SIEMENS

SITRANS F

Ultrasonic Flowmeters

FST020 IP65 NEMA 4X

Function manual

Edition 09/2017

Answers for industry.

SIEMENS

SITRANS F

Ultrasonic Flowmeters FST020 Function manual

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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.

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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.

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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

1.1 Function Manual scope

Note

This Function Manual applies to the SITRANS FST020 only.

The FST020 transmitter can be connected to sensor types FSS200 and FSS300.

1.2 Purpose of this documentation

This manual contains a description of all device parameters and is aimed at persons configuring the device.

The default settings and the setting ranges are listed in tables for each parameter. Furthermore, the relation, if any, between parameters is described.

As of chapter 3, Setup (Page 19), the chapter and subchapter numbers equal the parameter numbers in the HMI structure.

For parameters with access level other than User (for example Read only or Expert), the access level is stated in parenthesis after the parameter name.

1.3 Quick start wizards

The device offers a set of wizards which will guide you through configuration of parameters essential for your application. The quick commissioning wizards are described in the Commissioning chapter of the device Operating Instructions.

1.4 Support

For product support, or to contact a Siemens representative, see Technical support (Page 187).

1.5 Product compatibility

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

Edition	Remarks	Product compatibility	Compatibility version of device integration package	
09/2017	• First edition	Modbus FW: 2.01.00-04 HW: 002 or later	SIMATIC PDM V8.2 SP1 or later	EDD: 1.00.00 or later
			AMS Device Manager 12.0	EDD: 1.00.00 or later
			SITRANS DTM V4.1	EDD: 1.00.00 or later
			Field communicator V3.8	EDD: 1.00.00 or later

1.6 Document history

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

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

Edition	Note
09/2017	First edition

1.7 Device documentation package

The user documentation package for this product includes the following documents

Document	Purpose	Intended users	Availability
Application planning sheets	*Contains all information needed to* • *plan the mechanical / physical installation and control signals before the product arrives*	*Plant design engineers, control system designers*	• *Sent to the customer with Quote* • *Available for download from homepage*
Operating Instructions	Contains all information needed to • check and identify the delivered package • install and electrically connect the product • commission the product, (setting parameters via HMI menu) • operate and maintain the device on a daily basis • troubleshoot and remedy minor operation interruptions	Instrument technicians, plant operators	• On documentation disk • Available for download from homepage • Hardcopy can be purchased via PIA Life Cycle Portal

Document	Purpose	Intended users	Availability
Sensor Installation Manual	Contains all information needed to install Clamp-on sensors.	Mechanical and electrical installers; instrument technicians	• Included in the delivery • On documentation disk • Available for download from homepage
Functions Manual	Contains • descriptions of all functions that can be accessed via the local display (HMI) • guide to setting parameters to obtain optimum operation of the device	Instrument technicians, plant operators	• Available for download from homepage • Hardcopy can be purchased via PIA Life Cycle Portal

Quick start 2

2.1 Introduction

The quick start wizard topics and introductory explanations are listed below. For detailed quick start wizard procedures refer to the FST020 Operating Instructions manual.

2.2 Quick commissioning

Description

Quick commissioning - 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.

2.3 Sensor settings

Description

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

2.4 Process values

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 1st process value appears as first value in the views.

2.5 Inputs and outputs

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

2.6 Copy configuration

This wizard allows you to copy the configuration from the SensorFlash to the device.

Setup 3

3.1 Sensor settings

3.1.1 Length unit

Description

Unit for length values.

3.1.2 Length unit - settings

Setting	ft; m; in; cm; mm
Default	m

Related

Path	Setup → Sensor settings → Length units

3.1.3 Pipe settings

3.1.3.1 Pipe class

Description

Pipe class - Read only. Can only be changed via the Sensor Wizard. Indicates the pipe class chosen from the pipe data library included in the sensor setup wizard.

3.1.3.2 Pipe size

Description

Pipe size - Read only. Can only be changed via the Sensor Wizard. Indicates the pipe class chosen from the pipe data library included in the sensor setup wizard.

3.1.3.3 Outer pipe diameter

Description

External pipe diameter.

Setting	0.006 m to 10.0 m
Default	0.1 m

Related

Path	Setup → Sensor settings → Pipe settings → Outer pipe diameter

3.1.3.4 Wall thickness

Description

Pipe wall thickness.

Setting	1.0^{-6} m to 0.5 m
Default	0.001 m

Related

Path	Setup → Sensor settings → Pipe settings → Wall thickness

3.1.3.5 Pipe material

Description

Pipe material - Read only. Can only be changed via the Sensor Wizard.

Setting	Read only: Carbon steel; Stainless steel; ABS plastic; Aluminum; Black iron; Brass; Cast iron; Copper nickel 70/30; Copper nickel 90/10; Copper; Ductile iron; FRP plastic; Glass; Hastelloy; Inconel; Kynar plastic; Monel; Nickel; Polyethylene; PVC plastic; Teflon; Titanium
Default	Can only be changed via the Sensor wizard

Related

Path	Setup → Sensor settings → Pipe settings → Pipe material

3.1.3.6 Wall sound velocity

Description

Pipe wall material sound velocity (clamp-on).

Use the shear velocity for metallic pipes. Use the longitudinal velocity for plastic pipes.

Setting	200.0 m/s to 4000.0 m/s
Default	3000.0 m/s

Related

Path	Setup → Sensor settings → Pipe settings → Wall sound velocity

3.1.3.7 Liner settings

3.1.3.7.1 Liner thickness

Description

Pipe liner thickness

Setting	0.0 m to 0.5 m
Default	0.0 m

Related

Path	Setup → Sensor settings → Pipe settings → Liner settings → Liner thickness

3.1.3.7.2 Liner material

Description

Liner material - Read only. Can only be changed via the Sensor Wizard.

Setting	Read only: Custom; Cement; Coal tar; Enamel; Glass; Plastic; Hi_dens_Poly; PTFE; Rubber
Default	Custom

Related

Path	Setup → Sensor settings → Pipe settings → Liner settings → Liner material

3.1.3.7.3 Liner sound velocity

Description

Liner material sound velocity (clamp-on).

Setting	200.0 m/s to 4000.0 m/s
Default	2000.0 m/s

Related

Path	Setup → Sensor settings → Pipe settings → Liner settings → Liner sound velocity

3.1.3.8 Inner pipe roughness

Description

Roughness of inner pipe/liner material.

Setting	0.0 m to 0.01 m
Default	0.0001 m

Related

Path	Setup → Sensor settings → Pipe settings → Inner pipe roughness

3.1.3.9 Inner pipe diameter

Description

Read only. Calculated inner diameter of pipe (clamp-on).

Setting	
Default	0.0 m

Related

Path	Setup → Sensor settings → Pipe settings → Inner pipe diameter

3.1.4 Upstream and downstream conditions

3.1.4.1 Disturbed flow profile compensation

Description

Disturbed flow profile compensation enable/disable

Setting	Enable; Disabled
Default	Disabled

Related

Path	Setup → Sensor settings → Upstream and downstream conditions → Disturbed flow profile compensation

3.1.4.2 Type of upstream condition

Description

Compensation for upstream pipe geometry.

Setting	Straight run; Single elbow; Double elbow (in-plane); Double elbow (out-of-plane); Reducer; Expansion
Default	Straight run

Related

Path	Setup → Sensor settings → Upstream and downstream conditions → Type of upstream condition

3.1.4.3 Upstream distance

Description

The distance to the upstream flow disturbance. The distance is given in pipe diameters.

Used for clamp-on flow profile compensation.

Setting	0 to 40
Default	0

Related

Path	Setup → Sensor settings → Upstream and downstream conditions → Upstream distance

3.1.4.4 Type of downstream condition

Description

Compensation for downstream pipe geometry.

Setting	Straight run; Single elbow; Double elbow (in-plane); Double elbow (out-of-plane); Reducer; Expansion
Default	Straight run

Related

Path	Setup → Sensor settings → Upstream and downstream conditions → Type of downstream condition

3.1.4.5 Downstream distance

Description

The distance to the downstream flow disturbance. The distance is given in pipe diameters.

Used for clamp-on flow profile compensation.

Setting	0 to 40
Default	0

Related

Path	Setup → Sensor settings → Upstream and downstream conditions → Downstream distance

3.1.5 Medium characteristics

3.1.5.1 Process medium type

Description

Process medium types - Read only. Can only be changed via the Sensor Wizard. Indicates the fluid medium type chosen from the fluid data library included in the sensor setup wizard.

3.1.5.2 Expected sound velocity

Description

Expected sound velocity in the medium at process temperature.

Setting	100.0 m/s to 2500.0 m/s
Default	1500.0 m/s

Related

Path	Setup → Sensor settings → Fluid settings → Expected sound velocity

3.1.5.3 Process temperature

Description

Temperature of media used for compensation.

Input during setup.

Setting	-273.0 °C to 400.0 °C
Default	20.0 °C

Related

Path	Setup → Sensor settings → Medium characteristics → Process temperature

3.1.5.4 Kinematic viscosity

Description

Viscosity of media used for compensation.

Input during setup.

Setting	0.00 m^2/s to 5000.0 m^2/s
Default	0.000001 m^2/s

Related

Path	Setup → Sensor settings → Medium characteristics → Kinematic viscosity

3.1.5.5 Process density

Description

Density of media used for compensation.

Input during setup.

Setting	0.0 kg/m^3 to 2000.0 kg/m^3
Default	1000.0 kg/m^3

Related

Path	Setup → Sensor settings → Medium characteristics → Process density

3.1.6 Sensor selection

3.1.6.1 Sensor model

Description

Installed sensor model (for multi-path all must be the same). Read only. Can only be changed via the Sensor Wizard. Indicates the Sensor model chosen from the sensor setup wizard.

Setting	Read only: FSS200 high precision; FSS200 / 1011 Universal; FSS200 / 991 high temperature; 1011 high precision liquid
Default	FSS200 / 1011 Universal

Related

Path	Setup → Sensor settings → Sensor selection → Sensor model

3.1.6.2 Clamp-on sensor size

Description

Installed sensor size. Read only. Can only be changed via the Sensor Wizard. Indicates the Sensor model chosen from the sensor setup wizard.

3.1.6.3 Nominal sensor frequency

Description

Nominal frequencies for the sensors

Setting	80000.0 m/s to 4000000.0 m/s
Default	1100000.0 m/s

Related

Path	Setup → Sensor settings → Sensor selection → Nominal sensor frequency

3.1.6.4 Sensor crystal projection

Description

Length of the crystal projection onto the emitting surface of the sensor (clamp-on). Access level: Expert user only.

Setting	0.0 m to 0.3 m
Default	0.03409 m

Related

Path	Setup → Sensor settings → Sensor settings → Sensor crystal projection

3.1.6.5 Sensor phase velocity

Description

The velocity at which the wave fronts traverse the interface between the wedge and pipe. Access level: Expert user only.

Setting	1000.0 m/s to 20000.0 m/s
Default	3695.5 m/s

Related

Path	Setup → Sensor settings → Sensor settings → Sensor phase velocity

3.1.6.6 Sensor inactive wedge

Description

The part of the wedge that is not part of the sound path. Access level: Expert user only.

Setting	0.0 m to 0.05 m
Default	0.00076 m

Related

Path	Setup → Sensor settings → Sensor settings → Sensor inactive wedge

3.1.6.7 Sensor fixed time

Description

Fixed time in sensor wedge. Access level: Expert user only.

Setting	2.0×10^{-6} s to 200.0×10^{-6} s
Default	10.61×10^{-6} s

Related

Path	Setup → Sensor settings → Sensor settings → Sensor fixed time

3.1.6.8 Mounting hole offset

Description

Distance between spacer hole and sensor front face.

Setting	0.0 m to 0.05 m
Default	0.00953 m

Related

Path	Setup → Sensor settings → Sensor settings → Mounting hole offset

3.1.6.9 Spacing offset

Description

Sensor spacing offset

Setting	MIN; NOM; MAX and A,B, C, D for High Temperature sensors
Default	MIN

Related

Path	Setup → Sensor settings → Sensor selection → Spacing offset

3.1.6.10 Temperature code of the sensor

Description

Temperature code selections for sensors.

Setting	T1 (21°C), T2, T3
Default	T1 (21°C)

Related

Path	Setup → Sensor settings → Sensor selection → Temperature code of the sensor

3.1.6.11 Temperature compensation factor

Description

Temperature compensation factors for the sensors.

Setting	0.0001 to 0.0009
Default	0.000638

Related

Path	Setup → Sensor settings → Sensor selection → Temperature compensation factor

3.1.6.12 Length of sensor cables

Description

Length of sensor cable between transmitter/DSL and any sensors. All cables must have the same length.

Setting	0.0 m to 20.0 m
Default	0.0 m

Related

Path	Setup → Sensor settings → Sensor selection → Length of sensor cables

3.1.7 Path settings

3.1.7.1 Installed paths

Description

Bit encoded value containing installed paths for clamp-on systems.

Bit 0: Path 1 installed

Setting	0 to 31
Default	0

Related

Path	Setup → Sensor settings → Path settings → Installed paths

3.1.7.2 Path 1

3.1.7.2.1 Sensor frequency

Description

Desired sensor frequency for path 1. Read only.

Setting	80000.0 Hz to 4000000.0 Hz
Default	

Related

Path	Setup → Sensor settings → Path settings → Path 1 → Sensor frequency

3.1.7.2.2 Path geometry

Description

The number of crossings the signal makes through the pipe (Reflect or Direct geometry for Path 1).

For example:
Direct (1 traverse)

Reflect (2 traverse)

Direct (3 traverse)

Reflect (4 traverse)

Setting	1 to 10
Default	1

Related

Path	Setup → Sensor settings → Path settings → Path 1 → Path geometry

3.1.7.2.3 Sensor spacing

Description

Sensor spacing - Distance between the front faces of the sensors for path 1.

Setting	-100.0 m to 100.0 m
Default	0.0 m

Related

Path	Setup → Sensor settings → Path settings → Path 1 → Sensor spacing

3.1.7.2.4 Zero point adjustment

Description

Zero point adjustment. Can only be changed via the Sensor Wizard.

Note

Important

Please stop all flow in the pipe and perform this function. The flow velocity is measured prior and after the function has been applied.

Setting	5 to 300
Default	10

Related

Path	Setup → Sensor settings → Path settings → Path 1 → Zero point adjustment → Time duration

3.1.7.2.5 Serial number

Description

Serial number of sensor (clamp-on)

Setting	
Default	

Related

Path	Setup → Sensor settings → Path settings → Path 1 → Serial number

3.1.7.3 Path diagnostic alarm limits

3.1.7.3.1 Percent bursts accepted alarm limit

Description

Sets the desired limit for the percentage of accepted bursts. If measured percentage accepted burst drops below this limit for any installed path, an alarm will be issued.

Setting	Min: 0%; Max: 100%
Default	50%

Related

Path	Setup → Sensor settings → Path settings → Path diagnostic alarm limits → Percent bursts accepted alarm limit

3.1.7.3.2 Correlation factor alarm limit

Description

Sets the desired limit for the correlation factor. If the measured correlation factor drops below this limit for any installed path, an alarm will be issued.

Setting	Min: 0.0; Max: 1.0
Default	0.95

Related

Path	Setup → Sensor settings → Path settings → Path diagnostic alarm limits → Correlation factor alarm limit

3.1.7.3.3 RxGain alarm limit

Description

Sets the limit for the RxGain value. If the RxGain goes above this limit for any installed path, an alarm will be issued.

Setting	Min: 0.0 dB; Max: 100.0 dB
Default	50.0 dB

Related

Path	Setup → Sensor settings → Path settings → Path diagnostic alarm limits → RxGain alarm limit

3.1.7.3.4 SNR alarm limit

Description

Sets the desired limit for the measured SNR. If the measured SNR drops below this limit for any installed path, an alarm will be issued.

Setting	Min: 0.0 dB; Max: 100 dB
Default	20 dB

Related

Path	Setup → Sensor settings → Path settings → Path diagnostic alarm limits → SNR alarm limit

3.1.8 User calibration

3.1.8.1 Slope

Description

A single point flow correction applied to volume flow equally at any flow rate.

Q = Q * Slope (e.g. Slope of 0.99 = -1% correction)

Setting	0.5 to 2.0
Default	1.0

Related

Path	Setup → Sensor settings → User calibration → Slope

3.1.8.2 Path 1 offset

Description

User calibrated zero offset for path 1.

Delta time offset correction value, which can be determined at zero flow.

Setting	-1250ns to 1250ns
Default	0.0

Related

Path	Setup → Sensor settings → User calibration → Path 1 offset

3.1.9 Multipoint calibration

3.1.9.1 Enable multipoint calibration

Description

Enable or disable the multipoint calibration.

