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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 quarantee 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

1.1 Purpose of this documentation

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.

1.2 Product compatibility

Edition	Remarks	Device revision	Compatible device revision integration package	
05/2022	Firmware up-	Modbus	SIMATIC PDM V8.2 SP1 or later	EDD: 1.00.00 or later
	date	FW: 2.01.00-04		
		HW: 3.00.02 or later		
09/2017	First edition	Modbus	SIMATIC PDM V8.2 SP1 or later	EDD: 1.00.00 or later
		FW: 2.01.00-04		
		HW: 3.00.02 or later		

1.3 Document history

The following table shows the most important changes in the documentation compared to each previous edition.

Edition	Note
05/2022	Firmware update, corrections regarding pulse output
09/2017	First edition

1.5 Items supplied

1.4 Device documentation package

The user documentation package for this product includes the following documents:

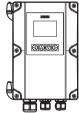
Document	Purpose	Intended users	Availability
Operating Instructions	 Contains all information needed to check and identify the delivered package install and electrically connect the product commission the product, (setting parameters via HMI menu) operate and maintain the device on a daily basis troubleshoot and remedy minor operation interruptions 	tors	 Available for download from homepage Hardcopy can be purchased via PIA Life Cycle Portal (only English and German ver- sions)

1.5 Items supplied

The device is delivered as:

Wall mount enclosure

- FST020 transmitter wall mount enclosure
- Siemens Process Instrumentation disk containing certificates and manuals.





Note

Supplementary information

Supplementary product and production specific certificates are included on the SensorFlash® SD card in the transmitter socket.

Note

Scope of delivery may vary, depending on version and add-ons. Make sure the scope of delivery and the information on the nameplate correspond to your order and the delivery note.

1.6 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.

1.7 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/cert.

1 9 Further Information

1.8 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 specifications (Page 77).

Identification

Note

IMPORTANT

This device is **NOT** to be used in hazardous areas. CE declaration is delivered with the device.

Transmitter model number is: FST020

The system ordering code represents the transmitter including accessories.

AC System ordering code: 7ME3570-1JA4XXXXXX DC System ordering code: 7ME3570-1JB4XXXXXX

AC - Transmitter ordering code: 7ME3570 - 1JA40-0AA1 DC - Transmitter ordering code: 7ME3570 - 1JB40-0AA1

1.9 Further Information

Product information on the Internet

The Operating Instructions are available on the documentation disk shipped with the device, and on the Internet on the Siemens homepage, where further information on the range of SITRANS F flowmeters may also be found:

Product information on the internet (http://www.siemens.com/flow)

Worldwide contact person

If you need more information or have particular problems not covered sufficiently by these Operating Instructions, get in touch with your contact person. You can find contact information for your local contact person on the Internet:

Local contact person (http://www.automation.siemens.com/partner)

1.10 Notes on warranty

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.

1.10 Notes on warranty

Safety notes 2

2.1 Precondition 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.

2.2 Warning symbols on the device

Symbol	Explanation
Ŵ	Caution. The Caution symbol is used throughout the operating instructions.

2.3 Laws and directives

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)

For CE marked equipment the device complies with the following directives:

- Low voltage directive LVD 2014/35/EU
- EMC directive 2014/35/EU
- Restriction of hazardous substances directive 2011/65/EC and 2015/863/EU

Conformity with European directives 2.4

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

itv EMC 2014/30/EU

Electromagnetic compatibil- Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to elec-

tromagnetic 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

Restrictions on Hazardous

Substances

RoHS 2011/65/EC and

2015/863/EU

EU Directive: Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive and Annex II Commission

Delegated Directive

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

2.5 Lithium batteries

Lithium batteries are primary power sources with high energy content designed to represent the highest possible degree of safety.



WARNING

Lithium batteries

Explosion Hazard - Can cause death or serious injury.

Lithium batteries may present an Explosion Hazard if they are abused electrically or mechanically. This is in most circumstances associated with the generation of excessive heat where internal pressure may cause the cell to rupture.

Thus the following basic precautions should be observed when handling and using lithium batteries:

- Do not short-circuit, recharge or connect with false polarity.
- Do not expose to temperature beyond the specified temperature range or incinerate the battery.
- Do not crush, puncture or open cells or disassemble battery packs.
- Do not weld or solder to the battery's body.
- Do not expose contents to water.

Description 3

3.1 Overview

SITRANS FST020 ultrasonic flow meter systems consist of a transmitter and a sensor. The following table lists the available combinations of transmitters and sensors.

Transmitter	Sensor type	
FST020	FSS200 family	
	DN 15 to DN 10m (0.5" to 360")	

3.2 Design

The transmitter reads the measured process values from the sensor and calculates derived values. It provides Modbus communications, 1x 4-20ma, 1x relay, and 1x Pulse/Frequency, USB service port, and a local display. It also adds functionalities such as totalizers, access control, diagnostics, and configuration. The local user interface consists of a display and four buttons for user interaction.

The transmitter has a modular design with discrete, replaceable electronic modules and connection boards to maintain separation between functions and facilitate field service. All modules are fully traceable and their provenance is included in the transmitter setup.

The SITRANS FST020 is available as:

Wall mount housings: AC and DC

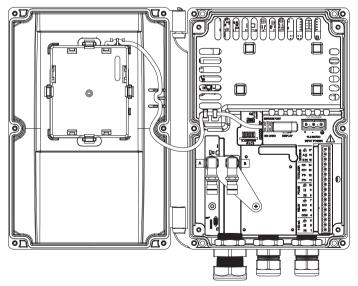


Figure 3-1 DC Wall Mount housing shown

3.3 Features

Pipe mount kit

The Pipe kit is CQO:1012NMB-1.

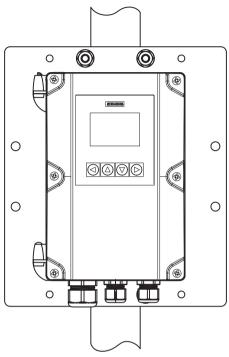


Figure 3-2 Pipe Mounting shown with mounting plate

3.3 Features

- Wall mount IP65 enclosure
- Full graphical local display
- SensorFlash (SD card) for memory backup, Datalogger and documentation storage (certificates etc.)
- USB service interface
- Modbus communications
- One pulse/frequency output
- One relay
- One current output 4-20 mA
- High immunity against process noise
- Fast response to step changes in flow
- High update rate (100 Hz) on all process values

- Measurement of:
 - Volume flow
 - Mass flow (with fixed density setpoint)
 - Flow velocity
 - Sound velocity
- Configurable upper and lower alarms and warning limits for nearly all process values
- Independent low flow cut-off settings for volume flow and mass flow
- Zero-point adjustment (initiated by host system)
- Process noise damping using digital signal processing (DSP)
- Simulation of process values
- Simulation of all outputs
- Simulation of alarms
- Enabling alarms for visibility on all outputs (HMI, status and communication)
- Comprehensive diagnostics (Siemens standard) for troubleshooting and sensor checking
- Firmware update
- Data logging in SensorFlash
- Peak indicators
- Alarm delay

3.3 Features

Installing/mounting

4.1 Chapter overview (transmitter)

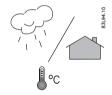
This chapter describes how to install the wall mount housing transmitter.

Wall mount housing

The wall mount housing transmitter can be mounted either on a wall or on a pipe (with optional pipe mount bracket), see Installation instructions (Page 20).

4.2 Installation location requirements

4.2.1 Environment



SITRANS F flowmeters with minimum IP65/NEMA 4X enclosure rating are suitable for indoor and outdoor installations.

Process pressure and medium temperature

If applicable, make sure that specifications for rated medium temperature (T_s) plus ambient temperature that are indicated on the device nameplate / label will not be exceeded.

Aggressive atmospheres

Ensure that the device is suitable for the application and that it is installed where there is no risk of penetration of aggressive vapors.

Direct sunlight

Prevent the device from overheating or materials becoming brittle due to UV exposure by protecting it from direct sunlight. Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical specifications (Page 77).



WARNING

Electrical shock hazard

May cause death or serious injury

Disconnect power before working on this product.

Upstream / Downstream

Avoid long drop lines downstream from the sensor to prevent the meter pipe from draining. Avoid installing the sensor upstream of a free discharge in a drop line where possible.

Sensor Location in piping system

The optimum location in the system depends on the presence of excessive gas or air bubbles in the fluid may result in erroneous measurements. Therefore, it is preferred not to install the sensor at the highest point in the system, where gas *l* air bubbles will be trapped. For liquids it is advantageous to install the sensor in low pipeline sections, at the bottom of a U-section in the pipeline.

4.2.2 Normal environmental conditions

Normal environmental conditions

This standard applies to equipment designed to be safe at least under the following conditions:

- Indoor and outdoor use
- Altitude up to 2000 m
- Operating temperature -10 °C to 50 °C (14 °F to 122 °F)
- Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C (104 °F)
- Mains supply voltage fluctuations up to ±10 % of the nominal voltage
- Transient Overvoltages up to the levels of Overvoltage Category II
- Temporary Overvoltages occurring on the Mains supply.
- Pollution Degree II

4.3 Installation instructions

4.3.1 Wall mount transmitter

Wall mounting



WARNING

Hazardous voltage

May cause death or serious injury

Disconnect power before working on this device.

The transmitter can be mounted on any wall surface including wood, metal or concrete. Use the appropriate bolts and screws as needed for your mounting application and adhere to local codes.

Prepare holes for the four screws (M6x100 or equivalent). Screw head diameter: max. 13.5 mm; screw shaft diameter: max. 6 mm.

- Recommended mounting: Directly to wall or to electrical cabinet back panel.
- If alternate mounting surface is used it MUST support four times the weight of the unit.

Mounting the enclosure

- 1. Loosen the enclosure cover screws and open the cover to reveal the mounting holes.
- 2. Mark and drill four holes in the mounting surface for four mounting screws (supplied).
- 3. Using a long flat-blade screw driver, mount transmitter and tighten screws.
- 4. Tighten nuts (torque: 10 Nm).
- 5. Refer to Connecting the power supply (Page 28) and Sensor connections (Page 28) to complete installation.

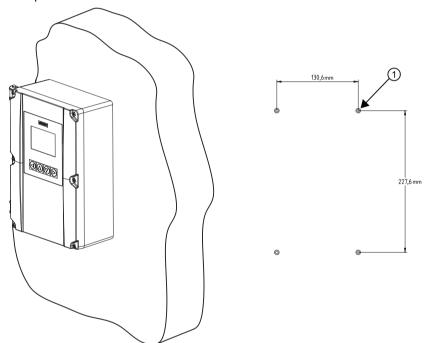


Figure 4-1 Wall mounted transmitter showing mounting hole pattern

Mounting on pipe

Note

Mounting on pipe

For mounting on pipe, see the installation instructions given in the CQO:1012NMB-1 instructions that are provided with the optional mounting bracket kit.

U-bolts and other miscellaneous hardware are not supplied with the flowmeter.

For installation on 2-inch standpipe use the optional CQO:1012NMB pipe mounting kit.

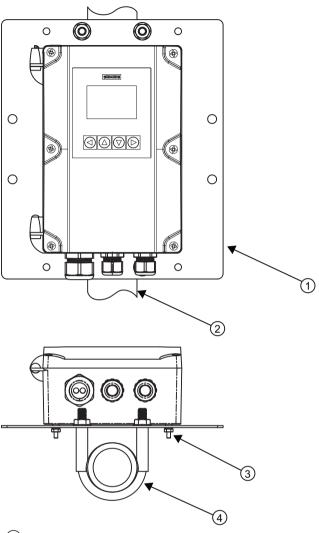
Table 4-1 CQO:1012NMB-1 Mounting Kit

Description	Qty
Mounting Plate	1
U-Bolt Assembly including bracket and nuts	2
8-32 x 5/8 LG cross round head screws	4
#8 Flat washer	4
#8 Split lock washers	4
8-32 Hex nut	4

- 1. Affix mounting plate to standpipe using the U-bolt assemblies.
- 2. Secure transmitter to mounting plate using #8-32 screws, washers and nuts.
- 3. Tighten nuts (torque: 10 Nm).
- 4. Refer to Connecting the power supply (Page 28) and Sensor connections (Page 28) to complete installation.

Note

Use conduit fittings or cable glands on all cables.



- 1 Mounting plate
- 2 Stand pipe
- 3 Mounting hardware (see table above)
- 4 U-bolt assembly

Connecting

This chapter describes how to wire up the transmitter for operation with a sensor.

- Transmitter power supply, communications and I/O connections (Page 28)
- Sensor connections (Page 28)
- Connecting the power supply (Page 28)
- Connecting Inputs/Outputs (Page 30)
- Connecting channel 1 (Page 31) (Modbus communication channel)

For connection of the sensor, see the relevant sensor Installation Manual.

5.1 Basic safety notes

5.1.1 Missing PE/ground connection



⚠ WARNING

Missing PE/ground connection

Risk of electric shock. May cause death or serious injury.

