

SIEMENS

SITRANS F

Ultrasonic Flowmeters FST020 IP65 NEMA 4X

Operating Instructions

7ME3570 - AC: 1HA400AA0 / 7ME3570 - DC:
1HB400AA0

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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.

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Disclaimer of Liability

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

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Introduction

1.1 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	
09/2017	First edition	Modbus FW: 2.01.00-04 HW: 3.00.02 or later	SIMATIC PDM V8.2 SP1 or later	EDD: 1.00.00 or later

1.3 Document history

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

Edition	Note
09/2017	First edition

1.4 Device documentation package

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

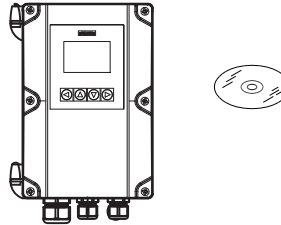
Document	Purpose	Intended users	Availability
Operating Instructions	Contains all information needed to <ul style="list-style-type: none"> • check and identify the delivered package • install and electrically connect the product • commission the product, (setting parameters via HMI menu) • operate and maintain the device on a daily basis • troubleshoot and remedy minor operation interruptions 	Instrument technicians, plant operators	<ul style="list-style-type: none"> • Available for download from homepage • Hardcopy can be purchased via PIA Life Cycle Portal (only English and German versions)

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

Check the device packaging for damage. Inform your supplier of any damage. Retain the damaged parts for clarification.

Check the scope of delivery by comparing the shipping documents with your order for correctness and completeness.

Do not take damaged or incomplete devices into operation under any circumstances.

Special conditions for storage and transportation of device listed in Section "Service and maintenance (Page 57)".

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

1.7 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>)

See also

Technical support (Page 173)

1.8 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.


Safety notes

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
	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

2.4 Conformity with European directives

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

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
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

3.1 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

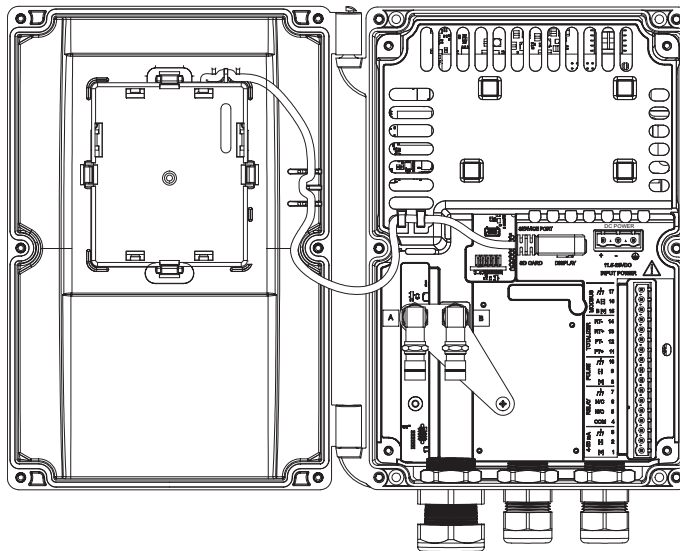


Figure 3-1 DC Wall Mount housing shown

Pipe mount kit

The Pipe kit is CQO:1012NMB-1.

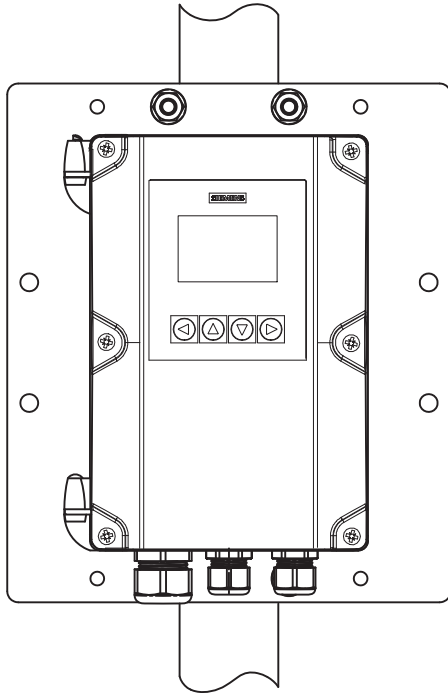


Figure 3-2 Pipe Mounting shown with mounting plate

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)

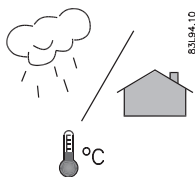
This chapter describes how to install the wall mount housing transmitter.

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 data (Page 65).

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.

4.3 Installation instructions

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 / 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.

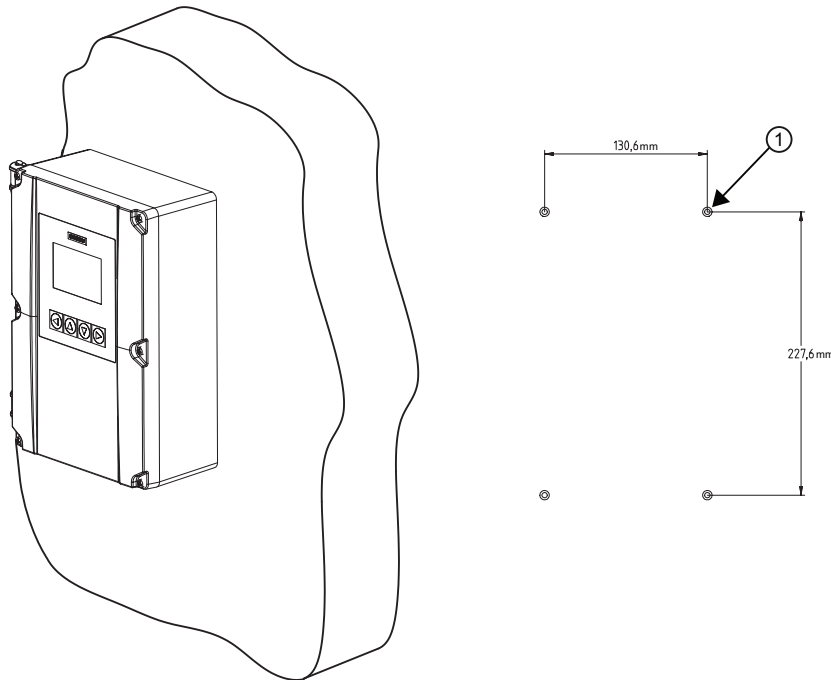


Figure 4-1 Wall mounted transmitter showing mounting hole pattern

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.

4.3 Installation instructions

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

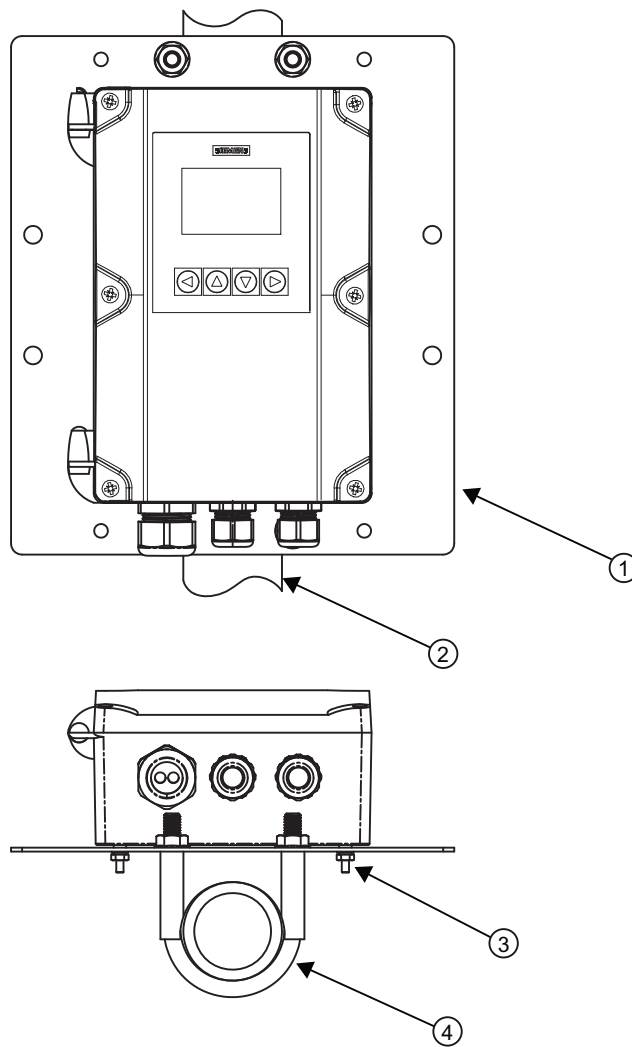
Table 4-1 CQO:1012NMB-1 Mounting Kit

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: <ul style="list-style-type: none">• 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.

 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

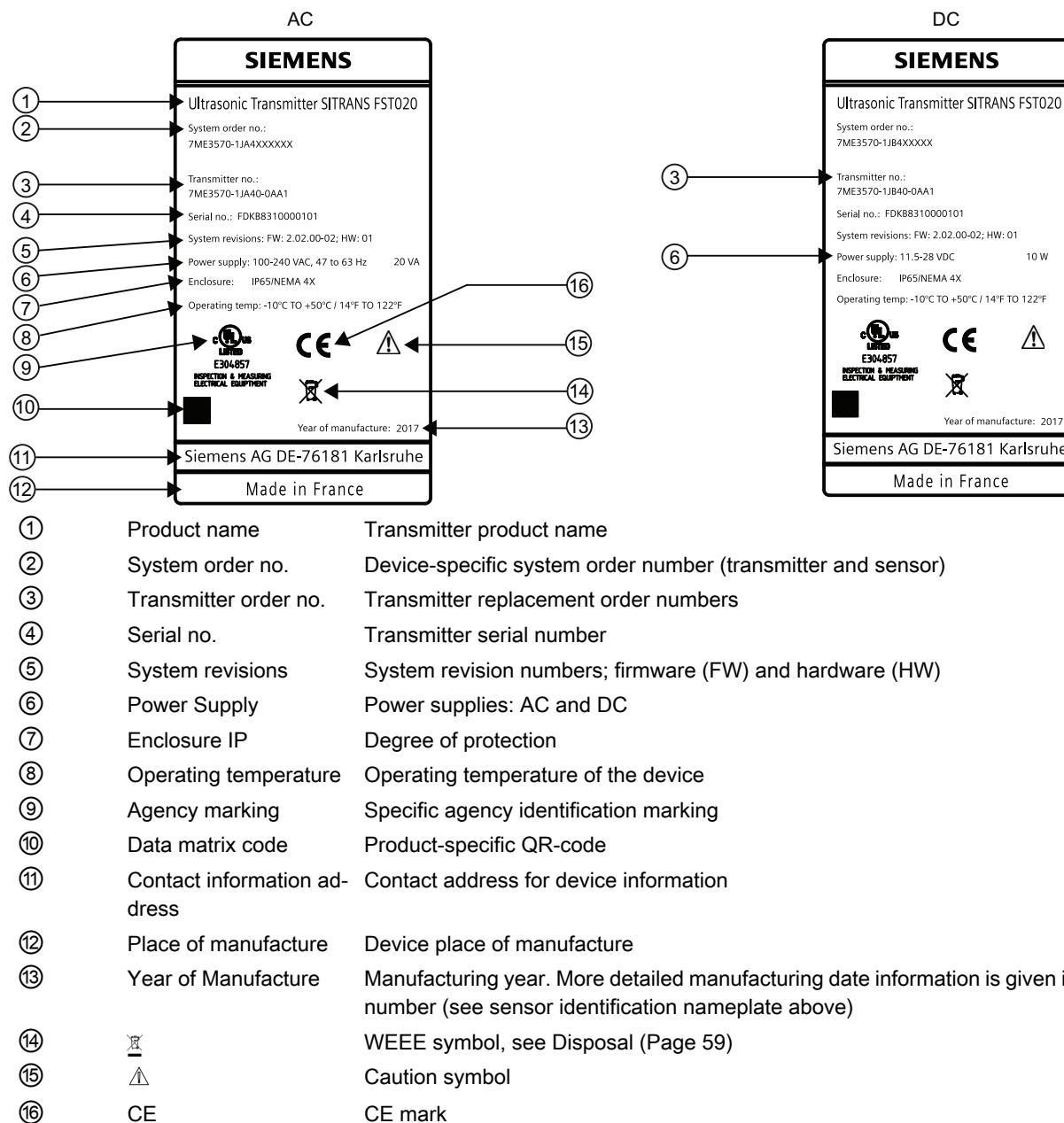


Figure 5-1 Transmitter Labels: AC-DC

5.4 Transmitter power supply, communications and I/O connections

5.4.1 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.

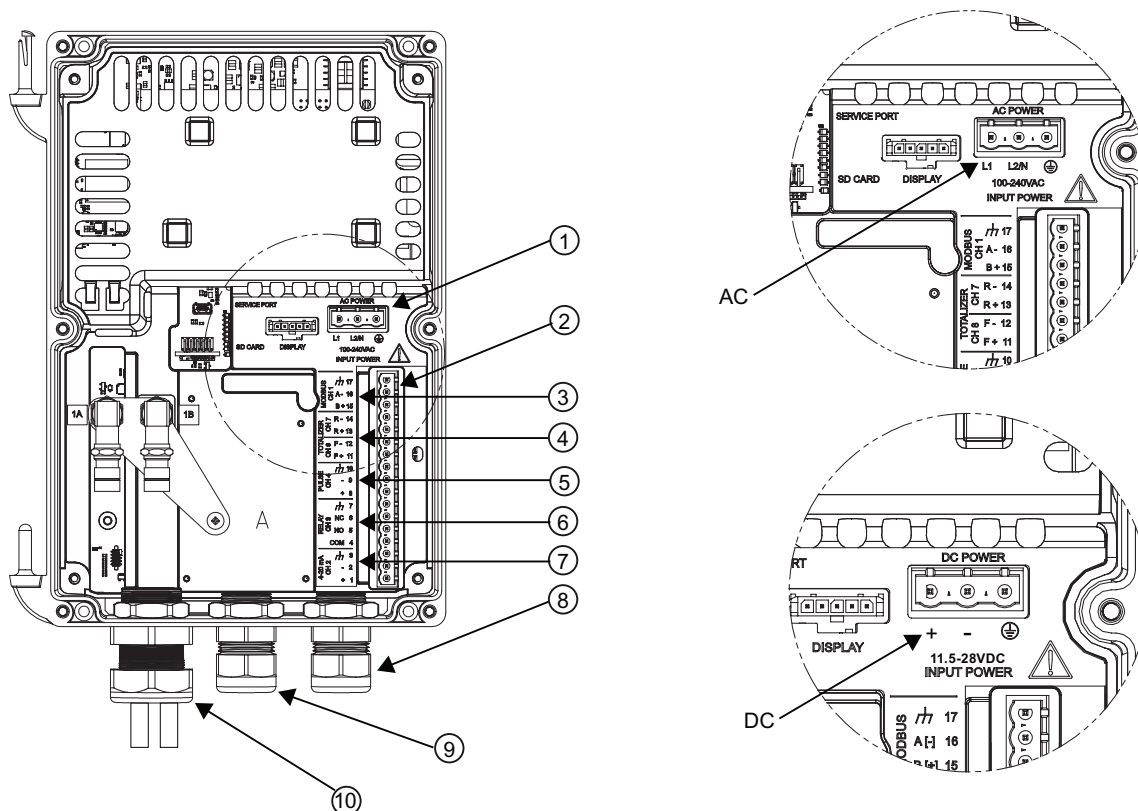
Connector pins	AC	DC	Wire color
1	L1	+	Black
2	L2N	-	White
3	Ground	Ground	Green

5.4 Transmitter power supply, communications and I/O connections

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 \oplus and power to terminals L1 and L2N.
 - For DC - Connect ground to terminal \oplus 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) | ⑥ Relay |
| ② I/O terminals TB1 | ⑦ 4-20 mA |
| ③ Modbus | ⑧ I/O input cable - 30m (98ft) max length |
| ④ Totalizer | ⑨ Power input cable |
| ⑤ Pulse | ⑩ Sensor cables - 90m (300 ft) max length |

Figure 5-2 Input Power Wiring

8. Plug power connector into jack.

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.

⚠ WARNING

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.

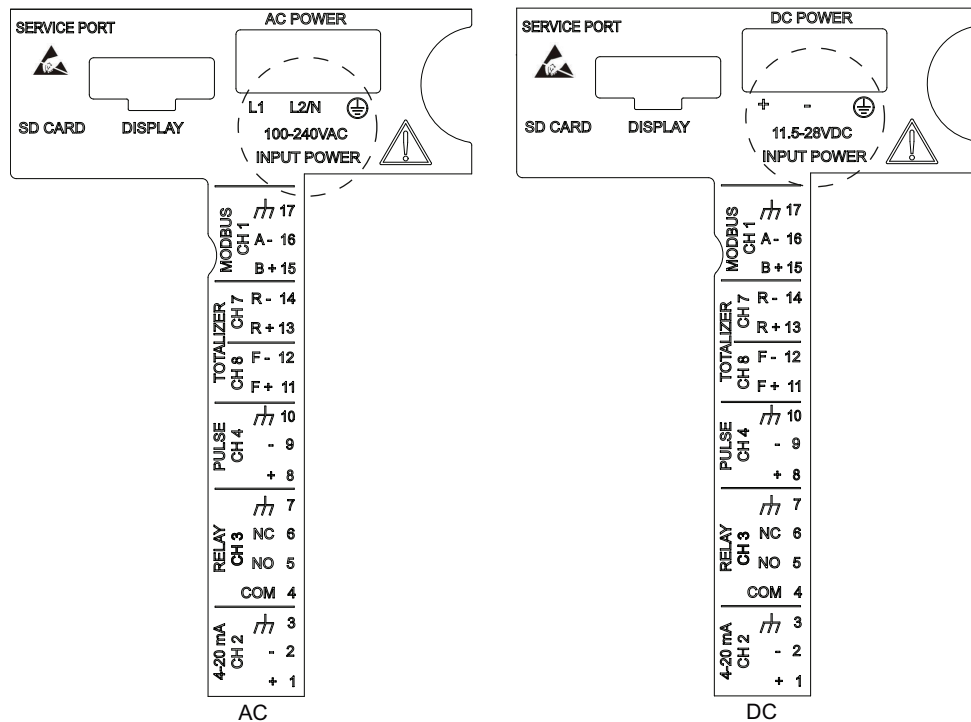


Figure 5-3 Inside cover - AC and DC labels

5.4.4 Connection Wiring

Terminal Block Wiring

These connection diagrams apply to the part numbers listed below.

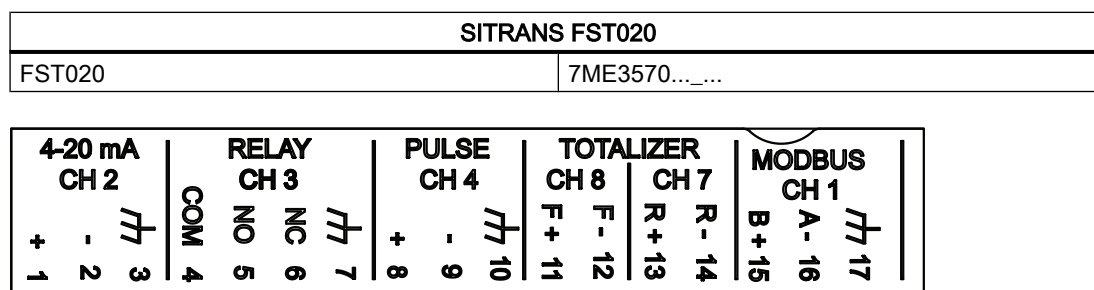


Figure 5-4 Terminal board channels and pin numbers

Note

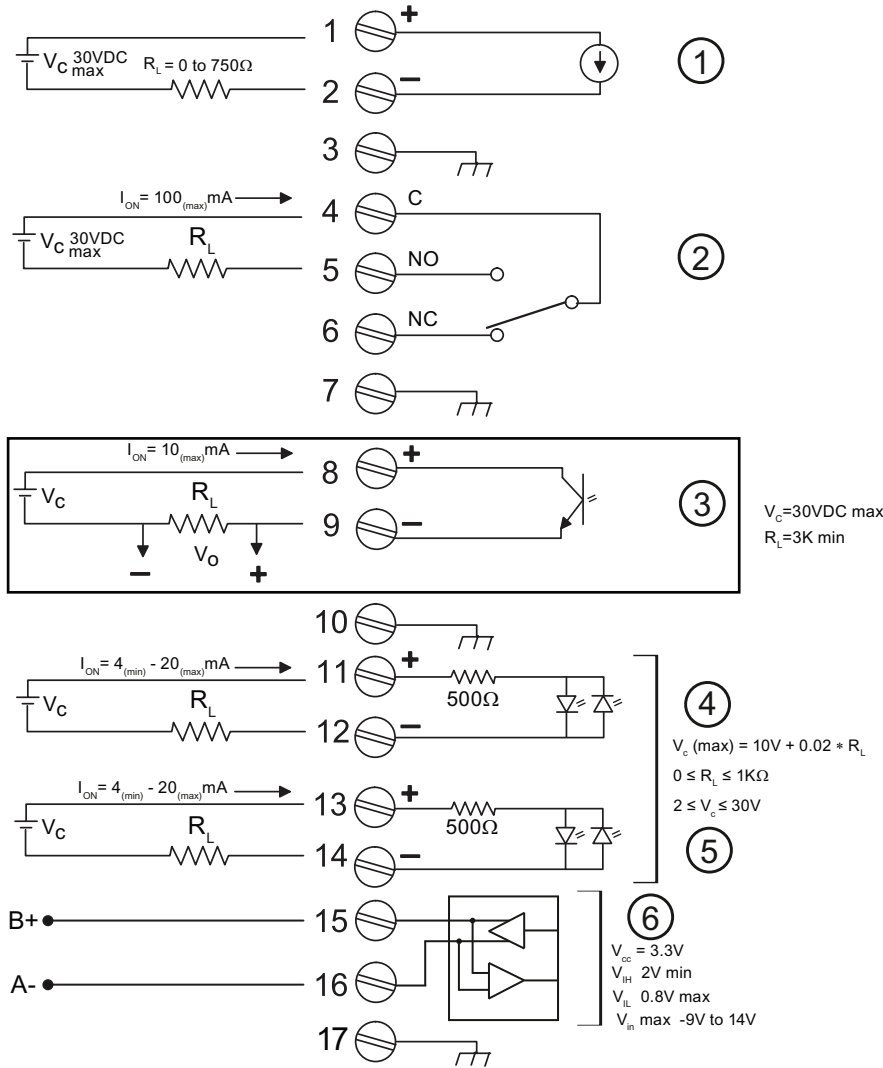
4 to 20 mA current output Channel 2

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	Io1+	Isolated Loop Supply	Spannable 4-20mA output (Loop Powered) This output also provides a fault indication by dropping to 2mA if assigned to flow rate and under fault conditions.
2	Io1-	Isolated Loop Return	
3	Chassis	Ground	Ground
4	C	Common	Relay Output
5	NO	Normally Open	Relay Output
6	NC	Normally Closed	Relay Output
7	Chassis	Ground	Ground
8	PULSE OUTPUT +	Isolated Transistor	Menu selection: PGEN, POS TOTAL, NEG TOTAL
9	PULSE OUTPUT -	Isolated Transistor	
10	Chassis	Ground	Ground
11	NO TOT +	DIGITAL INPUT +	Stops Totalizer from 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

Wiring



- ① 4 - 20mA output (current source)
- ② Relay output
- ③ Pulse output
- ④ Digital input (Freeze TOT)
- ⑤ Digital input (CLR TOT)
- ⑥ Modbus

Figure 5-5 Typical FST020 Wiring

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 x R_L) max. $2 \leq V_c \leq 30$ VDC
$0 \leq R_L \leq 1000 \Omega$	

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.