Setting	Disabled; Enabled
Default	Disabled

Related

Path	Setup → Sensor settings → Multipoint calibration

3.1.9.2 Asymmetric calibration table

Description

Note

Access level: Expert user only

Only available for LUILOCAL_CURRENT_LUI_ACCESS_LEVEL == SUP AND PID_ProtectCalibrationTable == 0 AND PID_EnableUserCalibrationTable == 1

Usage of the calibration table:

- Unidirectional: All 20 calibration points are used for positive flow calibration and are then mirrored for negative flow.
- Bidirectional: The first 10 calibration points are used for positive flow calibration and the 10 last calibration points are used for negative flow calibration.

Setting	Unidirectional; Bidirectional
Default	Unidirectional

Related

Path	Setup → Sensor settings → Asymmetric calibration table

3.1.9.3 Calibration point

Description

Calibration point that is to be transferred to the multipoint calibration table.

Setting	0.0 m^3/s to 100000.0 m^3/s
Default	0.0 m^3/s

Related

Path	Setup → Sensor settings → Calibration point

3.1.9.4 Multipoint calibration table

3.1.9.4.1 Calibration points 1 - 20

Description

Calibration points 1 through 20 for unidirectional flow or calibration points 1 through 20 for bidirectional positive flow. If 0.0 the calibration point is not used.

Access level: Expert user only.

Note

Only available for PID_ProtectCalibrationTable == 1 OR PID_EnableUserCalibrationTable == 1

Setting	0.0 m^3/s to 100000.0 m^3/s
Default	0.0 m^3/s

Related

Path	Setup → Sensor settings → Multipoint calibration → Multipoint calibration table → Calibration points 1 - 20

3.1.9.4.2 Calibration value

Description

Calibration correction factor that is associated to Calibration points 1 through 20.

Access level: Expert user only.

Setting	0.5 to 2.0
Default	1.0

Related

Path	Setup → Sensor settings → Multipoint calibration → Multipoint calibration table → Calibration value 1 - 20

3.1.10 Flow direction

Description

The calibrated flow direction is indicated by the arrow on the sensor. If the system requires installation of the sensor with the flow running in the opposite direction, the **Flow Direction** parameter must be changed from Positive to Negative to totalize correctly. The sensitivity and the accuracy of the sensor do not change with reverse flow.

Define positive and negative flow direction. Default positive flow direction is indicated by the arrow on the sensor.

Setting	Negative; Positive
Default	Positive

Related

Path	Setup → Sensor settings → Flow direction

3.1.11 Miscellaneous

3.1.11.1 Preamplifier Setting

Description

Preamplifier settings
Access level: Expert user only

Auto (default): Will automatically turn on the pre-amplifier if the sensor type is clamp-on.

Off: Turns off the pre-amplifier regardless of the sensor type (inline or clamp-on).

On: Turns on the pre-amplifier regardless of the sensor type (inline or clamp-on).

Half transmit amplitude: Reduces the transmit signal from the default ±10 volts to ±5 volts and turns off the pre-amplifier. This may be necessary for the smaller SONO sensors which can saturate the amplifiers even with the pre-amp off.

Setting	Auto; Off; On; Half transmit amplitude
Default	Auto

Related

Path	Setup → Sensor settings → Miscellaneous → Preamplifier Setting

3.1.11.2 Number of pulses to be transmitted

Description

The number of pulses to configure optimum signal processing.

Access level: Expert user only.

Setting	1 to 10
Default	5

Related

Path	Setup → Sensor settings → Miscellaneous → Number of pulses to be transmitted

3.1.11.3 Minimum ringdown delay

Description

The minimum ringdown delay is needed for optimized signal processing.

Access level: Expert user only.

Read only.

The minimum ringdown delay setting for optimized signal processing is: **2000.000122 µs**

3.1.11.4 Electronic time delay

Description

The time delay induced by the DSL electronics.

Access level: Expert user only.

Read only.

The time delay induced by the DSL electronincs is: **0.519 µs**

3.1.12 Configuration of test blocks

3.1.12.1 About

Description

NOTICE
Configuration data overwrite error
Running the test block configuration procedure will overwrite any existing sensor configuration.
Do not run the test block configuration procedure if configuration data is needed. Back up and record data as necessary.

The wizard configures the device for use with the Siemens sensor test blocks including sensor size and sensor path. It also allows for saving the setting.

3.1.12.2 Sensor size

Sensor size	Sensor path
A1	Path 1; Path 2
A2	Path 1; Path 2
B1	Path 1; Path 2
B2	Path 1; Path 2
B3	Path 1; Path 2
C1	Path 1; Path 2
C2	Path 1; Path 2
C3	Path 1; Path 2
D1	Path 1; Path 2
D2	Path 1; Path 2
D3	Path 1; Path 2

Save settings

After settings are complete, press the right arrow to save sensor test block settings.

3.2 Process values

3.2.1 Volume flow

3.2.1.1 Units

Description

Select units for displayed volume flow rate. Units are not applied at communication interface.

Setting	l/s (liters per second); l/min (liters per minute); l/h (liters per hour); l/d (liters per day); Ml/d (million liters per day); hl/s (hectoliters per second); hl/min (hectoliters per minute); hl/min (hectoliters per hour); hl/min (hectoliters per day); m^3/s (cubic meters per second); m^3/min (cubic meters per minute); m^3/h (cubic meters per hour); m^3/d (cubic meters per day); Mm^3/d (million cubic meters per day); gal/s (US gallons per second); gal/min (US gallons per minute); gal/h (US gallons per hour); gal/d (US gallons per day); Mgal/d (million US gallons per day); i.gal/s (Imperial gallons per second); i.gal/min (Imperial gallons per minute); i.gal/h (Imperial gallons per hour); i.gal/d (Imperial gallons per day); BBL31/s (1 barrel = 31 US gallons); BBL31/min (1 barrel = 31 US gallons); BBL31/h (1 barrel = 31 US gallons); BBL31/d (1 barrel = 31 US gallons); BBL42/s (1 barrel = 42 US gallons); BBL42/min (1 barrel = 42 US gallons); BBL42/h (1 barrel = 42 US gallons); BBL42/d (1 barrel = 42 US gallons); KBBL42/d (Thousand barrels per day); MBBL42/d (million barrels per day); BBL31.5/s (1 barrel=31.5 US gallons); BBL31.5/min (1 barrel=31.5 US gallons); BBL31.5/h (1 barrel=31.5 US gallons); BBL31.5/d (1 barrel=31.5 US gallons); ft^3/s (cubic feet per second); ft^3/min (cubic feet per minute); ft^3/h (cubic feet per hour); ft^3/d (cubic feet per day); Mft^3/d (million cubic feet per day); af/min (acre-feet per minute); af/h (acre-feet per hour); af/d (acre-feet per day); in^3/sec (cubic inches per second); in^3/min (cubic inches per minute); in^3/h (cubic inches per hour); in^3/d (cubic inches per day); yd^3/s (cubic yards per second); yd^3/min (cubic yards per minute); yd^3/h (cubic yards per hour); yd^3/d (cubic yards per day); bush/s (bushels per second); bush/min (bushels per minute); bush/h (bushels per hour); bush/d (bushels per day); custom units (see Custom units / Custom conversion factor)
Default	m^3/h (cubic meters per hour)

Related

Path	Setup → Process values → Volume flow → Units

3.2.1.2 Custom units

Description

User specific text string for volume flow unit values. The custom units can then be selected in volume flow units.

Setting	-
Default	-

Related

Path	Setup → Process values → Volume flow → Custom units

3.2.1.3 Custom conversion factor

Description

Conversion factor for user specific standard volume flow values related to SI m^3/s.

Setting	-
Default	1.0

Related

Path	Setup → Process values → Volume flow → Custom conversion factor

3.2.1.4 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Standard volume flow → Decimal places

3.2.1.5 Low flow cut-off

Description

Volume flow limit for low flow cut off. Below limit volume flow output is forced to zero.

Setting	0.00 m^3/h to 896.40 m^3/h (depends on sensor)
Default	0.1% of maximum flow (depends on sensor)

Related

Path	Setup → Process values → Volume flow → Low flow cut-off

3.2.1.6 Alarm and warning limits

3.2.1.6.1 Upper alarm limit

Description

Set Upper alarm limit. Alarm is triggered if measured value is above the limit.

Setting	-896.40 m^3/h to 896.40 m^3/h
Default	896.40 m^3/h

Related

Path	Setup → Process values → Volume flow → Alarm and warning limits → Upper alarm limit

3.2.1.6.2 Upper warning limit

Description

Exceeding this limit causes a warning.

Setting	-896.40 m^3/h to 896.40 m^3/h
Default	896.40 m^3/h

Related

Path	Setup → Process values → Volume flow → Alarm and warning limits → Upper warning limit

3.2.1.6.3 Lower warning limit

Description

Falling below this limit causes a warning.

Setting	-896.40 m^3/h to 896.40 m^3/h
Default	896.40 m^3/h

Related

Path	Setup → Process values → Volume flow → Alarm and warning limits → Lower warning limit

3.2.1.6.4 Lower alarm limit

Description

Set Lower alarm limit. Alarm is triggered if measured value is below the limit.

Setting	-896.40 m^3/h to 896.40 m^3/h
Default	896.40m^3/h

Related

Path	Setup → Process values → Volume flow → Alarm and warning limits → Lower alarm limit

3.2.1.6.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0.00 m^3/h to 896.40 m^3/h
Default	0.0 m^3/h

Related

Path	Setup → Process values → Volume flow → Alarm and warning limits → Hysteresis

3.2.2 Mass flow

3.2.2.1 Units

Description

Select units for displayed mass flow rate. Units are not applied at communication interface.

Setting	g/s (grams per second); g/min (grams per min); g/h (grams per hour); kg/s (kilograms per second); kg/min (kilograms per minute); kg/h (kilograms per hour); kg/d (kilograms per day); t/min (1 t = 1000 kg); t/h (1 t = 1000 kg); t/d (1 t = 1000 kg); STon/min (1 STon = 2000 lb); STon/h (1 STon = 2000 lb); STon/d (1 STon = 2000 lb); T/h (1 T = 2240 lb); T/d (1 T = 2240 lb); lb/s (pounds per second); lb/min (pounds per minute); lb/h (pounds per hour); lb/d (pounds per day); custom units (see Custom units / Custom conversion factor)
Default	kg/h (kilograms per hour)

Related

Path	Setup → Process values → Mass flow → Units

3.2.2.2 Custom units

Description

User specific string for mass flow values.

Setting	-
Default	-

Related

Path	Setup → Process values → Mass flow → Custom units

3.2.2.3 Custom conversion factor

Description

User specific conversion factor based on SI mass flow units kg/s.

Setting	-
Default	1.0

Related

Path	Setup → Process values → Mass flow → Custom conversion factor

3.2.2.4 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Mass flow → Decimal places

3.2.2.5 Low flow cut-off

Description

Mass flow limit for low flow cut off. Below limit mass flow output is forced to zero.

Setting	0.00 to 3682800.00 kg/h (depends on sensor)
Default	0.1% of maximum mass flow (depends on sensor)

Related

Path	Setup → Process values → Mass flow → Low flow cut-off

3.2.2.6 Alarm and warning limits

3.2.2.6.1 Upper alarm limit

Description

If mass flow value exceeds this limit an alarm is triggered.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	3682800.00 kg/h

Related

Path	Setup → Process values → Mass flow → Alarm and warning limits → Upper alarm limit

3.2.2.6.2 Upper warning limit

Description

Exceeding this limit causes a warning.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	3682800.00 kg/h

Related

Path	Setup → Process values → Mass flow → Alarm and warning limits → Upper warning limit

3.2.2.6.3 Lower warning limit

Description

If the mass flow value falls below this limit a warning is triggered.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	-3682800.00 kg/h

Related

Path	Setup → Process values → Mass flow → Alarm and warning limits → Lower warning limit

3.2.2.6.4 Lower alarm limit

Description

If mass flow value falls below this limit an alarm is triggered.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	-3682800.00 kg/h

Related

Path	Setup → Process values → Mass flow → Alarm and warning limits → Lower alarm limit

3.2.2.6.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0.0 kg/h to 3682800.00 kg/h
Default	0.0 kg/h

Related

Path	Setup → Process values → Mass flow → Alarm and warning limits → Hysteresis

3.2.3 Flow velocity

3.2.3.1 Units

Description

Select units for displayed flow velocity. Units are not applied at communication interface.

Units for flow velocity values.

Setting	m/s (meters per second); m/h (meters per hour); in/s (inches per second); in/min (inches per minute); ft/s (feet per second); ft/min (feet per minute); custom units (see Custom units / Custom conversion factor)
Default	m/s (meters per second)

Related

Path	Setup → Process values → Flow velocity → Units

3.2.3.2 Custom units

Description

User specific text string to define custom unit values. The custom unit can then be selected in the flow velocity units.

Setting	-
Default	-

Related

Path	Setup → Process values → Flow velocity → Custom units

3.2.3.3 Custom conversion factor

Description

Conversion factor for custom unit flow velocity values based on SI velocity units m/s.

Setting	-
Default	1.0

Related

Path	Setup → Process values → Flow velocity → Custom conversion factor

3.2.3.4 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Flow velocity → Decimal places

3.2.3.5 Low flow cut-off

Description

Flow velocity limit for low flow cut off. Below limit flow velocity output is forced to zero.

Setting	Min 0.00
Default	0.0 m/s

Related

Path	Setup → Process values → Flow velocity → Low flow cut-off

3.2.3.6 Alarm and warning limits

3.2.3.6.1 Upper alarm limit

Description

If process value exceeds this limit an alarm is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	9999997952 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Upper alarm limit

3.2.3.6.2 Upper warning limits

Description

If process value exceeds this limit a warning is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	9999997952 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Upper warning limit

3.2.3.6.3 Lower warning limit

Description

If process value falls below this limit a warning is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	-9999997952 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Lower warning limit

3.2.3.6.4 Lower alarm limit

Description

If the process value falls below this limit an alarm is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	-9999997952 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Lower alarm limit

3.2.3.6.5 Hysteresis

Setting	0 m/s to +9999997952 m/s
Default	0.00 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Hysteresis

Setting	0 m/s to +9999997952 m/s
Default	0.00 m/s

Related

Path	Setup → Process values → Flow velocity → Alarm and warning limits → Hysteresis

3.2.4 Sound velocity

3.2.4.1 Units

Description

Select units for displayed sound velocity. Units are not applied at communication interface.

Setting	m/s (meters per second); m/h (meters per hour); in/s (inches per second); in/min (inches per minute); ft/s (feet per second); ft/min (feet per minute); Custom units (see Custom units / Custom conversion factor)
Default	m/s (meters per second)

Related

Path	Setup → Process values → Sound velocity → Units

3.2.4.2 Custom units

Description

User specific text string to define a name for custom unit values. The custom unit can then be selected in the sound velocity units.

Setting	
Default	

Related

Path	Setup → Process values → Sound velocity → Custom units

3.2.4.3 Custom conversion factor

Description

Conversion factor for custom unit sound velocity values based on SI velocity units m/s.

Setting	
Default	1.0

Related

Path	Setup → Process values → Sound velocity → Custom conversion factor

3.2.4.4 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Sound velocity → Decimal places

3.2.4.5 Alarm and warning limits

3.2.4.5.1 Upper alarm limit

Description

If process value exceeds this limit an alarm is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	9999997952 m/s

Related

Path	Setup → Process values → Sound velocity → Alarm and warning limits → Upper alarm limit

3.2.4.5.2 Upper warning limit

Description

If process value exceeds this limit a warning is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	9999997952 m/s

Related

Path	Setup → Process values → Sound velocity → Alarm and warning limits → Upper warning limit

3.2.4.5.3 Lower warning limit

Description

if the process value falls below this limit a warning is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	-9999997952 m/s

Related

Path	Setup → Process values → Sound velocity → Alarm and warning limits → Lower warning limit

3.2.4.5.4 Lower alarm limit

Description

If the process value falls below this limit an alarm is triggered.

Setting	-9999997952 m/s to +9999997952 m/s
Default	-9999997952 m/s

Related

Path	Setup → Process values → Sound velocity → Alarm and warning limits → Lower alarm limit

3.2.4.5.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0 m/s to +9999997952 m/s
Default	0.00 m/s

Related

Path	Setup → Process values → Sound velocity → Alarm and warning limits → Hysteresis

3.2.5 Density

3.2.5.1 Units

Description

Displays units for displayed density. Units are not applied at communication interface.

Read only.