Depending on the device version, connect the power supply as follows:

- **Power plug**: Ensure that the used socket has a PE/ground conductor connection. Check that the PE/ground conductor connection of the socket and power plug match each other.
- **Connecting terminals**: Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.

5.1.2 Energized devices



WARNING

Energized devices

Risk of electric shock. May cause death or serious injury.

When energized the device may be opened by qualified personnel only.

5.3 Device nameplates



WARNING

Mains supply from building installation overvoltage category 2

A circuit breaker (max. 15 A) must be installed in close proximity to the equipment and within easy reach of the operator. It must be marked as the disconnecting device for the equipment.



WARNING

DC connection devices

The DC power source must be isolated from mains supply.

5.2 Disconnecting device

Overvoltage Category II

Connect mains supply through a circuit breaker (max. 15 A) in close proximity to the transmitter and within easy reach of the operator. Mark it as the disconnecting device for the transmitter.

5.3 Device nameplates

Each part of the system has one nameplate type 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.

The transmitter is identified as "Ultrasonic transmitter SITRANS FST020" and the sensor as "Ultrasonic sensor SITRANS FSS200".

5.3.1 Device nameplate

Transmitter nameplates

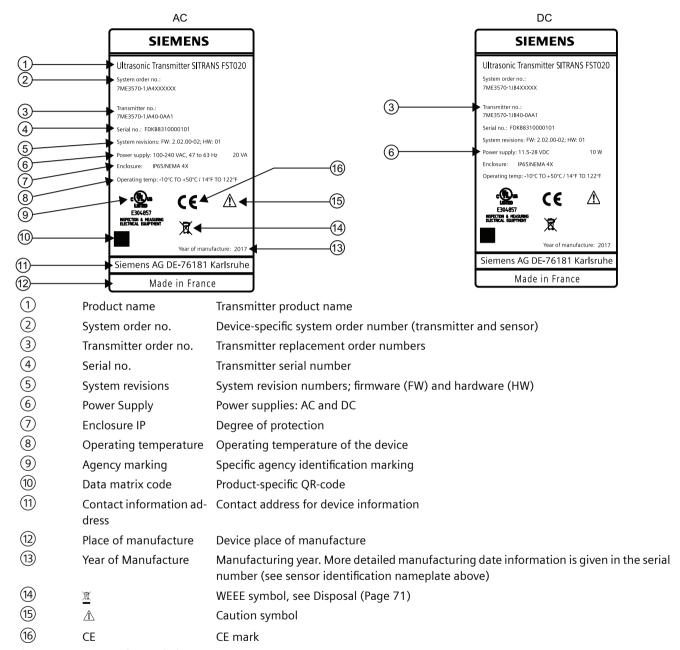


Figure 5-1 Transmitter Labels: AC-DC

5.4 Transmitter power supply, communications and I/O connections

5.4 Transmitter power supply, communications and I/O connections

5.4.1 Sensor connections

For sensor connection, see the FSS200 Sensor installation instructions manual.

5.4.2 Connecting the power supply

Note

If the transmitter is not already mounted and cabling has not been run, proceed to Mounting the Transmitter (Page 20) before connecting power.



WARNING

Hazardous Voltage

May cause death or serious personal injury.

Disconnect power before working on this product.

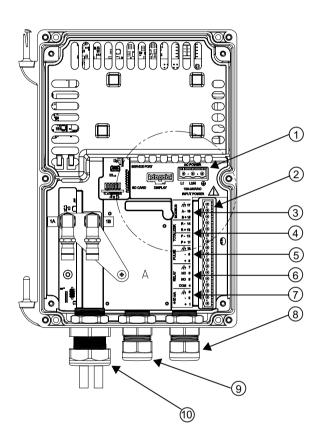
- 1. Using a flat-head screwdriver, loosen the six securing screws from the Keypad Enclosure Cover and open cover.
- 2. To determine type of power connection refer to the following part numbers:
 - 7ME3570-1HA4 = AC Power (with 500mA fuse)
 - 7ME3570-1HB4 = DC Power (with 2A fuse)
- 3. Remove input power blind plug and fit cable gland.
- 4. Push cable through open gland and cable path.
- 5. Loosen power plug connector screws.
- 6. Referring to the illustration and table below, as per local electric codes, wire input power connector for AC or DC power depending on power supply provided.

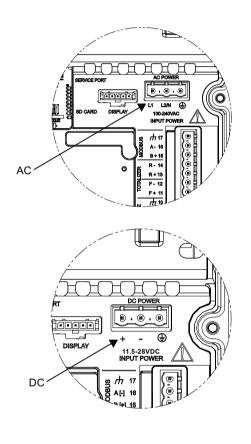
Connector pins	AC	DC	Wire color
1	L1	+	Black
2	L2N	-	White
3	Ground 😩	Ground 😩	Green

- 7. Insert AC or DC power wires into wire entry holes and secure by tightening wire clamp screws using a screwdriver.
 - For AC Connect ground to terminal ⊕ and power to terminals L1 and L2N.
 - For DC Connect ground to terminal
 and power to terminals + and -.

Note

Power supply connector wires should be stripped stranded or solid conductors AWG 12-18.





- 1 Power input (AC or DC see inserts)
- (2) I/O terminals TB1
- (3) Modbus
- (4) Totalizer
- (5) Pulse

Figure 5-2 Input Power Wiring

8. Plug power connector into jack.

- 6 Relay
- (7) 4-20 mA
- 8 I/O input cable 30m (98ft) max length
- 9 Power input cable
- (10) Sensor cables 90m (300 ft) max length

5.4 Transmitter power supply, communications and I/O connections

- 9. Tighten cable gland.
- 10. Connect the power cable to the appropriate power source (100-240 VAC @ 50/60 Hz or 11.5-28.5 VDC) and power up unit.



Circuit limited to 15 Amps

The branch circuit must be limited to 15A or damage to the unit and death or serious injury may result.

It is recommended that the circuit breaker be located near the transmitter.

5.4.3 Connecting Inputs/Outputs

- 1. Remove blind plugs where required from the flowmeter case.
- 2. Loosen spring screws on housing lid.
- 3. Open housing lid.

A label showing the device configuration is placed on the PC board inside the transmitter housing. It is either for AC or DC power depending on the flowmeter type.

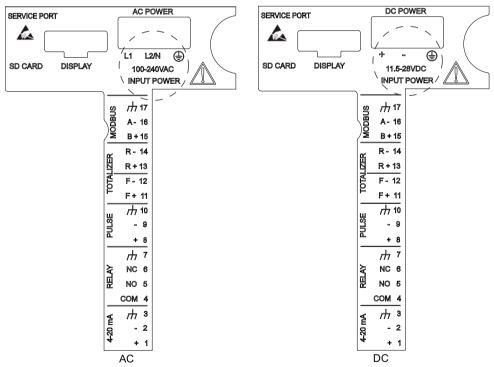


Figure 5-3 Inside cover - AC and DC labels

5.4.4 Connection Wiring

Terminal Block Wiring

These connection diagrams apply to the part numbers listed below.

SITRANS FST020	
FST020	7ME3570

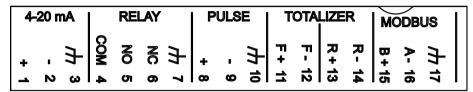


Figure 5-4 Terminal board channels and pin numbers

Note

4 to 20 mA current output Channel 2

It is not required to use shielded cables for the pure 4 to 20 mA current output.

Table 5-1 Input/Output Wiring

Pin#	Signal	Function	Description
1	lo1+	Isolated Loop Supply	Spannable 4-20mA output (Loop Powered) This
2	lo1-	Isolated Loop Return	output also provides a fault indication by drop- ping to 2mA if assigned to flow rate and under fault conditions.
3	Chassis	Ground	Ground
4	С	Common	Relay Output
5	NO	Normally Open	Relay Output
6	NC	Normally Closed	Relay Output
7	Chassis	Ground	Ground
8	PULSE OUTPUT +	Transistor	Menu selection: PGEN, POS TOTAL, NEG TOTAL
9	PULSE OUTPUT -	Transistor	
10	Chassis	Ground	Ground
11	NO TOT +	DIGITAL INPUT +	Freezes Totalizer to stop incrementing.
12	NO TOT -	DIGITAL INPUT -	
13	CLR TOT +	DIGITAL INPUT +	Clears Totalizer
14	CLR TOT -	DIGITAL INPUT -	
15	Modbus_B	Differential +	Serial communication, Modbus protocol
16	Modbus _A	Differential -	Serial communication, Modbus protocol
17	Chassis	Ground	Ground

5.4 Transmitter power supply, communications and I/O connections

Wiring

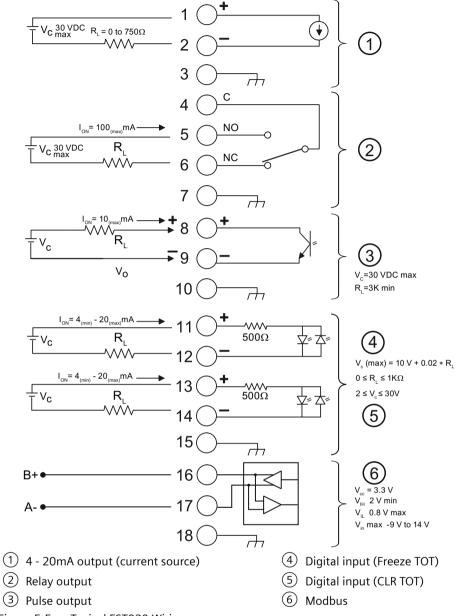


Figure 5-5 Typical FST020 Wiring

Connect pulse output to galvanically isolated input

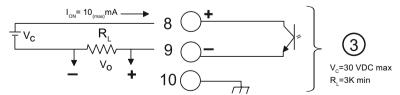


Figure 5-6 Alternative pulse output connection with galvanically isolated input

If the input is galvanically isolated the polarity does not need to be inverted.

	Isolated 4-20mA Output TB1-1/2			
R	= 250 Ω typical, 750 Ω maximum			
V _c	= 24 VDC typical / 30 VDC maximum			
I	= 4-20mA			
R _L	= Loop wire resistance (both ways) plus User's input load resistance.			

Pulse output TB1-8 / TB1-9		
V _c	= +30 VDC max.	
R _L	= 3K Ω minimum	

Digital Inputs TB1-11 / TB1-12 and TB1-13 / TB1-14		
V _c	$= (10V + 0.02 \times RL) \text{ max. } 2 \le Vc \le 30 \text{ VDC}$	
$0 \le R_L \le 1000 \ \Omega$		

Activate or deactivate digital input on channel 7 (freeze totalizer) or channel 8 (clear totalizer)

- 1. Apply voltage V_c according to your wiring to activate function on channel 7 or channel 8.
- 2. Apply short circuit between pins to deactivate function.

See also

Connecting Inputs/Outputs (Page 30)

5.4.5 Finishing the transmitter connection (wall mount housing)

Connection check-up

- 1. Check individual wire and cable installations by tugging firmly.
- 2. Firmly tighten cable glands and insert blanking plugs in unused cable entries.
- 3. Close flowmeter cover.
- 4. Tighten the six cover securing spring screws.

5.4 Transmitter power supply, communications and I/O connections

Commissioning

This chapter gives instructions to commissioning your device, see Commissioning via local display (Page 37).

Furthermore, the device can be commissioned using SIMATIC PDM, see Commissioning with SIMATIC PDM (Page 101).

6.1 Basic Safety notes



WARNING

Loss of type of protection

Risk of explosion. Damage to device if the enclosure is open or not properly closed. The type of protection specified on the nameplate or in Technical specifications (Page 77) is no longer guaranteed.

• Make sure that the device is securely closed.



WARNING

Hot surfaces

Risk of burns resulting from hot surfaces.

• Take corresponding protective measures, for example by wearing protective gloves.

6.1.1 Hazardous contact voltage



WARNING

Hazardous contact voltage

May cause death or serious injury.

Risk of injury through hazardous contact voltage when the device is open or not completely closed.

The degree of protection specified on the nameplate or in Technical data (Page 77)is no longer quaranteed if the device is open or not properly closed.

• Make sure that the device is securely closed.

6.2 General requirements

Before commissioning it must be checked that:

• The device has been installed and connected in accordance with the guidelines provided in Installing/mounting (Page 19) and Connecting (Page 25).

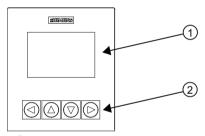
6.3 Power-up

Power up the device. Local display will show a screen for initial startup (Page 36).

6.4 Local display

The device is commissioned/operated with the touch keypad on the local display.

The graphic display above the keypad gives a menu-guided operation of the individual device function/parameters. Successful operation of the key is confirmed by tactile feedback as key is pressed.