Your device is now ready for commissioning.


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 PDM (Page 175).

6.1 Basic Safety notes

 CAUTION
Loss of type of protection
Damage to device if the enclosure is open or not properly closed. The type of protection specified on the nameplate or in Technical data (Page 65) is no longer guaranteed.
<ul style="list-style-type: none"> • Make sure that the device is securely closed.

 WARNING
Hot surfaces
Risk of burns resulting from hot surfaces.
<ul style="list-style-type: none"> • 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 65) is no longer guaranteed if the device is open or not properly closed.
<ul style="list-style-type: none"> • 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.

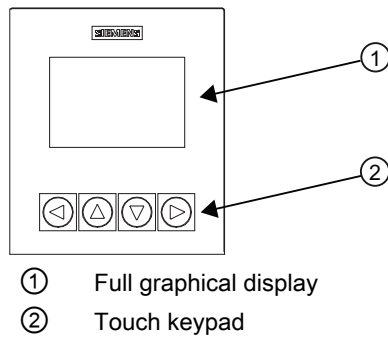


Figure 6-1 Local display

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.

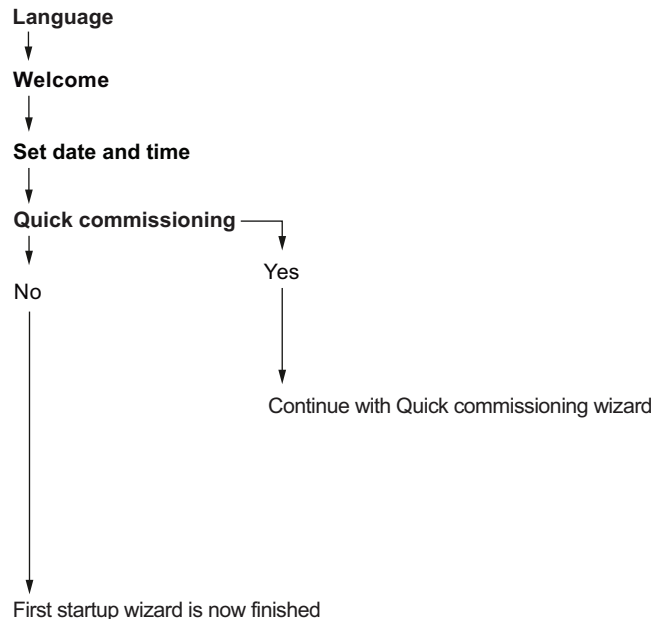
6.5 Initial startup

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.

Before using the flow meter for the first time, essential parameters should be considered. After confirming/changing date and time you can choose to accept the default values or start the Quick commissioning wizard.

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.

Start



Text	Options/description
Language	Set the language: English, Deutsch
Welcome	Information about the "Quick commissioning" wizard
Set date and time	The set date and time (real time clock) is used for all time stamps of logged information.
Quick commissioning	The "Quick commissioning" wizard comprises the most important parameters/menus for quick configuration of the flowmeter.

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

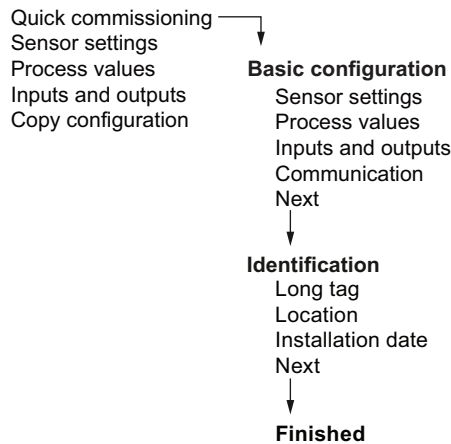
6.6.2.1 Quick Commissioning wizard (menu item 1.1)

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.

6.6.2.2 Quick Commissioning wizard (wizard)

Start

Quick start



Text

Options/Description

Select a basic configuration wizard

Sensor settings, Process values, Inputs and outputs, Copy configuration

Set the identification parameters

Long tag, Location, Installation date

The "Quick commissioning" wizard comprises the following subwizards:

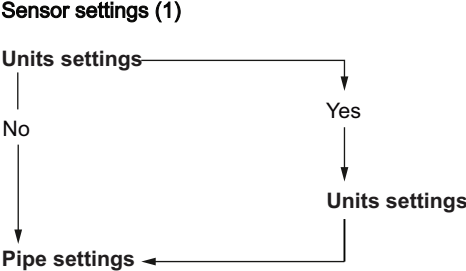
- Sensor settings wizard (wizard) (Page 39)
- Process values wizard (wizard) (Page 44)
- Inputs/Outputs wizard (Page 45)

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)

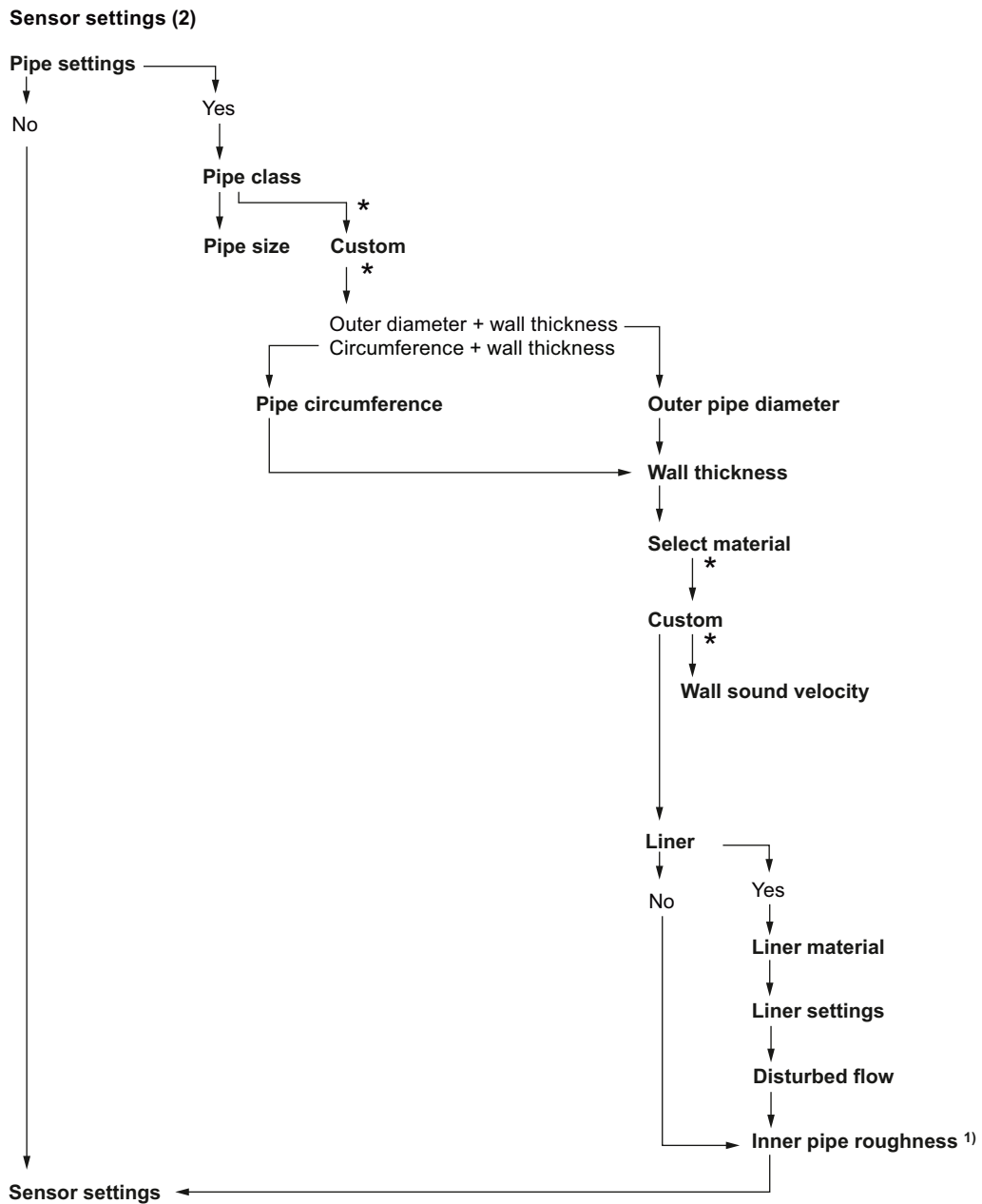


Text

Unit settings
Unit settings

Options/Description

Select "Yes" to configure the display units.
Set the display units of length, temperature, pressure, kinematic viscosity, and density.



Text

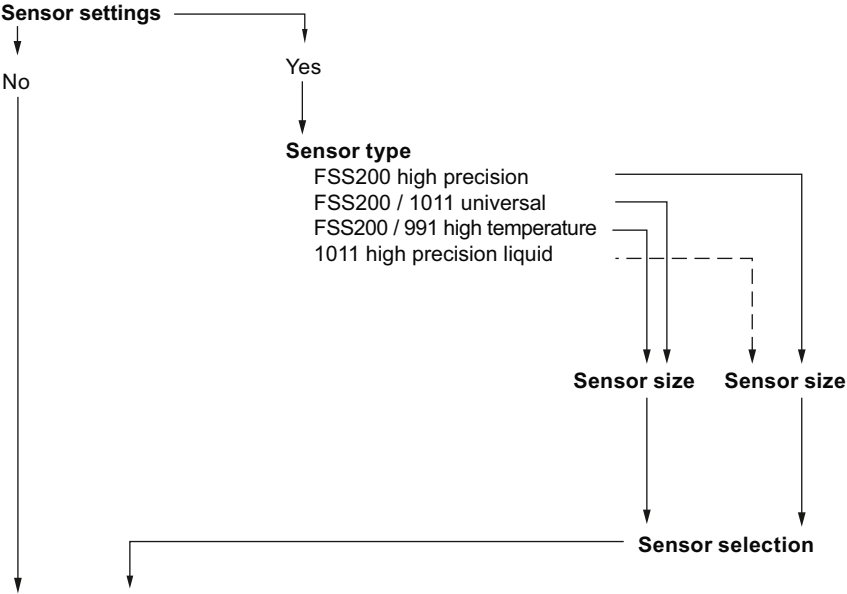
Pipe settings
 Pipe class
 Pipe size
 Pipe circumference
 Outer pipe diameter
 Wall thickness
 Select material
 Wall sound velocity

Options/Description

Select "Yes" to configure the pipe.
 Select the pipe class.
 Select the pipe size from the options available for the selected pipe class.
 Enter pipe circumference. Only available if custom pipe class is selected.
 Enter outer pipe diameter. Only available if custom pipe class is selected.
 Enter wall thickness. Only available if custom pipe class is selected.
 Select the pipe material.
 Enter the wall sound velocity of the material. Only available if custom material is selected.

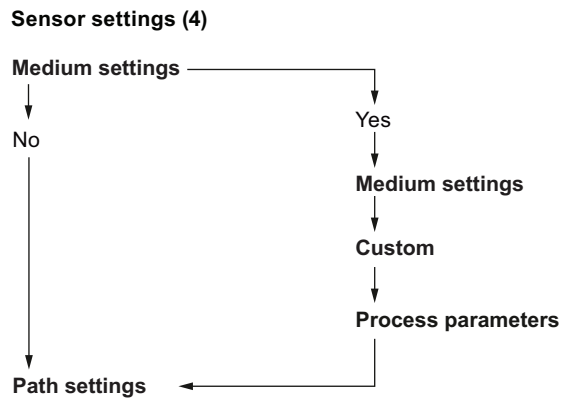
Liner	Select "Yes" to configure the liner material. Select "No" to only configure the Inner pipe roughness.
Liner material	Select the liner material.
Liner settings	Set the liner sound velocity and thickness.
Disturbed flow	Define the type of pipe configuration and the distance to the sensor.
Inner pipe 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

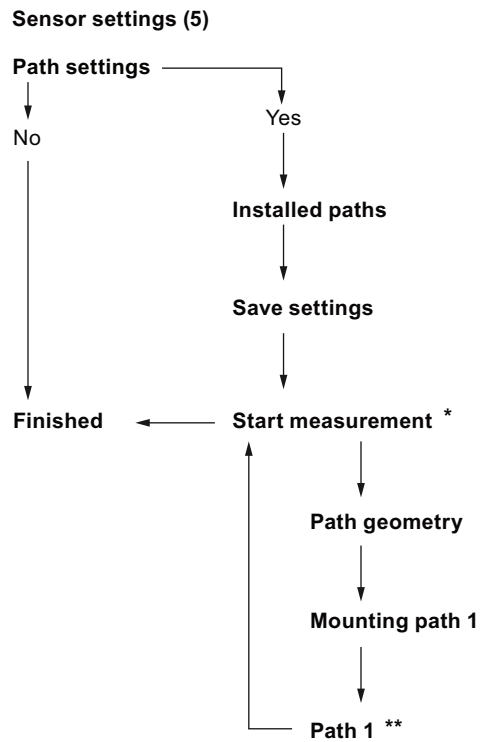


Text

- Medium settings
- Medium settings
- Process parameters

Options/Description

- Select "Yes" to configure the medium.
- Select the process medium.
- Set the expected sound velocity (only available if custom process medium is selected) and the process temperature, pressure, kinetic viscosity, and density.

**Text**

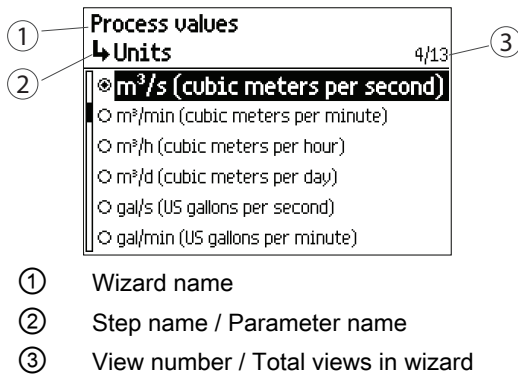
Path settings
 Installed paths
 Save settings
 Start measurement
 Path geometry
 Mounting path 1
 Path 1

Options/Description

Select "YES" to configure the path(s).
 Select the paths installed.
 Moves to the next menu item.
 * for each installed path. Select the path to configure.
 Define the geometry of the path (direct or reflect mode)
 Represents the spacing offset. Use Nom for most applications.
 Select "Receiver signal" to view graphical display of the receiver signal.
 ** Select "Next" to configure next path or to select "Next" to finish the wizard.

6.6.2.5 Process Values wizard (menu item 1.3)

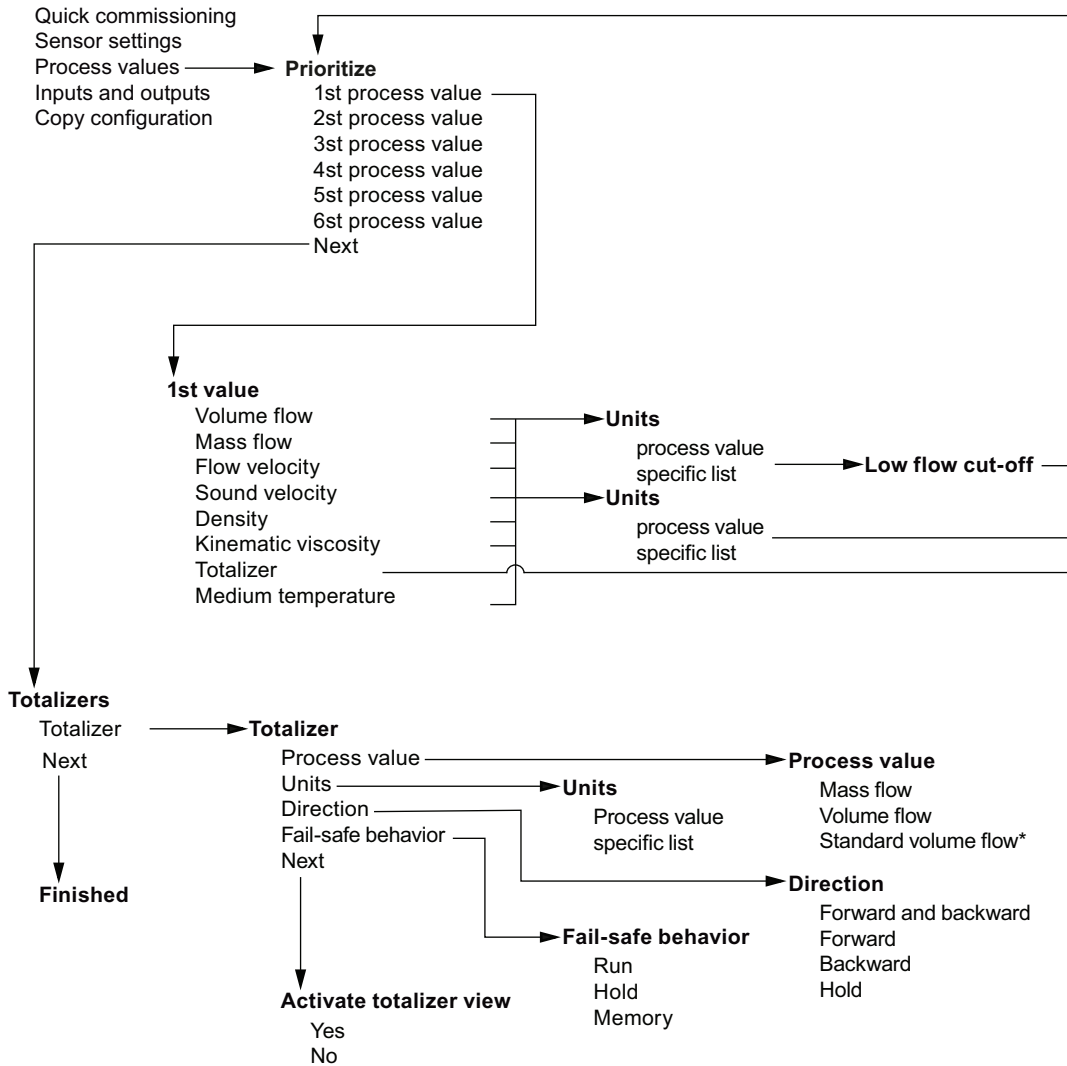
The Process values wizard will guide you through setup of process values for your application. The prioritizing of the process values automatically configures the measurement views on the display. The process value configured as first process value is set as first display view.



6.6.2.6 Process values wizard (wizard)

Start

Quick 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 the Function Manual.

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.

- 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).

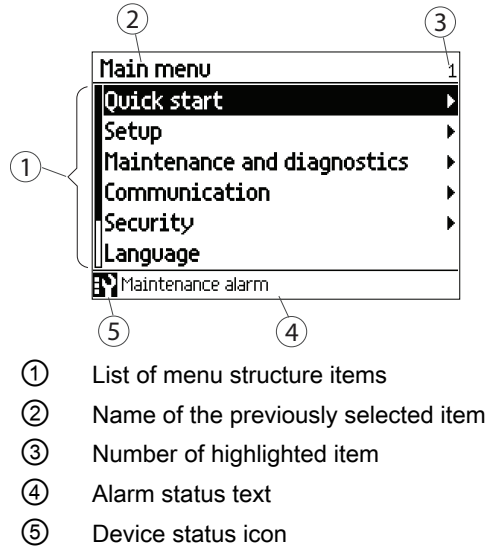


Figure 6-2 Level 1 of the menu structure

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.

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

7.1 Display views

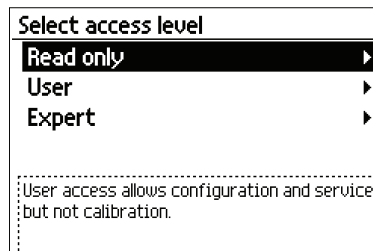
There are six display views, all fully configurable. Use the  and the  keys to switch between the operator views,


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 52).
- Display of six configurable measurement/diagnostic values, see AUTOHOTSPOT.

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.
- **Expert**
Allows configuration and service of all parameters including flow and calibration parameters.

NOTICE
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)

Fixed display text	Process value name
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

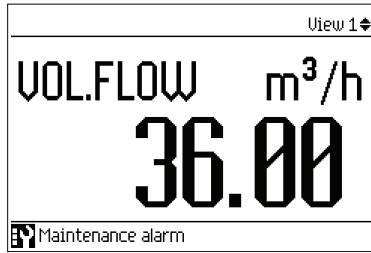
The value of the process values can be displayed either as one or more numeric values or as numeric value(s) in combination with a graph/bargraph. The following view types are available:

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

Table 7-3 Key functions - operator view

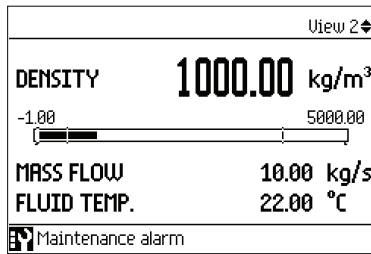
Key	Function
	No functionality
	Go to the previous operator view
	Go to the next operator view
	Enter the menu structure access point

Single value



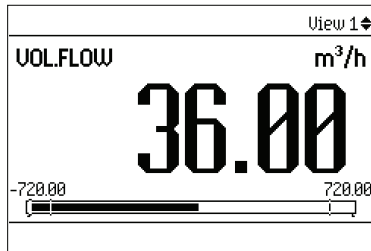
FS0033SS.01.02

Three values



FS0034SS.01.02

1 value and bargraph



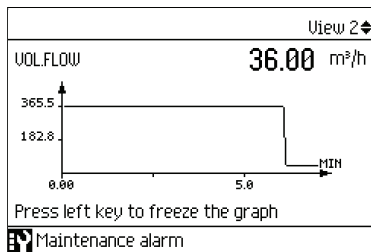
FS0035SS.01.02

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

		View 4
MASS FLOW	36000.00	kg/h
DENSITY	1000.00	kg/m ³
FLUID TEMP.	22.00	°C
VOL.FLOW	36.00	m ³ /h
PRESSURE	3.00	Pa
TOT1	727587.38	kg
Maintenance alarm		

7.3.3 Operating the totalizer

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

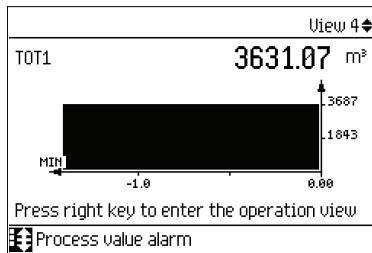




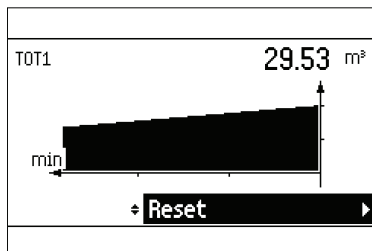



Table 7-4 Key functions - totalizer operation

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.