Setting	µg/l (micrograms per liter); µg/m³ (micrograms per cubic meter); mg/l (milligrams per liter); g/ml (grams per milliliter); g/cm³ (grams per cubic centimeters); g/l (grams per liter); kg/l (kilograms per liter); kg/m³ (kilograms per cubic meter); lb/in³ (pounds per cubic inch); lb/gal (pounds per US gallon); lb/ft³ (pounds per cubic foot); STon/yd³ (1 STon = 2000 lb); custom units (see Custom units / Custom conversion factor)
Default	kg/m³ (kilograms per cubic meter)

Related

Path	Setup → Process values → Density → Units

3.2.5.2 Custom units

Description

User specific text string to define custom unit values. The custom unit can then be selected in the density units.

Setting	
Default	

Related

Path	Setup → Process values → Density → Custom units

3.2.5.3 Custom conversion factor

Description

Conversion factor for custom Density values based on SI density units kg/m³.

Setting	
Default	1.0

Related

Path	Setup → Process values → Density → Custom conversion factor

3.2.5.4 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Density → Decimal places

3.2.5.5 Alarm warning limits

3.2.5.5.1 Upper alarm limit

Description

If density value exceeds this limit an alarm is triggered.

Setting	0.00 kg/m³ to +10000.00 kg/m³
Default	900.00 kg/m³

Related

Path	Setup → Process values → Density → Alarm and warning limits → Upper alarm limit

3.2.5.5.2 Upper warning limit

Description

If density value exceeds this limit a warning is triggered.

Setting	0.00 kg/m³ to +10000.00 kg/m³
Default	890.00 kg/m³

Related

Path	Setup → Process values → Density → Alarm and warning limits → Upper warning limit

3.2.5.5.3 Lower warning limit

Description

if density value falls below this limit a warning is triggered.

Setting	0.00 kg/m³ to +10000.00 kg/m³
Default	1.00 kg/m³

Related

Path	Setup → Process values → Density → Alarm and warning limits → Lower warning limit

3.2.5.5.4 Lower alarm limit

Description

If density value falls below this limit an alarm is triggered.

Setting	0.00 kg/m³ to +10000.00 kg/m³
Default	1.00 kg/m³

Related

Path	Setup → Process values → Density → Alarm and warning limits → Lower alarm limit

3.2.5.5.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0.00 kg/m³ to +10000.00 kg/m³
Default	0.00 kg/m³

Related

Path	Setup → Process values → Density → Alarm and warning limits → Hysteresis

3.2.6 Kinematic viscosity

3.2.6.1 Units

Description

Units for kinematic viscosity.

Read only.

Setting	m^2/s (square meters per second); cSt (1 centistoke = 1 mm^2/s); St (stokes, 1St = 1cm^2/s)
Default	m^2/s (square meters per second)

Related

Path	Setup → Process values → Kinematic viscosity→ Units

3.2.6.2 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Kinematic viscosity → Decimal places

3.2.6.3 Alarm and warning limits

3.2.6.3.1 Upper alarm limit

Description

If process value exceeds this limit an alarm is triggered.

Setting	-9999997952 m^2/s to +9999997952 m^2/s
Default	+9999997952 m^2/s

Related

Path	Setup → Process values → Standard kinematic viscosity → Alarm and warning limits → Upper alarm limit

3.2.6.3.2 Upper warning limit

Description

If process value exceeds this limit a warning is triggered.

Setting	-9999997952 m²/s to +9999997952 m²/s
Default	+9999997952 m²/s

Related

Path	Setup → Process values → Kinematic viscosity → Alarm and warning limits → Upper warning limit

3.2.6.3.3 Lower warning limit

Description

If process value falls below this limit a warning is triggered.

Setting	-9999997952 m²/s to +9999997952 m²/s
Default	-9999997952 m²/s

Related

Path	Setup → Process values → Kinematic viscosity → Alarm and warning limits → Lower warning limit

3.2.6.3.4 Lower alarm limit

Description

If process value falls below this limit an alarm is triggered.

Setting	-9999997952 m²/s to +9999997952 m²/s
Default	-9999997952 m²/s

Related

Path	Setup → Process values → Kinematic viscosity → Alarm and warning limits → Lower alarm limit

3.2.6.3.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0.00 m²/s to +9999997952 m²/s
Default	0.00 m²/s

Related

Path	Setup → Process values → Kinematic viscosity → Alarm and warning limits → Hysteresis

3.2.7 Medium temperature

3.2.7.1 Units

Description

Select units for displayed temperature. Units are not applied at communication interface.

Setting	°C (degrees Celsius); °F (degrees Fahrenheit); °R (degrees Rankine); K (kelvins)
Default	°C (degrees Celsius)

Related

Path	Setup → Process values → Medium temperature → Units

3.2.7.2 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Process values → Medium temperature → Decimal places

3.2.7.3 Alarm and warning limits

3.2.7.3.1 Upper alarm limit

Description

Exceeding this limit causes an alarm.

Setting	-272.77 to +400.00 °C
Default	280.00 °C

Related

Path	Setup → Process values → Medium temperature → Alarm and warning limits → Upper alarm limit

3.2.7.3.2 Upper warning limit

Description

Exceeding this limit causes a warning.

Related

Setting	-272.77 to +400.00 °C
Default	270.00 °C

Related

Path	Setup → Process values → Medium temperature → Alarm and warning limits → Upper warning limit

3.2.7.3.3 Lower warning limit

Description

Falling below this limit causes a warning.

Setting	-272.77.00 to +400.00 °C
Default	-270.00 °C

Related

Path	Setup → Process values → Medium temperature → Alarm and warning limits → Lower warning limit

3.2.7.3.4 Lower alarm limit

Description

Falling below this limit causes an alarm.

Related

Setting	-272.77 to +400.00 °C
Default	-270.00 °C

Related

Path	Setup → Process values → Medium temperature → Alarm and warning limits → Lower alarm limit

3.2.7.3.5 Hysteresis

Description

Sets the hysteresis for alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	0.00 °C to +200.00 °C
Default	0.00 °C

Related

Path	Setup → Process values → Medium temperature → Alarm and warning limits → Hysteresis

3.3 Totalizers

3.3.1 Totalizer 1

3.3.1.1 Process value

Description

Select the process value to be totalized.

Setting	Mass flow; Volume flow
Default	Volume flow

Related

Path	Setup → Totalizers → Totalizer 1 → Process value

3.3.1.2 Units

Description

Select units for displayed Totalizer 1. The set of units depends on the selected process value. Units are not applied at communication interface.

Setting	Process value = Mass flow: g (grams); kg (kilograms); t (1 t = 1000 kg); STon (1 STon = 2000 lb); T (1 T = 2240 lb); oz (ounces); lb (pounds); Process value = Volume flow: l (liters); hl (hectoliters); m³ (cubic meters); gal (US gallons); i.gal (Imperial gallons); BBL31.5 (1 barrel = 31.5 US gallons); BBL31 (1 barrel = 31 US gallons); BBL42 (1 barrel = 42 US gallons); in³ (cubic inches); ft³ (cubic feet); yd³ (cubic yards);bush (bushels); Process value = Standard volume flow: Nl (normal liters); Nm³ (normal cubic meters); Sl (standard liters); Sft³ (standard cubic feet); Sm³ (standard cubic meters); custom units (see Custom units / Custom conversion factor)
Default	kg (kilograms)

Related

Path	Setup → Totalizers → Totalizer 1 → Units

3.3.1.3 Custom units

Description

User specific string to define custom unit Totalizer 1 values.

Setting	-
Default	-

Related

Path	Setup → Totalizers → Totalizer 1→ Custom units

3.3.1.4 Custom conversion factor

Description

Conversion factor for user specific standard mass flow values related to SI kg.

Setting	-
Default	1.0

Related

Path	Setup → Totalizers → Totalizer 1 → Custom conversion factor

3.3.1.5 Decimal places

Description

Sets the decimal places for the process value displayed in the local display.

Setting	Auto; No decimal place; 1 decimal place; 2 decimal places; 3 decimal places; 4 decimal places; 5 decimal places; 6 decimal places
Default	2 decimal places

Related

Path	Setup → Totalizers → Totalizer 1 → Decimal places

3.3.1.6 Direction

Description

Totalizer 1 direction.

Setting	Forward and backward; Forward; Backward; Hold
Default	Forward

Related

Path	Setup → Totalizers → Totalizer 1 → Direction

3.3.1.7 Fail-safe behaviour

Description

Behaviour of the totalizer during the occurrence of bad input value.

Setting	RUN; totalization is continued using the bad input value; HOLD; totalization is stopped; MEMORY; totalization is continued based on the last incoming good value
Default	RUN; totalization is continued using the bad input value

Related

Path	Setup → Totalizers → Totalizer 1 → Fail safe mode

3.3.1.8 Reset

Description

Reset totalizer to zero.

Setting	Cancel; OK
Default	Cancel

Related

Path	Setup → Totalizers → Totalizer 1 → Reset

3.3.1.9 Preset

Description

Reset Totalizer 1 to selected preset value.

After selecting OK the user is asked for the PRESET value. The PRESET value units depend on the selected Process value.
Therefore the range of the Preset value is for:

- Mass flow: -9999997952 kg to +9999997952 kg
- Volume flow: -9999997952 m³ to +9999997952 m³

Setting	Cancel; OK
Default	Cancel

Related

Path	Setup → Totalizers → Totalizer 1 → Preset

3.3.1.10 Alarm and warning limits

3.3.1.10.1 Upper alarm limit

Description

Alarm is triggered if Totalizer 1 value is above the limit.

Setting	Process value = Mass flow: -9999997952 kg to +9999997952 kg Process value = Volume flow: -9999997952 m³ to +9999997952 m³
Default	Process value = Mass flow: +9999997952 kg Process value = Volume flow: +9999997952 m³

Related

Path	Setup → Totalizers → Totalizer 1 → Alarm and warning limits → Upper alarm limit

3.3.1.10.2 Upper warning limit

Description

Warning is triggered if Totalizer 1 value is above the limit.

Setting	Process value = Mass flow: -9999997952 kg to +9999997952 kg Process value = Volume flow: -9999997952 m³ to +9999997952 m³
Default	Process value = Mass flow: +9999997952 kg Process value = Volume flow: +9999997952 m³

Related

Path	Setup → Totalizers → Totalizer 1 → Alarm and warning limits → Upper warning limit

3.3.1.10.3 Lower warning limit

Description

Warning is triggered if Totalizer 1 value is below the limit.

Setting	Process value = Mass flow: -9999997952 kg to +9999997952 kg Process value = Volume flow: -9999997952 m³ to +9999997952 m³
Default	Process value = Mass flow: -9999997952 kg Process value = Volume flow: -9999997952 m³

Related

Path	Setup → Totalizers → Totalizer 1 → Alarm and warning limits → Lower warning limit

3.3.1.10.4 Lower alarm limit

Description

Alarm is triggered if Totalizer 1 value is below the limit.

Setting	Process value = Mass flow: -9999997952 kg to +9999997952 kg Process value = Volume flow: -9999997952 m³ to +9999997952 m³
Default	Process value = Mass flow: -9999997952 kg Process value = Volume flow: -9999997952 m³

Related

Path	Setup → Totalizers → Totalizer 1 → Alarm and warning limits → Lower alarm limit

3.3.1.10.5 Hysteresis

Description

Hysteresis sets the alarm and warning limits. The hysteresis is the distance between the limits for activation and deactivation of an alarm/warning.

Setting	Process value = Mass flow: 0.00 kg to +9999997952 kg Process value = Volume flow: 0.00 m³ to +9999997952 m³
Default	Process value = Mass flow: 0.00 kg Process value = Volume flow: 0.00 m³

Related

Path	Setup → Totalizers → Totalizer 1 → Alarm and warning limits → Hysteresis

3.4 Inputs and outputs

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

Table 3- 1 Hardware and software configuration of the input/output channels

Channel	HW configuration (fixed when ordering)	SW configuration available to the user
1	Modbus	Modbus
2	Signal output	Outputs: • Current output (0/4-20 mA)
3	Relay output	Status Output: • Alarm class • Alarm item • NAMUR status signals
4	Signal input/output	Outputs: • Frequency ouput • Pulse output

Current output

All four channels can be configured as current output.

Current output configuration

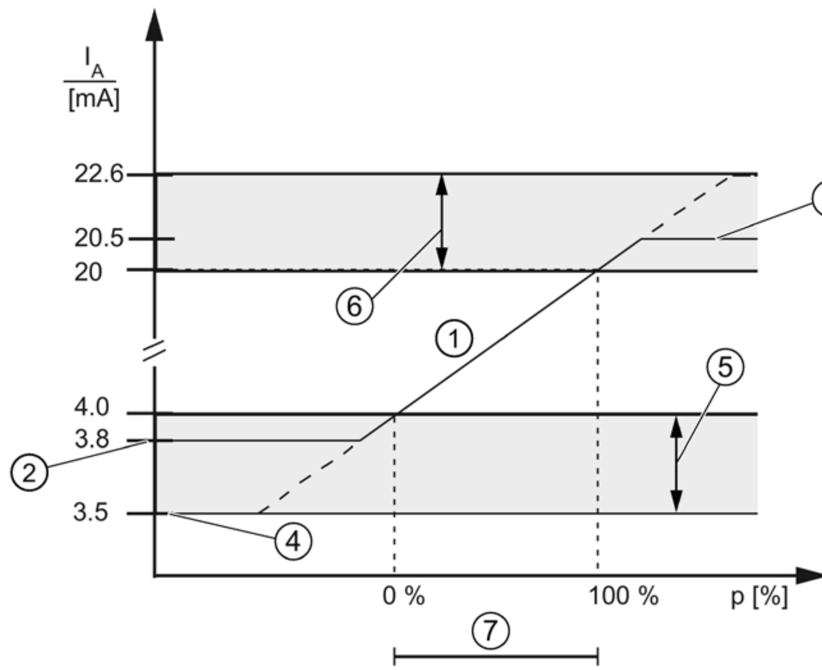
The following process values can be assigned to the current output:

- Volume flow
- Mass flow
- Sound velocity
- Flow velocity
- Density

- Medium temperature
- Kinematic viscosity

All process values are available for analog output channel 2 and frequency output channel 4.

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



① Linear control range
② Lower saturation limit
③ Upper saturation limit
④ Lower fault current value
⑤ Recommended setting range for lower fault current
⑥ Recommended setting range for upper fault current
⑦ Measuring range

Figure 3-1 Current limits for NAMUR configuration

The fail safe current output signal can be selected to:

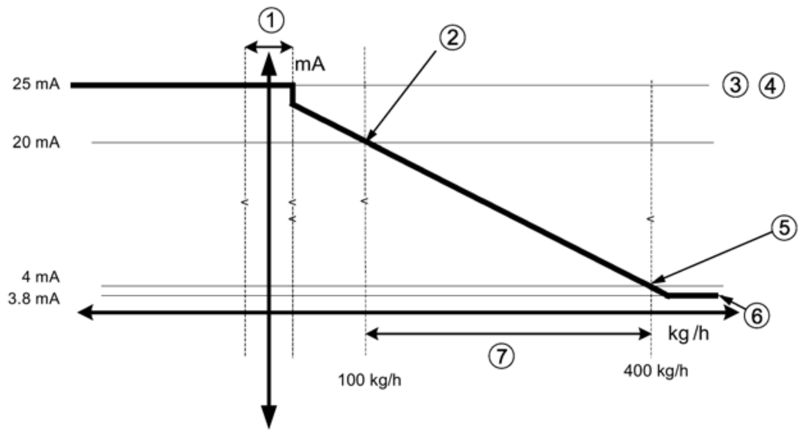
- Lower fault current (defined in the Loop current scale selection)
- Upper fault current (defined in the Loop current scale selection)
- Last valid value (the last process value before the failure occurred)
- Current value (actual measured value)
- Fail-safe value (within the range of 0 mA to 25 mA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

[1)] For channel 1 the range is 3.5 mA to 25 mA

Output scaling configuration

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

Positive flow with negative scaling

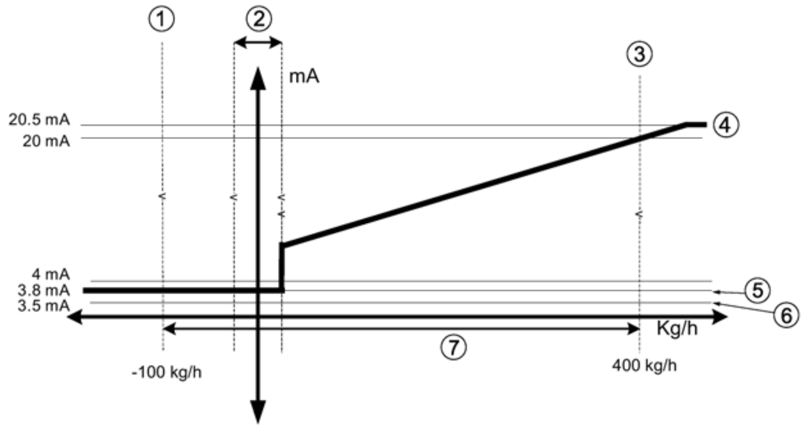


①	Low flow cut-off
②	Upper range value
③	Maximum output current
④	Upper fault current
⑤	Lower range value
⑥	Lower saturation limit
⑦	Span