- 1 Full graphical display
- (2) Touch keypad

Figure 6-1 Local display

Note

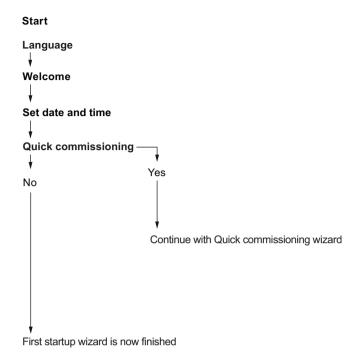
HMI timeout

If no key is pressed for 10 minutes, the display switches to show operation view. If Backlight is set to Automatic, display backlight goes off automatically 30 seconds after the last key press.

6.5 Initial startup

The first time the device is powered up, you will be prompted to set the language. The device always starts up showing "Language" in English. When the language has been set, you will be prompted to set the date and time.

You will be asked if you want to start the "Quick commissioning" wizard. If you choose "Yes" (recommended), the "Quick commissioning" wizard will start. If you choose "No", you accept the default values of the device, and the next HMI view will be the operation view 1.



6.6 Commissioning via local display

6.6.1 Chapter overview

In this chapter it is described how to commission the device via the local display using the Quick commissioning wizard.

6.6.2 Wizards

6.6.2.1 Quick Commissioning wizard (menu item 1.1)

The Quick commissioning wizard will guide you through configuration of parameters essential for your application. You configure parameters essential for your application by selecting the configuration path and sub-wizards appropriate for your application.

Start

6.6.2.2 Quick Commissioning wizard (wizard)

Quick start Quick commissioning Sensor settings **Basic configuration** Process values Inputs and outputs Sensor settings Copy configuration Process values Inputs and outputs Communication Next Identification Long tag Location Installation date

Text Options/Description

Next

Finished

Select a basic configuration wizard Sensor settings, Process values, Inputs and outputs, Copy configuration

Set the identification pa-

Long tag, Location, Installation date

rameters

The "Quick commissioning" wizard comprises the following subwizards:

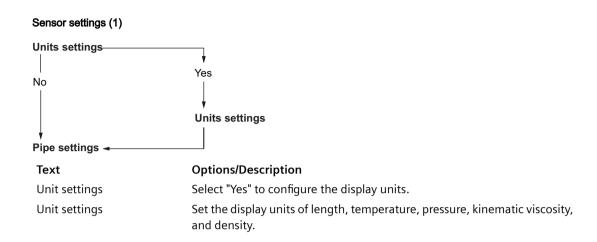
- Sensor settings wizard (wizard) (Page 39)
- Process values wizard (wizard) (Page 44)
- Inputs/Outputs wizard (Page 45)

Each sub-wizard has its own view numbering. The sub-wizard name and the parameter name are shown in the upper left corner of the display. The view number and the total views in the sub-wizard are shown in the upper right corner of the display.

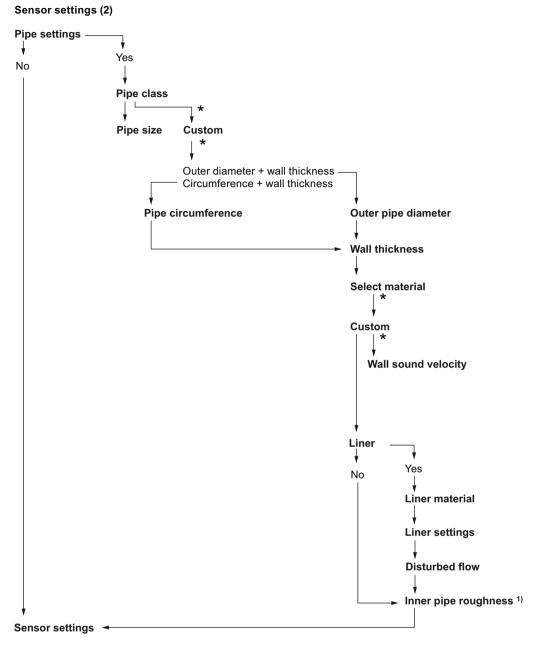
6.6.2.3 Sensor settings wizard (menu item 1.2)

The Sensor settings wizard will guide you through configuration of essential parameters.

6.6.2.4 Sensor settings wizard (wizard)



6.6 Commissioning via local display



Options/Description Text Select "Yes" to configure the pipe. Pipe settings Pipe class Select the pipe class. Pipe size Select the pips size from the options available for the selected pipe class. Enter pipe circumference. Only available if custom pipe class is selected. Pipe circumference Outer pipe diameter Enter outer pipe diameter. Only available if custom pipe class is selected. Wall thickness Enter wall thickness. Only available if custom pipe class is selected. Select material Select the pipe material.

material is selected.

Enter the wall sound velocity of the material. Only available if custom

Wall sound velocity

Liner Select "Yes" to configure the liner material.

Select "No" to only configure the Inner pipe roughness.

Liner material Select the liner material.

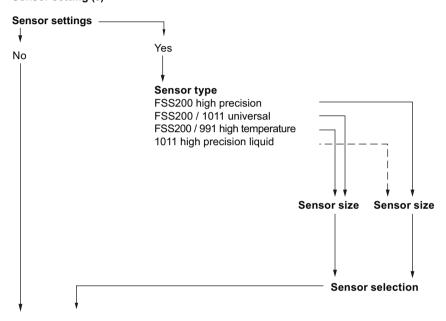
Liner settings Set the liner sound velocity and thickness.

Disturbed flow Define the type of pipe configuration and the distance to the sensor.

Inner pipe roughness Set the inner pipe roughness.

Select "Custom" to enter non-standard values.

Sensor setting (3)



Medium settings

Text Options/Description

Sensor settings Select "Yes" to configure the sensors.

Sensor settings Select the sensor type installed (found on sensor label).

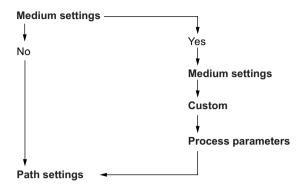
Sensor size Select the sensor size from the options list (found on sensor label).

Sensor selection Define the temperature compensation mode, the temperature class, the

spacing offset and the cable length

6.6 Commissioning via local display

Sensor settings (4)



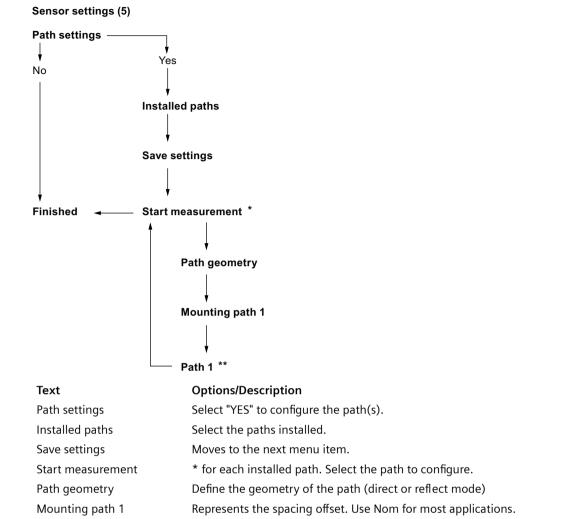
Text Options/Description

Medium settings Select "Yes" to configure the medium.

Medium settings Select the process medium.

Process parameters Set the expected sound velocity (only available if custom process medium is selected) and the process temperature, pressure, kinetic viscosity, and

density.



6.6.2.5 Process Values wizard (menu item 1.3)

Path 1

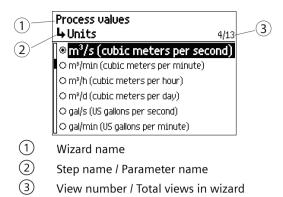
The Process values wizard will guide you through setup of process values for your application. The prioritizing of the process values automatically configures the measurement views on the display. The process value configured as first process value is set as first display view.

wizard.

Select "Receiver signal" to view graphical display of the receiver signal.

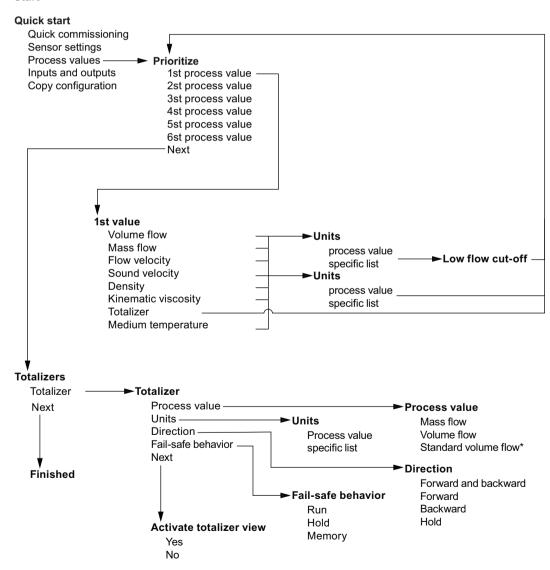
** Select "Next" to configure next path or to select "Next" to finish the

6.6 Commissioning via local display



6.6.2.6 Process values wizard (wizard)

Start



6.6.2.7 Inputs/Outputs wizard

The first screen in the Inputs and outputs wizard informs about the active/passive operation availability. It shows the application possibilities of your hardware. The kind of operation depends on the wiring.

The Inputs and outputs wizard will guide you through setup of inputs and outputs on the available channels.

Channel 2 - output

Channel 3 - relay

Channel 4 -input/output

6.6.3 Navigating the menu structure

6.6.3.1 Chapter overview

In this chapter it is described how to commission the device via the local display using the Quick commissioning wizard.

6.6.3.2 Navigation view

The exact structure of the operating menu is explained in HMI menu structure (Page 115).

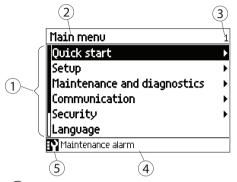
All items of the menu structure of the device are identified with a unique number.

Level 1 of the menu structure is standardized for all Siemens Process Instrumentation devices and covers the following groups:

- 1. Quick start: Lists the most important parameters for quick configuration of the device. All parameters in this view can be found elsewhere in the menu.
- 2. Setup: Contains all parameters which are needed to configure the device.
- 3. Maintenance and diagnostics: Contains parameters which affect the product behavior regarding maintenance, diagnostics and service.
- 4. Communication: Contains parameters which describe the Modbus communication settings of the device.

6.6 Commissioning via local display

- 5. Security: Contains parameters which describe all security settings of the device.
- 6. Language: Parameter for changing the language of the local display. Regardless of the language setting, the term for this parameter is always the English term (Language).



- 1 List of menu structure items
- 2 Name of the previously selected item
- 3 Number of highlighted item
- 4 Alarm status text
- (5) Device status icon

Figure 6-2 Level 1 of the menu structure

6.6.3.3 Navigating the menu structure

You can navigate through the menu structure items in the device using the four buttons on the display as described below.

Table 6-1 Key functions - menu structure navigation

Key	Function
◁	Return to previous item.
	Select the item above.
	Select the item below.
	Enter the selected item.

Operating

These Operating Instructions describe the operation via the local display (HMI). The device can also be operated via various software.

7.1 Display views

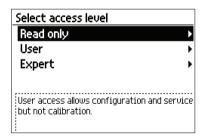
There are six display views, all fully configurable. Use the \square and the \square keys to switch between the operator views,

Four different types of views are available:

- Display of measured process values, see Reading the process values (Page 49).
- Display for totalizer operation, see Operating the totalizer (Page 51).
- Display of a list of active alarms, see Handling alarms (Page 51).
- Display of six configurable measurement/diagnostic values, see Reading the diagnostic values (Page 53).

7.2 Access control

You can view all items in the HMI menu but the parameters are protected against changes through access level control. To gain access, select one of the following access levels:



Read only
 Allows no configuration. The parameter values can be viewed only (indicated by a symbol).
 No PIN code required.

- User
 Allows configuration and service of all parameters except calibration parameters. Default PIN code is 2457.
- Expert
 Allows configuration and service of all parameters including flow and calibration parameters.
 Default PIN code is 2834.

7.3 Operating the FST020

PIN codes can be changed in **Security** (5).

Note

Lost PIN code

If the PIN code is lost, provide Siemens customer support with the transmitter serial number (see nameplate). Siemens customer support will provide a code to be entered in PIN recovery (5.3).

Disable access level control

If logged in as Expert you can **Deactivate user PIN**. As User you will not be prompted to enter the password. Enabling the access level control can be done in **Activate user PIN** and requires entering the Expert password.

Auto logout function

You will **not** be prompted for password for 10 minutes after the last key press.

N.	\cap	ГΙ	_	_
IV	U		L.	

Device restart

Whenever the device is restarted, the access level is reset to Read only.

7.3 Operating the FST020

7.3.1 Fixed display texts

Some displayed texts are fixed, which means they will not change regardless of changed display language.

The following tables list the fixed display texts and their corresponding process value, diagnostic value, and compensation value names.