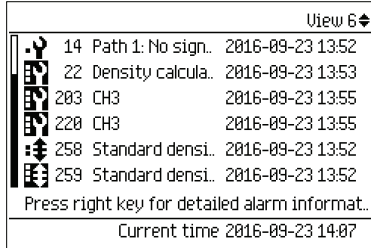




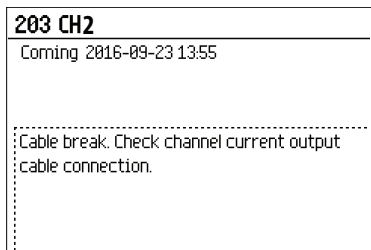
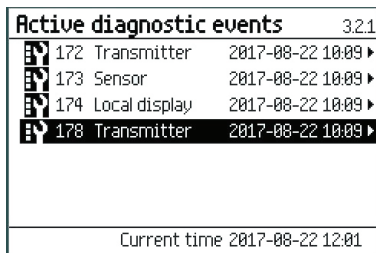


Table 7-5 Key functions - alarms list view



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

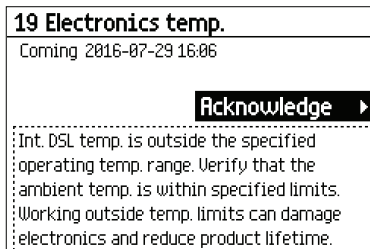


Press  to exit the detailed alarm information.

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.

		View 5 
VOL.FLOW	3.60	m ³ /h
FLOW VEL	1299.21	in/s
SOUND VEL	32.00	m/s
MASS FLOW	3600.00	kg/h
DENSITY	1000.00	kg/m ³
TOT1	137393.95	kg
 Maintenance alarm		


7.3.6 Reading / changing parameters

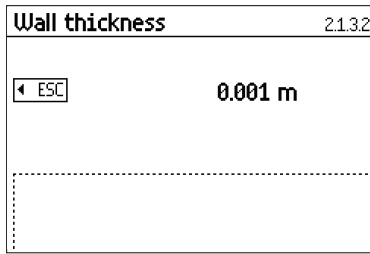
7.3.6.1 Parameter view introduction

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  to exit the view.



Edit

Editable alphanumeric parameters are displayed as shown here.

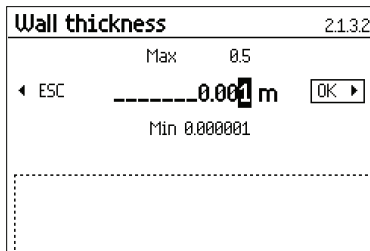


Table 7-6 Key functions - editing alphanumeric values

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.

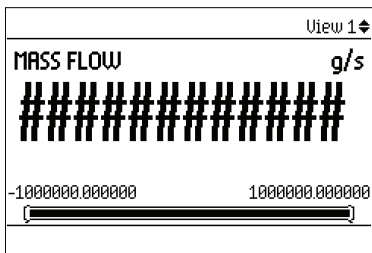
Note

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. Change the measurement units or the resolution.



7.3.7.1 Changing the resolution

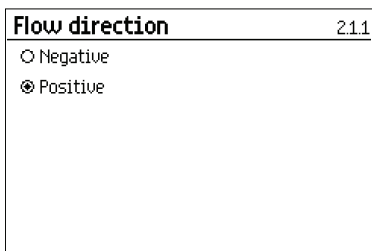
In order to change the resolution of the process value shown in the operation view (for example mass flow), set the decimal places parameter for the selected process value. For example, the decimal places for process value Mass flow is defined in **Decimal places**.

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
	No functionality



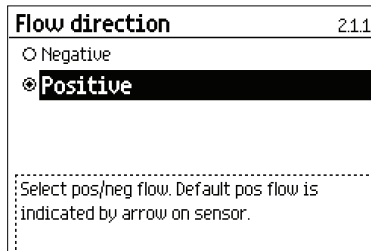
Parameter list - editable

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.

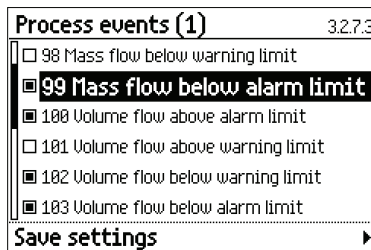
Key	Function
<input checked="" type="checkbox"/>	Select the option below.
<input type="checkbox"/>	Confirm selected option.



Multiselection

Table 7-9 Key functions - multiselection of options

Key	Function
<input type="checkbox"/>	Escape the view without changing the value.
<input type="checkbox"/>	Scroll up in the list. If the uppermost position is selected: highlight Save settings.
<input checked="" type="checkbox"/>	Scroll down in the list. If the lowermost position is selected: highlight Save settings.
<input type="checkbox"/>	Select / deselect option.




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

Service and maintenance

8.1 Basic safety notes

8.1.1 Impermissible repair of the device

 WARNING
Impermissible repair of the device
<ul style="list-style-type: none">• Repair must be carried out by Siemens authorized personnel only.

8.2 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.

8.3 Maintenance and repair work

8.3.1 Maintenance

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

8.3 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

8.3.2 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

8.4 Return procedure

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

Required forms

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

8.5 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, 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/>)

Diagnosing and troubleshooting

9.1 Introduction

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

This chapter is **To Be Determined**.

9.2 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
	1	Maintenance failure	<ul style="list-style-type: none"> • Maintenance alarm: maintenance demanded immediately • Measurement values are not valid
	5	Maintenance warning	<ul style="list-style-type: none"> • Maintenance warning • Measured signal still valid
	6	Maintenance required	<ul style="list-style-type: none"> • Maintenance required • Measured signal still valid



9.3 Fault codes and corrective actions

Icon	Priority level	Name	Description
	3	Process value error	<ul style="list-style-type: none"> Process value has reached an alarm limit
	3	Process value warning	<ul style="list-style-type: none"> Process value has reached a warning limit
	2	Function check	<ul style="list-style-type: none"> Change of configuration, local operation, or substitute value entered Output signals are temporarily invalid

NAMUR status signals

Icon	Priority level	Name	Description
	1	Failure	<ul style="list-style-type: none"> Failure Invalid output signal
	3	Out of specification	<ul style="list-style-type: none"> Out of specification Device will still work, but output signals may be invalid
	4	Maintenance required	<ul style="list-style-type: none"> Maintenance request Measured signal still valid
	2	Function check	<ul style="list-style-type: none"> Function check Output signal temporarily invalid

Info icons

Icon	Name	Description
	Read only	<ul style="list-style-type: none"> Write access disabled Indicate read only parameters
	Data exchange	<ul style="list-style-type: none"> Device is communicating

9.3 Fault codes and corrective actions

9.3.1 Alarm messages

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

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

Technical data

Note

Device specifications

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

10.1 Power

Table 10-1 Power supply

Description	Specification
Supply voltage	<ul style="list-style-type: none"> 100 to 240 V AC +10 / -10%, 47 to 63 Hz 11.5 to 28 V DC +10 / -10%
Power consumption	<ul style="list-style-type: none"> AC = 20 VA DC = 10 W
Fluctuation	<ul style="list-style-type: none"> Transient overvoltages up to the levels of overvoltage category II Temporary overvoltages occurring on mains supply only
Reverse polarity protection (y / n)	Y
Galvanic isolation	3000 V AC

10.2 Inputs

Table 10-2 Digital input

Description	Channel 7
Load	15 to 30 V DC, R_{in} 7 kOhm
Functionality	<ul style="list-style-type: none"> Reset totalizer 1

Table 10-3 Digital input

Description	Channel 8
Load	15 to 30 V DC, R_{in} 7 kOhm
Functionality	<ul style="list-style-type: none"> Start/Stop totalizer

10.3 Outputs

Table 10-4 Current output

Description	Channel 2	
Signal range	4 to 20 mA	
Resolution	0.4 μ A	
Load	<ul style="list-style-type: none"> • Ex i: <470 Ω (HART \geq 230 Ω) • Non-Ex: <770 Ω (HART \geq 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	<ul style="list-style-type: none"> • Last valid value <ul style="list-style-type: none"> - 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)	

10.4 Construction

Table 10-5 Designated use

Description	Specification
Measurement of process medium	<ul style="list-style-type: none"> • Fluid Group 1 (suitable for dangerous fluids) • Aggregate state: Paste/light slurry, liquid and gas

Table 10-6 System design

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

Device design

Table 10-7 Wall mount housing transmitter design

Description	Specification
Dimensions	See Dimension drawings (Page 69)
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 10-8 Installation torques

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

10.5 Operating conditions

Table 10-9 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	<ul style="list-style-type: none"> • Emission • Immunity 	<ul style="list-style-type: none"> • EN 55011 / CISPR-11 • EN/IEC 61326-1 (Industry)

10.7 SensorFlash

Table 10-10 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

10.6 Approvals

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

10.7 SensorFlash

Table 10-11 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:	-40 °C to +85 °C (-40 °F to 185 °F)	-25 °C to +85 °C (-13 °F to 185 °F)
Storage:	-40 °C to +100 °C (-40 °F to 212 °F)	-40 °C to +85 °C (-40 °F to 185 °F)

Note

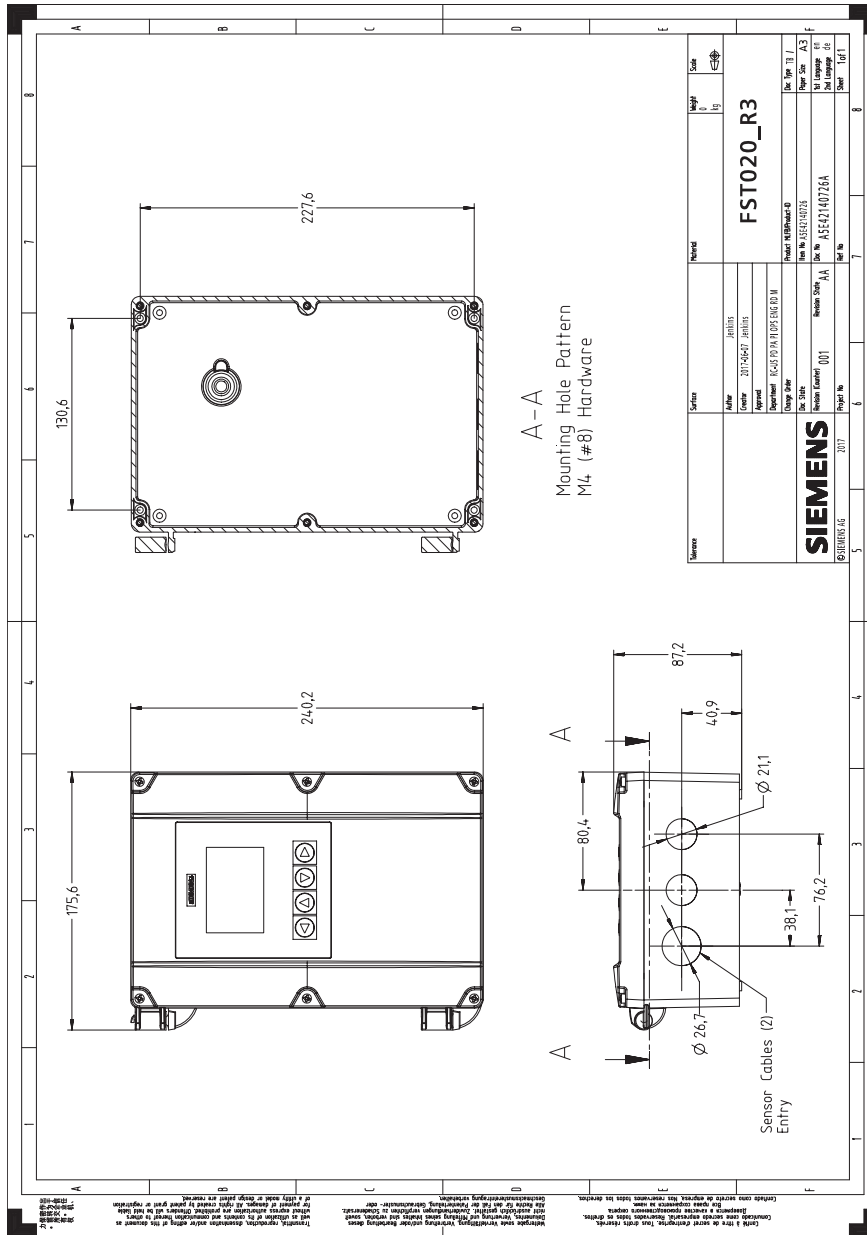
SensorFlash functions support

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

Dimension drawings

11

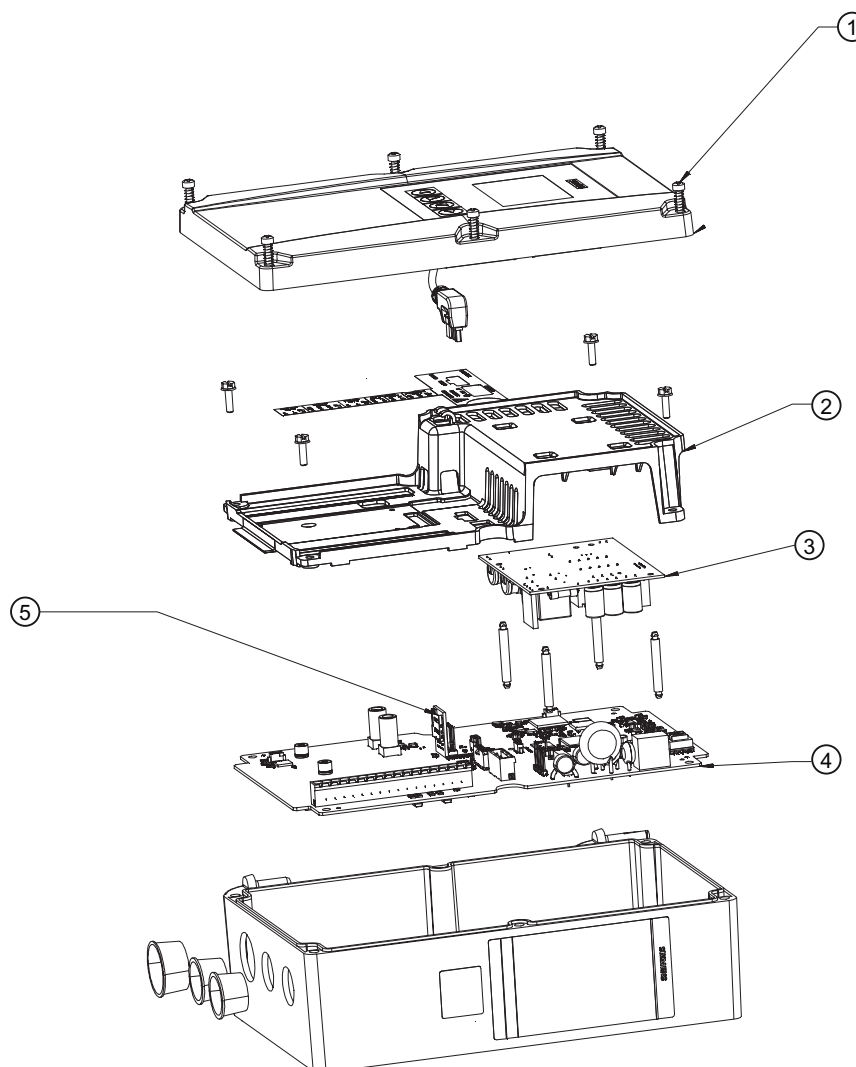
11.1 Dimension drawing



Replacement parts

12.1 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

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 one holding register block. All devices are mapped to this Modbus address space.

A.2 Modbus communication

Table A-1 General Modbus settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8291	Unsigned / 2	Restart communication	Restarts the communication using configured slave address, baud rate and parity/framing.	-	<ul style="list-style-type: none"> • 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

Modbus communication

A.2 Modbus communication

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8298	Unsigned / 2	Baud rate	Baud rate of Modbus interface.	19200 Bit/s	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 0: Even parity, 1 stop • 1: Odd parity, 1 stop • 2: No parity, 2 stops 	Read / write

A.3 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 register)	Value range / Setting options	Access level
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 bit-mask 1	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 bit-mask 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 bit-mask 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

A.4 Modbus register mapping

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] ¹ (units register)	Value range / Setting options	Access level
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
...						
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.4 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.

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 register)	Value range / Setting options	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 product 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 product parameter to which a Modbus request is redirected	65535	0 - 65535	Read / write

A.5 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 register)	Value range / Setting options	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 = most significant byte / high byte LSB = least significant byte / low byte	MSB - LSB (big endian)	0 - 1	Read / write

A.6 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 register)	Value range / Setting options	Access level
8296	Unsigned / 2	Float byte order	The float byte order used in Modbus messages. 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	3-2-1-0	0 - 3	Read / write

A.7 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)

Function code	Command text	Description
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 FC
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.8 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.9 Modbus holding register tables

A.9.1 Modbus holding registers tables

In the following the Modbus RTU holding registers available for SITRANS FST220/230 are described below.

Note

All Write parameters require password access.

Note

In case of error message "Check if the device is set to CT or SIL Operation mode", please check for the following root causes:

- The device is set to CT mode
- The device is set to SIL mode
- The used Modbus register address is wrong

A.9.2 Process values

Table A-8 Process values for standard applications

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
3000	Float / 4	Volume flow	Measured volume flow	- [m ³ /s] (7500)	-	Read only
3004	Float / 4	Mass flow	Measured mass flow	- [kg/s] (7400)	-	Read only
3008	Float / 4	Flow velocity	Measured liquid flow velocity	0.0 [m/s] (8014)	-	Read only
3006	Float / 4	Sound velocity	Measured fluid sound speed	1500.0 [m/s] (7684)	-	Read only
3040	Float / 4	Density	Liquid density	0.0 [kg/m ³] (7600)	-	Read only
3046	Float / 4	Kinematic viscosity	Liquid viscosity	- [m ² /s] (7524)	-	Read only
3042	Float / 4	Medium temperature	Measured medium temperature	- [°C] (7700)	-	Read only

A.9 Modbus holding register tables

Table A-9 IO values

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8803	Float / 4	Loop current CH2	Calculated current at output channel 2	- [mA]		Read only
9140	Unsigned / 2	Status output CH3	Calculated status at output channel 3	-	0 - 1	Read only
9400	Float / 4	Output frequency CH4	Calculated frequency at output channel 4	- [Hz]		Read only
9469	Float / 4	Amount on CH4	Current totalized amount according to pulse output channel 4	- (Mass: 7400 / Volume: 7500 / Standard Volume: 7964)		Read only

A.9.3 Totalizers

Table A-10 Totalizers

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8300	Float / 4	Totalizer 1 value	Totalized value of totalizer 1. Units depends on the selected process value the totalizer is configured to. Write access if Totalizer 1 target mode is set to 16: Manual	- (8321 / 8320 / 8322)	-	Read / write
8303	Unsigned / 2	Totalizer 1 set	Run, reset, or preset totalizer 1.	0	<ul style="list-style-type: none"> 0: Totalize 1: Reset 2: Preset to Totalizer 1 preset value 	Read / write
8304	Unsigned / 2	Totalizer 1 direction	Totalizer 1 direction.	1	<ul style="list-style-type: none"> 0: Balanced 1: Positive 2: Negative 3: Hold 	Read / write
8316	Float / 4	Totalizer 1 preset value	Preset value which will be used when Totalizer 1 set is set to 2	- (8321 / 8320 / 8322)	-	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8319	Unsigned / 2	Totalizer 1 target mode	Sets the desired mode for the totalizer.	8	<ul style="list-style-type: none"> • 8: Auto, the totalizer algorithm running • 16: Man, the totalizer algorithm is stopped. The totalizer value can be written 	Read / write
8549	Unsigned / 2	Reset all totalizers	Reset command for totalizers 1 to 3.	0	<ul style="list-style-type: none"> • 0: Run • 1: Reset all totalizers • 11: Reset totalizer 1 • 12: Reset totalizer 2 • 13: Reset totalizer 3 	Write only