Current output setting

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

Positive flow across zero with positive scaling

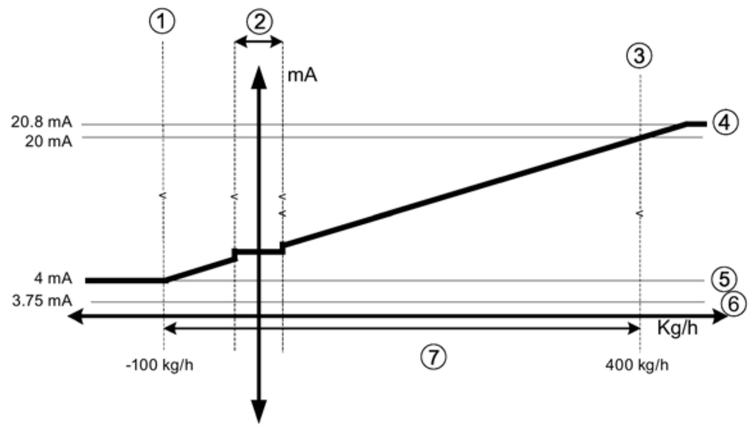


①	Lower range value
②	Low flow cut-off
③	Upper range value
④	Upper saturation limit
⑤	Lower saturation limit
⑥	Lower fault current
⑦	Span

Current output setting

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

Bidirectional flow across zero with positive scaling

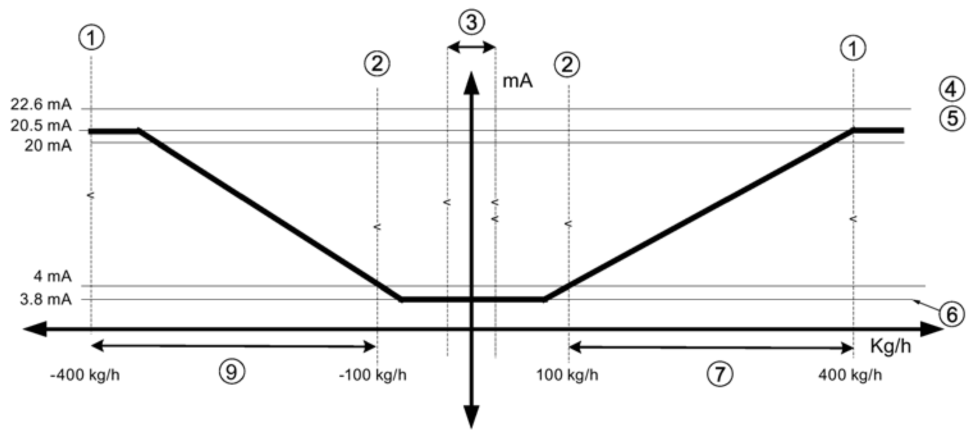


①	Lower range value
②	Low flow cut-off
③	Upper range value
④	Upper saturation limit
⑤	Lower saturation limit
⑥	Lower fault current
⑦	Span

Current output setting

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

Bidirectional flow with symmetrical scaling



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

Current output setting

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

Pulse output

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

Pulse repetition

Pulse repetition is calculated as follows:

$$\text{Pulse repetition} = \frac{\text{Amount per pulse}}{\text{Measured flow rate}}$$

FC0026.01

Example

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

Result:

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

$$\text{Pulse repetition} = \frac{\text{Amount per pulse}}{\text{Measured flow rate}}$$

FC0026.01

Note

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

Frequency output

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

Frequency is calculated as follows:

$$\text{Frequency} = \frac{\text{Measured mass flow value}}{\text{Upper range value - Lower range value}} \times \text{(Frequency value high - Frequency value low)}$$

Example

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

Frequency output configuration:

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

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

Result:

- Frequency = 4.5 kHz

Note

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

Status output

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

Note

Flow direction warning

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

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

3.4.1 Alarm status

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

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

Note

Alarm class / NAMUR status signals

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

Digital input

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

- Reset totalizer
  – Resets the totalizer when digital input is active.
- Start/Stop totalizer
  – Stops the totalizer when digital input is active, then resumes when the input is inactive.

Note

Changing polarity

Changing the polarity triggers the signal input to execute the set functionality.

3.4.2 Channel 2 - output

3.4.2.1 Operation mode

Description

Operation mode - Sets the output functionality for channel operation.

Setting	Off; Current output
Default	Off

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Operation mode

3.4.2.2 Active operation (read only)

Description

Shows application possibilities.

Setting	Active operation not possible, use passive wiring; Active operation possible, hardware is able to drive the current loop
Default	

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Active operation

3.4.2.3 Fail-safe activation condition

Description

Defines the condition the fail-safe behaviour of the channel becomes active and determines the channel availability.

Setting	Invalid process value; Maintenance alarm or Failure (NAMUR)
Default	Maintenance alarm or Failure (NAMUR)

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Fail-safe activation condition

3.4.2.4 Current output

3.4.3.4.1 Process value

Description

Select process value for the current output.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Medium temperature
Default	Mass flow

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Process value

3.4.3.4.2 Direction

Description

Flow direction filter applicable for process values mass flow/volume flow/flow velocity/standard volume flow rate (only hydrocarbon and gas applications).

Setting	Positive; Negative; Bidirectional; Bidirectional (symmetric)
Default	Positive

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Direction

3.4.3.4.3 Loop current scale

Description

Sets current output scaling according to desired measurement range.

Format:

<Nominal range> (<lower fault current>) <lower saturation limit> to <upper saturation limit> (<upper fault current>) [<Description>]

Setting	4 to 20 mA (3.50) 3.8 to 20.5 (22.6) NAMUR 4 to 20 mA (3.75) 4.0 to 20.8 (22.6) US 4 to 20 mA (0.00) 4.0 to 20.5 (22.0) 4 to 20 mA (2.00) 4.0 to 24.0 (25.0) 0 to 20 mA (0.00) 0.0 to 20.5 (22.0) 0 to 20 mA (0.00) 0.0 to 24.0 (25.0)
Default	4 to 20 mA (3.50) 3.8 to 20.5 (22.6) NAMUR

Related

Path	Setup → Inputs and outputs → Channel 2 -output → Current output → Loop current scale

3.4.3.4.4 Upper range value

Description

Sets value at 100% of measuring span and corresponds to a loop current of 20 mA.

Setting and Default are sensor specific, depending on the setting in Process value and depending on the Units setting.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	3682800.00 kg/h

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Upper range value

3.4.3.4.5 Lower range value

Description

Sets value at 0% of measuring span and corresponds to a loop current of 0/4 mA.

Setting and Default are sensor specific, depending on the setting in Process value and depending on the Units setting.

Setting	-3682800.00 kg/h to +3682800.00 kg/h
Default	0.00 kg/h

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Lower range value

3.4.3.4.6 Damping value

Description

Sets the Damping (filtering) to smooth out response to sudden changes in measurement.

An increase to Damping value increases response time of device, and affects digital value and loop current. If output values are noisy, increase Damping value. For faster response time, decrease Damping value. Find a value that meets requirements of signal stability and response time.

Setting	0.00 s to 100.00 s
Default	0.00 s

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Damping value

3.4.3.4.7 Fail-safe behaviour

Description

Current output reaction in case of a fault.

Setting	Lower fault current; Upper fault current; Last valid value; Current value; Fail-safe value
Default	Lower fault current

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Fail-safe behaviour

3.4.3.4.8 Fail-safe value

Description

Output value in case of a fault and when fail-safe behaviour configured to fail-safe value.

Setting	0.0 mA to 25.0 mA
Default	0.0 mA

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Fail-safe value

3.4.3.4.9 Fail-safe minimum time

Description

Minimum time the output stays in fail-safe mode.

Setting	0 s to 100 s
Default	0 s

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Current output → Fail-safe minimum time

3.4.2.5 Off delay

Description

Set the time delay between resetting alarm condition and de-activating the output.

Setting	0.0 s to 100.0 s
Default	0.0 s

Related

Path	Setup → Inputs and outputs → Channel 2 - output → Status output → Off delay

3.4.3 Channel 3 - relay

3.4.3.1 Operation mode

Description

Select the operation mode for the relay output.

Setting	Alarm class; Alarm item
Default	Alarm class

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Operation mode

3.4.3.2 Status mode

Description

Select the functionality for the status output.

Setting	Alarm class; Alarm item
Default	Alarm class

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Status mode

3.4.3.3 Sensor alarms (1)

Description

Selection of alarm items that impact the output. Mainly sensor alarms. Applicable if Status mode = Alarm item.

Setting	06 DSL Storage; 07 Flow measurement; 08 DSL internal; 14 Path 1: No signal; 26 Sensor temp. comp.; 28
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Sensor alarms (1)

3.4.3.4 Sensor alarms (2)

Description

Selection of alarm items that impact the output. Mainly sensor alarms. Applicable if Status mode = Alarm item.

Setting	34 Invalid flow meas.; 36 Configuration 2; 37 DSL system monitor
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Sensor alarms (2)

3.4.3.5 Process alarms (1)

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

Setting	96 Mass flow above alarm limit; 97 Mass flow above warning limit; 98 Mass flow below warning limit; 99 Mass flow below alarm limit; 100 Volume flow above alarm limit; 101 Volume flow above warning limit; 102 Volume flow below warning limit; 103 Volume flow below alarm limit; 104 Density above alarm limit; 105 Density above warning limit; 106 Density below warning limit; 107 Density below alarm limit; 108 Medium temp. above alarm limit; 109 Medium temp. above warning limit; 110 Medium temp. below warning limit; 111 Medium temp. below alarm limit
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Process alarms (1)

3.4.3.6 Process alarms (3)

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

For hydrocarbon and gas applications only.

Setting	228 Sound velocity above alarm limit; 229 Sound velocity above warning limit; 230 Sound velocity below warning limit; 231 Sound velocity below alarm limit; 232 Flow velocity above alarm limit; 233 Flow velocity above warning limit; 234 Flow velocity below warning limit; 235 Flow velocity below alarm limit; 244 Kin. viscosity above alarm limit; 245 Kin. viscosity above warning limit; 246 Kin. viscosity below warning limit; 247 Kin. viscosity below alarm limit
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Process alarms (3)

3.4.3.7 Process alarms (4)

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

For hydrocarbon and gas applications only.

Setting	285 Datalogging; 286 Datalogging; 287 Datalogging
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Process alarms (4)

3.4.3.8 Totalizer alarms

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

For hydrocarbon and gas applications only.

Setting	136 Totalizer 1 above alarm limit; 137 Totalizer 1 above warning limit; 138 Totalizer 1 - below warning limit; 139 Totalizer 1 below alarm
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Totalizer alarms

3.4.3.9 Device alarms

Description

Device alarms - If one of the selected events appears this affects the status icon, the related status output, and the alarm on the communication interface.

Setting	148 Transm. temp. above alarm limit; 149 Transm. temp. below alarm limit; 150 Sensor signal disrupted; 159 Internal error in transmitter
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Device alarms

3.4.3.10 Input/output alarms (1)

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

Availability of certain settings depends on Hardware and Software configuration.

Setting	195 CH2 loop cur. in lower saturation; 196 CH2 loop cur. in upper saturation; 197 CH2 cable break; 209 CH4 cable break; 210 CH4 output frequency too low; 211 CH4 output frequency too high; 212 CH4 pulse overflow; 214 Channel 2 simulated; 216 Channel 4 simulated; 217 Process values frozen; 218 All outputs forced; 219 CH2 loop current deviation; 222 Invalid register mapping; 223 Invalid coil configuration
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Input/output alarms

3.4.3.11 Simulation alarms (1)

Description

Selection of alarm items that impact the output. Mainly simulation alarms. Applicable if Status mode = Alarm item.

Setting	160 Mass flow simulated; 161 Volume flow simulated; 162 Density simulated; 163 Medium temp. simulated; 167 Totalizer 1 simulated
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Simulation alarms (1)

3.4.3.12 Simulation alarms (2)

Description

Selection of alarm items that impact the output. Applicable if Status mode = Alarm item.

Setting	289 Sound velocity simulated; 290 Flow velocity simulated; 292 Kin. viscosity simulated; 300 Std. Kin. viscosity simulated
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Simulation alarms (2)

3.4.3.13 Alarm class

Description

Selection of alarm classes which impact the status output. Each diagnostic event is allocated to an alarm class. Applicable if Status mode = Alarm class and Status icons = Standard.

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)

Setting	Maintenance alarm; Function check; Process value alarm; Process value warning; Maintenance demanded; Maintenance required; None
Default	

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Alarm class

3.4.3.14 NAMUR status signal

Description

Selection of NAMUR status signals which impact the status output. Each diagnostic event is allocated to a NAMUR status signal. Application if Status mode = Alarm class and Status icons = NAMUR

Setting	Failure; Function Check; Out of specification; Maintenance Required
Default	None

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → NAMUR status signal

3.4.3.15 Polarity

Description

Logical polarity of status output.

Setting	Active high level; Active low level
Default	Active high level

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Polarity

3.4.3.16 On delay

Description

Sets the time delay between alarm condition and activating the output.

Setting	0.0 s to 100.0 s
Default	0.0 s

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → On delay

3.4.3.17 Off delay

Description

Set the time delay between resetting alarm condition and de-activating the output.

Setting	0.0 s to 100.0 s
Default	0.0 s

Related

Path	Setup → Inputs and outputs → Channel 3 - relay → Off delay

3.4.4 Channel 4 - input/output

3.4.4.1 Operation mode

Description

Shows the configured Operation mode. Use Change operation mode to set the mode.

Read only.

Setting	Off; Frequency output; Pulse output
Default	Off

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Operation mode

3.4.4.2 Change operation mode

Description

Sets operation mode.

Setting	Off; Frequency output; Pulse output
Default	Off

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Change operation mode

3.4.4.3 Frequency output

3.4.3.3.1 Process value

Description

Select process value for the frequency output.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Medium temperature
Default	Volume flow

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output (4) → Frequency output → Process value

3.4.3.3.2 Direction

Description

Flow direction filter applicable for process values mass flow/volume flow/flow velocity/standard volume flow rate (only hydrocarbon and gas applications).

Setting	Positive; Negative; Bidirectional; Bidirectional (symmetric)
Default	Positive

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Direction

3.4.3.3.3 Frequency value high

Description

Upper frequency value. Upper nominal output range boundary.

Setting	0.0 Hz to 12500.0 Hz
Default	10000.0 Hz

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Frequency value high

3.4.3.3.4 Frequency value low

Description

Lower frequency value. Lower nominal output range boundary.

Setting	0.0 Hz to 12500.0 Hz
Default	0.0 Hz

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Frequency value low

3.4.3.3.5 Upper range value

Description

Sets value at 100% of measuring span and corresponds to Frequency value high.

Setting and Default are sensor specific, depending on the setting in Process value and depending on the Units setting.

Setting	-10800000000.00 kg/h to +10800000000.00 kg/h
Default	+10800000000.00 kg/h

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Upper range value

3.4.3.3.6 Lower range value

Description

Sets value at 0% of measuring span and corresponds to Frequency value low.

Setting and Default are sensor specific, depending on the setting in Process value and depending on the Units setting.

Setting	-108000000.00 kg/h to +10800000000.00 kg/h
Default	0.00 kg/h

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Lower range value

3.4.3.3.7 Damping value

Description

Time constant of damping filter for frequency output signal.

Setting	0.0 s to 100.0 s
Default	0.0 s

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Damping value

3.4.3.3.8 Fail-safe behaviour

Description

Frequency output reaction in case of a fault.

Setting	Minimum frequency; Maximum frequency; Last valid value; Current valid; fail-safe value
Default	Last valid value

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Fail-safe behaviour

3.4.3.3.9 Fail-safe minimum time

Description

Minimum time the output stays in fail-safe mode.

Setting	0 s to 100 s
Default	0 s

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Fail-safe minimum time

3.4.3.3.10 Fail-safe value

Description

Output value in case of a fault and when fail-safe mode configured to fail-safe value.

Setting	0.0 Hz to 12500.0 Hz
Default	0.0 Hz

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Frequency output → Fail-safe value

3.4.4.4 Pulse output

3.4.3.4.1 Process value

Description

Select process value for the pulse output.

Setting	Mass flow; Volume flow
Default	Volume flow

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Process value

3.4.3.4.2 Direction

Description

Flow direction filter.