Table 7-1 Process values

Fixed display text	Process value name
VOL.FLOW	Volume flow
MASS FLOW	Mass flow
FLOW VEL	Flow velocity
SOUND VEL	Sound velocity
DENSITY	Density (Fixed value)
KIN. VISCOSITY	Kinematic viscosity (Fixed value)
FLUID TEMP.	Medium temperature (Fixed value
TOT1	Totalizer 1

Table 7-2 Diagnostic values

Fixed display text	Diagnostic value name
TRN TEMP.	Transmitter internal temperature
CURR. OUT (CH2)	Ch2 value
REYNOLDS NO.	Reynolds number
P1.SNR UP	SNR up path 1
P1.SNR DOWN	SNR down path 1
P1.SOUND VEL	Sound velocity path 1
P1.DELTA TIME	Delta time path 1
P1.ACC.BURST	Path 1 percentage of bursts accepted
P1.PEAK AMP.DN	Peak amplitude down path 1
P1.PEAK AMP.UP	Peak amplitude up path 1

7.3.2 Reading the process values

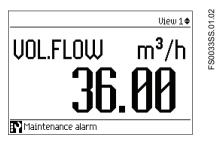
The value of the process values can be displayed either as one or more numeric values or as numeric value(s) in combination with a graph/bargraph. The following view types are available:

- Single value
- Three values
- Totalizer
- 1 value and graph
- 1 value and bargraph
- Six values

Table 7-3 Key functions - operator view

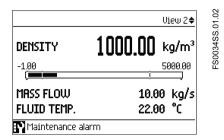
Key	Function
◁	No functionality
	Go to the previous operator view
	Go to the next operator view
D	Enter the menu structure access point

Single value

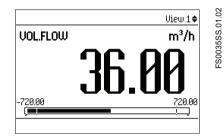


7.3 Operating the FST020

Three values



1 value and bargraph

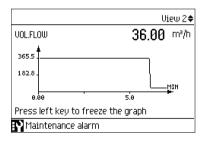


Note

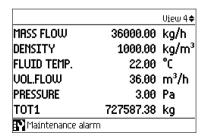
Bargraphs

The bargraph limit values indicate the set lower and upper alarm limits, and the vertical lines in the bargraph indicate the set lower and upper warning limits.

1 value and graph



Six values



7.3.3 Operating the totalizer

When totalizer is displayed in the main view, press to access the totalizer operation.

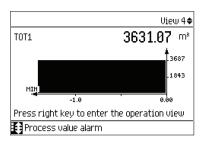
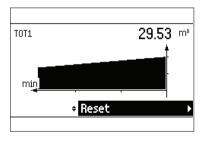


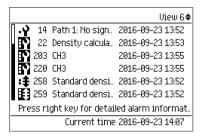
Table 7-4 Key functions - totalizer operation

Key	Function
◁	Exit totalizer operation
	Select action to perform
	Select action to perform
	Perform selected action



7.3.4 Handling alarms

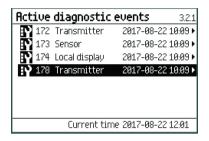
When the alarm list is displayed in the main view, press to get more detailed information about the active alarms.

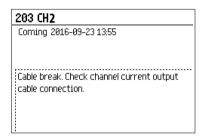


7.3 Operating the FST020

Table 7-5 Key functions - alarms list view

Key	Function
	Exit alarm list view
	Select the item above in the list; keep pressing the key to accelerate scrolling up the selection list
	Select the item below in the list; keep pressing the key to accelerate scrolling down the selection list
	View more information on the selected alarm



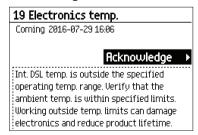


Press to exit the detailed alarm information.

Alarm acknowledgement

There are two ways to have the alarms removed from the alarm list.

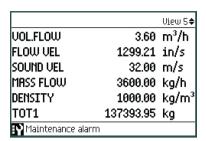
• Manual: The alarm remains in the alarm list until the alarm is manually acknowledged (ack.). Before the alarm can be acknowledged, the cause must be eliminated. Press ▶ to go to the detailed alarm information. Press ▶ again to acknowledge the alarm. The time of the acknowledgement is shown in the history log.



Auto: The alarm is removed from the alarm list when the cause is removed (going)

7.3.5 Reading the diagnostic values

One of the main views can be configured to show six diagnostic values.



7.3.6 Reading / changing parameters

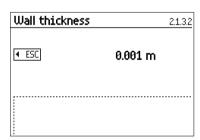
7.3.6.1 Parameter view introduction

Depending on your access level, you can read the current value and/or edit the value of the selected parameter.

7.3.7 Alphanumeric parameters

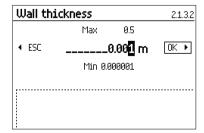
Read only

The view shows the set value. Press \textstyle to exit the view.



Edit

Editable alphanumeric parameters are displayed as shown here.



7.3 Operating the FST020

Table 7-6 Key functions - editing alphanumeric values

Key	Function
	Select the next left position. If the most left position is selected: exit the parameter edit view without confirming the changes. Keep pressing the key to jump to the most left position.
	Change the selected number/character. Numeric characters: increase the number by one (for example from 7 to 8) ASCII characters: select the previous character in the alphabet.
	Change the selected number/character. Numeric characters: decrease the number by one (for example. from 8 to 7) ASCII characters: select the next character in the alphabet.
	Select the next right position. If most right position is selected: confirm the change and exit the parameter edit view. Keep pressing the key to jump to the most right position.

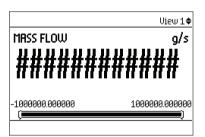
Note

Ensure that the new value is within the minimum/maximum range when changing numeric values.

Note

signs in display

The display is unable to show the measured value or the value is missing or invalid. Try to fix by changing the measurement units or the resolution.



7.3.7.1 Changing the resolution

Changing the resolution

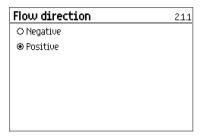
In order to change the resolution of the process value shown in the operation view (for example mass flow), set the decimal places parameter for the selected process value. For example, the decimal places for process value Mass flow is defined in **Decimal places**.

The resolution can also be changed by changing the resolution of one configuration parameter for this process value. For example **Low flow cut-off**. Any changes in resolution will change the resolution of all configuration parameters for this process value as well.

Parameter list - read only

Table 7-7 Key functions - read only

Key	Function
◁	Exit parameter list
	No functionality
	No functionality
D	No functionality

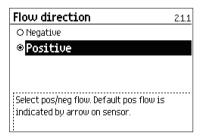


Parameter list - editable

The help texts describe the possible adjustments of the respective parameters.

Table 7-8 Key functions - edit

Key	Function
◁	Escape the view without changing the value.
	Select the option above.
	Select the option below.
	Confirm selected option.



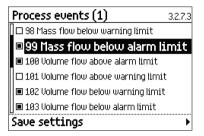
Multiselection

Table 7-9 Key functions - multiselection of options

Key	Function
◁	Escape the view without changing the value.
	Scroll up in the list. If the uppermost position is selected: highlight Save settings.

7.3 Operating the FST020

Key	Function
	Scroll down in the list. If the lowermost position is selected: highlight Save settings.
	Select / deselect option.



It is possible to select/deselect multiple alarms to be suppressed. The marked alarms will **NOT** be suppressed.

Parameter assignment 8

8.1 Multipoint calibration

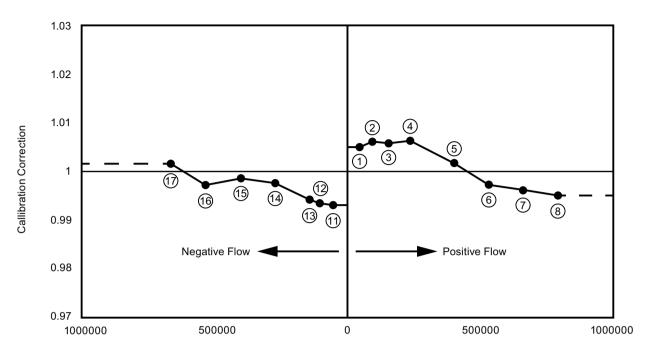
The transmitter provides an additional 20 point piecewise linear calibration table with user selectable input value: volume flow, reynolds number or fluid sound velocity. The table can be configured for either unidirectional or bidirectional calibration.

Note

Ascending order by reynolds number

The datapoints must be entered in ascending order by reynolds number.

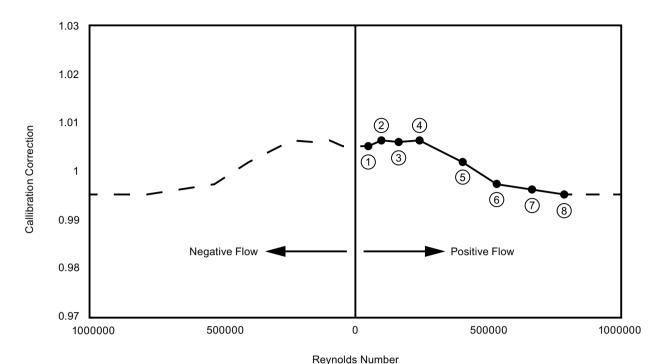
8.1 Multipoint calibration



Rev	nolds	Num	her

Point	Reynolds number	Calibration correction	Point	Reynolds number	Calibration correction
1	47339	1.0050	11)	54231	0.9930
2	94701	1.0060	12	102932	0.9934
3	156034	1.0058	13)	141382	0.9942
4	238385	1.0062	14)	271843	0.9975
(5)	402304	1.0017	(15)	402304	0.9984
6	532765	0.9971	16)	532765	0.9971
7	663226	0.9960	17)	663226	1.0015
8	793687	0.9950	18)	0	0
9	0	0	19	0	0
10	0	0	20	0	0

Figure 8-1 User calibration table behavior (bidirectional calibration)



		J. 1. 0. 1. 0. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Point	Reynolds number	Calibration correction
1	47339	1.0050
2	94701	1.0060
3	156034	1.0058
4	238385	1.0062
5	402304	1.0017
6	532765	0.9971
7	663226	0.9960
8	793687	0.9950
9	0	0
10	0	0

Figure 8-2 User calibration table behavior (unidirectional calibration)

8.2 Inputs and outputs

The available configuration of the hardware functionality of input and output is described in the following table.

Hardware and software configuration of the input/output channels Table 8-1

Channel	HW configuration (fixed when ordering)	SW configuration available to the user
1	Modbus	Modbus
2	Current output	Current output (0/4-20 mA)

8.2 Inputs and outputs

Channel	HW configuration (fixed when ordering)	SW configuration available to the user	
3	Relay output	Status Output:	
		Status signals	
		Alarm and diagnostics	
		Flow direction	
4	Output	Frequency output	
		Pulse output	
7	Digital input	Reset totalizer 1	
8	Digital input	Pause/resume totalizer 1	

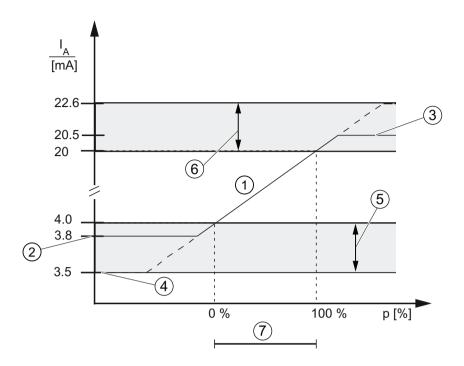
Current output

Current output configuration

The following process values can be assigned to the current output:

- Volume flow
- Mass flow
- Flow velocity
- Sound velocity
- Density
- Kinematic viscosity
- Medium temperature

The accuracy specified for the analog output signal applies only within the range 4 to 20 mA. Lower limit (4 mA) and upper limit (20 mA) can be assigned to any specific measurement values.



- 1 Linear control range
- Lower saturation limit
- (2)(3) Upper saturation limit
- Lower fault current value
- <u>(5)</u> Recommended setting range for lower fault current
- 6 Recommended setting range for upper fault current
- (7)Measuring range

Current limits for NAMUR configuration Figure 8-3

The fail safe current output signal can be selected to:

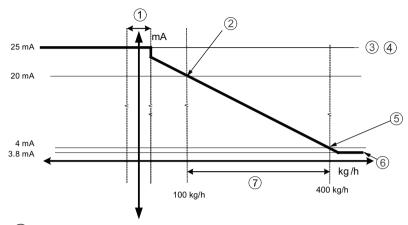
- Lower fault current (defined in the Loop current scale selection)
- Upper fault current (defined in the Loop current scale selection)
- Last valid value (the last process value before the failure occurred)
- Current value (actual measured value)
- Fail-safe value (within the range of 0 mA to 25 mA 1)

Output scaling configuration

Below are four examples describing configuration possibilities for a current output.