A.9.4 Units

Table A-11 Units settings for values and quantities communicated via Modbus

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7500	Unsigned / 2	Volume flow units	Units for volume flow values.	19	<ul style="list-style-type: none"> • 15: ft³/min (cubic feet per minute) • 16: gal/min (US gallons per minute) • 17: l/min (liters per minute) • 18: i.gal/min (Imperial gallons per minute) • 19: m³/h (cubic meters per hour) • 22: gal/s (US gallons per second) • 23: Mgal/d (million US gallons per day) • 24: l/s (liters per second) • 25: Ml/d (million liters per day) • 26: ft³/s (cubic feet per second) • 27: ft³/d (cubic feet per day) • 28: m³/s (cubic meters per second) • 29: m³/d (cubic meters per day) • 30: i.gal/h (Imperial gallons per hour) • 31: i.gal/d (Imperial gallons per day) • 130: ft³/h (cubic feet per hour) • 131: m³/min (cubic meters per minute) • 132: BBL42/s (1 barrel = 42 US gallons) • 133: BBL42/min (1 barrel = 42 US gallons) • 134: BBL42/h (1 barrel = 42 US gallons) • 135: BBL42/d (1 barrel = 42 US gallons) • 136: gal/h (US gallons per hour) • 137: i.gal/s (Imperial gallons per second) • 138: l/h (liters per hour) • 170: BBL31/s (1 barrel = 31 US gallons) 	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
					<ul style="list-style-type: none"> • 171: BBL31/min (1 barrel = 31 US gallons) • 172: BBL31/h (1 barrel = 31 US gallons) • 173: beer barrel per day • 235: gal/d (US gallons per day) • 253: custom units (see Custom volume flow units string (8470) / factor (8468)) 	
7400	Unsigned / 2	Mass flow units	Units for mass flow values.	75	<ul style="list-style-type: none"> • 70: g/s (grams per second) • 71: g/min (grams per min) • 72: g/h (grams per hour) • 73: kg/s (kilograms per second) • 74: kg/min (kilograms per minute) • 75: kg/h (kilograms per hour) • 76: kg/d (kilograms per day) • 77: t/min (1 t = 1000 kg) • 78: t/h (1 t = 1000 kg) • 79: t/d (1 t = 1000 kg) • 80: lb/s (pounds per second) • 81: lb/min (pounds per minute) • 82: lb/h (pounds per hour) • 83: lb/d (pounds per day) • 84: STon/min (1 STon = 2000 lb) • 85: STon/h (1 STon = 2000 lb) • 86: STon/d (1 STon = 2000 lb) • 87: T/h (1 T = 2240 lb) • 88: T/d (1 T = 2240 lb) • 253: custom units (see Custom mass flow units string (8458) / factor (8456)) 	Read / write
8014	Unsigned / 2	Flow velocity units	Units for flow velocity values.	21	<ul style="list-style-type: none"> • 20: ft/s (feet per second) • 21: m/s (meters per second) • 114: in/s (inches per second) • 115: in/min (inches per minute) • 116: ft/min (feet per minute) • 120: m/h (meters per hour) • 253: custom units (see Custom velocity units string (8494) / factor (8492)) 	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7648	Unsigned / 2	Sound velocity units	Units for sound velocity values.	21	<ul style="list-style-type: none"> • 20: ft/s (feet per second) • 21: m/s (meters per second) • 114: in/s (inches per second) • 115: in/min (inches per minute) • 116: ft/min (feet per minute) • 120: m/h (meters per hour) • 253: custom units (see Custom velocity units string (8494) / factor (8492)) 	Read / write
7600	Unsigned / 2	Density units	Units for density values.	92	<ul style="list-style-type: none"> • 91: g/cm³ (grams per cubic centimeters) • 92: kg/m³ (kilograms per cubic meter) • 93: lb/gal (pounds per US gallon) • 94: lb/ft³ (pounds per cubic foot) • 95: g/ml (grams per milliliter) • 96: kg/l (kilograms per liter) • 97: g/l (grams per liter) • 98: lb/in³ (pounds per cubic inch) • 99: STon/yd³ (1 STon = 2000 lb) • 146: µg/l (micrograms per liter) • 147: µg/m³ (micrograms per cubic meter) • 170: mg/l (milligrams per liter) • 253: custom units (see Custom density units string (8464) / factor (8462)) 	Read / write
7524	Unsigned / 2	Viscosity units	Units for viscosity values.	54	<ul style="list-style-type: none"> • 54: cSt (centistokes, 1 cSt = 1 mm²/s) 	Read / write
7700	Unsigned / 2	Temperature units	Units for temperature values.	32	<ul style="list-style-type: none"> • 32: °C (degrees Celsius) • 33: °F (degrees Fahrenheit) • 34: °R (degrees Rankine) • 35: K (kelvins) 	Read / write
8556	Unsigned / 2	Length units	Units for length values.	45	<ul style="list-style-type: none"> • 44: ft (feet) • 45: m (meters) • 47: in (inches) • 48: cm (centimeters) • 49: mm (millimeters) 	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8564	Unsigned / 2	Acceleration units	Units for acceleration values.	172	<ul style="list-style-type: none"> 171: ft/s² (feet per second squared) 172: m/s² (meters per second squared) 	Read / write
8321	Unsigned / 2	Totalizer 1 units	Units for volume quantities of totalizer 1 (totalizer 1 is configured to volume flow).	41	<ul style="list-style-type: none"> 40: US gallons 41: l (liters) 42: i.gal (Imperial gallons) 43: m³ (cubic meters) 46: BBL42 (1 barrel = 42 US gallons) 110: bush (bushels) 111: yd³ (cubic yards) 112: ft³ (cubic feet) 113: in³ (cubic inches) 124: BBL31.5 (1 barrel = 31.5 US gallons) 170: BBL31 (1 barrel = 31 US gallons) 236: hl (hectoliters) 253: custom units (see Custom volume units string (8452) / factor (8450)) 	Read / write
8320	Unsigned / 2	Totalizer 1 units	Units for mass quantities of totalizer 1 (totalizer 1 is configured to mass flow).	61	<ul style="list-style-type: none"> 60: g (grams) 61: kg (kilograms) 62: t (1 t = 1000 kg) 63: lb (pounds) 64: STon (1 STon = 2000 lb) 65: T (1 T = 2240 lb) 125: oz (ounces) 253: custom units (see Custom mass units string (8476) / factor (8474)) 	Read / write
8322	Unsigned / 2	Totalizer 1 units	Units for standard volume quantities of totalizer 1 (totalizer 1 is configured to standard volume flow).	171	<ul style="list-style-type: none"> 166: Nm³ (normal cubic meters) 167: NI (normal liters) 168: Sft³ (standard cubic feet) 171: SI (standard liters) 172: Sm³ (standard cubic meters) 	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8470	String / 8	Custom volume flow units string	User specific string for volume flow values.	-----	-	Read / write
8468	Float / 4	Custom volume flow units factor	Conversion factor for user specific volume flow values related to m ³ /s.	1.0	-	Read / write
7518	String / 8	Custom standard volume flow units string	User specific string for standard volume flow values.	-----	-	Read / write
7516	Float / 4	Custom standard volume flow units factor	Conversion factor for user specific standard volume flow values related to Sm ³ /s.	1.0	-	Read / write
8458	String / 8	Custom mass flow units string	User specific string for mass flow values.	-----	-	Read / write
8456	Float / 4	Custom mass flow units factor	Conversion factor for user specific mass flow values related to kg/s.	1.0	-	Read / write
8464	String / 8	Custom density units string	User specific string for density values.	-----	-	Read / write
8462	Float / 4	Custom density units factor	Conversion factor for user specific density values related to kg/m ³ .	1.0	-	Read / write
8494	String / 8	Custom velocity units string	User specific string for velocity values.	-----	-	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8492	Float / 4	Custom velocity units factor	Conversion factor for user specific velocity values related to m/s.	1.0	-	Read / write
8452	String / 8	Custom volume units string	User specific string for volume quantities.	-----	-	Read / write
8450	Float / 4	Custom volume units factor	Conversion factor for user specific volume quantities related to m ³ .	1.0	-	Read / write
8476	String / 8	Custom mass units string	User specific string for mass quantities.	-----	-	Read / write
8474	Float / 4	Custom mass units factor	Conversion factor for user specific mass quantities related to kg.	1.0	-	Read / write

A.9.5 Device reset

Table A-12 Device reset

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
700	Unsigned / 2	Set to default	Command to set all changeable parameters to their defined values.	0	<ul style="list-style-type: none"> 1: Reset parameters 	Write only
6000	Unsigned / 2	Restart device	Command to restart device.	-	<ul style="list-style-type: none"> 1: Restart device 	Write only

A.9.6 Setup

A.9.6.1 Sensor

Sensor settings

Table A-13 General sensor settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1801	Unsigned / 2	Flow direction	Define positive and negative flow direction. Default positive flow direction is indicated by an arrow on the sensor.	1	<ul style="list-style-type: none"> 0: Negative: The flow is measured '+' in default negative direction and '-' in default positive direction. 1: Positive: The flow is measured '+' in default positive direction and '-' in default negative direction. 	Read / write

Pipe settings (clamp-on)

Table A-14 Pipe settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1200	Float / 4	Outer pipe diameter	External pipe diameter.	0.1 [m] (8556)	0.006 - 10.0	Read / write
1202	Float / 4	Wall thickness	Pipe wall thickness.	0.001 [m] (8556)	1.0E-6 - 0.5	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1226	Unsigned / 2	Pipe material	Pipe material.		<ul style="list-style-type: none"> • 0: Unspecified • 1: Custom • 2: Carbon steel • 3: Stainless steel • 4: ABS plastic • 5: Aluminum • 6: Black iron • 7: Brass • 8: Case iron • 9: Copper nickel 70/30 • 10: Copper nickel 90/10 • 11: Copper • 12: Ductile iron • 13: FRP plastic • 14: Glass • 15: Hastelloy • 16: Inconel • 17: Kynar plastic • 18: Monel • 19: Nickel • 20: Polyethylene • 21: PVC plastic • 22: Teflon • 23: Titanium 	Read / write
1204	Float / 4	Wall sound velocity	<p>Pipe wall material sound velocity.</p> <p>Use the shear velocity for metallic pipes. Use the longitudinal velocity for plastic pipes.</p>	3000.0 [m/s] (7648)	200.0 - 4000.0	Read / write
1208	Float / 4	Liner thickness	Pipe liner thickness.	0.0 [m] (8556)	0.0 - 0.5	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1227	Unsigned / 2	Liner material	Liner material.		<ul style="list-style-type: none"> • 0: Not applicable • 1: Custom • 2: Cement • 3: Coal tar • 4: Enamel • 5: Glass • 6 Plastic • 7: Hi_dens_Poly • 8: PTFE • 9: Rubber 	Read / write
1210	Float / 4	Liner sound velocity	Liner material sound velocity.	2000.0 [m/s] (7648)	200.0 - 4000.0	Read / write
1214	Float / 4	Inner pipe roughness	Roughness of inner pipe/liner material.	0.0001 [m] (8556)	0.0 - 0.01	Read / write
1216	Float / 4	Inner pipe diameter	Calculated inner diameter of pipe.	- [m] (8556)	-	Read only

Upstream and downstream conditions

Table A-15 Upstream and downstream conditions

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1220	Unsigned / 2	Upstream pipe geometry	Compensation for upstream pipe geometry.	0	<ul style="list-style-type: none"> • 0: Straight run • 1: Single elbow • 2: Double elbow (in-plane) • 3: Double elbow (out-of-plane) • 4: Reducer • 5: Expansion 	Read / write
1221	Unsigned / 2	Upstream distance	The distance to the upstream flow disturbance in multiples of inner pipe diameter.	0	0 - 40	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1223	Unsigned / 2	Downstream pipe geometry	Compensation for downstream pipe geometry.	0	<ul style="list-style-type: none"> • 0: Straight run • 1: Single elbow • 2: Double elbow (in-plane) • 3: Double elbow (out-of-plane) • 4: Reducer • 5: Expansion 	Read / write
1224	Unsigned / 2	Downstream distance	The distance to the downstream flow disturbance in multiples of inner pipe diameter.	0	0 - 40	Read / write

Process medium characteristics

Table A-16 Process medium characteristics

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1825	Float / 4	Expected sound velocity	Expected sound velocity in the medium at medium temperature.	1500.0 [m/s] (7648)	100.0 - 2500.0	Read / write
1701	Float / 4	Fixed medium temperature	Fixed medium temperature value used for compensation.	20 [°C] (7700)	-273 - 400	Read / write
1705	Float / 4	Fixed process viscosity	Fixed process viscosity value used for compensation.	0.000001 [m ² /s] (7524)	0.0 - 5000.0	Read / write
1707	Float / 4	Fixed process density	Fixed process density used for compensation.	1000.0 [kg/m ³] (7600)	0.0 - 2000.0	Read / write

Sensor settings (clamp-on)

Table A-17 Sensor settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1324	Unsigned / 2	Sensor model	Installed sensor model (for multi-path all must be the same).	2	<ul style="list-style-type: none"> • 0: None • 1: 1011 High precision • 2: 1011 Universal • 3: 991 Universal (High temperature) • 4: Custom clamp-on (Lamb wave) • 5: Custom clamp-on (Shear wave) 	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1327	Unsigned / 2	Clamp-on sensor model	Installed sensor size.	20	<ul style="list-style-type: none"> • 0: None selected / Custom sensor • 1: A1H (High precision) • 2: A2H (High precision) • 3: A3H (High precision) • 4: B1H (High precision) • 5: B2H (High precision) • 6: B3H (High precision) • 7: C1H (High precision) • 8: C2H (High precision) • 9: D1H (High precision) • 10: D2H (High precision) • 11: D3H (High precision) • 12: D4H (High precision) • 13: A1 (Universal) • 14: A2 (Universal) • 15: B1 (Universal) • 16: B2 (Universal) • 17: B3 (Universal) • 18: C1 (Universal) • 19: C2 (Universal) • 20: C3 (Universal) • 21: D1 (Universal) • 22: D2 (Universal) • 23: D3 (Universal) • 24: E1 (Universal) • 25: E2 (Universal) • 26: E3 (Universal) • 27: 1 (High temperature) • 28: 2 (High temperature) • 29: 2A (High temperature) • 30: 3 (High temperature) • 31: 3A (High temperature) • 32: 4 (High temperature) • 33: 4A (High temperature) 	Read / write
1312	Float / 4	Sensor crystal projection	Length of the crystal projection onto the emitting surface of the sensor.	0.03409 [m] (8556)	0.0 - 3.0	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1314	Float / 4	Sensor phase velocity	The velocity at which the wave fronts traverse the interface between the wedge and the pipe.	3695.5 [m/s] (7648)	2000.0 - 10000.0	Read / write
1316	Float / 4	Sensor inactive wedge	The part of the wedge that is not part of the sound path.	0.00076 [m] (8556)	0.0 - 0.05	Read / write
1318	Float / 4	Sensor fixed time	Fixed time in sensor wedge.	10.61E-6 [s]	2.0E-6 - 200.0E-6	Read / write
1320	Float / 4	Mounting hole offset	Distance between spacer hole and sensor front face.	0.00953 [m] (8556)	0.0 - 0.05	Read / write
1322	Unsigned / 2	Pipe travel time	Designated multiplier on the crystal projection value used in formula for calculating pipe travel.	0	0 - 200	Read / write
1711	Float / 4	Temperature compensation factor	Sensor temperature compensation slope factor.	0.00063761 [1/K]	0.0001 - 0.0009	Read / write
1713	Unsigned / 2	Reference temperature	Sensor reference (nominal) temperature.	0	<ul style="list-style-type: none"> • 0: 21 °C • 1: 60 °C • 2: 93 °C 	Read / write

General path settings

Table A-18 General path settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1400	Unsigned / 2	Installed paths	Bit encoded value containing installed paths for clamp-on systems.	0	<ul style="list-style-type: none"> • Bit 0: Path 1 installed 	Read / write
1401	Unsigned / 2	Path mode	Measurement mode of paths	1	1: Transit Time	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1402	Unsigned / 2	Pre amp selection	Enable or disable pre-amplifiers on all paths.	0	<ul style="list-style-type: none"> 0: Based on register 1300 Sensor type (on for clamp-on) 1: Off 2: On 3: Half TX signal amplitude 	Read / write
1403	Unsigned / 2	Tx wave periods	Number of transmit periods in TX signal	5	1 - 10	Read / write
1407	Float / 4	Minimum ringdown delay	Minimum ringdown delay. Dynamically calculated ringdown values below this value it will be set to the next higher ringdown echo value.	0.002 [s]	0.0 - 0.01	Read / write
1411	Float / 4	Cable length	Length of the used sensor cables (One way). Used for calculating and compensating the time delay in the cables.	0.0 [m] (8556)	0.0 - 20.0	Read / write
1441	Unsigned / 2	Perform frequency search	Command to perform a frequency sweep on a path.	0	<ul style="list-style-type: none"> 0: Frequency sweep done / not running 1: Perform frequency sweep on path 1 2: Perform frequency sweep on path 2 3: Perform frequency sweep on path 3 4: Perform frequency sweep on path 4 5: Perform frequency sweep on path 5 	Read / write

Sensor spacing

Table A-19 Sensor spacing settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1426	Unsigned / 2	Recommended space method	Recommended spacing method between clamp-on sensors for path X. Calculated on request.	-	<ul style="list-style-type: none"> • 0: None (default) • 1: Track 1012TN • 2: Track 1012TNH • 3: Track 992 • 4: Spacer bar 1012BN • 5: Manual • 6: Spacing Error 	Read only
1420	Unsigned / 2	Clamp-on recommended spacing path X	The path the current recommended spacing values were calculated for. 0 means not calculated since power up.	0	0 - 255	Read only
1421	Float / 4	Clamp-on recommended spacing ideal	Recommended ideal spacing distance (LTN) between clamp-on sensors for path X. Calculated on request.	0.0 [m] (8556)	-	Read only
1423	Float / 4	Recommended spacing	Recommended spacing distance (LTN corresponding to recommended spacing index) between clamp-on sensors for path X. Calculated on request.	0.0 [m] (8556)	-	Read only
1425	Unsigned / 2	Recommended spacing (index)	Recommended spacing index between clamp-on sensors for path X for the given spacing method. Calculated on request.	0	0 to 255	Read only
1442	Unsigned / 2	Calculate spacing	Command to calculate recommended spacing distance, recommended spacing method and recommended spacing index for a given path.	0	<ul style="list-style-type: none"> • 0: Calculation done / not running • 1: Perform calculation on path 1 • 2: Perform calculation on path 2 • 3: Perform calculation on Path 3 • 4: Perform calculation on path 4 • 5: Perform calculation on path 5 	Read / write

Path 1 settings

Table A-20 Path 1 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1450	Float / 4	Sensor frequency	Desired sensor frequency for path 1.	1100000 [Hz]	80000.0 - 4000000.0	Read / write
1458	Unsigned / 2	Path geometry	The number of crossings the signal makes through the pipe (Reflect or direct geometry for path 1). E.g.: Z path = 1 V path = 2 W path = 4	1	1 - 10	Read / write
1465	Float / 4	Spacing offset	Spacing offset (LTN) between clamp-on sensors for path 1.	0.0 [m] (8556)	-100.0 - 100.0	Read / write

User calibration

Table A-21 User calibration

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1000	Float / 4	Slope correction factor	Single point flow correction applies to any flow rate, positive or negative.	1.0	0.5 - 2.0	Read / write
1006	Float / 4	Path 1 offset	User calibrated zero offset for path 1. Calibrated delta time = delta time + Path 1 factory offset + Path 1 offset.	0.0 [s]	-1.25E-6 - +1.25E-6	Read / write
1004	Float / 4	Path 1 factory offset	Factory calibrated zero offset for path 1.	0.0 [s]	-	Read only

Auto offset adjustment

Table A-22 Auto offset adjustment

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
950	Unsigned / 2	Perform zero adjust - factory	Command to start an automatic factory zero offset adjustment. Queued command.	0	<ul style="list-style-type: none"> 0: Automatic factory ZOA done / not running 1: Perform ZOA on path 1 6: Perform ZOA on all installed paths 7: Revert to last good factory offset values 	Read / write
951	Unsigned / 2	Perform zero adjust - user	Command to start an automatic user zero offset adjustment. Queued command.	0	<ul style="list-style-type: none"> 0: Automatic factory ZOA done / not running 1: Perform ZOA on path 1 7: Revert to last good factory offset values 	Read / write
952	Unsigned / 2	Zero adjust time	The amount of time the zero offset adjustment runs (i.e. amount of time to average samples over).	30 [s]	5 - 300	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
953	Unsigned / 2	Zero adjust progress	The progress of the currently running Zero offset adjustment.	0	-	Read only
954	Unsigned / 2	Last zero adjust status	Status of the last performed zero offset adjustment. Bit enumerated. Each bit set to '1' equals an error. Note: Path X error indicates that path entered signal search, freq sweep or was uninstalled during the ZOA execution. Results may not be optimal	0	<ul style="list-style-type: none"> • Bit 0: Path 1 zero offset limit exceeded • Bit 5: Path 1 error during zero offset adjustment 	Read only

Multipoint calibration

Table A-23 Multipoint calibration

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1051	Unsigned / 2	Protect calibration table	Specifies protection of the multipoint calibration table	0	<ul style="list-style-type: none"> 0: No protection of the calibration table. End users can use Calibration table command (1064) to change the multipoint calibration table. 1: Calibration table is protected. Calibration table command (1064) will not grant access to modify the multipoint calibration table. 	Read / write (Expert)
1052	Unsigned / 2	Enable multipoint calibration	Enable or disable the Multipoint calibration.	0	<ul style="list-style-type: none"> 0: Disabled 1: Enabled 	Read / write
1053	Unsigned / 2	Asymmetric calibration table	Usage of the calibration table.	0	<ul style="list-style-type: none"> 0: Unidirectional. All 20 calibration points are used for positive flow calibration and are then mirrored for negative flow. 1: Bidirectional. The first 10 calibration points are used for positive flow calibration and the 10 last calibration points are used for negative flow calibration. 	Read / write (Expert)
1066	Float / 4	Calibration point	Calibration point that is to be transferred to the multipoint calibration table.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write
1068	Float / 4	Calibration value	Calibration correction factor that is to be transferred to the multipoint calibration table. E. g. 0.99 = -1% correction.	1.0	0.5 - 2.0	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1064	Unsigned / 2	Calibration table command	<p>The register "Multipoint calibration status" is updated after each command has been handled.</p> <p>Command 21 will always be accepted.</p> <p>Remaining commands will only be accepted if register "Calibration table protection" is 0.</p>	-	<ul style="list-style-type: none"> • 1..20: Transfer calibration data specified in registers "Calibration point" and "Calibration value" to according entry of the multipoint calibration table. • 21: Perform sanity check of the calibration table (calibration point values must be in nominal ascending order). • 22: Reset calibration table to default values (all "Calibration point X" values set to 0.0 and all "Calibration value X" values set to 1.0). • 23: Set register "Asymmetric calibration table" to 0 to indicate that the calibration table is used as a uni-directional table. • 24: Set register "Asymmetric calibration table" to 1 to indicate that the calibration table is used as a bi-directional table. 	Read / write
1065	Unsigned / 2	Multipoint calibration status	Status of last performed Multipoint calibration command.	0	<ul style="list-style-type: none"> • 0: Command successfully performed. • 1: Sanity check failed. Not all calibration points are in nominal ascending order. • 2: Command not performed. Calibration table is protected. 	Read only

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1070	Float / 4	Calibration point 1	Calibration point 1 for unidirectional flow or calibration point 1 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1072	Float / 4	Calibration value 1	Calibration correction factor that is associated to Calibration point 1.	1.0	0.5 - 2.0	Read / write (Expert)
1074	Float / 4	Calibration point 2	Calibration point 2 for unidirectional flow or calibration point 2 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1076	Float / 4	Calibration value 2	Calibration correction factor that is associated to Calibration point 2.	1.0	0.5 - 2.0	Read / write (Expert)
1078	Float / 4	Calibration point 3	Calibration point 3 for unidirectional flow or calibration point 3 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s]	0.0 - 100000.0	Read / write (Expert)
1080	Float / 4	Calibration value 3	Calibration correction factor that is associated to Calibration point 3.	1.0	0.5 - 2.0	Read / write (Expert)
1082	Float / 4	Calibration point 4	Calibration point 4 for unidirectional flow or calibration point 4 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1084	Float / 4	Calibration value 4	Calibration correction factor that is associated to Calibration point 4.	1.0	0.5 - 2.0	Read / write (Expert)
1086	Float / 4	Calibration point 5	Calibration point 5 for unidirectional flow or calibration point 5 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1088	Float / 4	Calibration value 5	Calibration correction factor that is associated to Calibration point 5.	1.0	0.5 - 2.0	Read / write (Expert)

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1090	Float / 4	Calibration point 6	Calibration point 6 for unidirectional flow or calibration point 6 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1092	Float / 4	Calibration value 6	Calibration correction factor that is associated to Calibration point 6.	1.0	0.5 - 2.0	Read / write (Expert)
1094	Float / 4	Calibration point 7	Calibration point 7 for unidirectional flow or calibration point 7 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1096	Float / 4	Calibration value 7	Calibration correction factor that is associated to Calibration point 7.	1.0	0.5 - 2.0	Read / write (Expert)
1098	Float / 4	Calibration point 8	Calibration point 8 for unidirectional flow or calibration point 8 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1100	Float / 4	Calibration value 8	Calibration correction factor that is associated to Calibration point 8.	1.0	0.5 - 2.0	Read / write (Expert)
1102	Float / 4	Calibration point 9	Calibration point 9 for unidirectional flow or calibration point 9 for bi-directional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1104	Float / 4	Calibration value 9	Calibration correction factor that is associated to Calibration point 9.	1.0	0.5 - 2.0	Read / write (Expert)
1106	Float / 4	Calibration point 10	Calibration point 10 for unidirectional flow or calibration point 10 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1108	Float / 4	Calibration value 10	Calibration correction factor that is associated to Calibration point 10.	1.0	0.5 - 2.0	Read / write (Expert)