Setting	Positive; Negative; Bidirectional; Bidirectional (symmetric)
Default	Positive

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Direction

3.4.3.4.3 Pulse units

Description

Units of pulse duration values of Ch4 in pulse mode.

Setting	Volume: l (liters); hl (hectoliters); m³ (cubic meters); gal (US gallons); i.gal (Imperial gallons); BBL31.5 (1 barrel = 31.5 US gallons); BBL31 (1 barrel = 31 US gallons); BBL42 (1 barrel = 42 US gallons); in³ (cubic inches); ft³ (cubic feet); yd³ (cubic yards); bush (bushels); Mass: g (grams); kg (kilograms); t (1 t = 1000 kg); STon (1 STon = 2000 lb); T (1 T = 2240 lb); oz (ounces); lb (pounds); custom units (see Custom units / Custom conversion factor
Default	l (liters)

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Pulse units

3.4.3.4.4 Custom units

Description

User specific string to define custom pulse units.

Setting	-
Default	-

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Custom units

3.4.3.4.5 Custom conversion factor

Description

Conversion factor for user specific pulse values.

Setting	-
Default	-

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse outputs → Custom conversion factor

3.4.3.4.6 Amount per pulse

Description

Amount of value to generate an output pulse.

Setting	0.0 l to 99999997952 l
Default	1.00 l

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Amount per pulse

3.4.3.4.7 Pulses per amount

Description

Number of pulses which will be output when configured amount is reached.

Setting	1 to 65535
Default	1

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Pulses per amount

3.4.3.4.8 Pulse width units

Description

Units of pulse duration value used to configure Ch4 pulse width.

Setting	s (seconds); ms (milliseconds); μs (micro seconds)
Default	s (seconds)

Related

Path	Setup → Inputs & outputs → Channel 4 - input/output → Pulse output → Pulse width units

3.4.3.4.9 Polarity

Description

Logical polarity of pulse output.

Setting	Active high level; Active low level
Default	Active high level

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Polarity

3.4.3.4.10 Fail-safe behaviour

Description

Current output reaction in case of a fault.

Setting	Last valid value; Hold; Current value; Fail-safe value
Default	Last valid value

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Fail safe behaviour

3.4.3.4.11 Fail-safe value

Description

Output value in case of a fault and when fail-safe behaviour configured to Fail-safe value.

Setting	0.0 pulses/s to 12500.0 pulses/s
Default	1.0 pulses/s

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Fail-safe value

3.4.3.4.12 Fail-safe minimum time

Description

Minimum time the output stays in fail safe mode.

Setting	0 s to 100 s
Default	0 s

Related

Path	Setup → Inputs and outputs → Channel 4 - input/output → Pulse output → Fail-safe minimum time

3.4.5 Channel 7 - digital input

3.4.5.1 Input function

Description

Shows the digital input function. Selects the signal input functionality.

Setting	Off; Reset totalizer 1
Default	Off

Related

Path	Setup → Inputs and outputs → Channel 7 - digital input → Input function

3.4.6 Channel 8 - digital input

3.4.6.1 Input function

Description

Shows the digital input function. Selects the signal input functionality.

3.4.6.2 Input function - settings

Setting	Off; Start/Stop totalizer 1 on level
Default	Off

Related

Path	Setup → Inputs and outputs → Channel 8 - digital input → Input function

3.5 Date and time

3.5.1 Current date and time

Description

Displays the current date and time.

Read only.

Setting	
Default	

Related

Path	Setup → Date and time → Current date and time

3.5.2 Set date and time

Sets current date and time for the device. This date and time is used for all timestamps of logged information.

Setting	
Default	

Related

Path	Setup → Date and time → Set date and time

3.6 Local display

3.6.1 FST020 - Display

The system can be configured to show up to six different views.

In view 1 only measurement or diagnostic views can be selected. In views 2 to 6 all view types can be selected.

Measurement views

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

Operation view

- Totalizer

Alarm view

- Alarm list

Diagnostic view

- Six diagnostic values

3.6.2 Brightness

Description

Adjust backlight level to improve local display conditions.

Setting	0%; 10%; 20%; 30%; 40%; 50%; 60%; 70%; 80%; 90%; 100%
Default	50%

Related

Path	Setup → Local display→ Brightness

3.6.3 Backlight

Description

Select between always on or backlight switch-off after 10 minutes..

Setting	Automatic; Always on
Default	Automatic (30 s)

Related

Path	Setup → Local display → Backlight

3.6.4 Contrast

Description

Adjust contrast to improve local display conditions.

Setting	0%; 10%; 20%; 30%; 40%; 50%; 60%; 70%; 80%; 90%; 100%
Default	80%

Related

Path	Setup → Local display → Contrast

3.7 Damping

3.7.1 Damping value

Description

The damping filter time constant.

Setting	0.0 to 100.0
Default	10 s

Related

Path	Setup → Local display → Damping → Damping value

3.7.2 Process values (1)

Description

Available process values for the meter.

Setting	Volume flow; Mass flow; Totalizer 1; Sound velocity; Flow velocity; Pressure; Kinematic viscosity; Density; Medium temperature
Default	

Related

Path	Setup → Local display → Damping → Process values (1)

3.7.3 Process values (2)

Description

Available process values for the meter.

Setting	API gravity; Standard API gravity; Specific gravity; Standard specific gravity; Rate of change
Default	Specific gravity

Related

Path	Setup → Local display → Damping → Process values (2)

3.8 View 1

3.8.1 View

Description

The display View 1 can be configured.

Setting	Single value; Three values; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values
Default	Three values

Related

If Single value is selected, **1st process value** must be configured.
If Three values is selected, **1st process value**, **2nd process value** and **3rd process value** must be configured.
If 1 value and bargraph is selected, **1st process value** must be configured.
If 1 value and graph is selected, **1st process value**, **Trend scale mode** and **Trend log time window** must be configured.
If Six values or Six diagnostic values is selected, **1st process value**, **2nd process value**, **3rd process value**, **4th process value**, **5th process value**, and **6th process value** must be configured.

Path	Setup → Local display → View 1 → View

3.8.2 1st value

Description

The display **1st process value** can be selected. This process value is shown in all view types.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Medium temperature
Default	Volume flow

Related

Path	Setup → Local display → View 1 → 1st value

3.8.3 Graph scale mode

Description

Graph scale mode

Setting	Auto; Fixed
Default	Auto

Related

Path	Setup → Local display → View 1 → Graph scale mode

3.8.4 2nd value

Description

The display **2nd process value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Density

Related

This parameter is only available if **View 1** is set to Three values, Six values or Six diagnostic values.

Path	Setup → Local display → View 1 → 2nd value

3.8.5 3rd value

Description

The display **3rd process value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Totalizer 2; Totalizer 3; Pressure; Medium temperature
Default	Medium temperature

Related

This parameter is only available if **View 1** is set to Three values, Six values or Six diagnostic values.

Path	Setup → Local display → View 1 → 3rd value

3.8.6 4th process value

Description

The display **4th process value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Process viscosity; Fluid temperature; Totalizer 1
Default	Sound velocity

Related

This parameter is only available if **View 1** is set to Six values or Six diagnostic values.

Path	Setup → Local display → View 1 → 4th process value

3.8.7 5th process value

Description

The display **5th process value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Process viscosity; Fluid temperature; Totalizer 1
Default	Process pressure

Related

This parameter is only available if **View 1** is set to Six values or Six diagnostic values.

Path	Setup → Local display → View 1 → 5th process value

3.8.8 6th process value

Description

The display **6th process value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Process viscosity; Fluid temperature; Totalizer 1
Default	Fluid temperature

Related

This parameter is only available if **View 1** is set to Six values or Six diagnostic values.

Path	Setup → Local display → View 1 → 6th process value

3.8.9 Trend scale mode

Description

The **Trend scale mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to 1 value and graph.

If Fixed is selected, **Trend scale lower limit** and **Trend scale upper limit** must be configured.

Path	Setup → Local display → View 1 → Trend scale mode

3.8.10 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 minute; 5 minutes; 15 minutes; 30 minutes; 1 hour; 2 hours; 3 hours
Default	5 minutes

Related

This parameter is only available if **View** is set to 1 value and graph.

Path	Setup → Local display → View 1 → Trend log time window

3.8.11 Trend scale lower limit

Description

The **Trend scale lower limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend scale mode** is set to Fixed.

Path	Setup → Local display → View 1 → Trend scale lower limit

3.8.12 Trend scale upper limit

Description

The **Trend scale upper limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend scale mode** is set to Fixed.

Path	Setup → Local display → View 1 → Trend scale upper limit

3.9 View 2

3.9.1 Enable or disable

Description

In this parameter View 2 can be enabled.

Setting	Disabled; Enabled
Default	Enabled

Related

If Enabled is selected, all parameters for View 2 must be configured.

Path	Setup → Local display → View 2 → Enable or disable

3.9.2 View

Description

The display View 2 can be configured.

Setting	Single value; Three values; Totalizer; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values; Alarm list
Default	Single value

Related

If Single value or Dosing is selected, **1st process value** must be configured.
If Three values is selected, **1st process value**, **2nd process value** and **3rd process value** must be configured.
If Totalizer or 1 value and graph is selected, **1st process value**, **Trend scale mode** and **Trend log time window** must be configured.
If 1 value and bargraph is selected, **1st process value** must be configured.
If Six values or Six diagnostic values is selected, **1st process value**, **2nd process value**, **3rd process value**, **4th process value**, **5th process value**, and **6th process value** must be configured.

Path	Setup → Local display → View 2 → View

3.9.3 1st value

Description

The display **1st Process Value** can be selected. This process value is shown in all view types.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Volume flow

Related

Path	Setup → Local display → View 2 → 1st value

3.9.4 2nd process value

Description

The display **2nd Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Density

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 2nd Process Value

3.9.5 3rd process value

Description

The display **3rd Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Fluid Temperature

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 3rd Process Value

3.9.6 4th process value

Description

The display **4th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Volumeflow

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 4th Process Value

3.9.7 5th process value

Description

The display **5th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Corrected Volume flow; Reference Density; Totalizer 1; Totalizer 2; Totalizer 3
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 5th Process Value

3.9.8 6th process value

Description

The display **6th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 6th Process Value

3.9.9 Trend scale mode

Description

The **Trend Scale Mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

If Fixed is selected, **Trend Scale Lower Limit** and **Trend Scale Upper Limit** must be configured.

Path	Setup → Display → View 2 → Trend Scale Mode

3.9.10 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 Minute; 5 Minutes; 15 Minutes; 30 Minutes; 1 Hour; 2 Hours; 3 Hours
Default	5 Minutes

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

Path	Setup → Display → View 2 → Trend log time window

3.9.11 Trend scale lower limit

Description

The **Trend Scale Lower Limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 2 → Trend Scale Lower Limit

3.9.12 Trend scale upper limit

Description

The **Trend Scale Upper Limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 2 → Trend Scale Upper Limit

3.10 View 3

3.10.1 Enable or disable

Description

In this parameter View 3 can be enabled.

Setting	Disabled; Enabled
Default	Enabled

Related

If Enabled is selected, all parameters for View 3 must be configured.

Path	Setup → Display → View 3 → Enable or disable

3.10.2 View

Description

The display View 3 can be configured.

Setting	Single value; Three values; Totalizer; Dosing; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values; Alarm list
Default	1 value and bargraph

Related

If Single value or Dosing is selected, **1st process value** must be configured.
If Three values is selected, **1st process value**, **2nd process value** and **3rd process value** must be configured.
If Totalizer or 1 value and graph is selected, **1st process value**, **Trend scale mode** and **Trend log time window** must be configured.
If 1 value and bargraph is selected, **1st process value** must be configured.
If Six values or Six diagnostic values is selected, **1st process value**, **2nd process value**, **3rd process value**, **4th process value**, **5th process value**, and **6th process value** must be configured.

Path	Setup → Display → View 3 → View

3.10.3 1st value

Description

The display **1st Process Value** can be selected. This process value is shown in all view types.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium Temperature
Default	Volume flow

Related

Path	Setup → Display → View 3 → 1st Value

3.10.4 Graphic scale mode

Description

Graphic scale mode

Setting	Auto; Fixed
Default	Auto

Related

Path	Setup → Display → View 3 → Graphic scale mode

3.10.5 2nd process value

Description

The display **2nd Process Value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium Temperature
Default	Flow velocity

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 2 → 2nd Process Value

3.10.6 3rd process value

Description

The display **3rd Process Value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium Temperature
Default	Sound velocity

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 3 → 3rd Process Value

3.10.7 4th process value

Description

The display **4th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Volumeflow

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 3 → 4th Process Value

3.10.8 5th process value

Description

The display **5th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 3 → 5th Process Value

3.10.9 6th process value

Description

The display **6th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 3 → 6th Process Value

3.10.10 Trend scale mode

Description

The **Trend Scale Mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

If Fixed is selected, **Trend Scale Lower Limit** and **Trend Scale Upper Limit** must be configured.

Path	Setup → Display → View 3 → Trend Scale Mode

3.10.11 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 Minute; 5 Minutes; 15 Minutes; 30 Minutes; 1 Hour; 2 Hours; 3 Hours
Default	5 Minutes

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

Path	Setup → Display → View 3 → Trend log time window

3.10.12 Trend scale lower limit

Description

The **Trend Scale Lower Limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 3 → Trend Scale Lower Limit

3.10.13 Trend scale upper limit

Description

The **Trend Scale Upper Limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 3 → Trend Scale Upper Limit

3.11 View 4

3.11.1 Enable or disable

Description

In this parameter View 4 can be enabled.

Setting	Disabled; Enabled
Default	Enabled

Related

If Enabled is selected, all parameters for View 4 must be configured.

Path	Setup → Display → View 4 → Enable or disable

3.11.2 View

Description

The display View 4 can be configured.

Setting	Single value; Three values; Totalizer; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values; Alarm list
Default	Six diagnostic values

Related

If Single Value or Dosing is selected, **1st Process Value** must be configured.
If Three Values is selected, **1st Process Value**, **2nd Process Value** and **3rd Process Value** must be configured.
If Totalizer or 1 Value and Graph is selected, **1st Process Value**, **Trend Scale Mode** and **Trend log time window** must be configured.
If 1 Value and Bargraph is selected, **1st Process Value** must be configured.
If Six Values or Six Diagnostic Values is selected, **1st Process Value**, **2nd Process Value**, **3rd Process Value**, **4th Process Value**, **5th Process Value**, and **6th Process Value** must be configured.

Path	Setup → Display → View 4 → View

3.11.3 1st value

Description

The display **1st Process Value** can be selected. This process value is shown in all view types.

Setting	Transmitter internal temperature; Ch3 value; Ch4 value; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Flow velocity path 1

Related

Path	Setup → Display → View 4 → 1st value

3.11.4 2nd value

Description

The display **2nd Process Value** can be selected.

Setting	Transmitter internal temperature; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Flow velocity path 1

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 4 → 2nd Value

3.11.5 3rd value

Description

The display **3rd Process Value** can be selected.

Setting	Transmitter internal temperature; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Sound velocity path 1

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 4 → 3rd Value

3.11.6 4th value

Description

The display **4th Process Value** can be selected.

Setting	Transmitter internal temperature; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Flow velocity path 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 4 → 4th Value

3.11.7 5th value

Description

The display **5th Process Value** can be selected.

Setting	Transmitter internal temperature; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Peak amplitude up path 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 4 → 5th value

3.11.8 6th value

Description

The display **6th Process Value** can be selected.

Setting	Transmitter internal temperature; Reynolds number; RxGain up path 1; RxGain down path 1; SNR up path 1; SNR down path 1; Sound velocity path 1; Flow velocity path 1; Delta time path 1; Travel time up path 1; Travel time down path 1; Correlation factor path 1; Percentage of bursts accepted path1; Peak amplitude up path 1; Peak amplitude down path 1; Min acc travel time path 1; Min acc travel time path 1; Max acc travel time path 1
Default	Flow velocity path 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 4 → 6th value

3.11.9 Trend scale mode

Description

The **Trend Scale Mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

If Fixed is selected, **Trend Scale Lower Limit** and **Trend Scale Upper Limit** must be configured.

Path	Setup → Display → View 4 → Trend Scale Mode

3.11.10 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 Minute; 5 Minutes; 15 Minutes; 30 Minutes; 1 Hour; 2 Hours; 3 Hours
Default	5 Minutes

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

Path	Setup → Display → View 4 → Trend log time window

3.11.11 Trend scale lower limit

Description

The **Trend Scale Lower Limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 4 → Trend Scale Lower Limit

3.11.12 Trend scale upper limit

Description

The **Trend Scale Upper Limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 4 → Trend Scale Upper Limit

3.12 View 5

3.12.1 Enable or disable

Description

In this parameter View 5 can be enabled.