8.2 Inputs and outputs

Positive flow with negative scaling

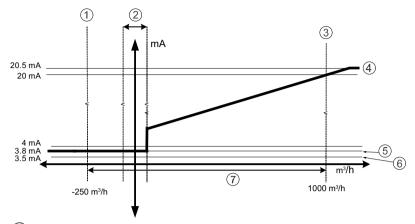


- (1) Low flow cut-off
- 2 Upper range value
- 3 Maximum output current
- (4) Upper fault current
- 5 Lower range value
- (6) Lower saturation limit
- 7 Span

Current output setting

- Process value = Mass flow
- Direction = Positive
- Loop current scale = 4-20 mA (maximum 25 mA)
- Upper range value = 100 kg/h
- Lower range value = 400 kg/h
- Fail-safe behaviour = Upper fault current
- Low flow cut-off = 25 kg/h

Positive flow across zero with positive scaling



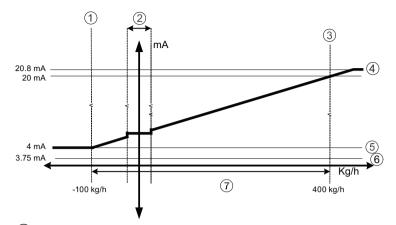
- 1 Lower range value
- 2 Low flow cut-off
- 3 Upper range value
- 4 Upper saturation limit
- (5) Lower saturation limit
- 6 Lower fault current
- 7 Measuring range

Current output setting

- Process value = Mass flow
- Direction = Bidirectional
- Loop current scale = 4-20 mA NAMUR
- Upper range value = 1000 m³/h
- Lower range value = -250 m³/h
- Fail-safe behaviour = Upper fault current
- Low flow cut-off = $25 \text{ m}^3/\text{h}$

8.2 Inputs and outputs

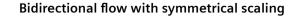
Bidirectional flow across zero with positive scaling

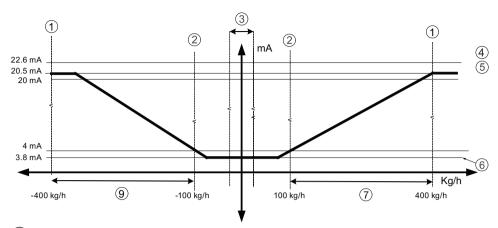


- 1 Lower range value
- 2 Low flow cut-off
- 3 Upper range value
- 4 Upper saturation limit
- (5) Lower saturation limit
- 6 Lower fault current
- 7 Span

Current output setting

- Process value = Mass flow
- Direction = Bidirectional
- Loop current scale = 4-20 mA US
- Upper range value = 400 kg/h
- Lower range value = -100 kg/h
- Fail-safe behaviour = Minimum current
- Low flow cut-off = 25 kg/h





- 1 Upper range value
- 2 Lower range value
- 3 Low flow cut-off
- 4 Upper fault current
- (5) Upper saturation limit
- 6 Lower saturation limit
- Span

Current output setting

- Process value = Mass flow
- Direction = Bidirectional (Symmetric)
- Loop current scale = 4-20 mA NAMUR
- Upper range value = 400 kg/h
- Lower range value = 100 kg/h
- Fail-safe behaviour = Upper fault current
- Low flow cut-off = 25 kg/h

Pulse output

The pulse output function supplies pulses equivalent to a configured amount of accumulated volume or mass. The pulse width is configured and the pulse repetition is proportional to the selected flow rate.

Pulse repetition

Pulse repetition is calculated as follows:

8.2 Inputs and outputs

Example

- Pulse output configuration (channels 2 to 4)
 - Operation mode = Pulse output
 - Process value = Mass flow
 - Amount per pulse = 1 kg
 - Pulse width = 1 ms
- Measured mass flow value = 10 kg/s (constant)

Result:

- Pulse repetition = 100 ms
- Output frequency = 10 pulses per second with a pulse width of 1 ms
- Remaining time between pulses is 99 ms

Note

Pulse width must be selected with the view that remaining time is always greater than pulse width at the highest measured flow.

Frequency output

The frequency output function supplies a frequency (50% duty cycle) proportional to the selected process value.

Frequency is calculated as follows:

Example

This example shows how to calculate the output frequency for any measured flowrate:

Frequency output configuration:

- Operation mode = Frequency output (Channel 2 to 4)
- Process value = Mass flow
- Direction = Positive
- Frequency value high = 12 kHz
- Frequency value low = 2 kHz
- Upper range value = 15 kg/s
- Lower range value = 5 kg/s

Measured mass flow value = 7.5 kg/s (constant)

Result:

• Frequency = 4.5 kHz

Note

The connected equipment must be capable of registering the full range of frequencies configured.

Status output

The status output can be used to show alarm status and it can be signaled on Status output or Relay output.

Note

Flow direction warning

The limit function for the current output can be used to signal the flow direction by setting the Lower warning limit for the Process value to 0. A warning will occur in case of negative flow.

This warning can be output on the status ouput if Status mode is set to Alarm item and the Process alarms (1) [relevant process value] below warning limit is selected.

Depending on the Status mode setting, multiple alarms can be signaled on the output and selected from the alarm class or the alarm item lists.

- Alarm class: Alarm will be signaled if alarm within the selected alarm class occurs.
- Alarm item: Alarm will be signaled if selected alarm item occurs. It is possible to select multiple alarms to be signaled.

Note

Alarm class / NAMUR status signals

The options depend on the setting selected in **Staus icons**, either NAMUR status signals or Alarm class (Siemens Standard).

8.2.1 Digital input

Digital input

If the input signal is activated with a logical signal (15 to 30 V DC) and the Polarity is set to Active high level, the meter carries out an activity selected in the menu Input function:

- Reset totalizer 1 on channel 7
- Pause/resume totalizer 1 on channel 8

8.2 Inputs and outputs

Note

Changing polarity

Changing the polarity triggers the signal input to executes the parameterized function.

Service and maintenance

9.1 Basic safety notes

9.1.1 Impermissible repair of the device



WARNING

Impermissible repair of the device

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

9.2 Recalibration

Siemens offers to recalibrate the system.

Note

For recalibration the transmitter must always be returned with the sensor

Note

SensorFlash

For sensor recalibration the SensorFlash memory unit must always be returned with the sensor.

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 could be damaged. The inscriptions could become unreadable.

9.3 Maintenance and repair work

9.3.1 Maintenance

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

9.3 Maintenance and repair work

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
- Coupling compound mating the sensors to the pipe surface

9.3.2 Service and maintenance information

Service and maintenance information is information about the condition of the device used for diagnostics and service purposes.

Maintenance information parameters

The basic maintenance information parameters are:

- Identification
 - Order number
 - Long tag
 - Descriptor
 - Location
 - Installation date
 - Product name
 - Hardware and firmware versions
- Condition and setup
 - Peak values
 - Signal monitoring
 - Temperature monitoring
 - Monitoring of inputs and outputs
 - Operating time
 - Parameter change log
 - FW update log
 - Diagnostic log

Service information parameters

- Operating time total
- · Operating time

- Transmitter hardware version
- Display module hardware version

9.4 Return procedure

To return a product to Siemens, see Returns to Siemens (<u>www.siemens.com/returns-to-siemens</u>).

Contact your Siemens representative to clarify if a product is repairable, and how to return it. They can also help with quick repair processing, a repair cost estimate, or a repair report/cause of failure report.

NOTICE

Decontamination

The product may have to be decontaminated before it is returned. Your Siemens contact person will let you know for which products this is required.

See also

Decontamination declaration (https://www.siemens.com/sc/declarationofdecontamination)

9.5 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 and UK, 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/)

9.5 Disposal

Diagnostics and troubleshooting

10

10.1 Introduction

This chapter describes various deviations from normal operation and lists suggested remedy actions.

This chapter is **To Be Determined**.

10.2 Device status icons

Messages are shown in the display.

- In the operation view the alarms are shown as a combination of symbol and text in the lower line of the display. If several diagnostic messages are active at the same time, the most critical is shown.
- In the alarm list view all active alarms are shown as a list. The alarm list combines a symbol, text and an alarm ID number. The most recent alarm is shown on top of the list. The alarm list view can also be accessed via **Active diagnostic events**.
- In the alarm history view the most recent alarms (up to 100) are listed. The alarm history log can be viewed in **Diagnostic log**. The alarm history log can be reset in **Reset log**.

Characteristics of messages

The device provides two types of alarm formats, Siemens standard alarm classes and NAMUR status signals, selected in **Status icons**.

The following tables summarize the two types of alarm formats in an overview.

The sequence of the symbols corresponds to the priority of the messages, beginning with the most critical.

Siemens standard alarm classes

Icon	Priority level	Name	Description
· V	1	Maintenance failure	 Maintenance alarm: maintenance demanded immediately Measurement values are not valid
: \	5	Maintenance warning	Maintenance warning Measured signal still valid
Ŷ	6	Maintenance required	Maintenance required Measured signal still valid

10.3 Fault codes and corrective actions

Icon	Priority level	Name	Description
‡	3	Process value error	Process value has reached an alarm limit
: ‡	3	Process value warning	Process value has reached a warning limit
(\mathbf{k})	2	Function check	 Change of configuration, local operation, or substitute value entered Output signals are temporarily invalid

NAMUR status signals

Icon	Priority level	Name	Description
⊗	1	Failure	Failure Invalid output signal
A	3	Out of specification	 Out of specification Device will still work, but output signals may be invalid
ᢒ	4	Maintenance required	Maintenance request Measured signal still valid
∇	2	Function check	Function check Output signal temporarily invalid

Info icons

Icon	Name	Description
	Read only	Write access disabledIndicate read only parameters
‡	Data exchange	Device is communicating

10.3 Fault codes and corrective actions

10.3.1 Alarm messages

Alarms and system messages support both Siemens standard alarm classes and NAMUR status signals.

10.3 Fault codes and corrective actions

In the following tables the alarm IDs (identification numbers) are listed along with possible causes and directions for corrective action.

10.3 Fault codes and corrective actions

Technical specifications

Note

Device specifications

Siemens makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

11.1 Power

Table 11-1 Power supply

Description	Specification
Supply voltage	• 100 to 240 V AC +10 / -10%, 47 to 63 Hz
	• 11.5 to 28 V DC +10 / -10%
Power consumption	• AC = 20 VA
	• DC = 10 W
Fluctuation	Transient overvoltages up to the levels of overvoltage category II
	Temporary overvoltages occurring on mains supply only
Reverse polarity protection (y / n)	Υ
Galvanic isolation	3000 V AC

11.2 Inputs

Table 11-2 Digital input

Description	Channel 7
Load	15 to 30 V DC, R _{in} 7 kOhm
Functionality	Reset totalizer

Table 11-3 Digital input

Description	Channel 8
Load	15 to 30 V DC, R _{in} 7 kOhm
Functionality	Start/Stop totalizer

11.3 Outputs

Table 11-4 Current output

Description	Channel 2	
Signal range	4 to 20 mA	
Resolution	0.4 μΑ	
Load	• Ex i: <470 Ω (HART ≥ 230 Ω)	
	• Non-Ex: <770 Ω (HART ≥ 230 Ω)	
Time constant (adjustable)	0.0 to 100 s	
Fault current	4 - 20 NAMUR	4 - 20 US
Measurement range (mA)	3.8 - 20.5	4.0 - 20.8
Lower fault current (mA)	3.5	3.75
Upper fault current (mA)	22.6	22.6
Customized fail-safe mode	Last valid value	
	 Lower fault current 	
	Upper fault current	
	Fail-safe value	
	Current value	
Galvanic isolation	All inputs and outputs are galvanically isolated PELV circuits with 60 V DC isolation from each other and ground. Maximum test voltage: 500 V AC	
Cable	Standard industrial signal cable with up to 3 twisted pairs with overall screen can be connected between the transmitter and the control system. Individual pair or overall screen is optional depending on user requirements.	
Voltage range	14 to 30 V DC (passive)	

11.4 Construction

Table 11-5 Designated use

Description	Specification
Measurement of process medium	Fluid Group 1 (suitable for dangerous fluids)
	Aggregate state: Paste/light slurry, liquid and gas

Table 11-6 System design

Description	Specification
Measuring principle	Ultrasonic
System architecture	Wall mount housing with all functions integrated in a single pc board

Device design

Table 11-7 Wall mount housing transmitter design

Description	Specification	
Dimensions	See Dimension drawings (Page 81)	
Weight	Transmitter: 1.27 kg +/- 0.09 kg (2 lbs 8.8 oz)	
Design	Wall mount housing	
Material	Plastic	
Ingress protection	IP65 NEMA 4X to EN/IEC 60529	
Mechanical load	18 to 1000 Hz random, 3.17 g RMS, in all directions, to EN/IEC 68-2-36	

Torques

Table 11-8 Installation torques

Description	Torque (Nm)
Cable gland to housing (Siemens supplied, metric, NPT)	10

11.5 Operating conditions

Table 11-9 Basic conditions

Description		Specification
Ambient temperature (Humidity max. 90 %)	Operation:	-10 °C to +50 °C (14 °F to +122 °F)
Ambient temperature (Humidity max. 90 %)	Storage:	-20 °C to +60 °C (-4 °F to +140 °F)
Climate class		DIN 60721-3-4
Altitude		Up to 2000 m (6560 ft)
Relative humidity		95 %
Bump resistance		On request
Shock resistance		On request
Thermal shock		On request
Vibration resistance		On request
EMC performance	• Emission	• EN 55011 / CISPR-11
	Immunity	• EN/IEC 61326-1 (Industry)

