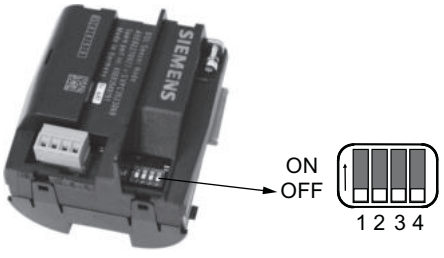
⚠ CAUTION

Hazardous areas

Only change the DIP switches in hazardous areas when the device is deenergized.

Location of DIP switch

The DIP switch is located in the electronic as shown below.

FW4	FW3 (before 07/2018)
	

DIP switch settings for communication set-up

DIP switch Communication set-up	Switch 1	Switch 2	Switch 3	Switch 4
EOL active	On	On	On	On
EOL not active	On	On	Off	Off

NOTICE
Avoid DIP switch settings not mentioned in the table DIP switch settings not mentioned in the table preceding are not allowed and may reduce communication interface reliability.

Commissioning 5

5.1 Basic safety notes

WARNING

Improper commissioning in hazardous areas

Device failure or risk of explosion in hazardous areas.

- Do not commission the device until it has been mounted completely and connected in accordance with the information in Installing/mounting (Page 17).
- Before commissioning take the effect on other devices in the system into account.

WARNING

Commissioning and operation with pending error

If an error message appears, correct operation in the process is no longer guaranteed.

- Check the gravity of the error.
- Correct the error.
- If the error still exists:
  - Take the device out of operation.
  - Prevent renewed commissioning.

DANGER

Toxic gases and liquids

Danger of poisoning when venting the device: if toxic process media are measured, toxic gases and liquids can be released.

- Before venting ensure that there are no toxic gases or liquids in the device, or take the appropriate safety measures.

WARNING

Loss of explosion protection

Risk of explosion in hazardous areas if the device is open or not properly closed.

- Close the device as described in Installing/mounting (Page 17).

WARNING

Opening device in energized state

Risk of explosion in hazardous areas

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.

Service and maintenance

6

6.1 Basic safety notes

Note

The device is maintenance-free.

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include, for example, check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover
- Reliability of power supply, lightning protection, and grounds

WARNING

Impermissible repair and maintenance of the device

- Repair and maintenance must be carried out by Siemens authorized personnel only.

WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

- Repair must be carried out by Siemens authorized personnel only.

WARNING

Dust layers above 5 mm

Risk of explosion in hazardous areas.

Device may overheat due to dust build up.

- Remove dust layers in excess of 5 mm.

NOTICE

Penetration of moisture into the device

Damage to device.

- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

⚠ WARNING

Leaks in the sample gas path

Risk of poisoning.

When measuring toxic process media, these can be released or collect in the device if there are leaks in the sample gas path.

- Purge the device as described in Commissioning (Page 37).
- Dispose of the toxic process media displaced by purging in an environmentally friendly manner.

⚠ CAUTION

Releasing button lock

Improper modification of parameters could influence process safety.

- Make sure that only authorized personnel may cancel the button locking of devices for safety-related applications.

⚠ WARNING

Use of a computer in a hazardous area

If the interface to the computer is used in the hazardous area, there is a risk of explosion.

- Ensure that the atmosphere is explosion-free (hot work permit).

6.2 Cleaning

Cleaning the enclosure

- Clean the outside of the enclosure with the inscriptions and the display window using a cloth moistened with water or a mild detergent.
- Do not use any aggressive cleansing agents or solvents, e.g. acetone. Plastic parts or the painted surface could be damaged. The inscriptions could become unreadable.

WARNING

Electrostatic charge

Risk of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

6.3 Maintenance and repair work

WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

- Repair must be carried out by Siemens authorized personnel only.

WARNING

Maintenance during continued operation in a hazardous area

There is a risk of explosion when carrying out repairs and maintenance on the device in a hazardous area.

- Isolate the device from power.

- or -

- Ensure that the atmosphere is explosion-free (hot work permit).

WARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

⚠ WARNING

Humid environment

Risk of electric shock.

- Avoid working on the device when it is energized.
- If working on an energized device is necessary, ensure that the environment is dry.
- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

⚠ CAUTION

Hot parts in the device

Temperatures that can burn unprotected skin may be present for some time after the device has been switched off.

- Observe the waiting time specified in Technical data (Page 47) or on the device before starting with maintenance work.

⚠ WARNING

Enclosure open

Risk of explosion in hazardous areas as a result of hot components and/or charged capacitors inside the device.