Setting	Disabled; Enabled
Default	Enabled

Related

If Enabled is selected, all parameters for View 5 must be configured.

Path	Setup → Display → View 5 → Enable or disable

3.12.2 View

Description

The display View 5 can be configured.

Setting	Single value; Three values; Totalizer; Dosing; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values; Alarm list
Default	Three values

Related

If Single Value or Dosing is selected, **1st Process Value** must be configured.
If Three Values is selected, **1st Process Value**, **2nd Process Value** and **3rd Process Value** must be configured.
If Totalizer or 1 Value and Graph is selected, **1st Process Value**, **Trend Scale Mode** and **Trend log time window** must be configured.
If 1 Value and Bargraph is selected, **1st Process Value** must be configured.
If Six Values or Six Diagnostic Values is selected, **1st Process Value** , **2nd Process Value**,

3rd Process Value, **4th Process Value**, **5th Process Value**, and **6th Process Value** must be configured.

Path	Setup → Local display → View 5 → View

3.12.3 1st value

Description

The display **1st Process Value** can be selected. This process value is shown in all view types.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Totalizer 1

Related

Path	Setup → Display → View 5 → 1st value

3.12.4 2nd value

Description

The display **2nd Process Value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Density

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 5 → 2nd value

3.12.5 3rd value

Description

The display **3rd Process Value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Medium temperature

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 5 → 3rd value

3.12.6 4th process value

Description

The display **4th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Volumeflow

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 5 → 4th Process Value

3.12.7 5th process value

Description

The display **5th Process Value** can be selected.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Totalizer 1; Medium temperature
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 5 → 5th value

3.12.8 6th process value

Description

The display **6th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 5 → 6th Process Value

3.12.9 Trend scale mode

Description

The **Trend Scale Mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

If Fixed is selected, **Trend Scale Lower Limit** and **Trend Scale Upper Limit** must be configured.

Path	Setup → Display → View 5 → Trend Scale Mode

3.12.10 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 Minute; 5 Minutes; 15 Minutes; 30 Minutes; 1 Hour; 2 Hours; 3 Hours
Default	5 Minutes

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

Path	Setup → Display → View 5 → Trend log time window

3.12.11 Trend scale lower limit

Description

The **Trend Scale Lower Limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 5 → Trend Scale Lower Limit

3.12.12 Trend scale upper limit

Description

The **Trend Scale Upper Limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 5 → Trend Scale Upper Limit

3.13 View 6

3.13.1 Enable or disable

Description

In this parameter View 6 can be enabled.

Setting	Disabled; Enabled
Default	Enabled

Related

If Enabled is selected, all parameters for View 6 must be configured.

Path	Setup → Display → View 6 → Enable or disable

3.13.2 View

Description

The display View 6 can be configured.

Setting	Single value; Three values; Totalizer; Dosing; 1 value and bargraph; 1 value and graph; Six values; Six diagnostic values; Alarm list
Default	Alarm list

Related

If Single Value or Dosing is selected, **1st Process Value** must be configured.
If Three Values is selected, **1st Process Value**, **2nd Process Value** and **3rd Process Value** must be configured.
If Totalizer or 1 Value and Graph is selected, **1st Process Value**, **Trend Scale Mode** and **Trend log time window** must be configured.
If 1 Value and Bargraph is selected, **1st Process Value** must be configured.
If Six Values or Six Diagnostic Values is selected, **1st Process Value**, **2nd Process Value**, **3rd Process Value**, **4th Process Value**, **5th Process Value**, and **6th Process Value** must be configured.

Path	Setup → Local display → View 6 → View

3.13.3 1st process value

Description

The display **1st Process Value** can be selected. This process value is shown in all view types.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Massflow

Related

Path	Setup → Display → View 6 → 1st Process Value

3.13.4 2nd process value

Description

The display **2nd Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Density

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 6 → 2nd Process Value

3.13.5 3rd process value

Description

The display **3rd Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Fluid Temperature

Related

This parameter is only available if **View** is set to Three Values, Six Values or Six Diagnostic Values.

Path	Setup → Display → View 6 → 3rd Process Value

3.13.6 4th process value

Description

The display **4th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Volumeflow

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 6 → 4th Process Value

3.13.7 5th process value

Description

The display **5th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 6 → 5th Process Value

3.13.8 6th process value

Description

The display **6th Process Value** can be selected.

Setting	Mass flow; Volume flow; Density; Fluid Temperature; Totalizer 1
Default	Totalizer 1

Related

This parameter is only available if **View** is set to Six Values or Six Diagnostic Values.

Path	Setup → Display → View 6 → 6th Process Value

3.13.9 Trend scale mode

Description

The **Trend Scale Mode** can be selected with automatic scaling or fixed scaling.

Setting	Auto; Fixed
Default	Auto

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

If Fixed is selected, **Trend Scale Lower Limit** and **Trend Scale Upper Limit** must be configured.

Path	Setup → Display → View 6 → Trend Scale Mode

3.13.10 Trend log time window

Description

The **Trend log time window** logging period (time axis length) can be selected.

Setting	1 Minute; 5 Minutes; 15 Minutes; 30 Minutes; 1 Hour; 2 Hours; 3 Hours
Default	5 Minutes

Related

This parameter is only available if **View** is set to Totalizer or 1 Value and Graph.

Path	Setup → Display → View 6 → Trend log time window

3.13.11 Trend scale lower limit

Description

The **Trend Scale Lower Limit** defines the scaling lower limit of the value axis for the fixed mode.

Setting	
Default	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 6 → Trend Scale Lower Limit

3.13.12 Trend scale upper limit

Description

The **Trend Scale Upper Limit** defines the scaling upper limit of the value axis for the fixed mode.

Setting options	
Default setting	0

Related

This parameter is only available if **Trend Scale Mode** is set to Fixed.

Path	Setup → Display → View 6 → Trend Scale Upper Limit

3.14 Status icons

Description

Sets the type of status icons used for diagnostic events.

Setting	Standard; NAMUR
Default	Standard

Related

Path	Setup → Local display→ Status icons

Maintenance and diagnostics 4

4.1 Identification

4.1.1 Long tag

Sets a unique tag name for device. Limited to 32 characters.

Setting	User-configurable
Default	--------------------------------; 32 characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance and diagnostics → Identification → Long tag

4.1.2 Tag

Sets a unique short tag name for device or measurement point. Limited to 8 characters.

Setting	User-configurable
Default	--------------------------------; characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance & diagnostics → Identification → Tag

4.1.3 Descriptor

Sets unique description for device. Limited to 32 characters.

Setting	User-configurable
Default	----------------; 16 characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance and diagnostics → Identification → Descriptor

4.1.4 Message

Sets unique message for device. Limited to 32 characters.

Setting	User-configurable
Default	--------------------------------; 32 characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance and diagnostics → Identification → Message

4.1.5 Location

Sets unique location for device. Limited to 32 characters.

Setting	User-configurable
Default	--------------------------------; 32 characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance and diagnostics → Identification → Location

4.1.6 Installation date

Sets the installation date of the device.

Setting	User-configurable
Default	----------------; 16 characters (A, B, C, ... X, Y, Z, /, 1, 2, 3, ... 7, 8, 9)

Related

Path	Maintenance and diagnostics → Identification → Installation date

4.1.7 Manufacturer

Displays manufacturer of device.

Setting	
Default	SIEMENS

Related

Path	Maintenance and diagnostics → Identification → Manufacturer

4.1.8 Product name

Displays product name.

Setting	
Default	SITRANS FS230

Related

Path	Maintenance and diagnostics → Identification → Product name

4.1.9 Version (read only)

Description

The product **Version** according to order can be viewed.

Setting	
Default	WM int DSL

Related

Path	Maintenance and diagnostics → Identification → Version

4.1.10 Order number (read only)

Description

System order number (MLFB) can be viewed. The system order number consists of three parts. Also shown on the device nameplate.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → System order number

4.1.11 Serial number

Description

Displays transmitter serial number. Also shown on the device nameplate.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Serial number

4.1.12 FW version

Displays version number corresponding to software or firmware embedded in device.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → FW version

4.1.13 HW version

Displays version number corresponding to electronics hardware of device.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → HW version

4.1.14 Final assembly number

Displays number corresponding to materials and components used in final assembly of device.

Setting	0 to 4294967295
Default	0

Related

Path	Maintenance and diagnostics → Identification → Final assembly number

4.1.15 System type

Description

System type

Setting	SITRANS FUS; SITRANS FUH
Default	SITRANS FUS

Related

Path	Maintenance and diagnostics → Identification → System type

4.1.16 Transmitter electronics

4.1.16.1 HW version

Displays version number corresponding to electronics hardware of device.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → HW version

4.1.16.2 FW version

Displays version number corresponding to software or firmware embedded in device.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → FW version

4.1.16.3 Serial number

Description

Displays transmitter serial number. Also shown on the device nameplate.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Transmitter → Serial number

4.1.16.4 Order number

Displays order number for current device configuration.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Transmitter → Order number

4.1.16.5 Comm. interface serial number

Description

Communication interface serial number

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Transmitter → Comm. interface serial number

4.1.17 Local display

Description

Local display

Setting	HW version 1.01.00
Default	
Setting	FW version - 1.04.13-09
Default	
Setting	HMI cfg. version - 1.00.01.39
Default	

Related

Path	Maintenance and diagnostics → Identification → Local display

4.1.18 I/O electronics

Description

I/O electronics

Setting	FW version
Default	

Related

Path	Maintenance and diagnostics → Identification → I/O electronics

4.1.19 DSL

Description

Displays DSL versions

Setting	FW version
Default	

Related

Path	Maintenance and diagnostics → Identification → DSL

4.1.20 Sensor

4.1.20.1 Type (read only)

Description

The name of the digital sensor.

Path	Maintenance and diagnostics → Identification → Sensor → Type

4.1.20.2 Sensor type (read only)

Description

Identification of the sensor type. Used by the transmitter to enable technology-specific functionalities.

Path	Maintenance and diagnostics → Identification → Sensor → Sensor type

4.1.20.3 Serial number (read only)

Description

Unique frontend serial number.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Sensor → Frontend serial number

4.1.20.4 Sensor type (read only)

Description

Type of sensor.

Setting	SITRANS FSS200 (Clamp-on); SITRANS FSS600 (Clamp-on)
Default	

Related

Path	Maintenance and diagnostics → Identification → Sensor → Sensor type

4.1.20.5 Sensor firmware version (read only)

Description

Sensor firmware version.

Setting	
Default	

Related

Path	Maintenance and diagnostics → Identification → Sensor → Sensor firmware version

4.1.20.6 Frontend variant (read only)

Description

Frontend variant.

Setting	Remote/integrated; Compact
Default	

Related

Path	Maintenance and diagnostics → Identification → Sensor → Frontend variant

4.2 Diagnostic events

4.2.1 Active diagnostic events

Displays list of active events.

Path	Maintenance and diagnostics → Diagnostic events → Active events

4.2.2 Diagnostic log

Displays list of logged events.

Path	Maintenance and diagnostics → Diagnostic events → Diagnostic log

4.2.3 Clear diagnostic log

Description

The diagnostic log can be reset using this parameter.

Setting	Cancel; OK
Default	Cancel

Related

When you confirm the reset by selecting OK, the **Diagnostic log** will be cleared.

Path	Maintenance and diagnostics → Diagnostic events → Clear diagnostic log

4.2.4 Acknowledge mode

Description

The system can be configured to acknowledge the alarms automatically when they are gone (Auto), or it can be configured to require an acknowledgement from the operator (Manual).

Setting	Auto; Manual
Default	Auto

Path	Maintenance and diagnostics → Diagnostic events → Acknowledge mode

4.2.5 Transmitter detailed events (read only)

Description

Transmitter Detail Alarms menu is only visible in case an alarm with detailed alarm information is pending.

Setting	• DE10 Failed to read any data related page • DE11 Failed to read FATAL_ERROR_PAGE from • DE12 Failed to read SHUT_DOWN_PAGE from • DE21 The EEPROM data is inconsistent • DE22 Inconsistency of totalizer 1 values • DE26 parameter cache full • DE27 Unsupported sensor units • De28 Communications module not found • DE29 Incomplete sensor connected • DE30 Invalid sensor type
Default	Communication module not found

Path	Maintenance and diagnostics → Diagnostic events → Transmitter detailed events

4.2.6 Suppression time

Description

A coming event can be suppressed in order to prevent alarm flooding.

Setting	0 to 300 s
Default	0 s

Path	Maintenance and diagnostics → Diagnostic events → Suppression time

4.2.7 Enable alarms

4.2.7.1 Sensor events (1)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	05 DSL voltages; 06 DSL storage; 07 Flow measurement; 08 DSL internal; 14 Path 1: No Signal; 15 Path 2: No signal; 16 Path 3: No signal; 17 Path : No signal; 19 Electronics temp.; 22 Density calculation; 23 Medium temp. calc.; 24 Pressure calculation; 25 Viscosity calculation; 26 Sensor temp. comp.; 28 Configuration 1; 31 Sensor temp.
Default	-

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Sensor events (1)

4.2.7.2 Sensor events (2)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	34 Invalid flow meas.; 36 Configuration 2; 37 DSL system monitor
Default	-

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Sensor events (2)

4.2.7.3 Process events (1)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	228 Sound velocity above alarm limit; 229 Sound velocity above warning limit; 230 Sound velocity below warning limit; 231 Sound velocity below alarm limit; 232 Flow velocity above alarm limit; 233 Flow velocity above warning limit; 234 Flow velocity below warning limit; 235 Flow velocity below alarm limit; 244 Kin. viscosity above alarm limit; 245 Kin. viscosity above warning limit; 246 Kin. viscosity below warning limit; 247 Kin. viscosity below alarm limit
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Process events (1)

4.2.7.4 Process events (2)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	Various process alarms selectable
Default	-

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Process events (2)

4.2.7.5 Process events (3)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	228 Sound velocity above alarm limit; 229 Sound velocity above warning limit; 230 Sound velocity below warning limit; 231 Sound velocity below alarm limit; 232 Flow velocity above alarm limit; 233 Flow velocity above warning limit; 234 Flow velocity below warning limit; 235 Flow velocity below alarm limit; 244 Kin. viscosity above alarm limit; 245 Kin. viscosity above warning limit; 246 Kin. viscosity below warning limit; 247 Kin. viscosity
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Process events (3)

4.2.7.6 Process events (4)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	Various process alarms selectable
Default	-

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Process events (4)

4.2.7.7 Totalizer events

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	136 Totalizer 1 above alarm limit; 137 Totalizer 1 above warning limit; 138 Totalizer 1 below warning limit; 139 Totalizer 1 below alarm limit
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Totalizer events

4.2.7.8 Device events

Description

If one of the selected events appears this affects the status icon, the related status output and the alarm on the communication interface.

Setting	148 Transm. temp. above alarm limit; 149 Transm. temp. below alarm limit; 150 Sensor signal disruption; 159 Internal error in transmitter
Default	

Related

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Device events

4.2.7.9 Simulation events (1)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	160 Mass flow simulated; 161 Volume flow simulated; 162 Density simulated; 163 Medium temp. simulated; 167 Totalizer 1 simulated
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Simulation events (1)

4.2.7.10 Simulation events (2)

Description

Various sensor alarms can be enabled to show in the display and on the output if they occur.

Setting	289 Sound velocity simulated; 290 Flow velocity simulated; 292 Kin. viscosity simulated
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Simulation events (2)

4.2.7.11 Input/output events (1)

Description

If one of the selected events appears this affects the status icon, the related status output and the alarm on the communication interface.

Setting	214 Channel 2 simulated; 215 Channel 3 simulated; 217 Process values frozen; 218 All outputs forced
Default	

Related

The selected events will be shown in the display when they occur. Furthermore, they will be indicated on the output if **Output (2)**, **Input/output (3)** and/or **Input/output (4)** is set to Status output and **Status mode** is set to Alarm item.

Path	Maintenance and diagnostics → Diagnostic events → Enable alarms → Input/output events (1)

4.2.8 Assign alarm class

4.2.8.1 14 - Path 1: No signal

Description

Warning alarms for Path 1

Setting	Process value warning; Maintenance demanded; Maintenance required
Default	Maintenance required

Path	Maintenance and diagnostics → Diagnostic events → Assign alarm class → 14 - Path 1: No signal

4.2.8.2 148 - Transm. temp. above alarm limit

Description

This event can be mapped to an alarm class respective NAMUR status signal.

Setting	Process value alarm (PA) resp. Out of specification; Maintenance alarm resp. Failure
Default	Process value alarm (PA) resp. Out of specification

Path	Maintenance and diagnostics → Diagnostic events → Assign alarm class → 148 - Transm. temp. above alarm limit

4.2.8.3 149 - Transm. temp. below alarm limit

Description

This event can be mapped to an alarm class respective NAMUR status signal.