Table 11-10 Process medium conditions

Description	Specification
Process medium temperature (T _s) (min to max)	-50 °C to +200 °C (-58 °F to 492 °F)
Process medium viscosity	Non-compressible liquids

11.7 SensorFlash

11.6 Approvals

UL 61010-1 3rd Edition CAN/CSA-C22.2 No. 61010-1, 3rd Edition EN61010-1: 2010

11.7 SensorFlash

Table 11-11 SensorFlash

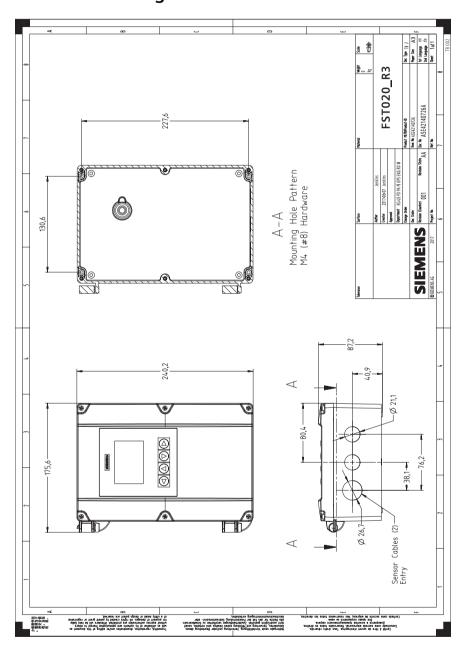
Description Specification			
	SD card (S-300u)	SD card (Class 4 with adapter)	
Capacity	4 GB	4 GB	
File system support	FAT32 / 8.3	FAT32 / 8.3	
Temperature range Operation: Storage:	-40 °C to +85 °C (-40 °F to 185 °F) -40 °C to +100 °C (-40 °F to 212 °F)	-25 °C to +85 °C (-13 °F to 185 °F) -40 °C to +85 °C (-40 °F to 185 °F)	

Note

SensorFlash functions support

Only the supplied 4 GB SD cards are supported for backup, restore, logging, and firmware update.

12.1 Dimension drawing

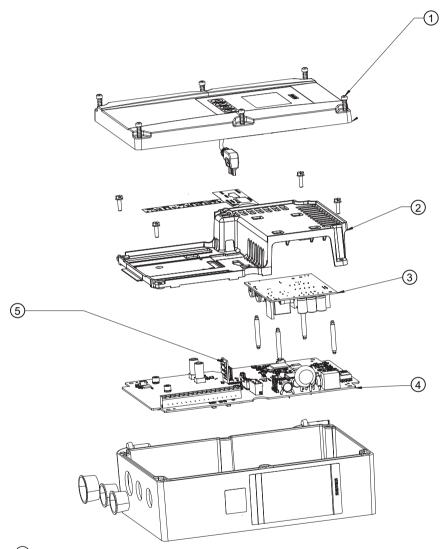


12.1 Dimension drawing

Replacement parts

13.1 AC Transmitter exploded view

Replaceable parts



- 1 Enclosure cover w/screws and display A5E38846901
- 2 Cover with screws A5E41693888 for AC power supply / A5E41693889 for DC power supply
- 3 AC power supply 7ML18301MD / DC power supply 7ML18301ME
- 4 Main board assembly with SD card and firmware A5E41693884
- 5 SensorFlash Micro SD A5E38288507

13.1 AC Transmitter exploded view

Note

It is recommended that when replacing the transmitter main board or display board ensure to remove original SD-card from transmitter and re-install after new modules have been installed in order to recall site parameters.

The following components are not shown:

- Connector plugs
- Power and I/O plugs with Right angle connectors for sensor cables A5E41693892
- Gland kit A5E41693895
- Spare battery A5E41372210

Modbus communication

A.1 Modbus addressing model

The device allows read/write access to the following standard Modbus RTU data holding register blocks:

• Holding registers (ref. 4x address range)

The minimum value of a writable **holding register** can be read by adding 10000 to the Modbus address of the register.

The maximum value of a writable **holding register** can be read by adding 20000 to the Modbus address of the register.

The default value of a writable **holding register** can be read by adding 30000 to the Modbus address of the register.

A.2 Modbus function codes

This device supports following function codes: 3, 8 and 16.

Function codes 3 and 16 are used for accessing registers, max. 16 registers per read/write request is accepted.

Function code 8 is used for reading Modbus communication diagnostic information.

Below the various function code are described.

Function code 3 (Read holding registers)

General exceptions:

- Requesting less than 1 or more than 16 registers => Exception 3 (Illegal data value)
- Requesting invalid start address or start address with invalid quantity => Exception 2 (Illegal data address)

Application exceptions:

 Application errors; min/max limit of parameter exceeded; or parameter write-protected => Exception 4 (Slave device error)

Holes/register alignment:

- The read command always returns data if no exception is given.
- Holes in the holding register map return value zero in all bytes. E.g. reading 2 registers starting at 4:0004 above will result in 2 bytes of "float B" followed by 2 zeroes.

Function code 3 example

Query

Slave address	1 byte
Function	1 byte
Starting Address Hi	1 byte
Starting Address Lo	1 byte
Quantity of Registers Hi	1 byte
Quantity of Registers Lo	1 byte
CRC	2 bytes

Response

Slave address	1 byte
Function	1 byte
Byte count	1 byte
Register Value Hi	1 byte
Register Value Lo	1 byte
:	:
Register Value Hi	1 byte
Register Value Lo	1 byte
CRC	2 bytes

Example: Read absolute massflow (address 3000)

Query: 1,3,11,184,0,2,70,10

Slave address = 1 (0x01)

Function = 3(0x03)

Starting Address Hi, Lo = 11, 184 (0x0B,0xB8)

Quantity of Registers Hi, Lo = 0, 2 (0x00,0x02)

CRC = 70,10 (0x46, 0x0A)

Starting address 0x0BB8 = 3000

Quantity of registers = 0x0002 = 2

Response: 1,3,4,64,195,82,139,98,200

Slave address = 1 (0x01)

Function = 3(0x03)

Byte Count = 4(0x04)

Register 1 - Register Value Hi, Lo = 64, 195 (0x40, 0xC3)

Register 2 - Register Value Hi, Lo = 82, 139 (0x52, 0x93)

CRC = 98,200 (0x62, 0xC8)

Absolute mass flow = 0x40C35293 = 6.10383 kg/sec

Function code 16 (Write multiple registers)

General exceptions

- Writing less than 1 or more than 16 registers => Exception 3 (Illegal data value)
- If ByteCount is not exactly 2 times NoOfRegisters => Exception 3 (Illegal data value)
- Requesting invalid start address or start address with invalid quantity => Exception 2 (Illegal data address)

Application exceptions:

- Application errors; min/max limit of parameter exceeded; or parameter write-protected => Exception 4 (Slave device error)
- Application errors include writing to ReadOnly holding registers

Holes/register alignment:

- If start-address is not the start of a mapped holding register => Exception 2 (Illegal data address)
- Writing to holes is allowed (ie ignored and no exception occurs) except for the condition described above
- If the end address is only part of a mapped holding register item (e.g. one half of a float value), the action depends on the data type. Writing parts of all data types => Exception 4 (Slave device error)

Function code 16 example

Query

Slave address	1 byte
Function	1 byte
Starting Address Hi	1 byte
Starting Address Lo	1 byte
Quantity of Registers Hi	1 byte
Quantity of Registers Lo	1 byte
Byte Count	1 byte
Registers Value Hi	1 byte
Registers Value Lo	1 byte
:	:
Registers Value Hi	1 byte
Registers Value Lo	1 byte
CRC	2 bytes

Response

Slave address	1 byte
Function	1 byte
Starting Address Hi	1 byte

A.2 Modbus function codes

Starting Address Lo	1 byte
Quantity of Registers Hi	1 byte
Quantity of Registers Lo	1 byte
CRC	2 bytes

Example: Set baud rate to 115200 baud (address 529)

Query: 1,16,2,17,0,1,2,0,5,70,210

Slave address = 1 (0x01)Function = 16 (0x10)

Starting Address Hi, Lo = 2, 17 (0x02,0x11)

Quantity of Registers Hi, Lo = 0, 1 (0x00,0x01)

Byte Count = 2(0x02)

Registers Value Hi, Lo = 0, 5 (0x00,0x05)

CRC = 70,10 (0x46, 0x0A)

Starting address 0x0211 = 529

Number of registers = 0x0001 = 1

Data 0x0005 = (115200 = value 5)

Response: 1,16,2,17,0,1,80,116

Slave address = 1 (0x01)

Function = 16 (0x10)

Starting Address Hi, Lo = 2, 17 (0x02,0x11)

Quantity of Registers Hi, Lo = 0, 1 (0x00,0x01)

CRC = 80,116 (0x50, 0x74)

Function code 8 (Diagnostics)

Modbus function code 8 provides a series of tests for checking the communication system between a client (Master) device and a server (Slave).

The following diagnostics functions are supported:

Sub- func- tion code (Dec)	Name	Description
00	Return Query Data	The data passed in the request data field is to be returned (looped back) in the response.
10	Clear Counters and Diagnostic Register	Clears all counters and the diagnostic register. Counters are also cleared upon power–up.
11	Return Bus Message Count	The response data field returns the quantity of messages that the remote device has detected on the communications system since its last restart, clear counters execution, or powerup.
12	Return Bus Communication Error Count	The response data field returns the quantity of CRC errors encountered by the remote device since its last restart, clear counters execution, or power–up.

Sub- func- tion code (Dec)	Name	Description
13	Return Bus Exception Error Count	The response data field returns the quantity of MODBUS exception responses returned by the remote device since its last restart, clear counters execution, or power–up.
14	Return Slave Message Count	The response data field returns the quantity of messages broadcast or addressed to the remote device that the remote device has processed since its last restart, clear counters execution, or power–up.
15	Return Slave No Response Count	The response data field returns the quantity of messages addressed to the remote device for which it has returned no response (neither a normal response nor an exception response), since its last restart, clear counters execution, or power—up.
16	Return Slave NAK Count	The response data field returns the quantity of messages addressed to the remote device for which it returned a Negative Acknowledge (NAK) exception response, since its last restart, clear counters execution, or power–up.
17	Return Slave Busy Count	The response data field returns the quantity of messages addressed to the remote device for which it returned a Slave Device Busy exception response, since its last restart, clear counters execution, or power–up.
18	Return Bus Character Overrun Count	The response data field returns the quantity of messages addressed to the remote device that it could not handle due to a character overrun condition, since its last restart, clear counters execution, or power–up.
20	Clear Overrun Counter and Flag	Clears the overrun error counter and resets the error flag.

Function code 8 example

Query

Slave address	1 byte
Function	1 byte
Sub-function Hi	1 byte
Sub-function Lo	1 byte
Data Hi	1 byte
Data Lo	1 byte
:	:
Data Hi	1 byte
Data Lo	1 byte
CRC	2 bytes

Response

Slave address	1 byte
Function	1 byte

A.3 Changing Modbus communication settings

Sub-function Hi	1 byte
Sub-function Lo	1 byte
Data Hi	1 byte
Data Lo	1 byte
:	:
Data Hi	1 byte
Data Lo	1 byte
CRC	2 bytes

Example: Read Return Slave Message Count (address 529)

Query: 1,8,0,14,0,0,129,200

Slave address = 1 (0x01)Function = 8 (0x08)

Sub-function Hi, Lo = 0, 14 (0x00,0x0E)

Data Hi, Lo = 0, 0 (0x00,0x00) CRC = 129,200 (0x81, 0xC8)

Sub-function 0x000E = 14 = Read Return Slave Message Count

Response: 1,8,0,14,0,97,64,32

Slave address = 1 (0x01) Function = 8 (0x08) Sub-function Hi, Lo = 0, 14 (0x00,0x0E) Data Hi, Lo = 0, 97 (0x00,0x65) CRC = 64,32 (0x41, 0xE3)

Read Return Slave Message Count = 0x0065 = 97 message received

A.3 Changing Modbus communication settings

Changing communication parameters, for example **Baud Rate**, **Modbus Parity Framing** or **Bus Address** effects the Modbus communication as follows:

- The new settings have effect only after a reset, either by restarting the device or writing the value 1 to Modbus address 600 **Restart communication**.
- The new settings will not have effect until the Modbus driver has responded to any ongoing Modbus request.

NOTICE

Setting addresses in a multidrop network

It is recommended NOT to use the default address in a multi-drop network. When setting device addresses, make sure that each device has a unique address. Replication of addresses may cause abnormal behavior of the entire serial bus and make the master unable to communicate with all slaves on the bus.