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1110	Float / 4	Calibration point 11	Calibration point 11 for unidirectional flow or calibration point 11 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1112	Float / 4	Calibration value 11	Calibration correction factor that is associated to Calibration point 11.	1.0	0.5 - 2.0	Read / write (Expert)
1114	Float / 4	Calibration point 12	Calibration point 12 for unidirectional flow or calibration point 12 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1116	Float / 4	Calibration value 12	Calibration correction factor that is associated to Calibration point 12.	1.0	0.5 - 2.0	Read / write (Expert)
1118	Float / 4	Calibration point 13	Calibration point 13 for unidirectional flow or calibration point 13 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1120	Float / 4	Calibration value 13	Calibration correction factor that is associated to Calibration point 13.	1.0	0.5 - 2.0	Read / write (Expert)
1122	Float / 4	Calibration point 14	Calibration point 14 for unidirectional flow or calibration point 14 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1124	Float / 4	Calibration value 14	Calibration correction factor that is associated to Calibration point 14.	1.0	0.5 - 2.0	Read / write (Expert)
1126	Float / 4	Calibration point 15	Calibration point 15 for unidirectional flow or calibration point 15 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1128	Float / 4	Calibration value 15	Calibration correction factor that is associated to Calibration point 15.	1.0	0.5 - 2.0	Read / write (Expert)

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
1130	Float / 4	Calibration point 16	Calibration point 16 for unidirectional flow or calibration point 16 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1132	Float / 4	Calibration value 16	Calibration correction factor that is associated to Calibration point 16.	1.0	0.5 - 2.0	Read / write (Expert)
1134	Float / 4	Calibration point 17	Calibration point 17 for unidirectional flow or calibration point 17 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1136	Float / 4	Calibration value 17	Calibration correction factor that is associated to Calibration point 17.	1.0	0.5 - 2.0	Read / write (Expert)
1138	Float / 4	Calibration point 18	Calibration point 18 for unidirectional flow or calibration point 18 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1140	Float / 4	Calibration value 18	Calibration correction factor that is associated to Calibration point 18.	1.0	0.5 - 2.0	Read / write (Expert)
1142	Float / 4	Calibration point 19	Calibration point 19 for unidirectional flow or calibration point 19 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1144	Float / 4	Calibration value 19	Calibration correction factor that is associated to Calibration point 19.	1.0	0.5 - 2.0	Read / write (Expert)
1146	Float / 4	Calibration point 20	Calibration point 20 for unidirectional flow or calibration point 20 for bidirectional positive flow. If 0.0 the calibration point is not used.	0.0 [m ³ /s] (7500)	0.0 - 100000.0	Read / write (Expert)
1148	Float / 4	Calibration value 20	Calibration correction factor that is associated to Calibration point 20.	1.0	0.5 - 2.0	Read / write (Expert)

A.9.6.2 Process values

Volume flow settings

Table A-24 Volume flow settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7510	Float / 4	Low flow cut-off	Volume flow limit for low flow cut-off. Below limit volume flow output is forced to zero.	Sensor size specific	0 - max. volume flow	Read / write
7501	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	max. volume flow [m ³ /s] (7500)	-max. volume flow - +max. volume flow	Read / write
7503	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	max. volume flow [m ³ /s] (7500)	-max. volume flow - +max. volume flow	Read / write
7505	Float / 4	Lower warning limit	Falling below this limit causes a warning.	-max. volume flow [m ³ /s] (7500)	-max. volume flow - +max. volume flow	Read / write
7507	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	-max. volume flow [m ³ /s] (7500)	-max. volume flow - +max. volume flow	Read / write
7512	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	0.0 [m ³ /s] (7500)	0 - max. volume flow	Read / write

Mass flow settings

Table A-25 Mass flow settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7410	Float / 4	Low flow cut-off	Mass flow limit for low flow cut-off. Below limit mass flow output is forced to zero.	0.001 x max. mass flow [kg/s] (7400)	0 - max. mass flow	Read / write
7401	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	max. mass flow [kg/s] (7400)	-max. mass flow - +max. mass flow	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7403	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	max. mass flow [kg/s] (7400)	-max. mass flow - +max. mass flow	Read / write
7405	Float / 4	Lower warning limit	Falling below this limit causes a warning.	-max. mass flow [kg/s] (7400)	-max. mass flow - +max. mass flow	Read / write
7407	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	-max. mass flow [kg/s] (7400)	-max. mass flow - +max. mass flow	Read / write
7412	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	0 [kg/s] (7400)	0 - max. mass flow	Read / write

Flow velocity settings

Table A-26 Flow velocity settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7644	Float / 4	Low flow cut-off	Flow velocity limit for low flow cut-off. Below limit flow velocity output is forced to zero.	0.0 [m/s] (8014)	-	Read / write
7634	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	Max. floating point value [m/s] (8014)	-	Read / write
7636	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	Max. floating point value [m/s] (8014)	-	Read / write
7638	Float / 4	Lower warning limit	Falling below this limit causes a warning.	Min. floating point value [m/s] (8014)	-	Read / write
7640	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	Min. floating point value [m/s] (8014)	-	Read / write
7642	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	0.0 [m/s] (8014)	-	Read / write

Sound velocity settings

Table A-27 Sound velocity settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7624	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	Max. floating point value [m/s] (7648)	-	Read / write
7626	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	Max floating point value [m/s] (7648)	-	Read / write
7628	Float / 4	Lower warning limit	Falling below this limit causes a warning.	Min. floating point value [m/s] (7648)	-	Read / write
7630	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	Min. floating point value [m/s] (7648)	-	Read / write
7632	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	0.0 [m/s] (7648)	-	Read / write

Density settings

Table A-28 Density settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7601	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	max. density [kg/m ³] (7600)	0 - max. density	Read / write
7603	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	max. density [kg/m ³] (7600)	0 - max. density	Read / write
7605	Float / 4	Lower warning limit	Falling below this limit causes a warning.	1.0 [kg/m ³] (7600)	0 - max. density	Read / write
7607	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	1.0 [kg/m ³] (7600)	0 - max. density	Read / write
7612	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	.0 [kg/m ³] (7600)	0 - max. density	Read / write

Kinematic viscosity settings

Table A-29 Kinematic viscosity settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7682	Float / 4	Upper alarm limit	Exceeding this limit causes an alarm.	Max. floating point value [cSt] (7524)	-	Read / write
7684	Float / 4	Upper warning limit	Exceeding this limit causes a warning.	Max. floating point value [cSt] (7524)	-	Read / write
7686	Float / 4	Lower warning limit	Falling below this limit causes a warning.	Min. floating point value [cSt] (7524)	-	Read / write
7688	Float / 4	Lower alarm limit	Falling below this limit causes an alarm.	Min. floating point value [cSt] (7524)	-	Read / write
7690	Float / 4	Hysteresis	Hysteresis that affects the alarm and warning limits.	0.0 [cSt] (7524)	-	Read / write

A.9.6.3 Totalizers

Totalizer 1 settings

Table A-30 Totalizer 1 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8305	Unsigned / 2	Process value	Select process value for totalization.	0	<ul style="list-style-type: none"> 0: Cut-off filtered mass flow 1: Cut-off filtered volume flow 	Read / write
8302	Unsigned / 2	Fail-safe behavior	Behavior of the totalizer during the occurrence of bad input value.	0	<ul style="list-style-type: none"> 0: RUN; totalization is continued using the bad input value. 1: HOLD; totalization is stopped. 2: MEMORY; totalization is continued based on the last incoming good value. 	Read / write
8323	Float / 4	Volume upper alarm limit	Exceeding this limit causes an alarm when volume flow is selected as input.	Max. floating point value [m ³] (8321)		Read / write
8325	Float / 4	Volume upper warning limit	Exceeding this limit causes a warning when volume flow is selected as input.	Max. floating point value [m ³] (8321)		Read / write
8327	Float / 4	Volume lower warning limit	Falling below this limit causes a warning when volume flow is selected as input.	Min. floating point value [m ³] (8321)		Read / write
8329	Float / 4	Volume lower alarm limit	Falling below this limit causes an alarm when volume flow is selected as input.	Min. floating point value [m ³] (8321)		Read / write
8331	Float / 4	Volume alarm hysteresis	Hysteresis that affects the alarm and warning limits when volume flow is selected as input.	0.0 [m ³] (8321)	-	Read / write
8306	Float / 4	Mass upper alarm limit	Exceeding this limit causes an alarm when mass flow is selected as input.	Max. floating point value [kg] (8320)		Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8308	Float / 4	Mass upper warning limit	Exceeding this limit causes a warning when mass flow is selected as input.	Max. floating point value [kg] (8320)		Read / write
8310	Float / 4	Mass lower warning limit	Falling below this limit causes a warning when mass flow is selected as input.	Min. floating point value [kg] (8320)		Read / write
8312	Float / 4	Mass lower alarm limit	Falling below this limit causes an alarm when mass flow is selected as input.	Min. floating point value [kg] (8320)		Read / write
8314	Float / 4	Mass alarm hysteresis	Hysteresis that affects the alarm and warning limits when mass flow is selected as input.	0.0 [kg] (8320)	-	Read / write

A.9.6.4 Inputs and outputs

General channel 2 settings

Table A-31 General channel 2 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8801	Unsigned / 2	Operation mode	Operation mode.	0	<ul style="list-style-type: none"> 0: Off 1: Current output 	Read / write
7420	Unsigned / 2	Active/passive operation	Shows application possibilities.	-	<ul style="list-style-type: none"> 0: Active operation not possible, use passive wiring! 1: Active operation possible, hardware is able to drive the current loop. 	Read only
9590	Unsigned / 2	Fail-safe activation condition	Fail-safe activation condition.	1	<ul style="list-style-type: none"> 0: Bad status of selected process value 1: Active Maintenance alarm or Failure (NAMUR) 	Read / write
8981	Unsigned / 2	Fail-safe min. time	Minimum time the output stays in fail-safe behavior.	0 [s]	0 - 100	Read / write

Channel 2 current output settings

Table A-32 Channel 2 current output settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8802	Unsigned / 2	Process value	Select process value for the current output.	-	<ul style="list-style-type: none"> • 0: Mass flow • 1: Volume flow • 2: Density • 3: Medium temperature • 18: Sound velocity • 19: Flow velocity • 27: Viscosity 	Read / write
8809	Unsigned / 2	Flow direction	Flow direction filter applicable for Process values (8802) = 0, 1, 19 and 27.	0	<ul style="list-style-type: none"> • 0: Positive direction • 1: Negative direction • 2: Positive and negative directions • 3: Positive and negative directions (symmetric mode) 	Read / write
8806	Unsigned / 2	Current mode	Mode of current output.	0	<ul style="list-style-type: none"> • 0: 4-20 mA (3.5) 3.8-20.5 (22.6) NAMUR • 1: 4-20 mA (3.75) 4.0-20.8 (22.6) US • 2: 4-20 mA (2.0) 4.0-20.5 (22.0) • 3: 4-20 mA (2.0) 4.0-24.0 (25.0) • 4: 0-20 mA (0.0) 0.0-20.5 (22.0) • 5: 0-20 mA (0.0) 0.0-24.0 (25.0) 	Read / write
8866	Float / 4	Upper range value volume flow	Upper volume flow value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 1.	0.004 • max. volume flow [m ³ /s] (7500)	-	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
8868	Float / 4	Lower range value volume flow	Lower volume flow value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 1.	0 [m ³ /s] (7500)	-	Read / write
8810	Float / 4	Upper range value mass flow	Upper mass flow value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 0.	0.2 • max. mass flow [kg/s] (7400)	-	Read / write
8812	Float / 4	Lower range value mass flow	Lower mass flow value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 0.	0.0 [kg/s] (7400)	-	Read / write
8870	Float / 4	Upper range value density	Upper process density value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 2.	Max. density [kg/m ³] (7600)	-	Read / write
8872	Float / 4	Lower range value density	Lower process density value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 2.	0.08 [kg/m ³] (7600)	-	Read / write
10000	Float / 4	Upper range value velocity	Upper velocity value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 18, 19 or 31.	1.0 [m/s] (8014 / 7648)	-	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10002	Float / 4	Lower range value velocity	Lower velocity value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 18, 19 or 31.	0.0 [m/s] (8014 / 7648)	-	Read / write
10008	Float / 4	Upper range value dimensionless	Upper dimensionless value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 28, 32, 33, 34, or 36.	1.0	-	Read / write
10010	Float / 4	Lower range value dimensionless	Lower dimensionless value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 28, 32, 33, 34, or 36.	0.0	-	Read / write
10012	Float / 4	Upper range value current	Upper current value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 25 or 26.	20.0 [mA]	-	Read / write
10014	Float / 4	Lower range value current	Lower current value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 25 or 26.	4.0 [mA]	-	Read / write
10016	Float / 4	Upper range value viscosity	Upper process viscosity value that is mapped to the upper nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 21 or 29.	1.0 [m ² /s] (7524)	-	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10018	Float / 4	Lower range value viscosity	Lower process viscosity value that is mapped to the lower nominal range boundary selected by Current mode (8806). Applicable if Process value (8802) = 21 or 29.	0.0 [m ² /s] (7524)	-	Read / write
8807	Float / 4	Damping value	Time constant of damping filter for current output signal.	0.0 [s]	0.0 - 100.0	Read / write
8814	Unsigned / 2	Fail-safe behavior	Current output reaction in case of a fault.	0	<ul style="list-style-type: none"> • 0: Lower fault current • 1: Upper fault current • 2: Last valid value • 3: Disabled • 4: Custom value 	Read / write
8815	Float / 4	Fail-safe value	Output value in case of a fault and when Fail-safe behavior (8814) is configured to 4.	0.0 [mA]	0.0 - 25.0	Read / write
7146	Float / 4	Forced value	Forced value when forcing is active.	4.0 [mA]	3.5 - 25.0	Read / write
8886	Float / 4	Offset adjustment	Command to trim the lower range value of the loop current. Simulate a loop current of 4.0 mA, measure the current with an ampere meter and write the measured value to this register.	[mA]	0.0 - 25.0	Write only
8888	Float / 4	Gain adjustment	Command to trim the upper range value of the loop current. Simulate a loop current of 20.0 mA, measure the current with an ampere meter and write the measured value to this register.	[mA]	0.0 - 25.0	Write only

Channel 3 status output settings (relay)

Table A-33 Channel 3 status output settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9141	Unsigned / 2	Status mode	Select the functionality for the status output.	0	<ul style="list-style-type: none"> 0: Alarm class 1: Alarm item 	Read / write
9158	Unsigned / 2	Alarm class	Bit encoded selection of alarm classes which impact the status output. Each diagnostic event is allocated to an alarm class. See Alarm items (Page 146). Applicable if Status mode = 0.	0	<ul style="list-style-type: none"> Bit 0: Process value alarm (PA) Bit 1: Process value warning (PW) Bit 2: Maintenance alarm (MA) Bit 3: Maintenance warning (MW) Bit 4: Maintenance required (MR) Bit 5: Function check (FC) 	Read / write
9199	Unsigned / 2	NAMUR status signals	Bit encoded selection of NAMUR status signals which impacts the status output. Applicable if Status mode = 0. NAMUR status is derived from Alarm class (9158).	0	<ul style="list-style-type: none"> Bit 0: Out of specification (PA, PW) Bit 1: Failure (MA) Bit 2: Maintenance required (MR, MD) Bit 3: Function check (FC) 	Read / write
9142	Unsigned / 4	Alarm items 1	Bit encoded selection of alarm items that impact the output. Mainly sensor alarms. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9144	Unsigned / 4	Alarm items 2	Bit encoded selection of alarm items that impact the output. Mainly sensor alarms. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9148	Unsigned / 4	Alarm items 4	Bit encoded selection of alarm items that impact the output. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9150	Unsigned / 4	Alarm items 5	Bit encoded selection of alarm items that impact the output. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9156	Unsigned / 4	Alarm items 8	Bit encoded selection of alarm items that impact the output. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
10156	Unsigned / 4	Alarm items 9	Bit encoded selection of alarm items that impact the output. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9154	Unsigned / 4	Alarm items 7	Bit encoded selection of alarm items that impact the output. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9152	Unsigned / 4	Alarm items 6	Bit encoded selection of alarm items that impact the output. Mainly simulation alarms. See Alarm items (Page 146). Applicable if Status mode = 1.	0		Read / write
9159	Unsigned / 2	Polarity	Logical polarity of status output.	0	<ul style="list-style-type: none"> • 0: Active high level • 1: Active low level 	Read / write
9160	Float / 4	On delay	Time to delay the leading edge of the output.	0.0 [s]	0.0 - 100.0	Read / write
9162	Float / 4	Off delay	Time to delay the trailing edge of the output.	0.0 [s]	0.0 - 100.0	Read / write
7155	Unsigned / 2	Forced value	Forced value when forcing is active.	0	<ul style="list-style-type: none"> • 0 • 1 	Read / write

Channel 7 discrete input settings

Table A-34 Channel 7 discrete input settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10563	Unsigned / 2	Input leading edge function	Select the functionality for the leading edge of the active discrete input signal.	0	<ul style="list-style-type: none"> 0: Off 6: Reset totalizer 1 	Read / write
10566	Unsigned / 2	Polarity	Logical polarity of discrete input signal.	0	<ul style="list-style-type: none"> 0: Active high level 1: Active low level 	Read / write

Channel 8 discrete input settings

Table A-35 Channel 8 discrete input settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10663	Unsigned / 2	Input trailing edge function	Select the functionality for the trailing edge of the active discrete input signal.	0	<ul style="list-style-type: none"> 0: Off 3858: Start/Stop totalizer 	Read / write
10666	Unsigned / 2	Polarity	Logical polarity of discrete input signal.	0	<ul style="list-style-type: none"> 0: Active high level 1: Active low level 	Read / write

General channel 4 settings

Table A-36 General channel 4 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9301	Unsigned / 2	Operation mode	Operation mode.	0	<ul style="list-style-type: none"> 0: Off 2: Frequency output 3: Pulse output 	Read / write

Channel 4 frequency output settings

Table A-37 Channel 4 frequency output settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9404	Unsigned / 2	Process value	Select process value for the current output.	0	<ul style="list-style-type: none"> • 0: Mass flow • 1: Volume flow • 2: Density • 3: Medium temperature • 18: Sound velocity • 19: Flow velocity • 21: Viscosity 	Read / write
9410	Unsigned / 2	Flow direction	Flow direction filter applicable for Process values (9404) set to 0, 1, 19, or 27.	0	<ul style="list-style-type: none"> • 0: Positive direction • 1: Negative direction • 2: Positive and negative directions • 3: Positive and negative directions (symmetric mode) 	Read / write
9435	Float / 4	Frequency value high	Upper frequency value. Upper nominal output range boundary.	10000.0 [Hz]	0.0 - 12500.0	Read / write
9437	Float / 4	Frequency value low	Lower frequency value. Lower nominal output range boundary.	0.0 Hz	0.0 - 12500.0	Read / write
9415	Float / 4	Upper range value volume flow	Upper volume flow value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 1.	0.4 % • max. volume flow [m ³ /s] (7500)	-	Read / write
9417	Float / 4	Lower range value volume flow	Lower volume flow value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 1.	0.0 [m ³ /s] (7500)	-	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9411	Float / 4	Upper range value mass flow	Upper mass flow value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 0.	0.2 • max. mass flow [kg/s] (7400)	-	Read / write
9413	Float / 4	Lower range value mass flow	Lower mass flow value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 0.	0.0 [kg/s] (7400)	-	Read / write
9419	Float / 4	Upper range value density	Upper process density value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 2.	Max. density [kg/m ³] (7600)	-	Read / write
9421	Float / 4	Lower range value density	Lower process density value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 2.	0.08 [kg/m ³] (7600)	-	Read / write
9423	Float / 4	Lower range value temperature	Upper process medium temperature value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 3.	Max. medium temperature [°C] (7700)	-	Read / write
9424	Float / 4	Lower range value temperature	Lower process medium value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 3.	Max. medium temperature [°C] (7700)	-	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10224	Float / 4	Upper range value velocity	Upper velocity value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 18, 19 or 31.	1.0 [m/s] (8014 / 7648)	-	Read / write
10226	Float / 4	Lower range value velocity	Lower velocity value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 18, 19 or 31.	0.0 [m/s] (8014 / 7648)	-	Read / write
10232	Float / 4	Upper range value dimensionless	Upper dimensionless value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 28, 32, 33, 34, or 36.	1.0	-	Read / write
10234	Float / 4	Lower range value dimensionless	Lower dimensionless value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 28, 32, 33, 34, or 36.	0.0	-	Read / write
10236	Float / 4	Upper range value current	Upper current value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 25 or 26.	20.0 [mA]	-	Read / write
10238	Float / 4	Lower range value current	Lower current value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 25 or 26.	4.0 [mA]	-	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
10240	Float / 4	Upper range value viscosity	Upper process viscosity value that is mapped to the upper nominal range boundary selected by Frequency value high (9435). Applicable if Process value (9404) = 21 or 29.	1.0 [m ² /s] (7524)	-	Read / write
10242	Float / 4	Lower range value viscosity	Lower process viscosity value that is mapped to the lower nominal range boundary selected by Frequency value low (9437). Applicable if Process value (9404) = 21 or 29.	0.0 [m ² /s] (7524)	-	Read / write
9408	Float / 4	Damping filter	Time constant of damping filter for frequency output signal.	0.0 [s]	0.0 - 100.0	Read / write
9592	Unsigned / 2	Fail-safe activation condition	Fail-safe activation condition.	1	<ul style="list-style-type: none"> • 0: Bad status of selected process value • 1: Active Maintenance alarm or Failure (NAMUR) 	Read / write
9481	Unsigned / 2	Fail-safe min. time	Minimum time the output stays in fail-safe behavior.	0 [s]	0 - 100	Read / write
9439	Unsigned / 2	Fail-safe behavior	Frequency output reaction in case of a fault.	2	<ul style="list-style-type: none"> • 0: Frequency value low • 1: Frequency value high • 2: Last valid value • 3: Disabled • 4: Custom value 	Read / write
9440	Float / 4	Fail-safe value	Output value in case of a fault and when Fail-safe behavior (9439) is configured to 4.	0.0 [Hz]	0.0 - 12500.0	Read / write
7163	Float / 4	Forced value	Forced value when forcing is active.	1.0 [Hz]	0.0 - 12500.0	Read / write