Setting	Process value alarm (PA) resp. Out of specification; Maintenance alarm resp. Failure
Default	Process alarm (PA) resp. Out of specification

Path	Maintenance and diagnostics → Diagnostic events → Assign alarm class → 149 - Transm. temp. below alarm limit

4.3 Maintenance

4.3.1 Copy configuration

Description

Copy configuration - copy configurations from the SensorFlash to the device.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Copy configuration

4.3.2 Spare part replacement

4.3.2.1 Transmitter

4.3.2.1.1 Replace transmitter

Description

Only Siemens authorized personnel may replace spare parts.

Access level: Expert user only.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Spare part replacement → Transmitter → Replace transmitter

4.3.2.2 Operating time

4.3.2.2.1 Operating time

Description

Operating time - Indicates the operating time of the transmitter since the last power up.

Description

Operating time total - Indicates the total operating time of the transmitter since the last power up.

4.3.3 Electronic part identification

4.3.3.1 Transmitter cassette

4.3.3.1.1 HW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Transmitter cassette → HW version

4.3.3.1.2 FW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Transmitter cassette → FW version

4.3.3.1.3 Serial number (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Transmitter cassette → Serial number

4.3.3.1.4 Comm. HW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Transmitter cassette → Comm. HW version

4.3.3.1.5 Comm. serial number (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Transmitter cassette → Comm. serial number

4.3.3.2 Local display

4.3.3.2.1 HW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Local display → HW version

4.3.3.2.2 FW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Local display → FW version

4.3.3.2.3 HMI config. version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Local display → HMI config. version

4.3.3.3 I/O cassette

4.3.3.3.1 FW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → I/O cassette → FW version

4.3.3.3.2 Serial number (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → I/O cassette → Serial number

4.3.3.4 Sensor cassette

4.3.3.4.1 FW version (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Sensor cassette → FW version

4.3.3.4.2 Serial number (expert)

Description

Only Siemens authorized personnel may replace spare parts.

Setting	Cancel; OK
Default	Cancel

Path	Maintenance and diagnostics → Maintenance → Electronic part identification → Sensor cassette → Serial number

4.4 Diagnostics

4.4.1 Sensor

4.4.1.1 Receiver signal

Description

Receiver signal

Path	Maintenance and diagnostics → Diagnostics → Sensor → Receiver signal

4.4.1.2 Reynolds number (read only)

Description

Calculated Reynolds number.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Reynolds number

4.4.1.3 Path 1

4.4.1.3.1 RxGain up (read only)

Description

Rx gain of upstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → RxGain up

4.4.1.3.2 RxGain down (read only)

Description

Rx gain of downstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → RxGain down

4.4.1.3.3 SNR up (read only)

Description

Signal to noise ration of upstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → SNR up

4.4.1.3.4 SNR down (read only)

Description

Signal to noise ration of downstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → SNR down

4.4.1.3.5 Sound velocity (read only)

Description

Sound velocity.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Sound velocity

4.4.1.3.6 Flow velocity (read only)

Description

Flow velocity.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Flow velocity

4.4.1.3.7 Delta time (read only)

Description

Delta time.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Delta time

4.4.1.3.8 Travel time up (read only)

Description

Travel time of upstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Travel time up

4.4.1.3.9 Travel time down (read only)

Description

Travel time of downstream signal.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Travel time down

4.4.1.3.10 Correlation factor (read only)

Description

Correlation factor.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Correlation factor

4.4.1.3.11 Actual sensor frequency (read only)

Description

Sensor frequency.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Actual sensor frequency

4.4.1.3.12 Peak amplitude up (read only)

Description

Operating time of frontend since last power-up.

Path	Maintenance and diagnostics → Diagnostics → Sensor → Path 1 → Peak amplitude up

4.4.2 Temperature monitoring

4.4.2.1 Medium temperature

Description

Medium temperature

Setting	4.00 °C
Default	-

Related

Path	Maintenance and diagnostics → Diagnostic → Temperature monitoring → Medium temperature → Current value

4.4.2.2 Transmitter electronics temperature

4.4.2.2.1 Current value (read only).

Description

Measured value of transmitter internal temperature.

Path	Maintenance and diagnostics → Diagnostics → Temperature monitoring → Transmitter temperature → Current value

4.4.2.2.2 Minimum (read only)

Description

Drag indicator of minimum transmitter internal temperature.

Path	Maintenance and diagnostics → Diagnostics → Temperature monitoring → Transmitter electronics temperature → Minimum

4.4.2.2.3 Timestamp at minimum value (read only)

Description

Shows timestamp of recorded minimum transmitter internal temperature.

Path	Maintenance and diagnostics → Diagnostics → Temperature monitoring → Transmitter electronics temperature → Timestamp at minimum value

4.4.2.2.4 Maximum (read only)

Description

Drag indicator of maximum transmitter internal temperature.

Path	Maintenance and diagnostics → Diagnostics → Temperature monitoring → Transmitter electronics temperature → Maximum

4.4.2.2.5 Timestamp at maximum value (read only)

Description

Shows timestamp of recorded maximum transmitter internal temperature.

Path	Maintenance and diagnostics → Diagnostics → Temperature monitoring → Transmitter electronics temperature → Timestamp at maximum value

4.4.3 Inputs and outputs

4.4.3.1 Channel 2 - output

4.4.3.1.1 Operation mode (read only)

Description

The set Operation mode can be viewed in this parameter.

Options	Off; Current output
Default	Current output

Related

In this parameter the setting of **Operation mode** is read only.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 2 - output → Operation mode

4.4.3.1.2 Status output signal (read only)

Description

The channel value can be viewed in this parameter.

Related

if **Operation mode** is set to Current output, this parameter will show the current output value.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 2 - output → Channel value

Description

The error status of the channel can be viewed in this parameter.

Options	Overflow; Underflow; Fail--safe behaviour active; Cable break; Loop current deviation - Output current cannot be established (read back deviation > 0.1 mA)

Operation mode is set to Current output

Options	Overflow; Underflow; Fail-safe behaviour active

Operation mode is set to Frequency output

Options	The pulse output has reached maximum pulse output frequency; Fail-safe behaviour active

Operation mode is set to Pulse output

Related

This parameter is only available if **Operation mode** is set to Current output, Frequency output or Pulse output.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 2 - output → Error status

4.4.3.2 Channel 3 - relay

4.4.3.2.1 Channel 3 - relay

Description

The channel value can be viewed in this parameter.

Related

This parameter is only available if **Operation mode** is set to On.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 3 - relay → Channel value

4.4.3.3 Channel 4 - Input/output

4.4.3.3.1 Operation mode - (read only)

Description

The set Operation mode can be viewed in this parameter.

Setting	Off; Frequency output; Pulse output
Default	Off

Related

In this parameter the setting of **Operation mode** is read only.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 4 - input/output → Operation mode

4.4.3.3.2 Channel value

Description

The channel value can be viewed in this parameter.

Related

If **Operation mode** is set to Frequency output, this parameter will show the frequency output value.

If **Operation mode** is set to Pulse output, this parameter will show the pulse output value.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 4 - input/output → Channel value

4.4.3.3.3 Error status (read only)

Description

The error status of the channel can be viewed in this parameter.

Options	Overflow; Underflow; Fail-safe behaviour is activated

Operation mode is set to Frequency output

Options	The pulse output has reached maximum pulse output frequency; Fail-safe behaviour is activated

Operation mode is set to Pulse output

Options	The pulse output has reached maximum pulse output frequency; Fail-safe behaviour is activated

Operation mode is set to Pulse output

Related

This parameter is only available if **Operation mode** is set to Current output, Frequency output, Pulse output or Current input.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 4 - input/output→ Error status

4.4.3.3.4 Pulse counter (read only)

Description

This parameter shows the number of pulses since startup/last reset.

Related

This parameter is only available if **Operation mode** is set to Pulse output.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 4 - input/output → Pulse counter

4.4.3.3.5 Reset pulse counter

Description

The pulse counter can be reset.

Setting	Cancel; OK
Default	Cancel

Related

This parameter is only available if **Operation mode** is set to Pulse output.

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Channel 4 - input/output → Reset pulse counter

4.4.3.4 Calibration picture

Description

Calibration picture

Setting	
Default	mA

Related

Path	Maintenance and diagnostics → Diagnostics → Inputs and outputs → Calibration picture

4.5 Peak values

4.5.1 Process value 1

4.5.1.1 Process value

Description

Assign the process value to be monitored.

Setting	Disabled; Volume flow; Mass flow; Sound velocity; Flow velocity; Density; Medium temperature; Kinematic viscosity; Totalizer 1
Default	Disabled

Related

If this parameter is set to any other setting than Disabled, parameters **Maximum value**, **Timestamp at maximum value**, **Minimum value**, **Timestamp at Minimum value**, and **Reset logging** will be available.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Process value

4.5.1.2 Maximum

Displays maximum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Maximum value

4.5.1.3 Timestamp at maximum

Displays timestamp when maximum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Maximum value timestamp

4.5.1.4 Minimum

Displays minimum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Minimum value

4.5.1.5 Timestamp at minimum

Displays timestamp when minimum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Minimum value timestamp

4.5.1.6 Reset peak values

Description

This command is used to reset the logging of the recorded maximum and minimum values monitored. The drag pointers will be set to the current value.

Setting	Cancel; Ok
Default	Cancel

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 1 → Reset logging

4.5.2 Process value 2

4.5.2.1 Process value

Description

Assign the process value to be monitored.

Setting	Disabled; Volume flow; Mass flow; Sound velocity; Flow velocity; Density; Medium temperature; Kinematic viscosity; Totalizer 1
Default	Disabled

Related

If this parameter is set to any other setting than Disabled, parameters **Maximum value**, **Maximum value timestamp**, **Minimum value**, **Minimum value timestamp** and **Reset logging** will be available.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Process value

4.5.2.2 Maximum

Displays maximum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Maximum value

4.5.2.3 Timestamp at maximum

Displays timestamp when maximum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Maximum value timestamp

4.5.2.4 Minimum

Displays minimum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Minimum value

4.5.2.5 Timestamp at minimum

Displays timestamp when minimum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Minimum value timestamp

4.5.2.6 Reset peak values

Description

This command is used to reset the logging of the recorded maximum and minimum values monitored. The drag pointers will be set to the current value.

Setting	Cancel; Ok
Default	Cancel

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 2 → Reset logging

4.5.3 Process value 3

4.5.3.1 Process value

Description

Assign the process value to be monitored.

Setting	Disabled; Volume flow; Mass flow; Sound velocity; Flow velocity; Density; Medium temperature; Kinematic viscosity; Totalizer 1
Default	Disabled

Related

If this parameter is set to any other setting than Disabled, parameters **Maximum value**, **Maximum value timestamp**, **Minimum value**, **Minimum value timestamp**, and **Reset logging** will be available.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Process value

4.5.3.2 Maximum

Displays maximum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Maximum value

4.5.3.3 Timestamp at maximum

Displays timestamp when maximum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Maximum value timestamp

4.5.3.4 Minimum

Displays minimum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Minimum value

4.5.3.5 Timestamp at minimum

Displays timestamp when minimum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Minimum value timestamp

4.5.3.6 Reset peak values

Description

This command is used to reset the logging of the recorded maximum and minimum values monitored. The drag pointers will be set to the current value.

Setting	Cancel; Ok
Default	Cancel

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 3 → Reset logging

4.5.4 Process value 4

4.5.4.1 Process value

Description

Assign the process value to be monitored.

Setting	Disabled; Volume flow; Mass flow; Sound velocity; Flow velocity; Density; Medium temperature; Kinematic viscosity; Totalizer 1
Default	Disabled

Related

If this parameter is set to any other setting than Disabled, parameters **Maximum value**, **Maximum value timestamp**, **Minimum value**, **Minimum value timestamp**, and **Reset logging** will be available.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Assign process value

4.5.4.2 Maximum

Displays maximum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Maximum value

4.5.4.3 Timestamp at maximum

Displays timestamp when maximum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Maximum value timestamp

4.5.4.4 Minimum

Displays minimum measured value.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Minimum value

4.5.4.5 Timestamp at minimum

Displays timestamp when minimum value measured.

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Minimum value timestamp

4.5.4.6 Reset peak values

Description

This command is used to reset the logging of the recorded maximum and minimum values monitored. The drag pointers will be set to the current value.

Setting	Cancel; Ok
Default	Cancel

Related

This parameter is only available if **Process value** is **not** set to Disabled.

Path	Maintenance and diagnostics → Peak values → Process value 4 → Reset logging

4.6 Characteristics

4.6.1 Transmitter

4.6.1.1 Design (read only)

Description

Information about the main design features of the transmitter.

Path	Maintenance and diagnostics → Characteristics → Transmitter → Design

4.7 SensorFlash

4.7.1 Eject

Description

Eject Sensor Flash card

Setting	Cancel; Ok
Default	Cancel

Related

Path	Maintenance and diagnostics → SensorFlash → Eject

4.7.2 Installed (read only)

Description

Shows the status of the SD card.

Setting	SensorFlash not installed; SensorFlash installed; SensorFlash used as mass storage device
Default	SensorFlash installed

Related

Path	Maintenance and diagnostics → SensorFlash → Installed

4.7.3 Capacity total (read only)

Description

Total capacity of installed SensorFlash.

Shows INSERT CARD if card is not installed.

Setting	
Default	GB

Related

Path	Maintenance and diagnostics → SensorFlash → Capacity total

4.7.4 Capacity available (read only)

Description

Free capacity of installed SensorFlash.

Shows INSERT CARD if card is not installed.

Setting	
Default	GB

Related

Path	Maintenance and diagnostics → SensorFlash → Capacity available

4.7.5 Data logging

4.7.5.1 Activation

Description

Activation - turns on and off data logging activation

Setting	Off; On
Default	Off

Related

If this parameter is set to Enabled, the parameters **Logging value 1** through **Logging value 20** can be configured.

Path	Maintenance and diagnostics → SensorFlash → Data logging → Activation

4.7.5.2 Data logging mode

Description

Select between a momentary value or an averaged value calculated over one logging interval.

Setting	Log instantaneous, Log average value
Default	Log instantaneous

Related

Path	Maintenance and diagnostics → SensorFlash → Data logging → Data logging mode

4.7.5.3 Logging interval

Description

Defines the interval for logging. Granularity is 10 ms.

Setting	10 ms; 20 ms; 100 ms; 200 ms; 500 ms; 1 s; 5 s; 10 s; 15 s; 30 s; 1 min; 5 min; 15 min; 30 min; 1 h; 2 h; 4 h; 6 h; 12 h; 24 h
Default	5 s

Related

Path	Maintenance and diagnostics → SensorFlash → Data logging → Logging interval

4.7.5.4 Process values

4.7.5.4.1 Logging value 1...20

Description

The process value to be logged can be selected in this parameter.

Logged process values are an indicator that you have to stop logging before you can change the logged process values.

Setting	Disabled; Volume flow; Mass flow; Sound velocity; Flow velocity; Density; Medium temperature; Kinematic viscosity; Totalizer 1
Default	Disabled

Related

This parameter is only available if **Data logging** is enabled.

Path	Maintenance and diagnostics → SensorFlash → Data logging → Process values → Logging value 1...20

4.8 Simulation

4.8.1 Simulation Inputs/outputs

4.8.1.1 Channel 2 - output

4.8.1.1.1 Operation mode

Description

Set the output functionality you want the channel to operate.

Setting	Off; Current output
Default	Off

Related

The setting of this parameter affects the setting options in parameter **Simulation value.**

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 2 - output → Operation mode

4.8.1.1.2 Simulation

Description

Enables or disables simulation of channel 2 current output.

Setting	Disabled; Enabled
Default	Disabled

Related

Only if this parameter is set to Enabled, then the setting of parameter **Simulation value** will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 2 - output → Simulation

4.8.1.1.3 Simulation value

Description

Set the current value to be output on the channel when current output simulation is enabled.

Setting	0 mA to 25 mA
Default	0 mA

Operation mode is set to Current output

Related

Only if parameter **Simulation** is set to Enabled, the setting of this parameter will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 2 - output → Simulation value

4.8.1.2 Channel 3 - relay

4.8.1.2.1 Simulation

Description

Enables or disables simulation of channel 3 relay output.

Setting	Disabled; Enabled
Default	Disabled

Related

Only if this parameter is set to Enabled, then the setting of parameter **Simulation value** will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 3 - relay → Simulation

4.8.1.2.2 Simulation value

Description

Relay output value to be output when simulation is enabled.