A.4 Modbus communication

Table A-1 General Modbus settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range <i>l</i> Setting options	Access level
8291	Unsigned / 2	Restart com- munication	Restarts the communication using configured slave address, baud rate and parity/framing.	-	• 0: Cancel • 1: Restart	Write only
8005	Unsigned / 2	Slave address (HW)	DIP switch setting on the transmitter cassette. Address is used if DIP switch is set to a value > 0.	-	-	Read only
8297	Unsigned / 2	Slave address (SW)	Software address of Modbus interface. Address is used if switch is set to 0.	1	1 - 147	Read / write
8298	Unsigned / 2	Baud rate	Baud rate of Modbus interface.	19200 Bit/s	 0: 9600 Bit/s 1: 19200 Bit/s 2: 115200 Bit/s 3: Reserved 4: 38400 Bit/s 5: 57600 Bit/s 6: 76800 Bit/s 7: 1200 Bit/s 8: 2400 Bit/s 9: 4800 Bit/s 	Read / write
8299	Unsigned / 2	Parity and framing	Parity and framing of the Modbus communication interface.	Even parity, 1 stop	 0: Even parity, 1 stop 1: Odd parity, 1 stop 2: No parity, 2 stops 3: No parity, 1 stop 	Read / write

A.5 Coil configuration

The device provides 20 coil definitions which can be configured.

Table A-2 Coil configuration

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] ¹ (units regis- ter)	Value range / Setting options	Access lev- el
10300	Unsigned / 2	Modbus coil address 1	Specifies the coil address with which the following bit coded register value is accessible. The register and bit(s) are specified by Modbus coil register 1 and Modbus coil bitmask	1	0 - 65535	Read / write
10301	Unsigned / 2	Modbus coil register 1	Specifies the Modbus register whose value is checked against Modbus coil bitmask 1 to determine the coil value (false or true). A register value of 65535 specifies that this coil mapping is undefined.	Undefined	0 - 65535	Read / write
10302	Unsigned / 4	Modbus coil bit- mask 1	Bit mask which is compared against the register value specified with Modbus coil register 1 to determine the coil value. If any bit of the register value is set which is also set in the bit mask then the coil value is true, otherwise the coil is false.	0	0-4294967295	Read / write
10304	Unsigned / 2	Modbus coil length 1	Output parameter that informs about the size in bytes of the parameter that is specified by Modbus coil address 1. Could be used to identify the relevant bits of the Modbus coil bitmask 1	-		Read only
10305	Unsigned / 2	Modbus coil address 2	Specifies the coil address with which the following bit coded register value is accessible. The register and bit(s) are specified by Modbus coil register 2 and Modbus coil bitmask 2	2	0 - 65535	Read / write
10306	Unsigned / 2	Modbus coil register 2	Specifies the Modbus register whose value is checked against Modbus coil bitmask 2 to determine the coil value (false or true). A register value of 65535 specifies that this coil mapping is undefined.	Undefined		Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] ¹ (units regis- ter)	Value range <i>l</i> Setting options	Access lev- el
10307	Unsigned / 4	Modbus coil bit- mask 2	Bit mask which is compared against the register value specified with Modbus coil register 2 to determine the coil value. If any bit of the register value is set which is also set in the bit mask then the coil value is true otherwise false.	0	0 - 4294967295	Read / write
10309	Unsigned / 2	Modbus coil length 2	Output parameter that informs about size in bytes of parameter that is specified by Modbus coil address 2. Could be used to identify the relevant bits of the Modbus coil bitmask 2	-		Read only
	T	l			T	
10399	Unsigned / 2	Modbus coil length 20	Output parameter that informs about the size in bytes of the parameter that is specified by Modbus coil address 20. Could be used to identify the relevant bits of the Modbus coil bitmask 20	-		Read only

¹ If default value is "-" the command "Set to default" will not set this parameter to default.

A.6 Modbus register mapping

The device provides the possibility to map each existing parameter to a freely chosen Modbus register for communication purposes over channel 1.

A.6 Modbus register mapping

The device provides means to remap 20 Modbus registers.

Table A-3 Modbus register mapping

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units regis- ter)	Value range / Setting op- tions	Access level
10448	Unsigned / 4	Enable mapping	Activation/deactivation of the register mapping. A set bit means that the mapping pair is activated, a cleared bit that the mapping pair is deactivated. Bit 0: Requested register 1 / Target register 1 Bit 19: Requested register 20 / Target register 20	0	0 - 1048575	Read / write
10450	Unsigned / 2	Register 1 source	Modbus register that appears within Modbus request is redirected to the parameter specified by Target register 1	65535	0 - 65535	Read / write
10451	Unsigned / 2	Register 1 target	Register of an existing prod- uct parameter to which a Modbus request is redirected	65535	0 - 65535	Read / write
10488	Unsigned / 2	Register 20 source	Modbus register that appears within Modbus request is redirected to the parameter specified by Target register 20	65535	0 - 65535	Read / write
10489	Unsigned / 2	Register 20 target	Register of an existing prod- uct parameter to which a Modbus request is redirected	65535	0 - 65535	Read / write

A.7 Integer byte order

The device is able to adjust the byte order of integer values.

Table A-4 Integer byte order

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units regis- ter)	Value range / Setting op- tions	Access level
8295	Unsigned / 2	Integer order byte	The integer byte order used in Modbus messages. 0: MSB - LSB (big endian) 1: LSB - MSB (little endian)	MSB - LSB (big endian)	0 - 1	Read / write
			MSB = most significant byte / high byte			
			LSB = least significant byte / low byte			

A.8 Float byte order

The device is able to adjust the byte order of floating-point values.

Table A-5 Float byte order

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units regis- ter)	Value range / Setting op- tions	Access level
8296	Unsigned / 2	Float byte order	The float byte order used in Modbus messages.	3-2-1-0	0 - 3	Read / write
			0: 1-0-3-2 1: 0-1-2-3 2: 2-3-0-1 3: 3-2-1-0			
			The first mentioned byte is the first byte sent.			
			Byte 3 corresponds to the left-most byte (MSB) of a 32 bit floating point number in big endian format, byte 0 to the right-most byte			

A.9 Modbus function codes

Table A-6 General Modbus settings

Function code	Command text	Description
01	Read Coils	Reads the status of single bit(s)
02	Read Discrete Inputs	Reads the status of single input bit(s)
03	Read Holding Registers	Reads the binary content of multiple 16-bit registers
04	Read Input Registers	Reads the binary content of multiple 16-bit registers
05	Write Single Coil	Writes a single on/off bit
06	Write Single Register	Writes the binary content of single 16-bit register
07	Read Exception Status	Delivers the global alarm status of the device
08	Diagnostics	Provides a series of tests for checking the communication system
15	Write Multiple Coils	Writes multiple on/off bits
16	Write Multiple Registers	Writes the binary content of multiple 16-bit registers
17	Report Slave ID	The device will respond to a Report Slave ID command (command 17) request from the master by giving information about device type, vendor, and revision level
23	Read/Write Multiple Registers	Combined Write Multiple Registers / Read Holding Registers call

Function code 7 (Read exception status)

The device provides the content of the parameter Global alarm status as exceptions.

Function code 8 (Diagnostics)

The diagnostics function provides means for checking the communication between MODBUS master and slave. The function uses a sub-function code to select the functionality.

The following sub-function codes are supported:

Sub-function code	Name	Description
0	Return query data	The data passed in the request data field will be returned (looped back) in the response. The entire response message should be identical to the request.
1	Restart communications option	After having restarted the communication, select the baudrate, framing or Modbus address to get access to the device again.

Function code 17 (Report Slave ID)

The transmitter will respond to a Report Slave ID request from the master by giving information about device type, vendor, and firmware version in a format as shown:

Response

Slave address	1 byte	
Function code	1 byte	17
Byte count	1 byte	62
Slave ID	1 byte	Sensor device type 0: SITRANS FS
Run indicator	1 byte	255: Running

Manufacturer name	12 bytes	SIEMENS
Product name	32 bytes	SITRANS F
Product firmware version	16 bytes	-
CRC	2 bytes	

A.10 Access control

Access control manages whether the Modbus master is allowed to modify device parameters. Reading of parameters is always possible. The general access control rules are:

- The Modbus interface has an access level that can be changed by providing PIN information via the Modbus register 8292 (User PIN) or 8293 (Expert PIN).
- Each parameter has a protection level assigned that specifies the required access level to modify the parameter via the Modbus interface.
- If the access level of the Modbus interface is lower than the protection level of the parameter that is desired to be modified, then the attempt to modify the parameter is rejected by the device.

Table A-7 Access control

Access level	Description
Read only	The Modbus master is not able to modify the device configuration (setup parameters).
	The Modbus master is only able to execute the command, to reset PINs.
	This is the default level of the Modbus interface.
User	The Modbus master has to provide the correct user PIN with Modbus register 8292 to reach this access level.
	The Modbus master is able to modify a subset of the device configuration.
Expert	The Modbus master has to provide the correct expert PIN with Modbus register 8293 to reach this access level. The Modbus master is able to modify the configuration of the device.

If an incorrect user PIN or an incorrect expert PIN is entered, or if the device does not receive any request within 10 minutes, the device resets the access level to read only.

A.10 Access control

Product Documentation and support

B

B.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.

B.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).

For help creating a support request, view this video here (www.siemens.com/opensr).

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/serviceandsupport).

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 SIMATIC PDM

C.1 Commissioning with SIMATIC PDM

C.1.1 Overview SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a general-purpose, manufacturer-independent tool for the configuration, parameter assignment, commissioning, diagnostics and maintenance of intelligent field devices and field components. Follow-up installations and additional information on SIMATIC PDM are available on the Internet at SIMATIC PDM (https://www.siemens.com/simatic-pdm).

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

For information on, for example, how to install and integrate devices, commission the software, see Operating Manual 'Help for SIMATIC PDM'. The manual is delivered with SIMATIC PDM software. Once the SIMATIC PDM is installed on your computer you find the manual under: Start > All programs > Siemens Automation > SIMATIC > Documentation. Link at our website: SIMATIC PDM instructions and manuals (https://support.industry.siemens.com/cs/ww/en/ps/16983/man).

Note

Field device parameters

- For a list of parameters and additional information, consult section "HMI menu structure (Page 115)".
- The field device remains in measurement mode during the time you configure the field device.

C.1.2 Check SIMATIC PDM version

Procedure

- 1. Go to Software downloads (https://www.siemens.com/processinstrumentation/downloads).
- 2. Check the support page to make sure you have:
 - The latest version of SIMATIC PDM
 - The most recent Service Pack (SP)
 - The most recent hot fix (HF)

C.1.3 Deactivate buffers when connecting via serial modem

Introduction

This deactivation is required to align SIMATIC PDM with the HART modem when using a Microsoft Windows operating systems.

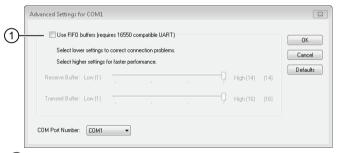
Deactivating buffers is not necessary when connecting via USB.

Condition

- You connect via RS232 (COM1).
- You have administrative rights on your operating system.
- You know the hardware and software requirements SIMATIC PDM installation documentation.

Procedure

- 1. Check the Operating Instructions for SIMATIC PDM for hardware and software requirements.
- 2. From the computer desktop, click "Start > Control Panel" to begin configuration.
- 3. Click "System and Security".
- 4. Select "Device Manager" under "System".
- 5. Open folder "Ports".
- 6. Double click the COM Port used by the system to open the properties window.
- 7. Select the tab "Port Settings".
- 8. Click the "Advanced" button.
 If the "Use FIFO buffers" radio box is selected, click to deselect.



- (1) Deselect "Use FIFO buffers" radio box
- 9. Click "OK" button to close out.
- 10. Close all screens.
- 11. Restart the computer.

C.1.4 Updating the Electronic Device Description (EDD) or Field Device Integration (FDI)

Procedure

- 1. Check that the EDD or FDI revision match the Firmware revision in the device according to the table in section Product compatibility (Page 7).
- 2. Go to the support page Software downloads (https://www.siemens.com/ processinstrumentation/downloads).
- 3. Enter the product name in the field "Enter search term...".
- 4. Download the most current EDD or FDI of your device.
- 5. Save files to your computer in an easily accessed location.
- 6. Launch SIMATIC PDM Device Integration Manager. From the File menu, click "Read device descriptions from compressed source...".
- 7. Browse to the compressed EDD or FDI files, select and open it.
- 8. Use the "Integration" function to integrate the EDD or FDI into the device catalog. The EDD or FDI is now accessible via SIMATIC Manager.

C.1.5 Adding device to communication network

Before setting the parameters, it is necessary to configure the FS230 project in PDM.

- 1. Add the device to SIMATIC Modbus network:
 - Open the project in the process device network view.
 - Right click on Networks and select Insert New Object → Communication network.
 The Insert Object(s) <...> dialog box opens.
 - Click on Assign Device Type.
 - Select the inserted Modbus network in the right window and right-click.
 - Select the Object Properties command.
 - Enter the device-specific information in the Communication tab of the Properties dialog for the Modbus network.