Channel 4 pulse output settings

Table A-38 Channel 4 pulse output settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
9460	Unsigned / 2	Process value	Select process value for the pulse output.	0	<ul style="list-style-type: none"> 0: Mass flow 1: Volume flow 	Read / write
9462	Unsigned / 2	Flow direction	Flow direction filter.	0	<ul style="list-style-type: none"> 0: Positive direction 1: negative direction 2: Positive and negative directions 	Read / write
9465	Float / 4	Amount of volume	Amount value to generate an output pulse. Applicable if process value (9460) is set to 1.	0.001 [m ³] (8993)	-	Read / write
9463	Float / 4	Amount of mass	Amount value to generate an output pulse. Applicable if process value (9460) is set to 0.	1.0 [kg] (8992)	-	Read / write
10255	Unsigned / 2	Pulses per amount	Number of pulses which will be output when configured amount is reached.	1	-	Read / write
9474	Float / 4	Pulse width	Pulse duration.	0.1 [s]	0.00004 - 4.0	Read / write
9477	Unsigned / 2	Polarity	Logical polarity of pulse output.	0	<ul style="list-style-type: none"> 0: Active high level 1: Active low level 	Read / write
9592	Unsigned / 2	Fail-safe activation condition	Fail safe activation condition.	1	<ul style="list-style-type: none"> 0: Bad status of selected process value 1: Active Maintenance alarm or Failure (NAMUR) 	Read / write
9481	Unsigned / 2	Fail-safe min. time	Minimum time the output stays in Fail-safe behavior.	0 [s]	0 - 100	Read / write
9461	Unsigned / 2	Fail-safe behavior	Pulse output reaction in case of a fault.	0	<ul style="list-style-type: none"> 0: Last valid value 1: Hold. Value 0.0 substitutes the actual input value 2: Disabled 3: Custom value 	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [units] (units register)	Value range / Setting options	Access level
7441	Float / 4	Fail-safe value	Output value in case of a fault and when Fail-safe behavior (9461) is configured to 4.	0.0 [pulses/s]	0.0 - 12500.0	Read / write
7165	Float / 4	Forced value	Forced value when forcing is active.	1.0 [pulses/s]	0.0 - 12500.0	Read / write

A.9.6.5 Date and time

General settings

Table A-39 General settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6185	Unsigned / 2	Year	Holds current year after Get time command was carried out. Holds year before Set time command is carried out.	2016	2001 - 2099	Read / write
6186	Unsigned / 2	Month	Holds current month after Get time command was carried out. Holds month before Set time command is carried out.	1	1 - 12	Read / write
6187	Unsigned / 2	Day	Holds current day after Get time command was carried out. Holds day before Set time command is carried out.	1	1 - 31	Read / write
6188	Unsigned / 2	Hours	Holds current hours after Get time command was carried out. Holds hours before Set time command is carried out.	0	0 - 23	Read / write
6189	Unsigned / 2	Minutes	Holds current minutes after Get time command was carried out. Holds minutes before Set time command is carried out.	0	0 - 59	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6669	Unsigned / 2	Seconds	Holds current seconds after Get time command was carried out. Holds seconds before Set time command is carried out.	0	0 - 59	Read / write
6184	Unsigned / 2	Get time	Command to get the device's current time by using the separate parameters above.	-	<ul style="list-style-type: none"> 0: Cancel 1: Get time 	Write only
6198	Unsigned / 2	Set time	Command to set the device's current time by using the separate parameters above.	-	<ul style="list-style-type: none"> 0: Cancel 1: Set time 	Write only
6190	String / 16	Current time	Current time in ISO 8610 format (YYYY-MM-DD hh:mm).	-	-	Read only
10864	String / 32	Current time high resolution	Current time in ISO 8610 format (YYYY-MM-DD hh:mm).	-	-	Read only

A.9.6.6 Local display

General settings

Table A-40 General settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9002	Unsigned / 2	Language	Language.	0	<ul style="list-style-type: none"> 0: English 1: German 	Read / write
9098	Unsigned / 2	Backlight	Duration of backlight activity after last key press.	30 [s]	0 - 240	Read / write
9094	Unsigned / 2	Inactivity time-out	Duration of display activity after last key press.	10 [min]	0 (always on) - 60	Read / write
9095	Unsigned / 2	Auto logout	Defines the need to enter PIN after leaving the menu and returning to any top level view.	1	<ul style="list-style-type: none"> 0: Enter menu without PIN for 10 min. 1: Automatic logout. 	Read / write
9096	Unsigned / 2	Help appearance	Duration until help text appears.	3 [s]	0 - 20	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9097	Unsigned / 2	Enable local access control	Controls local access.	1	<ul style="list-style-type: none"> 0: Disabled. Allows users to modify settings without PIN. Expert access is excluded. 1: Enabled. 	Read / write
9040	Unsigned / 2	Status icons	Type of alarm icons shown in local display.	Order-specific.	<ul style="list-style-type: none"> 0: Standard (Siemens) 1: NAMUR 	Read / write
6409	Float / 4	Filter time constant	Damping filter time for process values to be displayed.	1.0	0.0 - 100.0	Read / write
6411	Unsigned / 4	Process values (1)	Bit encoded selection group 1 of process values the display damping filter impacts. See Process value filter masks (Page 138).	0xFFFE37FF	-	Read / write
6413	Unsigned / 4	Process values (2)	Bit encoded selection group 2 of process values the display damping filter impacts. See Process value filter masks (Page 138).	0x00001E7F	-	Read / write

View 1 settings

Table A-41 View 1 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9007	Unsigned / 2	View	Type of appearance.	3	<ul style="list-style-type: none"> 1: Single value. 3: Three values. 6: 1 value and bar graph. 7: 1 value and graph. 8: Six values. 9: Six diagnostic values. 	Read / write
9018	Unsigned / 2	1 st value	Selection of the first value.	0	See Selectable values dependent on the view type (Page 137).	Read / write
9019	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	2	See Selectable values dependent on the view type (Page 137).	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9020	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9075	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9076	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9077	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	12	See Selectable values dependent on the view type (Page 137).	Read / write
8050	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> 0: Automatic scaling. 1: Fixed scaling defined by Trend scale lower limit (8052) and Trend scale upper limit (8054). 	Read / write
8051	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8050) is set to 1.	1	<ul style="list-style-type: none"> 0: 1 min 1: 5 min 2: 15 min 3: 30 min 4: 1 h 5: 2 h 6: 3 h 	Read / write
8052	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8050) is set to 1.	0.0	-	Read / write
8054	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8050) is set to 1.	0.0	-	Read / write

View 2 settings

Table A-42 View 2 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9013	Unsigned / 2	Enable or disable	Enable or disable view.	1	<ul style="list-style-type: none"> 0: Disabled. 1: Enabled. 	Read / write
9008	Unsigned / 2	View	Type of appearance.	1	<ul style="list-style-type: none"> 1: Single value. 2: Active diagnostic events. 3: Three values. 4: Totalizer. 6: 1 value and bar graph. 7: 1 value and graph. 8: Six values. 9: Six diagnostic values. 	Read / write
9021	Unsigned / 2	1 st value	Selection of the first value.	2	See Selectable values dependent on the view type (Page 137).	Read / write
9022	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	0	See Selectable values dependent on the view type (Page 137).	Read / write
9023	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9078	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9079	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9080	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	12	See Selectable values dependent on the view type (Page 137).	Read / write
8056	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> 0: Automatic scaling. 1: Fixed scaling defined by Trend scale lower limit (8058) and Trend scale upper limit (8060). 	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8057	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8056) is set to 1.	1	<ul style="list-style-type: none"> • 0: 1 min • 1: 5 min • 2: 15 min • 3: 30 min • 4: 1 h • 5: 2 h • 6: 3 h 	Read / write
8058	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8056) is set to 1.	0.0	-	Read / write
8060	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8056) is set to 1.	0.0	-	Read / write

View 3 settings

Table A-43 View 3 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9014	Unsigned / 2	Enable or disable	Enable or disable view.	1	<ul style="list-style-type: none"> • 0: Disabled. • 1: Enabled. 	Read / write
9009	Unsigned / 2	View	Type of appearance.	6	<ul style="list-style-type: none"> • 1: Single value. • 2: Active diagnostic events. • 3: Three values. • 4: Totalizer. • 6: 1 value and bar graph. • 7: 1 value and graph. • 8: Six values. • 9: Six diagnostic values. 	Read / write
9024	Unsigned / 2	1 st value	Selection of the first value.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9025	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	2	See Selectable values dependent on the view type (Page 137).	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9026	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	0	See Selectable values dependent on the view type (Page 137).	Read / write
9081	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9082	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9083	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	12	See Selectable values dependent on the view type (Page 137).	Read / write
8062	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> • 0: Automatic scaling. • 1: Fixed scaling defined by Trend scale lower limit (8064) and Trend scale upper limit (8066). 	Read / write
8063	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8062) is set to 1.	1	<ul style="list-style-type: none"> • 0: 1 min • 1: 5 min • 2: 15 min • 3: 30 min • 4: 1 h • 5: 2 h • 6: 3 h 	Read / write
8064	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8062) is set to 1.	0.0	-	Read / write
8066	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8062) is set to 1.	0.0	-	Read / write

View 4 settings

Table A-44 View 4 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9015	Unsigned / 2	Enable or disable	Enable or disable view.	1	<ul style="list-style-type: none"> 0: Disabled. 1: Enabled. 	Read / write
9010	Unsigned / 2	View	Type of appearance.	8	<ul style="list-style-type: none"> 1: Single value. 2: Active diagnostic events. 3: Three values. 4: Totalizer. 6: 1 value and bar graph. 7: 1 value and graph. 8: Six values. 9: Six diagnostic values. 	Read / write
9027	Unsigned / 2	1 st value	Selection of the first value.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9028	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	2	See Selectable values dependent on the view type (Page 137).	Read / write
9029	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9084	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	0	See Selectable values dependent on the view type (Page 137).	Read / write
9085	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9086	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	12	See Selectable values dependent on the view type (Page 137)..	Read / write
8068	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> 0: Automatic scaling. 1: Fixed scaling defined by Trend scale lower limit (8070) and Trend scale upper limit (8072). 	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8069	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8068) is set to 1.	1	<ul style="list-style-type: none"> • 0: 1 min • 1: 5 min • 2: 15 min • 3: 30 min • 4: 1 h • 5: 2 h • 6: 3 h 	Read / write
8070	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8068) is set to 1.	0.0	-	Read / write
8072	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8068) is set to 1.	0.0	-	Read / write

View 5 settings

Table A-45 View 5 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9016	Unsigned / 2	Enable or disable	Enable or disable view.	1	<ul style="list-style-type: none"> • 0: Disabled. • 1: Enabled. 	Read / write
9011	Unsigned / 2	View	Type of appearance.	3	<ul style="list-style-type: none"> • 1: Single value. • 2: Active diagnostic events. • 3: Three values. • 4: Totalizer. • 6: 1 value and bar graph. • 7: 1 value and graph. • 8: Six values. • 9: Six diagnostic values. 	Read / write
9030	Unsigned / 2	1 st value	Selection of the first value.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9031	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	2	See Selectable values dependent on the view type (Page 137).	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9032	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9087	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9088	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	0	See Selectable values dependent on the view type (Page 137).	Read / write
9089	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	12	See Selectable values dependent on the view type (Page 137).	Read / write
8074	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> • 0: Automatic scaling. • 1: Fixed scaling defined by Trend scale lower limit (8076) and Trend scale upper limit (8078). 	Read / write
8075	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8074) is set to 1.	1	<ul style="list-style-type: none"> • 0: 1 min • 1: 5 min • 2: 15 min • 3: 30 min • 4: 1 h • 5: 2 h • 6: 3 h 	Read / write
8076	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8074) is set to 1.	0.0	-	Read / write
8078	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8074) is set to 1.	0.0	-	Read / write

View 6 settings

Table A-46 View 6 settings

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9017	Unsigned / 2	Enable or disable	Enable or disable view.	1	<ul style="list-style-type: none"> 0: Disabled. 1: Enabled. 	Read / write
9012	Unsigned / 2	View	Type of appearance.	2	<ul style="list-style-type: none"> 1: Single value. 2: Active diagnostic events. 3: Three values. 4: Totalizer. 6: 1 value and bar graph. 7: 1 value and graph. 8: Six values. 9: Six diagnostic values. 	Read / write
9033	Unsigned / 2	1 st value	Selection of the first value.	12	See Selectable values dependent on the view type (Page 137).	Read / write
9034	Unsigned / 2	2 nd value	Selection of the second value. Depending on the number of values.	2	See Selectable values dependent on the view type (Page 137).	Read / write
9035	Unsigned / 2	3 rd value	Selection of the third value. Depending on the number of values.	3	See Selectable values dependent on the view type (Page 137).	Read / write
9090	Unsigned / 2	4 th value	Selection of the fourth value. Depending on the number of values.	1	See Selectable values dependent on the view type (Page 137).	Read / write
9091	Unsigned / 2	5 th value	Selection of the fifth value. Depending on the number of values.	11	See Selectable values dependent on the view type (Page 137).	Read / write
9092	Unsigned / 2	6 th value	Selection of the sixth value. Depending on the number of values.	0	See Selectable values dependent on the view type (Page 137).	Read / write
8080	Unsigned / 2	Trend scale mode	Scaling mode for the graph and totalizer view.	0	<ul style="list-style-type: none"> 0: Automatic scaling. 1: Fixed scaling defined by Trend scale lower limit (8082) and Trend scale upper limit (8084). 	Read / write

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8081	Unsigned / 2	Trend log time window	Scaling of the time axis. Effective when Trend scale mode (8080) is set to 1.	1	<ul style="list-style-type: none"> • 0: 1 min • 1: 5 min • 2: 15 min • 3: 30 min • 4: 1 h • 5: 2 h • 6: 3 h 	Read / write
8082	Float / 4	Trend scale lower limit	Scaling of the y-axis. Lower limit. Effective when Trend scale mode (8080) is set to 1.	0.0	-	Read / write
8084	Float / 4	Trend scale upper limit	Scaling of the y-axis. Upper limit. Effective when Trend scale mode (8080) is set to 1.	0.0	-	Read / write

A.9.6.7 Selectable values dependent on the view type

Table A-47 Selectable values dependent on the view type

Selected view type	Setting options
Single value, Three values, 1 value and bar graph, 1 value and graph	<ul style="list-style-type: none"> • 0: Mass flow • 1: Volume flow • 2: Density • 3: Medium temperature • 11: Totalizer 1 • 18: Sound velocity • 19: Flow velocity • 21: Viscosity
Totalizer	<ul style="list-style-type: none"> • 11: Totalizer 1
Six values	<ul style="list-style-type: none"> • 0: Mass flow • 1: Volume flow • 2: Density • 11: Totalizer 1 • 18: Sound velocity • 19: Flow velocity • 21: Viscosity

Selected view type	Setting options
Six diagnostic values	<ul style="list-style-type: none"> • 10: Transmitter internal temperature • 44: Ch2 value • 45: Ch3 value • 46: Ch4 value • 50: Reynolds number • 51: RxGain up path 1 • 52: RxGain down path 1 • 53: SNR upstream path 1 • 54: SNR downstream path 1 • 55: Sound velocity path 1 • 56: Delta time path 1 • 57: Path 1 percentage of bursts accepted • 58: Actual sensor frequency path 1 • 59: Downstream peak amplitude path 1 • 60: Upstream peak amplitude path 1
Alarm list	No selections possible.

A.9.6.8 Process value filter masks

Table A-48 Process value filter masks

Selected view type	Setting options
Process value filter mask 1	Bit coded mask to specify the process values that are filtered. Bit set means filtered: <ul style="list-style-type: none"> • Bit 0: Mass flow • Bit 1: Volume flow • Bit 2: Density • Bit 3: Medium temperature • Bit 11: Totalizer 1 • Bit 18: Sound velocity • Bit 19: Flow velocity • Bit 21: Viscosity
Process value filter mask 2	Bit coded mask to specify the process values that are filtered. Bit set means filtered:

A.9.7 Maintenance and diagnostics

Table A-49 Maintenance & diagnostics

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6004	Unsigned / 4	Configuration counter	Configuration counter. Counts number of parameter content modified.	-	-	Read only

A.9.7.1 Identification

System with FST020 transmitter

Table A-50 SITRANS FS220

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6592	String / 12	Manufacturer	Device manufacturer.	SIEMENS	-	Read only
6104	String / 32	Product name	Product name. Also shown on the device nameplate.	SITRANS F	-	Read only
6020	String / 16	Version	Product version according to order.	-	-	Read only
6120	String / 32	System order number	System order number part 1 (MLFB). Also shown on the device nameplate.	-	-	Read only
7236	String / 32	System order number	System order number part 2 (MLFB). Also shown on the device nameplate.	-	-	Read only
7268	String / 32	System order number	System order number part 3 (MLFB). Also shown on the device nameplate.	-	-	Read only
6088	Unsigned / 4	Final assembly number	Final assembly number. Can be used to identify device upgrades.	0	-	Read / write
6576	String / 32	Product serial number	Unique alpha numerical serial number. Also shown on the device name plate.	-	-	Read only
6334	String / 16	Hardware version	System hardware version. Also shown on the device name plate.	-	-	Read / write (Expert)

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6030	String / 16	Firmware version	Product firmware version. Also shown on the device name plate.	-	-	Read / write (Expert)
8120	String / 32	Long TAG	Unique TAG name.	-	-	Read / write
8176	String / 16	Descriptor	Description of the measuring point.	-	-	Read / write
8136	String / 32	Message	Additional information.	-	-	Read / write
8152	String / 32	Location	Device location in the plant.	-	-	Read / write
8168	String / 16	Installation date	Installation date of the device.	-	-	Read / write

Transmitter

Transmitter FST020

Table A-51 Transmitter FST020

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8104	String / 32	Transmitter order number	Transmitter order number part 1 (MLFB).	-	-	Read only
7310	String / 32	Transmitter order number	Transmitter order number part 2 (MLFB).	-	-	Read only
7342	String / 32	Transmitter order number	Transmitter order number part 3 (MLFB).	-	-	Read only

Sensor

Table A-52 Sensor

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
4043	String / 20	Sensors serial number path 1	Serial number of sensor set path 1 (clamp-on).	-	-	Read only
1300	Unsigned / 2	Sensor type	Type of sensor.	-	<ul style="list-style-type: none"> • 0: FSS200 (Clamp-on) • 1: FSS300 (Inline, SONO3100/3300) • 2: FSS300 retrofit (Inline, SONOKIT) • FSS600 (Clamp-on spool, FUT1010) • FSS400 (Oil, inline) 	Read only
4140	Unsigned / 2	Frontend variant	Frontend variant.	-	2: Integrated	Read only

A.9.8 Diagnostic events

A.9.8.1 Active events

Table A-53 Active events

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6200	Unsigned / 4	Active alarm items 1	Bitwise indication of active alarms in alarm items 1. See Alarm items (Page 146).	-	-	Read only
6202	Unsigned / 4	Active alarm items 2	Bitwise indication of active alarms in alarm items 2. See Alarm items (Page 146).	-	-	Read only
6206	Unsigned / 4	Active alarm items 4	Bitwise indication of active alarms in alarm items 4. See Alarm items (Page 146).	-	-	Read only
6208	Unsigned / 4	Active alarm items 5	Bitwise indication of active alarms in alarm items 5. See Alarm items (Page 146).	-	-	Read only

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6210	Unsigned / 4	Active alarm items 6	Bitwise indication of active alarms in alarm items 6. See Alarm items (Page 146).	-	-	Read only
6212	Unsigned / 4	Active alarm items 7	Bitwise indication of active alarms in alarm items 7. See Alarm items (Page 146).	-	-	Read only
6214	Unsigned / 4	Active alarm items 8	Bitwise indication of active alarms in alarm items 8. See Alarm items (Page 146).	-	-	Read only
7000	Unsigned / 4	Active alarm items 9	Bitwise indication of active alarms in alarm items 9. See Alarm items (Page 146).	-	-	Read only

Supported events

Table A-54 Supported events

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6250	Unsigned / 4	Supported alarm items 1	Bitwise indication of supported alarms in alarm items 1. See Alarm items (Page 146).	-	-	Read only
6252	Unsigned / 4	Supported alarm items 2	Bitwise indication of supported alarms in alarm items 2. See Alarm items (Page 146).	-	-	Read only
6256	Unsigned / 4	Supported alarm items 4	Bitwise indication of supported alarms in alarm items 4. See Alarm items (Page 146).	-	-	Read only
6258	Unsigned / 4	Supported alarm items 5	Bitwise indication of supported alarms in alarm items 5. See Alarm items (Page 146).	-	-	Read only
6260	Unsigned / 4	Supported alarm items 6	Bitwise indication of supported alarms in alarm items 6. See Alarm items (Page 146).	-	-	Read only

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6262	Unsigned / 4	Supported alarm items 7	Bitwise indication of supported alarms in alarm items 7. See Alarm items (Page 146).	-	-	Read only
6264	Unsigned / 4	Supported alarm items 8	Bitwise indication of supported alarms in alarm items 8. See Alarm items (Page 146).	-	-	Read only
7016	Unsigned / 4	Supported alarm items 9	Bitwise indication of supported alarms in alarm items 9. See Alarm items (Page 146).	-	-	Read only

Enable events

Table A-55 Enable events

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6266	Unsigned / 4	Active alarm items 1	Bitwise indication of active alarms in alarm items 1. See Alarm items (Page 146).	-	-	Read / write
6268	Unsigned / 4	Active alarm items 2	Bitwise indication of active alarms in alarm items 2. See Alarm items (Page 146).	-	-	Read / write
6272	Unsigned / 4	Active alarm items 4	Bitwise indication of active alarms in alarm items 4. See Alarm items (Page 146).	-	-	Read / write
6274	Unsigned / 4	Active alarm items 5	Bitwise indication of active alarms in alarm items 5. See Alarm items (Page 146).	-	-	Read / write
6276	Unsigned / 4	Active alarm items 6	Bitwise indication of active alarms in alarm items 6. See Alarm items (Page 146).	-	-	Read / write
6278	Unsigned / 4	Active alarm items 7	Bitwise indication of active alarms in alarm items 7. See Alarm items (Page 146).	-	-	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6280	Unsigned / 4	Active alarm items 8	Bitwise indication of active alarms in alarm items 8. See Alarm items (Page 146).	-	-	Read / write
7008	Unsigned / 4	Active alarm items 9	Bitwise indication of active alarms in alarm items 9. See Alarm items (Page 146).	-	-	Read / write

Acknowledge events

Table A-56 Acknowledge events

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6248	Unsigned / 2	Acknowledge mode	Mode to acknowledge active events.	1	<ul style="list-style-type: none"> 0: Manual alarm acknowledge (indication will remain even when event is gone) 1: Automatic acknowledge (indication will disappear when event is gone) 	Read / write
6294	Unsigned / 2	Alarm acknowledgement	Command to acknowledge a specific alarm item in manual acknowledge mode. Enter ID related to the item. See Alarm items (Page 146).	-	-	Write only

Assign alarm class

Table A-57 Assign alarm class

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6328	Unsigned / 2	Transmitter temp. too high	Defines the mapping of this event to an alarm class respective NA-MUR status signal.	1	<ul style="list-style-type: none"> 1: Process alarm (PA) resp. Out of specification. 4: Maintenance alarm (MA) resp. Failure. 	Read / write
6329	Unsigned / 2	Transmitter temp. too low	Defines the mapping of this event to an alarm class respective NA-MUR status signal.	1	<ul style="list-style-type: none"> 1: Process alarm (PA) resp. Out of specification. 4: Maintenance alarm (MA) resp. Failure. 	Read / write