To open the device in a hazardous area:

1. Isolate the device from power.
2. Visually inspect sensor inlet and outlet.

Exception: Devices exclusively having Intrinsic safety (Ex i) may be opened in an energized state in hazardous areas.

⚠ WARNING

Hot, toxic or corrosive process media

Risk of injury during maintenance work.

When working on the process connection, hot, toxic or corrosive process media could be released.

- As long as the device is under pressure, do not loosen process connections and do not remove any parts that are pressurized.
- Before opening or removing the device ensure that process media cannot be released.

⚠ WARNING

Improper connection after maintenance

Risk of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Power (Page 47).

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover screws
- Reliability of power supply, lightning protection, and grounds

NOTICE

Repair and service must be carried out by Siemens authorized personnel only.

Note

Siemens defines flow sensors as non-repairable products.

6.4 Replacing the device

⚠ CAUTION

Corrosive substances

Risk of chemical burns when replacing the sensor.

The sensor in the device contains corrosive substances that result in burns on unprotected skin.

- Make sure that the sensor enclosure is not damaged when replacing the sensor.
- If contact with the corrosive substances occurs, rinse the affected skin immediately with large amount of water to dilute substance.

6.5 Transport

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE
Insufficient protection during storage The packaging only provides limited protection against moisture and infiltration. • Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 47).

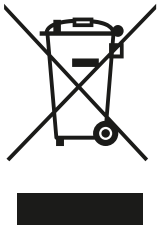
6.6 Return procedure

Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging.

Required forms

- Delivery note
- Return goods delivery note (http://www.siemens.com/processinstrumentation/returngoodsnote)
  with the following information:
  - Product (item description)
  - Number of returned devices/replacement parts
  - Reason for returning the item(s)
- Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)
  With this declaration you warrant "that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for humans and the environment."
  If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-contaminating substances, you must thoroughly clean and decontaminate the device/replacement part before returning it in order to ensure that all hollow areas are free from hazardous substances. Check the item after it has been cleaned. Any devices/replacement parts returned without a decontamination declaration will be cleaned at your expense before further processing.

6.7 Disposal



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information about battery / product return (WEEE) (https://support.industry.siemens.com/cs/document/109479891/)

Note

Special disposal required

The device includes components that require special disposal.

- Dispose of the device properly and environmentally through a local waste disposal contractor.

Technical data

7

7.1 Power

Table 7-1 Power supply

Description	Specification
Supply voltage [V]	12 - 27 VDC Um: 60 VDC
for Ex d, t	12 - 24 VDC
Reverse polarity protection	Yes
Power consumption	1.1 W

Specification in case of Intrinsic safety power supply: Ui: 20 V, Ii: 484 mA, Pi: 2.3 W, Li: 0.6 uH, Ci: 1.9 nF.

7.2 Modbus Communication Specification

Table 7-2 Modbus communication specification

Description	Specification
Device type	Slave
Baud rates	• 9600 • 19 200 (Factory setting) • 38 400 • 57 600 • 76 800 • 115 200
Number of stations	Max. 31 per segment without repeaters
Device address range	1 to 247
Protocol	Modbus RTU
Electrical interface	RS-485, 2-wire
Connector type	M12 or cable termination
Supported function codes	• 3: read holding registers • 16: write multiple registers • 8: diagnostics
Broadcast	No [1)]
Maximum cable length [m]	600 meters (@ 115 200 bits/sec)
Standard	Modbus over serial line v 1.0 [2)]

Description	Specification
Certification	one
Device Profile	None

[1]: Standard restriction. The standard requires a LED indicator for visual diagnosis. This device does not support a LED indicator. This device does not react to any Broadcast commands.

[2]: According to the Specification & Implementation guide v. 1.0 available at the Modbus Organization website

Note

Storage location

All Modbus settings of the device are stored in a non-volatile memory.

7.3 Operating conditions

Table 7-3 Basic conditions

Description		Specification
Ambient temperature (°C[°F]) (Humidity max. 90 %)	Operation: Transmitter without display Transmitter with display	 -40 to +60 [-40 to +140] -20 to +60 [-4 to +140]*
Ambient temperature (°C[°F]) (Humidity max. 90 %)	Storage: Transmitter without display Transmitter with display	 -40 to +70 [-40 to +158] -40 to +70 [-40 to +158]
Climate class		DIN 60721-3-4
Altitude		Up to 2000 m (6560 ft)
Relative humidity [%]		95
EMC performance		EN/IEC 61326-1 (Industry)