Modbus communication type: Serial or IrDA (infrared)			
Serial	The interface must be set accordingly on the PC station.		
IrDA	No additional setting required.		
	Once the device is within range, it is available for Modbus communication.		
	Only one infrared device can be coupled to Modbus at a given time. Several devices can be coupled under Windows.		
Response time	General timeout within which the device is allowed to report. If the timeout is too long, the communication is slowed. If it is too short, some devices may not be found.		

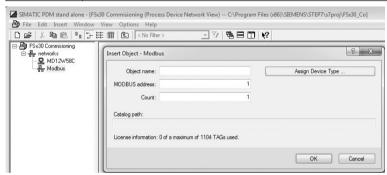


Figure C-1 Assigning Modbus device to network

 To check if the correct network and the correct port are assigned to the COM interface, double-click the PC object in the right window. Select the COM interface object in HW Config, and select the Object Properties menu command in the shortcut menu.

2. Set up the COM interface:

- To insert the Modbus device, select the Modbus network object in the right window and right-click. In the displayed shortcut menu, select the Insert New Object → Object command. In the displayed dialog box, enter the name of the Modbus device
- To set the device address, select the inserted Modbus device in the right window and rightclick. Select the Object Properties command in the displayed shortcut menu.
- Enter the device-specific information (Modbus address 0-247) in the Communication tab
 of the Properties dialog for the Modbus device.

- To change the device address, select the inserted Modbus device in the right window and then select the Object Properties menu command in the shortcut menu. Select the Communication tab in the displayed dialog and enter the new short address.
- Start SIMATIC PDM by double-clicking the newly inserted Modbus device in the right window. Select the relevant device in the menu tree (only required for the first call), and assign parameters for the device.

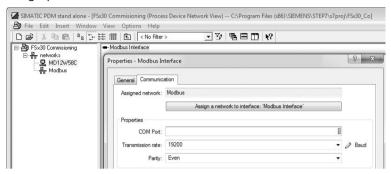


Figure C-2 Set COM port

Note

Multiple PCs in one project

If there are several PCs in your project, you have to define one of them as the current one. To do this, select the desired PC object in the left window and then select the menu command Options → Define Current PC.

C.1.6 Integrating a HART device in a HART modem network

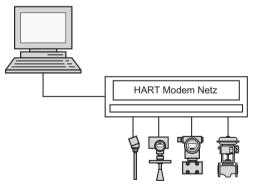


Figure C-3 HART modem

The following describes how to integrate a HART device in a HART modem network.

Requirements

- A project has been created.
- An access point of the computer is set to the COM port to which the HART modem network is connected.

Integrating a HART device in a HART modem network

- 1. Open the project in the process device network view.
- 2. Right-click the "Networks" object in the tree structure. In the shortcut menu that opens, select the menu command Insert New Object > Communication network. The "Insert Object(s) <...>" dialog box opens.
- 3. Click the "Assign Device Type" button.
 The "Insert Object(s) Assign Device Type" dialog box opens. You can find additional information in the section "Insert Object Assign Device Type" dialog box.
- 4. To set the network properties, select the inserted HART modem network in the right window and right-click. Select the Object Properties command in the displayed shortcut menu.
- 5. Enter the device-specific information in the "Communication" tab of the Properties dialog for the HART modem network.

Set the master type (primary or secondary, usually secondary): Here, you can select the "Prefer 'Long address'" check box.

Modbus communication type: Serial or IrDA (infrared)			
Serial	The interface must be set accordingly on the PC station.		
IrDA	No additional setting required.		
	Once the device is within range, it is available for Modbus communication.		
	Only one infrared device can be coupled to Modbus at a given time. Several devices can be coupled under Windows.		
Response time	General timeout within which the device is allowed to report. If the timeout is too long, the communication is slowed. If it is too short, some devices may not be found.		

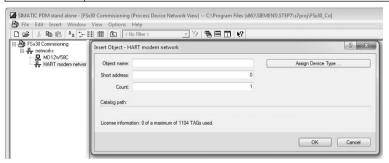


Figure C-4 Assigning HART device to network

6. To check if the correct network and the correct port are assigned to the COM interface, double-click the PC object in the right window. Select the COM interface object in HW Config, and select the Object Properties menu command in the shortcut menu.

Note

The COM port is almost always "1" for notebooks. Since most PCs have two COM ports, you must specify the port to which the HART modem is connected in this tab. Check whether the settings for the FIFO buffer of the COM port are suitable, or immediately use a USB HART modem.

7. To insert the HART device, select the HART modem Modbus network object in the right window and right-click. In the displayed shortcut menu, select the Insert New Object → Object command.

In the displayed dialog box, enter the name of the HART device

- 8. To set the device address, select the inserted Modbus device in the right window and right-click. Select the Object Properties command in the displayed shortcut menu.
- 9. Enter the device-specific information (Modbus address 0-247) in the Communication tab of the Properties dialog for the HART device.

Note

Address with HART

- The short address must be entered for HART devices. This address must correspond to the connected HART device. The short address is always "0", unless the device is in the multidrop function.
- For a HART interface, enter the long address. This address contains the following devicespecific information:
 - Manufacturer
 - Device type
 - Device name
- 10. To change the device address, select the inserted HART device in the right window and then select the Object properties menu command in the shortcut menu. Select the "Communication" tab in the displayed dialog and enter the new short address.

Note

The address must correspond to the connected device. The short address for HART devices is always "0" unless the device is in the multi-drop function.

11. Start SIMATIC PDM by double-clicking the newly inserted HART device in the right window. Select the relevant device in the menu tree (only required for the first call), and assign parameters for the device.



Figure C-5 Set COM port

Note

Multiple PCs in one project

If there are several PCs in your project, you have to define one of them as the current one. To do this, select the desired PC object in the left window and then select the menu command Options → Define Current PC.

C.1.7 Configuring a new device

Note

Configuring device via SIMATIC PDM

Clicking "Cancel" button during an upload from device to SIMATIC PDM will result in *some* parameters being updated.

- 1. Check that you have the most recent EDD, and if necessary update it. See Updating the Electronic Device Description (EDD) or Field Device Integration (FDI) (Page 103).
- 2. Launch **SIMATIC Manager** and create a new project for the device.
- 3. Open the menu "Device > Operation > Reset > Restore ordered configuration". Select "Yes" button and click "OK" to perform a reset to customer ordered settings.
- 4. After the reset is complete click on "Upload to PG/PC..." to customer ordered settings.
- 5. Configure the device via the Quick Start wizard. (See Wizard Quick Start via PDM (Page 108).)

C.1.8 Wizard - Quick Start via PDM

The graphic Quick Start Wizard provides an easy multistep procedure that configures the device for a simple application.

Please consult the SIMATIC PDM operating instructions or online help for details on using SIMATIC PDM.

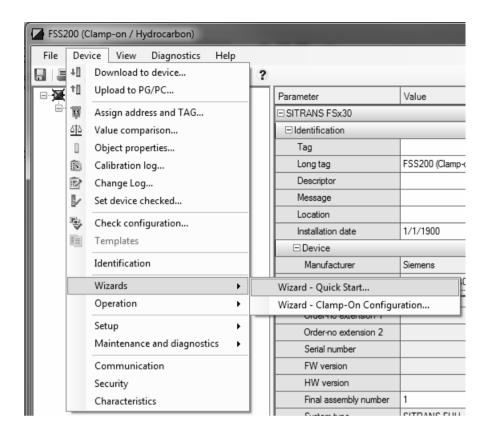
Quick start

Note

- The Quick Start wizard settings are inter-related and changes apply only after you click on Apply at the end of the wizard to transfer settings to the device.
- Do not use the Quick Start Wizard to modify individual parameters.
- Click on Back to return and revise settings or Cancel to exit the Quick Start.

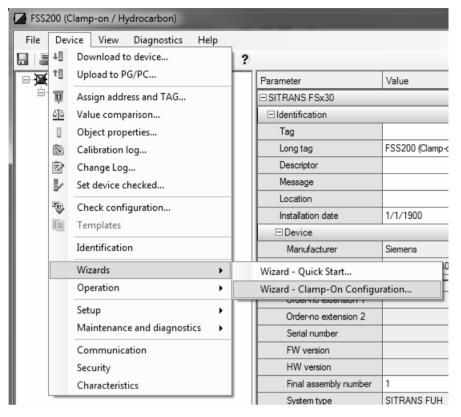
Launch SIMATIC PDM, open the menu Device → Wizards → Wizard - Quick Start..., and follow the steps.

C.1 Commissioning with SIMATIC PDM



C.1.9 Wizard - Clamp-On Configuration

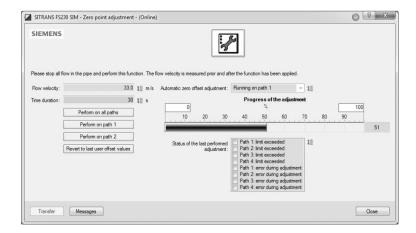
Open the menu Device → Wizards → Wizard - Clamp-On Configuration..., and follow the steps.



The clamp-on configuration wizard takes the user through the necessary steps to install the sensors to achieve proper operation.

C.1.10 Zero point adjustment

Open the menu Device \rightarrow Operation \rightarrow Zero point adjustment, and follow the steps.



Although the device zero is very stable from the factory the user has the ability to remove any residual zero offset that may exist by performing the Zero point adjustment.

C.1.11 Changing parameter settings using SIMATIC PDM

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

Parameters in SIMATIC PDM are identified by name and organized into function groups, similar to the structure of the local display (HMI).

Within SIMATIC PDM, parameters can be found in a structured view (which can be accessed when the device is offline), or in the PDM menus (when device is online): Device, View, Diagnostics.

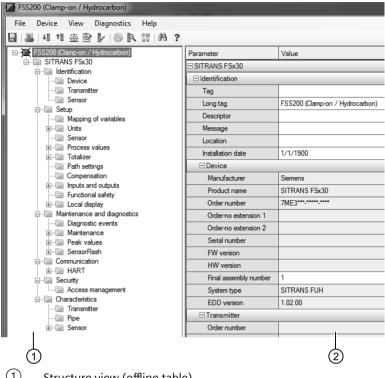
See:

- SIMATIC PDM structure view image (Page 112)
- Parameters accessed via PDM menus (Page 112)

Note

- Clicking button "Cancel" during an upload from device to SIMATIC PDM will result in *some* parameters being updated.
- While the device is in **Edit view** the output remains active and continues to respond to changes in the device.
- 1. Launch SIMATIC PDM, connect to device, and upload data from device.
- 2. Adjust parameter values in the parameter value field then press "Enter" key. The status fields read "Changed".
- 3. Open the Device menu, click "Download to device...". When complete, use "File > Save" to save settings offline. The status fields are cleared.

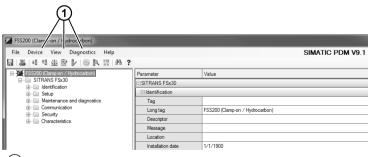
SIMATIC PDM structure view image C.1.12



- Structure view (offline table)
- Value fields

C.1.13 Parameters accessed via PDM menus

Click on "Device", "View", or "Diagnostics" to open the associated PDM menu.



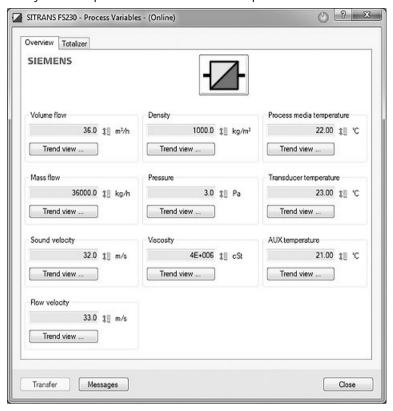
(1)PDM menus

PDM menus

Device	View	Diagnostics
Download to device	Process values	Update diagnostics
Upload to PC/PG		
Assign address and Tag	Start Life List	Alarms
Value comparison		Advanced diagnostics
Object properties		Receiver signal
Calibration log		
Change Log		
Set evice checked		
Check configuration		
Templates		
Identification		
Wizards		
Operation		
Setup		
Maintenance and diagnostics		
Communication		
Security		
Characteristics		

C.1.14 Process variables

- 1. To compare outputs in real time select View → Process variables to see all process values, totalizers and loop current.
- 2. Verify that the process values show the expected values.



Trend view

Open the menu View → Process variables and click on a Trend view button to monitor the trend of one or all process values available at each tab.

HMI menu structure

An overview of the HMI menu structure is available for download under this link (https://support.industry.siemens.com/cs/document/109804533/menu-structure-of-the-sitrans-fst020-and-sitrans-fst090?dti=0&pnid=24980&lc=en-US).

Note

Visibility of menus/parameters

The visibility of some parameter/menu items depends on previous selections. For example, if Frequency is selected on the output, only the frequency setup parameter/menu items are visible. The parameter/menu items for setting the current output, pulse output, and status output are hidden.

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