A.9.8.2 Diagnostic log

Table A-58 Diagnostic log

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6600	Unsigned / 2	Newest entry number	Entry number of newest entry. Older entries have a smaller entry number. (Wrap around from 0 - 100).	-	-	Read only
6614	Unsigned / 2	Entry number	Selection of the entry number.	0	0 - 100	Read / write
6615	String / 16	Time stamp	Time stamp of the diagnostic log entry specified by Entry number. Format is YYYY-MM-DD hh-mm.	-	-	Read only
10800	String / 32	Time stamp	Time stamp of the diagnostic log entry specified by Entry number. Format is YYYY-MM-DD hh-mm-ss.	-	-	Read only
6623	Unsigned / 2	State	Alarm state of the entry specified by Entry number.	-	<ul style="list-style-type: none"> 0: Event is reset (going). 1: Event is set (coming). 2: Alarm is acknowledged. 	Read only

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6624	Unsigned / 2	Alarm ID	Alarm ID of the entry specified by Entry number. See Alarm items (Page 146). 65335 specifies an empty entry that can be ignored.	-	-	Read only
6625	Unsigned / 2	Alarm class	Alarm class of the entry specified by Entry number. See Alarm items (Page 146). 65335 specifies an empty entry that can be ignored.	-	<ul style="list-style-type: none"> • 1: Process value alarm (PA) • 2: Process value warning (PW) • 4: Maintenance alarm (MA) • 8: Maintenance warning (MW) • 16: Maintenance required (MR) • 32: Function check (FC) 	Read only
6638	Unsigned / 2	Available entries	Current number of available diagnostic log entries.	-	-	Read only
6601	Unsigned / 2	Reset log	Command to clear the alarm history log.	-	<ul style="list-style-type: none"> • 0: Cancel • 1: Clear log 	Write only

A.9.8.3 Alarm items

Table A-59 Alarm items

Group	Bit	Alarm	ID	Restrictions	Associated alarm class
Alarm items 1 (Sensor alarm 1)	0	Sensor startup	0		
	6	Storage malfunction	6		
	7	Flow measurement	7		
	14	Path 1: No signal	14		
	20	Totalizer above alarm limit	20		
	21	Totalizer above warning limit	21		
	26	Sensor temperature compensation failure	26		
	28	Configuration error 1	28		
	29	Aeration detected	29		
	30	Turbulence detected	30		

Group	Bit	Alarm	ID	Restrictions	Associated alarm class
Alarm items 2 (Sensor alarms 2)	0	Auxiliary input failure	32		
	1		33		
	2	Unreliable flow measurement	34		
	3		35		
	4	Configuration error 2	36		
	5		37		
Alarm items 4 (Process alarms 1)	0	Mass flow above alarm limit	96		PA
	1	Mass flow above warning limit	97		PW
	2	Mass flow below warning limit	98		PW
	3	Mass flow below alarm limit	99		PA
	4	Volume flow above alarm limit	100		PA
	5	Volume flow above warning limit	101		PW
	6	Volume flow below warning limit	102		PW
	7	Volume flow below alarm limit	103		PA
	8	Density above alarm limit	104		PA
	9	Density above warning limit	105		PW
	10	Density below warning limit	106		PW
	11	Density below alarm limit	107		PA
	12	Medium temperature above alarm limit	108		PA
	13	Medium temperature above warning limit	109		PW
	14	Medium temperature below warning limit	110		PW
	15	Medium temperature below alarm limit	111		PA
16 - 31	Reserved				
Alarm items 5 (Process alarms 2, totalizer alarms)	-3	Reserved			
	8	Totalizer 1 above alarm limit	136		PA
	9	Totalizer 1 above warning limit	137		PW
	10	Totalizer 1 below warning limit	138		PW
	11	Totalizer 1 below alarm limit	139		PA
	22	Sensor signal disrupted	150		MA
	23	SensorFlash backup disabled	151		FC
	24	SensorFlash backup disabled	152		FC
	25	Reserved	153		
	26	Reserved	154		
	27	Reserved	155		
30	Loop current cable break	158		MA	
31	Internal error in transmitter	159		MA	

A.9 Modbus holding register tables

Group	Bit	Alarm	ID	Restrictions	Associated alarm class	
Alarm items 6 (Simulation alarms)	0	Mass flow simulated	160		FC	
	1	Volume flow simulated	161		FC	
	2	Density simulated	162		FC	
	4 - 5	Reserved				
	7	Totalizer 1 simulated	167		FC	
	10	Loop current simulated	170		FC	
	11	Product firmware incompatible	171		MA	
	12	Transmitter FW incompatible	172		MA	
	14	Display FW incompatible	174		MA	
	15	IO FW incompatible	175		MA	
	16	Sensor type incompatible	176		MA	
	17	Device is starting	177		FC	
	18	Display configuration version mismatch	178		MA	
	19	Alarm class simulation enabled	179		-	
	20	Reserved	180			
	21	SensorFlash Chkdsk failed	181		MA	
	23	Reserved	183			
	24	Reserved	184			
	25	Reserved	185			
	Alarm items 7 (Inputs and outputs alarms)	0	Reserved	192		
		1	Reserved	193		
		2	Reserved	194		
		3	Channel 2 loop current in lower saturation	195	If channel configured to current output	PA
		4	Channel 2 loop current in upper saturation	196		PA
		5	Channel 2 cable break	197		MA
17		Channel 4 cable break	209		MA	
18		Channel 4 output frequency too low	210	If channel configured to frequency output	PA	
19		Channel 4 output frequency too high	211		PA	
20		Channel 4 pulse overflow	212	If channel configured to pulse output	PA	
21		Reserved	213			
22		Channel 2 simulated	214	If channel configured to output	FC	
23		Channel 3 simulated	215	If channel configured to output	FC	
24		Channel 4 simulated	216	If channel configured to output	FC	
25		Process values frozen	217		FC	
26		All outputs forced	218		FC	
27		Channel 2 loop current deviation	219		MA	
30	Invalid register mapping	222		MA		
31	Invalid coil configuration	223		MA		

Group	Bit	Alarm	ID	Restrictions	Associated alarm class
Alarm items 8 (Process alarms 3)	0	Reserved	224		
	1	Reserved	225		
	2	Reserved	226		
	3	Reserved	227		
	4	Sound velocity above alarm limit	228		PA
	5	Sound velocity above warning limit	229		PW
	6	Sound velocity below warning limit	230		PW
	7	Sound velocity below alarm limit	231		PA
	8	Flow velocity above alarm limit	232		PA
	9	Flow velocity above warning limit	233		PW
	10	Flow velocity below warning limit	234		PW
	11	Flow velocity below alarm limit	235		PA
	20	Viscosity above alarm limit	244		PA
	21	Viscosity above warning limit	245		PW
	22	Viscosity below warning limit	246		PW
	23	Viscosity below alarm limit	247		PA
	Alarm items 9 (Process alarms 4)	26	Reserved	250	
27		Reserved	251		
24		Reserved	280		
25		Reserved	281		
26		Reserved	282		
27		Reserved	283		
28		Reserved	284		
29		Reserved	285		
30		Reserved	286		
31	Reserved	287			

PA	Process value alarm (NAMUR: Out of specification)
PW	Process value warning (NAMUR: Out of specification)
FC	Function check
MR	Maintenance required (NAMUR: Maintenance required)
MD	Maintenance demanded (NAMUR: Maintenance required)
MA	Maintenance alarm (NAMUR: Failure)

A.9.9 Diagnostics

A.9.9.1 Sensor

Sensor diagnostics

Table A-60 Sensor diagnostics

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
3302	Unsigned / 4	Frontend total operating time	Operating time of frontend in hours	- [h]	-	Read only
3304	Unsigned / 4	Frontend total operating time power-up	Operating of frontend since last power-up	- [h]	-	Read only
3307	Float / 4	Reynolds number	Calculated Reynolds number	-	-	Read only
3319	Unsigned / 2	Path state	State of paths 1-5. Bit 0-1: Path 1	-	<ul style="list-style-type: none"> • 00: Not installed • 01: Signal Search • 10: Frequency Search • 11: Measurement 	Read only

Table A-61 Path 1 diagnostics

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
3400	Float / 4	RxGain up path 1	Rx gain of upstream signal	-	-	Read only
3402	Float / 4	RxGain down path 1	Rx gain of downstream signal	-	-	Read only
3404	Float / 4	SNR upstream path 1	Signal to noise ratio of upstream signal	-	-	Read only
3406	Float / 4	SNR downstream path 1	Signal to noise ratio of downstream signal	-	-	Read only
3408	Float / 4	Sound velocity path 1	Sound velocity	-	-	Read only
3410	Float / 4	Flow velocity path 1	Flow velocity	-	-	Read only
3412	Float / 4	Delta time path 1	Delta time	-	-	Read only
3414	Float / 4	Travel time up path 1	Travel time of upstream signal	-	-	Read only

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
3416	Float / 4	Travel time down path 1	Travel time of downstream signal	-	-	Read only
3418	Float / 4	Correlation factor path 1	Correlation factor	-	-	Read only
3424	Unsigned / 2	Accepted burst percentage path 1	% of bursts accepted (path 1). Based on various diagnostic input (i.e. correlation strength, gain level, SNR, etc.) the meter may reject specific up/down received sets or bursts. The percentage of accepted bursts is one measure of the application's health.	-	-	Read only
3425	Float / 4	Actual sensor frequency path 1	Sensor frequency	-	-	Read only
3429	Float / 4	Upstream peak amplitude path 1	Upstream signal peak amplitude	-	-	Read only
3427	Float / 4	Downstream peak amplitude path 1	Downstream signal peak amplitude	-	-	Read only
3431	Float / 4	Fluid refraction angle path 1	Calculated fluid refraction angle on path 1 (clamp-on only).	-	-	Read only

A.9.9.2 DSL

DSL error codes

Table A-62 DSL error codes

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
3800	Unsigned / 4	Low level errors 1	Every bit represents an active low level error signaled in the SEN Firmware.	-	-	Read only
3802	Unsigned / 4	Low level errors 2	Every bit represents an active low level error signaled in the SEN Firmware.	-	-	Read only

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
3804	Unsigned / 4	Low level errors 3	Every bit represents an active low level error signaled in the SEN Firmware.	-	-	Read only
3806	Unsigned / 4	Low level errors 4	Every bit represents an active low level error signaled in the SEN Firmware.	-	-	Read only

A.9.9.3 Temperature monitoring

Transmitter temperature

Table A-63 Transmitter temperature

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8200	Float / 4	Current value	Measured value of transmitter internal temperature	-	-	Read only
10900	Float / 4	Minimum value	Drag indicator of minimum transmitter internal temperature	Max. floating point value [°C]	-	Read only
10902	String / 32	Minimum value timestamp	Shows timestamp of recorded minimum transmitter internal temperature		-	Read only
10918	Float / 4	Maximum value	Drag indicator of maximum transmitter internal temperature	Min. floating point value [°C]	-	Read only
10920	String / 32	Maximum value timestamp	Shows timestamp of recorded maximum transmitter internal temperature		-	Read only

A.9.9.4 Inputs and outputs

General

Table A-64 General

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8799	Unsigned / 2	Reset pulse counter	Command to reset pulse counters.	0	<ul style="list-style-type: none"> 4 Reset pulse totalizer in channel 4 	Write only

Channel 2

Table A-65 Channel 2

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8803	Float / 4	Current output value	Output current value if configured to current output.	-	-	Read only
8828	Unsigned / 2	Error status	Error status if configured to current output.	-	<ul style="list-style-type: none"> Bit 0: Overflow Bit 1: Underflow Bit 2: Fail mode activated Bit 3: Cable break Bit 4: Output current cannot be established (read back deviation > 0.1 mA) 	Read only

Channel 3

Table A-66 Channel 3

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9140	Unsigned / 2	Status output	Status value if configured to status output.	-	0 - 1	Read only

Channel 4

Table A-67 Channel 4

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9469	Float / 4	Pulse status output	Amount done if configured to pulse output.	-	-	Read only
9472	Unsigned / 2	Error status	Error status if configured to pulse output.	-	<ul style="list-style-type: none"> • Bit 0: The pulse output has reached the maximum pulse output frequency • Bit 1: Fail mode is activated 	Read only
9487	Unsigned / 4	Pulse counter	Pulse output since startup.	-	-	Read only
9400	Float / 4	Frequency output value	Frequency value if configured to frequency output.	-	-	Read only
9403	Unsigned / 2	Error status	Error status if configured to frequency output.	-	<ul style="list-style-type: none"> • Bit 0: Overflow • Bit 1: Underflow • Bit 2: Fail mode activated 	Read only

A.9.9.5 Peak values

Process value 1

Table A-68 Process value 1

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11200	Unsigned / 2	Process value	Process value configured to be monitored	Disabled	<ul style="list-style-type: none"> • 3000: Volume flow • 3004: Mass flow • 3006: Sound velocity • 3008: Flow velocity • 3040: Density • 3042: Medium temperature • 3046: Viscosity • 65535: Disabled 	Read / write
11226	Float / 4	Maximum value	Drag indicator of maximum value specified by Process value (11200)	Min. floating point value [units depending on process value]	-	Read only
11228	String / 32	Maximum value timestamp	Shows timestamp of recorded maximum value specified by Process value (11200)		-	Read only
11208	Float / 4	Minimum value	Drag indicator of minimum value specified by Process value (11200)	Max. floating point value [units depending on process value]	-	Read only
11210	String / 32	Minimum value timestamp	Shows timestamp of recorded minimum value specified by Process value (11200)		-	Read only
11204	Unsigned / 2	Reset logging	Command to reset the drag pointers to the process value's default value.	-	1: Reset	Write only

Process value 2

Table A-69 Process value 2

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11201	Unsigned / 2	Process value	Process value configured to be monitored	Disabled	<ul style="list-style-type: none"> • 3000: Volume flow • 3004: Mass flow • 3006: Sound velocity • 3008: Flow velocity • 3040: Density • 3042: Medium temperature • 3046: Viscosity • 65535: Disabled 	Read / write
11262	Float / 4	Maximum value	Drag indicator of maximum value specified by Process value (11201)	Min. floating point value [units depending on process value]	-	Read only
11264	String / 32	Maximum value timestamp	Shows timestamp of recorded maximum value specified by Process value (11201)		-	Read only
11244	Float / 4	Minimum value	Drag indicator of minimum value specified by Process value (11201)	Max. floating point value [units depending on process value]	-	Read only
11246	String / 32	Minimum value timestamp	Shows timestamp of recorded minimum value specified by Process value (11201)		-	Read only
11205	Unsigned / 2	Reset logging	Command to reset the drag pointers to the process value's default value.	-	1: Reset	Write only

Process value 3

Table A-70 Process value 3

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11202	Unsigned / 2	Process value	Process value configured to be monitored	Disabled	<ul style="list-style-type: none"> • 3000: Volume flow • 3004: Mass flow • 3006: Sound velocity • 3008: Flow velocity • 3040: Density • 3042: Medium temperature • 3046: Viscosity • 65535: Disabled 	Read / write
11298	Float / 4	Maximum value	Drag indicator of maximum value specified by Process value (11202)	Min. floating point value [units depending on process value]	-	Read only
11300	String / 32	Maximum value timestamp	Shows timestamp of recorded maximum value specified by Process value (11202)		-	Read only
11280	Float / 4	Minimum value	Drag indicator of minimum value specified by Process value (11202)	Max. floating point value [units depending on process value]	-	Read only
11282	String / 32	Minimum value timestamp	Shows timestamp of recorded minimum value specified by Process value (11202)		-	Read only
11206	Unsigned / 2	Reset logging	Command to reset the drag pointers to the process value's default value.	-	1: reset	Write only

Process value 4

Table A-71 Process value 4

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11203	Unsigned / 2	Process value	Process value configured to be monitored	Disabled	<ul style="list-style-type: none"> • 3000: Volume flow • 3004: Mass flow • 3006: Sound velocity • 3008: Flow velocity • 3040: Density • 3042: Medium temperature • 3046: Viscosity • 65535: Disabled 	Read / write
11334	Float / 4	Maximum value	Drag indicator of maximum value specified by Process value (11203)	Min. floating point value [units depending on process value]	-	Read only
11336	String / 32	Maximum value timestamp	Shows timestamp of recorded maximum value specified by Process value (11203)		-	Read only
11316	Float / 4	Minimum value	Drag indicator of minimum value specified by Process value (11203)	Max. floating point value [units depending on process value]	-	Read only
11318	String / 32	Minimum value timestamp	Shows timestamp of recorded minimum value specified by Process value (11203)		-	Read only
11207	Unsigned / 2	Reset logging	Command to reset the drag pointers to the process value's default value.	-	1: Reset	Write only

A.9.10 Characteristics

A.9.10.1 Transmitter

Table A-72 Transmitter

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6500	String / 32	Design 1	Information of design	-	-	Read only
6516	String / 32	Design 2	Information of design continued	-	-	Read only
6532	String / 32	Design 3	Information of design continued	-	-	Read only
6548	String / 32	Design 4	Information of design continued	-	-	Read only

A.9.10.2 Sensor frontend

Table A-73 Sensor frontend

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
4140	Unsigned / 2	Frontend variant	Sensor frontend variant.	-	2: Integrated	Read only

A.9.11 SensorFlash

A.9.11.1 SensorFlash

Table A-74 SensorFlash

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6164	Unsigned / 2	Installed	Shows status of SD card	-	<ul style="list-style-type: none"> 0: SensorFlash not installed 1: SensorFlash installed 2: SensorFlash used as mass storage device 	Read only
6165	Unsigned / 4	Capacity total	Total capacity of installed SensorFlash. 0 kB if card is not installed.	- [KB]	-	Read only
6564	String / 12	Capacity total	Total capacity of installed SensorFlash.	-	-	Read only
6167	Unsigned / 4	Capacity available	Free capacity of installed SensorFlash. 0 kB if card is not installed.	- [KB]	-	Read only
6570	String / 12	Capacity available	Free capacity of installed SensorFlash.	-	-	Read only
9499	Unsigned / 2	Check disc	Check disc command.	-	<ul style="list-style-type: none"> 1: Execute check disc with repair 	Write only

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6182	Unsigned / 2	Backup	Command to overwrite the existing backup data sets. This ensures that the current sensor serial number and transmitter serial numbers are updated in the backup dataset. This enables the automatic backup.	-	<ul style="list-style-type: none"> 1: Overwrite existing backup files 	Write only
6099	Unsigned / 2	Restore	Command to restore backup data. Coding is bitwise.	-	<ul style="list-style-type: none"> Bit 0: Restore sensor setup parameters Bit 1: Restore sensor application setup parameters Bit 2: Restore transmitter application setup parameters Bit 3: Restore customer transmitter configuration setup parameters Bit 4: Restore totalizers Bit 5: Restore system setup Bit 6: Restore customer sensor configuration setup parameters 	Write only

A.9.11.2 Data logging

Table A-75 Data logging

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11400	Unsigned / 2	Enable / disable	Controls data logging.	0	<ul style="list-style-type: none"> 0: Disabled 1: Enabled 	Read / write
11401	Unsigned / 2	Data logging mode	Controls data logging mode.	0	<ul style="list-style-type: none"> 0: Log instantaneous 1: Log average value 	Read / write
11402	Unsigned / 4	Logging interval	Defines interval for logging. Granularity is 10 ms.	500 [x 10 ms]	1 - 8640000	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
11404	Unsigned / 2	Register 1	Modbus register that defines the parameter to be logged. Only parameter of type float or unsigned can be logged. 65535: No logging	65535	-	Read / write
11405	Unsigned / 2	Register 2	Modbus register that defines the parameter to be logged. Only parameter of type float or unsigned can be logged. 65535: No logging	65535	-	Read / write
...						
11493	Unsigned / 2	Register 90	Modbus register that defines the parameter to be logged. Only parameter of type float or unsigned can be logged. 65535: No logging	65535	-	Read / write

A.9.12 Simulation

A.9.12.1 Inputs and outputs

Channel 2 output current

Table A-76 Channel 2 output current

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8825	Unsigned / 2	Simulation	Enables or disables simulation of channel 2 output current.	0	<ul style="list-style-type: none"> • 0: Disabled • 1: Enabled 	Read / write
8826	Float / 4	Simulated value	Current value that is output on the channel when simulation is enabled.	0 [mA]	0 - 25	Read / write

Channel 3 output status

Table A-77 Channel 3 output status

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9164	Unsigned / 2	Simulation	Enables or disables simulation of channel 3 output status.	0	<ul style="list-style-type: none"> • 0: Disabled • 1: Enabled 	Read / write
9165	Unsigned / 2	Simulated value	Signal level that is output on the channel when simulation is enabled.	0	0, 1	Read / write

Channel 4 output frequency

Table A-78 Channel 4 output frequency

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9405	Unsigned / 2	Simulation	Enables or disables simulation of channel 4 output frequency.	0	<ul style="list-style-type: none"> • 0: Disabled • 1: Enabled 	Read / write
9406	Float / 4	Simulated value	Frequency value that is output on the channel when simulation is enabled.	1.0 [Hz]	0.0 - 12500.0	Read / write

Channel 4 output pulse

Table A-79 Channel 4 output pulse

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9473	Unsigned / 2	Simulation	Enables or disables simulation of channel 4 output pulses.	0	<ul style="list-style-type: none"> • 0: Disabled • 1: Enabled 	Read / write
9478	Float / 4	Simulated value	Pulse frequency value that is output on the channel when simulation is enabled.	0.0 [pulses/s]	0.0 - 12500.0	Read / write

A.9.12.2 Process values

Simulate process values

Table A-80 Channel 2 output current

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
2700	Unsigned / 4	Enable simulation	Defines enabling or disabling simulation of multiple process values at a time.	0	Set bit means enabling: <ul style="list-style-type: none"> • Bit 0: Density • Bit 1: Medium temperature • Bit 3: Viscosity • Bit 18: Volume flow • Bit 19: Sound velocity • Bit 20: Flow velocity 	Read / write
2702	Float / 4	Density	Process density simulation value	1000.0 [kg/m ³] (7600)	0.08 to 10000.0	Read / write
2704	Float / 4	Medium temperature	Medium temperature simulation value	20.0 [°C]	-50.0 to 250.0	
2708	Float / 4	Viscosity	Process viscosity simulation value	0.000001 [m ² /s] (7524)	0.00000001 to 10.0	Read / write
2738	Float / 4	Volume flow	Volume flow simulation value	0.0 [m ³ /s] (7500)	-3000.0 to +3000.0	Read / write
2740	Float / 4	Sound velocity	Sound velocity simulation value	1500.0 [m/s] (7648)	200.0 to 3000.0	Read / write
2742	Float / 4	Flow velocity	Flow velocity simulation value	0.0 [m/s] (8014)	-40.0 to 40.0	Read / write