* Display can be unreadable below -20°C

Table 7-4 Cleaning and sterilizing conditions

Description	Specification
Cleaning method	• CIP • SIP

7.4 Certificates and approvals

FCT010 (can be installed in Zone 1 for gas and Zone 20/21 for dust)	
"Intrinsic safety" type of protection	
ATEX/IECEx Sira 17ATEX1215X	II 2(1) G II 1 (1) D II 2(1) D) Ex db ia [ia Ga] IIC T6 Gb Ex db [ia Ga] IIC T6 Gb Ex ia [ia] IIIC T85°C Da Ex tb [ia Da] IIIC T85°C Db Tamb = -20°C to +60°C
Pressure equipment	• 2014/68/EU Pressure Equipment Directive (PED) • Canadian Registration Number (CRN)

FC300 (can be installed in Zone 0)	
"Intrinsic safety" type of protection	
ATEX/IECEx DEMKO 05 ATEX 138072X	II 1G Ex ia IIC T6…T3 Ga
cCSAus (Canada, USA)	**Canada**: Class I Division 1. Class I Div. 1 Grp. A, B, C, D. Ex ia IIC T6…T3 IIC Ga **USA**: Class I Division 1. Class I Div. 1 Grp. A, B, C, DA AEx ia IIC T6…T3 IIC Ga
EU Declaration of Conformity	A5E31814816A/010
Pressure equipment	• 2014/68/EU Pressure Equipment Directive (PED) • Canadian Registration Number (CRN)

MASS 2100 - compact version (can be installed in Zone 0, 20)	
"Intrinsic safety" type of protection	
ATEX/IECEx	Ex ia IIC T6…T3 Ga Ex ia IIIC T135°C Da (For dust applications (IIIC) the maximum ambient temperature is limited to 100°C according to IEC 60079-11 table 4.)

MASS 2100 - compact version (can be installed in Zone 0, 20)	
cULus (Canada, USA)	**Canada**: Class I+II+III Division 1. Grp. A, B, C, D, E, F, G Ex ia IIC T6…T3 Ga Ex ia IIIC T135°C Da **USA**: Class I Division 1. Class I+II+III Division 1. Grp. A, B, C, D, E, F, G. AEx ia IIC T6…T3 Ga AEx ia IIIC T135°C Da (For dust applications (IIIC) the maximum ambient temperature is limitedto 100°C according to IEC 60079-11 table 4.)
EU Declaration of Conformity	A5E31814816A/010
Pressure equipment	• 2014/68/EU Pressure Equipment Directive (PED) • Canadian Registration Number (CRN)

MASS 2100 - remote version (can be installed in Zone 0, 20)	
"Intrinsic safety" type of protection	
ATEX/IECEx	Ex ia IIC T6…T3 Ga Ex ia IIIC T135°C Da (For dust applications (IIIC) the maximum ambient temperature is limited to 100°C according to IEC 60079-11 table 4.)
cULus (Canada, USA)	**Canada**: Class I+II+III Division 1. Grp. A, B, C, D, E, F, G Ex ia IIC T6…T3 Ga Ex ia IIIC T135°C Da **USA**: Class I Division 1. Class I+II+III Division 1. Grp. A, B, C, D, E, F, G. AEx ia IIC T6…T3 Ga AEx ia IIIC T135°C Da (For dust applications (IIIC) the maximum ambient temperature is limited to 100°C according to IEC 60079-11 table 4.)
EU Declaration of Conformity	A5E31814816A/010
Pressure equipment	• 2014/68/EU Pressure Equipment Directive (PED) • Canadian Registration Number (CRN)

Product documentation and support

A

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (http://www.siemens.com/processinstrumentation/certificates)
- Downloads (firmware, EDDs, software) (http://www.siemens.com/processinstrumentation/downloads)
- Catalog and catalog sheets (http://www.siemens.com/processinstrumentation/catalogs)
- Manuals (http://www.siemens.com/processinstrumentation/documentation)
  You have the option to show, open, save, or configure the manual.
  - "Display": Open the manual in HTML5 format
  - "Configure": Register and configure the documentation specific to your plant
  - "Download": Open or save the manual in PDF format
  - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (https://support.industry.siemens.com/cs/ww/en/sc/2067). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (https://www.pia-portal.automation.siemens.com).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (http://www.siemens.com/automation/support-request).

Additional information on our technical support can be found at Technical Support (http://www.siemens.com/automation/csi/service).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at Service & Support (http://www.siemens.com/automation/service&support).

Contact

If you have further questions about the device, contact your local Siemens representative at Personal Contact (http://www.automation.siemens.com/partner).

To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

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