A.9.12.3 Alarms

Simulate alarms

Table A-81 Simulate alarms

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6229	Unsigned / 2	Simulation mode	Defines mode of alarm simulation.	0	<ul style="list-style-type: none"> • 0: Off • 1: Simulate alarm item • 2: Simulate alarm class 	Read / write
6230	Unsigned / 4	Alarm items 1	Bitwise enabling of alarms in alarm items 1. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6232	Unsigned / 4	Alarm items 2	Bitwise enabling of alarms in alarm items 2. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6236	Unsigned / 4	Alarm items 4	Bitwise enabling of alarms in alarm items 4. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6238	Unsigned / 4	Alarm items 5	Bitwise enabling of alarms in alarm items 5. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6240	Unsigned / 4	Alarm items 6	Bitwise enabling of alarms in alarm items 6. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6242	Unsigned / 4	Alarm items 7	Bitwise enabling of alarms in alarm items 7. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6244	Unsigned / 4	Alarm items 8	Bitwise enabling of alarms in alarm items 8. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
7032	Unsigned / 4	Alarm items 9	Bitwise enabling of alarms in alarm items 9. Set bit means alarm item simulation activated. See Alarm items (Page 146).	0	-	Read / write
6247	Unsigned / 2	Alarm class	Bit encoded selection of alarm classes. Applicable if simulation mode = 2. Set bit means alarm class simulation activated: Bit 0: Process value alarm (PA) Bit 1: Process value warning (PW) Bit 2: Maintenance alarm (MA) Bit 3: Maintenance warning (MW) Bit 4: Maintenance required (MR) Bit 5: Function check (FC)	0	0 - 63	Read / write
6249	Unsigned / 2	NAMUR status	Bit encoded selection of NAMUR status signals. Applicable if simulation mode = 2. Set bit means NAMUR status signal simulation activated: Bit 0: Out of specification (PA, PW) Bit 1: Failure (MW) Bit 2: Maintenance required (MR, MD) Bit 3: Function check (FC)	0	0 - 15	Read / write

A.9.13 Audit trail

A.9.13.1 Operating time

Table A-82 Operating time

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6160	Unsigned / 4	Operating time total	Operating time of the transmitter.	- [h]	-	Read only
6162	Unsigned / 4	Operating time	Operating time of the transmitter since last startup.	- [h]	-	Read only

A.9.13.2 Parameter change log

Table A-83 Parameter change log

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6650	Unsigned / 2	Newest entry number	Entry number of newest entry. Older entries have a smaller entry number. (Wrap around for 0 - 100).	-	-	Read only
6651	Unsigned / 2	Available entries	Current number of available parameter change log entries.	-	-	Read only
6652	Unsigned / 2	Clear parameter change log	Command to clear the parameter change log.	-	<ul style="list-style-type: none"> • 0: Cancel • 1: Clear log 	Write only
6750	Unsigned / 2	Entry number	Selection of the entry number.	-	0 - 100	Read / write
6751	String / 16	Time stamp	Time stamp of the parameter change log entry specified by Entry number. Format is YYYY-MM-DD hh-mm.	-	-	Read only
10832	String / 32	Time stamp	Time stamp of the parameter change log entry specified by Entry number. Format is YYYY-MM-DD hh-mm-ss.	-	-	Read only
6759	Unsigned / 2	Modbus register	Modbus register specified by Entry number.	-	-	Read only

A.9 Modbus holding register tables

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6760	Unsigned / 2	Data type	Data type of Modbus register specified by Entry number.	-	<ul style="list-style-type: none"> • 0: No entry • 1: Unsigned8 • 2: Unsigned16 • 3: Unsigned32 • 4: Float32 • 5: String 	Read only
6761	Unsigned / 2	Old value unsigned8	Parameter value of type unsigned8 before modification.	-	-	Read only
6762	Unsigned / 2	Old value unsigned16	Parameter value of type unsigned16 before modification.	-	-	Read only
6763	Unsigned / 4	Old value unsigned32	Parameter value of type unsigned32 before modification.	-	-	Read only
6765	Float / 4	Old value float	Parameter value of type float before modification. (Unit is corresponding default unit. See A.9.3)	-	-	Read only
6767	String / 32	Old value string	Parameter value of type string before modification.	-	-	Read only
6783	Unsigned / 2	New value unsigned8	Parameter value of type unsigned8 after modification.	-	-	Read only
6784	Unsigned / 2	New value unsigned16	Parameter value of type unsigned16 after modification.	-	-	Read only
6785	Unsigned / 4	New value unsigned32	Parameter value of type unsigned32 after modification.	-	-	Read only
6787	Float / 4	New value float	Parameter value of type float after modification. (Unit is corresponding default unit. See Units (Page 84))	-	-	Read only
6789	String / 32	New value string	Parameter value of type string after modification.	-	-	Read only
6805	Unsigned / 2	Initiator	Host that initiated the parameter change.	-	<ul style="list-style-type: none"> • 1: Transmitter internal • 2: Communication channel • 3: Local display • 4: USB 	Read only

A.9.13.3 FW update change log

Table A-84 FW update change log

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
6900	Unsigned / 2	Newest entry number	Entry number of newest entry. Older entries have a smaller entry number. (Wrap around for 0 - 100).	-	-	Read only
6981	Unsigned / 2	Entry number	Selection of the entry number.	-	0 - 20	Read / write
6919	String / 16	Time stamp	Time stamp of the parameter change log entry specified by Entry number. Format is YYYY-MM-DD hh-mm.	-	-	Read only
6927	String / 16	Version	Version string specified by Entry number.	-	-	Read only
6952	Unsigned / 2	Available entries	Current number of available firmware updates log entries.	-	-	Read only
6953	Unsigned / 2	Clear parameter change log	Command to clear the parameter change log.	-	<ul style="list-style-type: none"> 1: Clear log 	Write only (Expert)

A.9.14 Communication

A.9.14.1 Service channel

Table A-85 Service channel

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
9594	Unsigned / 2	USB mode	Returns the USB mode.	-	<ul style="list-style-type: none"> 0: USB communication 1: Mass storage device (MSD) 	Read only
9595	Unsigned / 2	Auto mode	Automatically connected as MSD when USB cable is plugged.	-	<ul style="list-style-type: none"> 0: Disabled 1: Enabled 	Read / write
9596	Unsigned / 2	MSD connect	Command to connect / disconnect to PC.	-	<ul style="list-style-type: none"> 0: Cancel 1: Connect 2: Disconnect 	Write only

A.9.15 Security

A.9.15.1 Access management

Table A-86 Access management

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
8292	Unsigned / 2	User PIN	Input of user PIN.	-	-	Write only
8293	Unsigned / 2	Expert PIN	Input of expert PIN.	-	-	Write only
8294	Unsigned / 2	Access level	Granted access level.	-	<ul style="list-style-type: none"> 16: Read only 32: User privilege 64: Expert privilege 	Read only
6169	Unsigned / 2	New user PIN	Input to change user PIN.	-	-	Write only
6170	Unsigned / 2	New expert PIN	Input to change expert PIN.	-	-	Write only (Expert)

Modbus register	Data type / Size in bytes	Parameter	Description	Default value [unit] (unit register)	Value range / Setting options	Access level
7326	Unsigned / 2	Unique ID code	Unique ID code needed to request a PUK from Siemens customer support.	-	-	Read only
6177	Unsigned / 2	PUK	PUK to reset all PINs to default values.	-	-	Write only

Certificates and support

B.1 Certificates

You can find certificates on the Internet at online support portal (<http://www.siemens.com/processinstrumentation/certificates>) or on an included DVD.

B.2 Technical support

If you have any technical questions about the device described in these Operating Instructions and do not find the right answers, you can contact Customer Support:

- Via the Internet using the **Support Request:**
Service and support (<http://www.siemens.com/automation/service&support>)
- Via Phone:
 - Europe: +49 (0)911 895 7222
 - America: +1 423 262 5710
 - Asia-Pacific: +86 10 6475 7575

Further information about our technical support is available on the Internet at Local contact person (<http://www.automation.siemens.com/partner>)

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Technical support (<http://support.automation.siemens.com/WW/view/en/16604318>)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about field service, repairs, spare parts and lots more under **Services**.

Additional Support

If you have additional questions about the device, please contact your local Siemens representative and offices at:

Support request (<http://www.siemens.com/automation/support-request>)

B.3 QR code label

A QR code label can be found on the device. With the use of a smart phone, the QR code provides a direct link to a website with information specific to the device, such as manuals, FAQs, certificates, etc.

SIMATIC PDM

C.1 Commissioning with PDM

C.1.1 Introduction

SIMATIC PDM is a software package used to commission and maintain process devices.

Procedure examples are for FST030. FST020 procedure is similar but screen shots will appear different for FST020 Electrical Device Description (EDD).

SIMATIC PDM is a software package used to commission and maintain process devices.

C.1.2 Functions in SIMATIC PDM

Note

- For a complete list of parameters, see the Function Manual.
 - While the device is in PROGRAM mode the output remains fixed and does not respond to changes in the device.
-

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 are identified by name and organized into function groups. See the Function Manual for the complete HMI structure ¹⁾ and Changing parameter settings using SIMATIC PDM (Page 182) for more details.

See Parameters accessed via drop-down menus (Page 183) for parameters that do not appear in the menu structure in SIMATIC PDM.

¹⁾: The menu structure for SIMATIC PDM is almost identical to that for the HMI.

C.1.3 Supported SIMATIC PDM versions

Note

Supported SIMATIC PDM versions

The EDD supporting this product is compatible with SIMATIC PDM v. 8.2 + SP1 and higher.

C.1.4 Initial setup

To ensure that SIMATIC PDM connects properly, please complete the process outlined below:

C.1.5 Integrating the EDD

Integrating the Electronic Device Description (EDD)

The Device Integration Manager is the SIMATIC PDM function for integrating device descriptions.

Device descriptions of the Device Library DVD

Make sure the device descriptions are always integrated in SIMATIC PDM from the Device Library DVD provided with your version of SIMATIC PDM. Changes in the device descriptions and the catalog structure may exist between the different versions.

Upgrading SIMATIC PDM

1. Close all SIMATIC programs that are open on the PDM PC.
2. Go to the Windows Start menu and select the menu command SIMATIC PDM → Device Integration Manager under the Siemens SIMATIC programs. You must accept the license agreement to be able to use the Device Integration Manager.
3. Select File → Read device descriptions from source directory... or File → Read device descriptions from compressed source.
4. Navigate to the folder with the device descriptions in the tree structure.

Note

Device Library DVD

The Device Library DVD is supplied with SIMATIC PDM. Select the drive containing the DVD.

5. Click OK.
The device descriptions found are displayed in the Devices list.
6. Select the check boxes for the devices whose device descriptions are to be integrated. The check box is automatically selected for devices that have not been integrated or have been integrated with an older version. You can work with a split device list window.
7. Select Catalog → Integration.
The device descriptions are transferred to the PC.

Note

During the device description integration

Do not open any SIMATIC programs until the device description integration has completed.

See also

FS230 product page (www.siemens.com/FS230)

C.1.6 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.

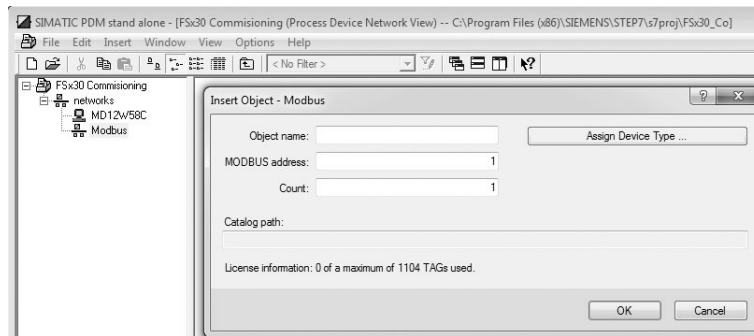


Figure C-1 Assigning Modbus device to network

- 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:

Note

The COM port is usually 1 for notebooks. Since most PCs have two COM ports, you have to specify which port the device is connected to in this tab.

- 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 right-click. 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.

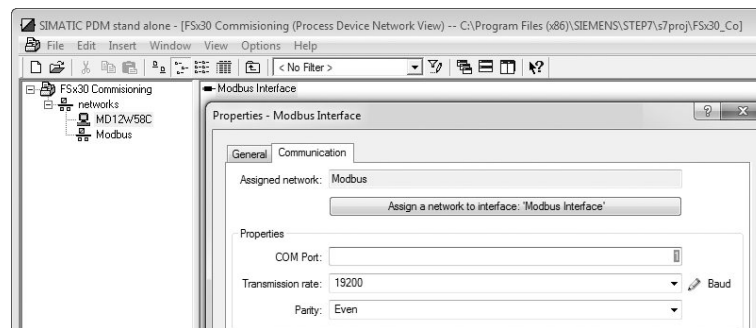


Figure C-2 Set COM port

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.1.7 Configuring a new device**Note**

Clicking on Cancel during an upload from device to SIMATIC PDM will result in some parameters NOT being updated.

1. Check that you have the most recent EDD, and if necessary update it, see Updating the Electronic Device Description (EDD) in Initial setup (Page 176).
2. Launch SIMATIC PDM – Device Integration Manager, browse to the EDD file and select it.
3. Launch SIMATIC Manager and create a new project for the device.
4. After the reset is complete upload parameters to the PC/PG.
5. Configure the device via the Wizard Quick Start.

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.

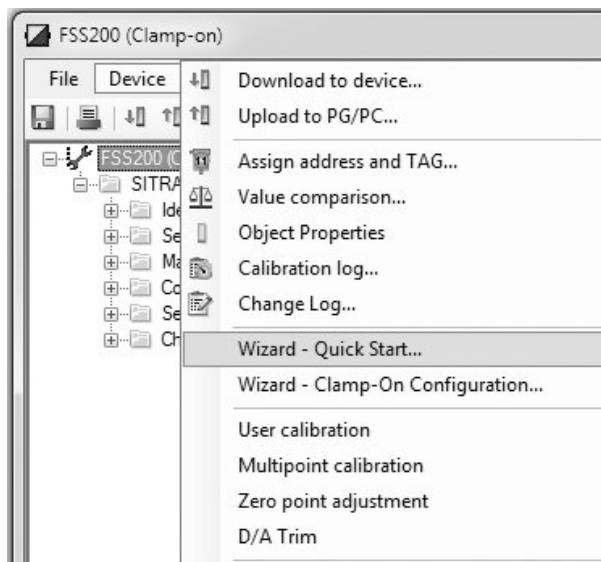
Please consult the SIMATIC PDM operating instructions or online help for details on using SIMATIC PDM.

Quick start

Note

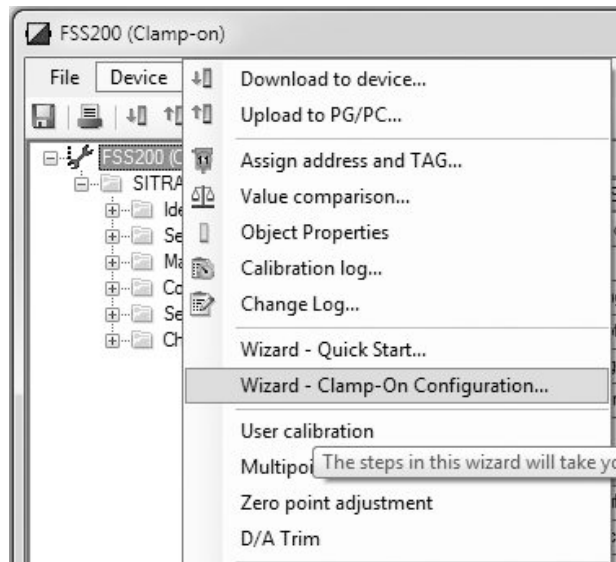
- The Quick Start wizard settings are inter-related and changes apply only after you click on Apply at the end of the wizard to transfer settings to the device.
 - Do not use the Quick Start Wizard to modify individual parameters.
 - Click on Back to return and revise settings or Cancel to exit the Quick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

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



C.1.9 Wizard - Clamp-On Configuration

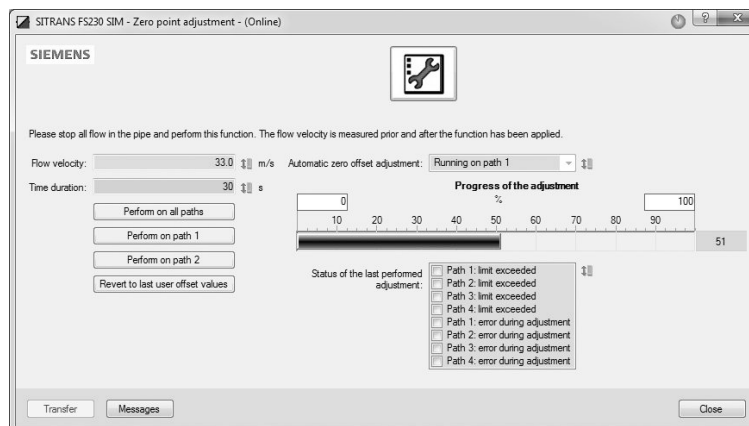
Open the menu Device→Wizard→Clamp-On Configuration, and follow the steps.



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

C.1.10 Wizard - Zero point adjustment

Open the menu Device → Wizard → Inline Configuration, 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 wizard.

C.1.11 Changing parameter settings using SIMATIC PDM

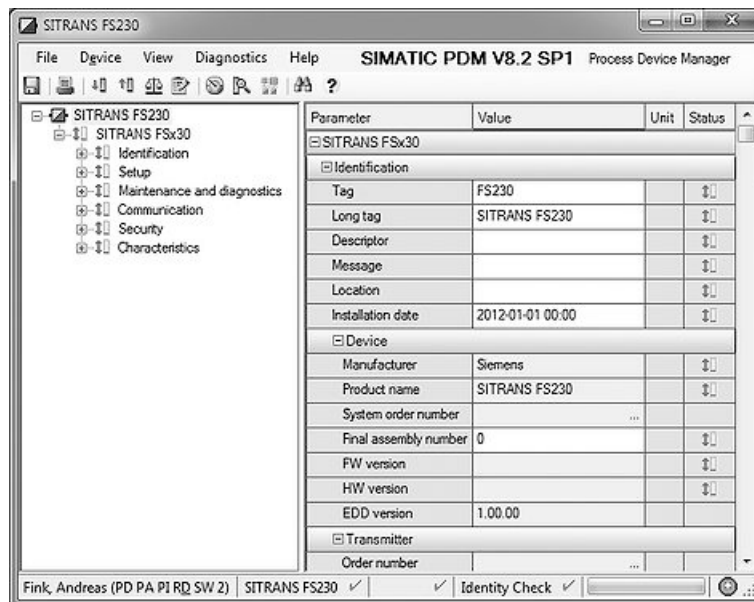
Note

For a complete list of parameters, see the Function Manual.

Clicking on Cancel during an upload from device to SIMATIC PDM will result in some parameters NOT being updated.

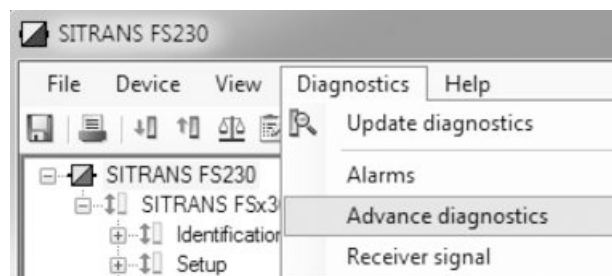
Many parameters are accessed via the online menus in PDM, see Parameters accessed via drop-down menus for the others.

1. Launch SIMATIC PDM, connect to the appropriate device and upload data.
2. Adjust parameter values in the parameter value field then click on Enter. The status fields read Changed.
3. Open the Device menu, click on Download to device, then use File → Save to save settings offline. The status fields are cleared.



C.1.12 Parameters accessed via drop-down menus

Click on Device, View or Diagnostics to open the associated drop-down menus.



Drop-down menus

Table C-1 Device menus

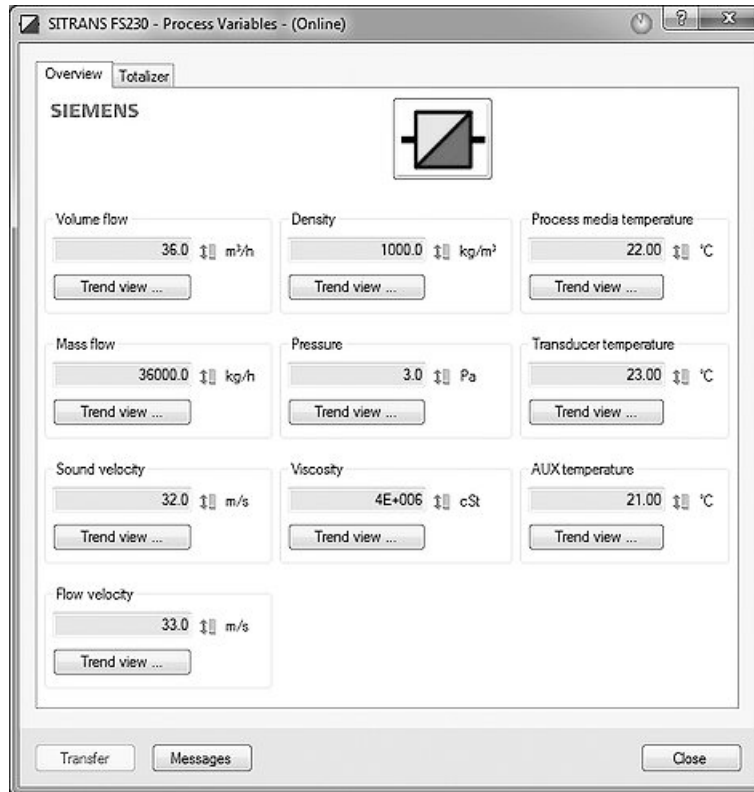
Device menus	Description
Communication Path	Shows the communication interface (HART modem)
Communication (Modbus)	Shows the communication interface (Modbus interface)
Download to Device	Downloads all writable parameters to the device
Upload to PC/PG	Uploads all parameters from the device to the parameter table
Update Diagnostic Status	Reads current diagnostic status from the device and updates the diagnostic status icon
Set Address	Sets the HART polling address
Wizard - Quick Start	Guide for a quick commissioning
Wizard - Clamp-On Configuration...	Guide for a configuration of clamp-on sensors
Wizard - Inline Configuration...	Guide for a configuration of inline sensors
Trim Signal Output (online dialog)	Calibration of current output (channels 2 to 4)
Totalizer (online dialog)	Controlling totalizers 1, 2 and 3
Multipoint calibration	The multipoint calibration allows the user to set a calibration curve, if deemed necessary, at various flow rates across the range of operation
FW update	A FW update is a firmware update. This function allows the user to install firmware that has been placed on the SD-card
Maintenance (online dialog)	Setup of maintenance functions
Suppress Alarms	Suppresses individual alarms
Audit Trail	Lists parameter changes, FW updates, and alarm history logs
Simulation (online dialog)	Simulation of process values, alarms, and inputs/outputs (channels 2 to 4)
Access Management	Possibility to upgrade access level from User to Expert and to change PIN code for "expert" level
Reset (online dialog)	Resets device to default settings or restarts device

Table C-2 View menus

View menus	Description
Process Variables (online dialog)	Shows all process values
Device Diagnostic (online dialog)	Shows all diagnostics information (alarms and advanced diagnostic parameters)
Advanced diagnostics	Advanced diagnostics provides the user with operational information to assist in determining that the device is functioning properly, producing quality data, or assist in troubleshooting
Signal snapshot	The signal snapshot provides a view into the signal quality the device is using for measurement. Knowledgeable persons familiar with ultrasonic can interpret the signal to gauge the quality performance of the device
Toolbar (online dialog)	Shows/hides the toolbar
Status Bar	Shows/hides the status bar
Update	Updates the content of the active window

C.1.13 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.

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