Setting	0; 1
Default	0

Related

Only if parameter **Simulation** is set to Enabled, then the setting of this parameter will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 3 - relay → Simulation value

4.8.1.3 Channel 4 - Input/output

4.8.1.3.1 Operation mode

Description

Set the output functionality you want the channel to operate.

Setting	Off; Frequency output; Pulse output
Default	Off

Related

The setting of this parameter affects the setting options in parameter **Simulation value.**

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 4 - input/output → Operation mode

4.8.1.3.2 Simulation

Description

Enables or disables simulation of Channel 4 input/output.

Setting	Disabled; Enabled
Default	Disabled

Related

Only if this parameter is set to Enabled, then the setting of parameter **Simulation value** will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 4 - input/output → Simulation

4.8.1.3.3 Simulation value

Description

Set the frequency value to be output on the channel when frequency output simulation is enabled.

Set the pulse value to be output on the channel when pulse output simulation is enabled.

Setting	0.0 Hz to 12500.0 Hz
Default	1.0 Hz

Operation mode is set to Frequency output

Setting	0.0 pulses/s to 12500.0 pulses/s
Default	0.0

Operation mode is set to Pulse output

Related

Only if parameter **Simulation** is set to Enabled, then the setting of this parameter will be relevant.

Path	Maintenance and diagnostics → Simulation → Simulation inputs and outputs → Channel 4 - input/output → Simulation value

4.8.2 Simulation process values

4.8.2.1 Enable simulation

Description

Select the process value(s) to be simulated.

Setting	Volume flow; Mass flow; Flow velocity; Sound velocity; Density; Kinematic viscosity; Medium temperature
Default	None selected

Related

Only if process values are marked in this parameter, the setting of **Simulated value** under each relevant process value becomes relevant.

Path	Maintenance and diagnostics → Simulation → Simulation process values → Enable simulation

4.8.2.2 Volume flow

Simulation value

Description

Set the Volume flow value to be simulated.

Setting	-10800000000.0 m^3/h to +10800000000.0 m^3/h
Default	0.0 m^3/h

Related

Only if Volume flow is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Volume flow → Simulation value

4.8.2.3 Mass flow

Simulation value

Description

Set the Mass flow value to be simulated.

Setting	-10800000000.000001 kg/h to +10800000000.000001 kg/h
Default	0.0 kg/h

Related

Only if Mass flow is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Mass flow → Simulation value

4.8.2.4 Flow velocity

Simulation value

Description

Set the Flow velocity value to be simulated.

Setting	-400 m/s to +400 m/s
Default	0.0 m/s

Related

Only if Flow velocity is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Flow velocity → Simulation value

4.8.2.5 Sound velocity

Simulation value

Description

Set the Sound velocity value to be simulated.

Setting	100.0 m/s to 25000.0
Default	1500.0 m/s

Related

Only if Sound velocity is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Sound velocity → Simulation value

4.8.2.6 Density

Simulation value

Description

Set the Density value to be simulated.

Setting	0.0 kg/m³ - 10000.0 kg/m³
Default	1000.0 kg/m³

Related

Only if Density is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Density → Simulation value

4.8.2.7 Kinematic viscosity

Simulation value

Description

Set the Kinematic viscosity value to be simulated.

Setting	The range is shown as minimum and maximum values in the HMI.
Default	0.000001 m^2/s

Related

Only if Kinematic viscosity is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Kinematic viscosity → Simulation value

4.8.2.8 Medium temperature

Simulation value

Description

Set the Medium temperature value to be simulated.

Setting	-273.0 °C (-459.399994 °F) to +400.0 °C (752.0 °F)
Default	20.0 °C (68 °F)

Related

Only if Medium temperature is marked in **Enable simulation**, then the setting of this parameter will be relevant.

The range and default setting are dependent on the selected **Unit.**

Path	Maintenance and diagnostics → Simulation → Simulation process values → Medium temperature → Simulation value

4.8.3 Simulate alarms

4.8.3.1 Simulation mode

Description

The alarm simulation mode can be configured in this parameter.

Setting	Off; Simulate alarm (ID number); Simulate alarm class
Default	Off

Related

If **Simulation mode** is set to Simulate alarm (ID number), **Alarms** and its subcategories will be available.

If **Simulation mode** is set to Simulate alarm class, **Alarm class** will be available.

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Simulation mode

4.8.3.2 Alarms

4.8.3.2.1 Sensor alarms (1)

Description

The simulation of single and multiple **Sensor alarms (1)** can be configured.

Setting	Various sensor alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Sensor alarms (1)

4.8.3.2.2 Sensor alarms (2)

Description

The simulation of single and multiple **Sensor alarms (2)** can be configured.

Setting	Various sensor alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Sensor alarms (2)

4.8.3.2.3 Process alarms (1)

Description

The simulation of single and multiple **Process alarms (1)** can be configured.

Setting	Various process alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Process alarms (1)

4.8.3.2.4 Process alarms (2)

Description

The simulation of single and multiple **Process alarms (2)** can be configured.

Setting	Various process alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Process alarms (2)

4.8.3.2.5 Process alarms (3)

Description

The simulation of single and multiple **Process alarms (3)** can be configured.

Setting	Various process alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Process alarms (3)

4.8.3.2.6 Process alarms (4)

Description

The simulation of single and multiple **Process alarms (4)** can be configured.

Setting	Various process alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Process alarms (4)

4.8.3.2.7 Totalizer alarms

Description

The simulation of single and multiple **Totalizer alarms** can be configured.

Setting	Totalizer 1 above alarm limit; Totalizer 1 above warning limit; Totalizer 1 below warning limit; Totalizer 1 below alarm limit
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Totalizer alarms

4.8.3.2.8 Input/output alarms

Description

The simulation of single and multiple **Input/output alarms** can be configured.

Setting	Various input/output alarms can be selected
Default	None selected

Related

This parameter is only available if **Simulation mode** is set to Simulate alarm (ID number).

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarms → Input/output alarms

4.8.3.3 Alarm class

Description

The Siemens standard alarm class to be simulated can be configured. The alarm status is activated on all outputs.

Setting	Maintenance alarm; Function check; Process value alarm; Process value warning; Maintenance warning; Maintenance required
Default	None selected

Related

This parameter can only be accessed if **Status icons** is set to Standard.

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarm class

4.8.3.4 Alarm class

Description

The NAMUR alarm class to be simulated can be configured. The alarm status is activated on all outputs.

Setting	Failure; Function check; Out of specification; Maintenance required
Default	None selected

Related

This parameter can only be accessed if **Status icons** is set to NAMUR.

Path	Maintenance and diagnostics → Simulation → Simulation alarms → Alarm class

4.9 Audit trail

4.9.1 Parameter change log

Displays list of logged parameter changes. (Log shows parameter value before the change, not the current value.)

Path	Maintenance and diagnostics → Audit trail → Parameter change log

4.9.2 Clear parameter change log (write only)

Description

The parameter change log can be reset using this parameter.

Setting	Cancel; Ok
Default	Cancel

Related

Path	Maintenance and diagnostics → Audit trail → Clear parameter change log

4.9.3 Firmware update change log

Description

A list of logged firmware updates can be viewed in this parameter. Up to 20 logs can be listed with timestamp in the format YYYY-MM-DD hh-mm.

Path	Maintenance and diagnostics → Audit trail → Firmware update change log

4.9.4 Clear FW update change log (expert)

Description

The firmware update log can be reset using this parameter.

Setting	Cancel; Ok
Default	Cancel

Related

Path	Maintenance and diagnostics → Audit trail → Clear FW update change log

4.10 Self test

4.10.1 Display test

Description

The display can be tested using a wizard..

Path	Maintenance and diagnostics → Self test → Display test

4.11 Resets

4.11.1 Restore ordered configuration (write only)

Description

Command to set all parameters to their defined default values.

Setting	Cancel; Ok
Default	Cancel

Related

Path	Maintenance and diagnostics → Resets → Set to default

4.11.2 Device restart (write only)

Description

Command to restart device.

Setting	Cancel; Ok
Default	Cancel

Related

Path	Maintenance and diagnostics → Resets → Device restart

4.12 Firmware update

Description

The firmware of the device can be updated using a wizard.

Path	Maintenance and diagnostics → Firmware update

Communication 5

5.1 Service channel (USB)

5.1.1 USB mode (read only)

Description

The **USB mode** can be read in this parameter.

Options	USB communication; Mass storage device (MSD)

Related

Path	Communications → Service channel (USB) → USB mode

5.1.2 Auto mode

Description

The **Auto mode** can be enabled/disabled. When auto mode is enabled, a device connected via a USB cable is always considered an MSD.

Setting	Disabled; Enabled
Default	

Related

Path	Communications → Service channel (USB) → Auto mode

5.1.3 MSD connect (write only)

Description

This command is used to connect/disconnect to a mass storage device (for example: a PC).

Setting	Do nothing; Connect; Disconnect
Default	Do nothing

Related

Path	Communications → Service channel (USB) → MSD connect

5.2 Modbus (Channel 1)

5.2.1 Slave address (SW)

Description

The slave address (SW) for the Modbus device can be configured. This address is used if the DIP switch is set to 0.

Setting	1 to 247
Default	

Related

Path	Communication → Modbus (Channel 1) → Slave address (SW)

5.2.2 Slave address (HW) (read only)

Description

The slave address (HW is determined by the DIP switch setting on the transmitter cassette and can be read out in this parameter. This address is used if the DIP switch is set to a value > 0.

Options	Read only

Related

Path	Communication → Modbus (Channel 1) → Slave address (HW)

5.2.3 Baud rate

Description

Baud rate of Modbus interface.

Setting	9600 Bit/s; 19200 Bit/s; 115200 Bit/s; 38400 Bit/s; 57600 Bit/s; 76800 Bit/s; 1200 Bit/s; 2400 Bit/s; 4800 Bit/s
Default	

Related

Path	Communication → Modbus (Channel 1) → Baudrate

5.2.4 Parity / framing

Description

Parity and framing of the Modbus communication interface.

Setting	Even parity, 1 stop; Odd parity, 1 stop; No parity, 2 stop
Default	

Related

Path	Communication → Modbus (Channel 1) → Parity / framing

5.2.5 Floating point byte order

Description

The floating-point number byte order used within the data filed of Modbus messages,

The first mentioned byte is the first byte sent.
Byte 3 corresponds to the left-most byte (MSB) of a 32 bit floating-byte number in big endian format, byte 0 to the right-most byte.

Setting	1-0-3-2; 0-1-2-3; 2-3-0-1; 3-2-1-0
Default	

Related

Path	Communication → Modbus (Channel 1) → Floating point byte order

5.2.6 Integer byte order

Description

The integer byte order used in Modbus messages.

MSB = most significant byte / high byte
LSB = least significant byte / low byte

Setting	MSB to LSB (big endian); LSB to MSB (little endian)
Default	

Related

Path	Communication → Modbus (Channel 1) → Integer byte order

5.2.7 Register mapping

5.2.7.1 Enable mapping

Description

Activation/deactivation of the register mapping. A set bit means that the mapping pair is activated, a reset bit that the mapping pair is deactivated.

Bit 0:
Requested register 1 / Target register 1
...
Bit 19:
Requested register 20 / Target register 20

Setting	0 to 1048575
Default	

Related

Path	Communication → Modbus (Channel 1) → Register mapping → Enable mapping

5.2.7.2 Source register 1..20

Description

Modbus register that appears within Modbus request is redirected to the parameter specified by Target register 1..20.

Setting	
Default	

Related

Path	Communication → Modbus (Channel 1) → Register mapping → Source register 1..20

5.2.7.3 Target register 1..20

Description

Register of an existing product parameter to which a Modbus request is redirected.

Setting	
Default	

Related

Path	Communications → Modbus (Channel 1) → Register mapping → Target register 1..20

5.2.8 Modbus units

5.2.8.1 Mass flow unit

Description

Set the unit for mass flow values.

Setting	Metric:	Gram → g/s; g/min; g/h Kilogram → kg/s; kg/min; kg/h; kg/d Tonne → t/min; t/h; t/d
	US:	Pound → lb/s; lb/min; lb/h; lb/d Short ton → STon/min; STon/h; STon/d Ton (long ton) → T/h; T/d
	Custom unit	
Default	kg/h	

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Mass flow unit

5.2.8.2 Volume flow unit

Description

Set the unit for volume flow values.

Setting	Metric:	Litre → l/s; l/min; l/h; l/d; Ml/d; hl/s; hl/min; hl/h; hl/d m^3 → m^3/s; m^3/min; m^3/h; m^3/d
	US:	Gallons → Ugal/s; Ugal/min; Ugal/h; Ugal/d; Mgal/d; gal/s; gal/min; gal/h; gal/d Barrels → BBPS; BBPM; BBPH; BBPD; BOPS; BOPM; BOPH; BOPD; BLPS; BLPM; BLPH; BLPD ft^3 → ft^3/s; ft^3/min; ft^3/h; ft^3/d
	Custom unit	
Default	m^3/h	

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Volume flow unit

5.2.8.3 Flow velocity unit

Description

Set the unit for flow velocity values.

Setting	Metric:	Meter → m/s; m/h
	US:	Foot → ft/s; ft/min Inch → in/s; in/min
	Custom unit	
Default	m/s	

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Flow velocity unit

5.2.8.4 Sound velocity unit

Description

Set the unit for sound velocity values.

Setting	Metric:	Meter → m/s; m/h
	US:	Foot → ft/s; ft/min Inch → in/s; in/min
	Custom unit	
Default	m/s	

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Sound velocity unit

5.2.8.5 Density unit

Description

Set the unit for density values.

Setting	Metric:	Microgram → µg/l; µg/m^3 Milligram → mg/l Gram → g/ml; g/cm^3; g/l Kilogram → kg/l; kg/m^3
	US:	Pound → lb/in^3; lb/gal; lb/ft^3 Short ton → STon/yd^3
	Custom unit	
Default	kg/m^3	

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Density unit

5.2.8.6 Kinematic viscosity unit

Description

Set the unit for kinematic viscosity values.

Setting	cSt
Default	cSt

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Kinematic viscosity unit

5.2.8.7 Temperature units

Description

Set the unit for temperature values.

Setting	˚C, °F, °R, K
Default	˚C

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Temperature units

5.2.8.8 Totalizer 1 unit

Description

Set the unit for totalizer 1 quantities.

Setting	Metric:	l; hl; m^3
	US:	Ugal; gal; BBL42; BBL31; BBL31.5; bush; yd^3; ft^3; in^3
	Custom unit	
Default	m^3	

is set to Volume flow

Setting	Metric:	g; kg; t
	US:	lb; STon; T; oz
	Custom unit	
Default	kg	

is set to Mass flow

Setting	Metric:	Nl; Nm^3; Sl; Sm^3
	US:	Sft^3
Default	Nl	

is set to Corrected volume flow

Related

Path	Communications → Modbus (Channel 1) → Modbus units → Totalizer 1 unit

5.2.8.9 Service channel (USB)

USB mode (read only)

Description

The **USB mode** can be read in this parameter.

Options	USB communication; Mass storage device (MSD)

Related

Path	Communications → Service channel (USB) → USB mode

Security 6

6.1 Change user PIN

Used to change PIN code that enables User access level.

Setting	
Default	

Related

Path	Security → Access management → Change user PIN code

6.2 Change expert PIN code (expert)

Description

The **Change expert PIN code** function can be accessed.

Setting	
Default	

Related

Path	Security → Access management → Change expert PIN code

6.3 Recovery ID

Displays an ID number required to reset PIN if lost. Record this ID number for use when contacting Siemens customer support.

Setting	
Default	

Related

Path	Security → Access management → Unique ID code

6.4 PIN recovery

Used to enter PIN unlock key (PUK) which resets device PIN(s) to default. (PUK obtained from Siemens customer support.)

Setting	
Default	

Related

Path	Security → Access management → PUK

6.5 Activate user PIN

Description

The **Enable access level control** function can be configured.

Setting	Disable; Enable
Default	Enable

Related

Path	Security → Access management → Enable access level control

6.6 Deactivate user PIN

Description

The **Disable access level control** function can be configured.

Setting	Disable; Enable
Default	Enable

Related

Path	Security → Access management → Disable access level control

6.7 Auto logout

Description

The **Auto logout** function can be configured. When the parameter is set to Off (default), you will **not** be prompted for password for 10 minutes after the last key press. When the parameter is set to On, you will be prompted to enter the password before each HMI operation.

6.8 Auto logout

Description

The **Auto logout** function can be be configured. When the parameter is set to Off (default), you will **not** be prompted for password for 10 minutes after the last key press. When the parameter is set to On, you will be prompted to enter the password before each HMI operation.

Setting	Off; On
Default	Off

Related

Path	Security → Access management → Auto logout

6.9 Logout

Description

The **Logout** function can be configured.

Setting	
Default	

Related

Path	Security → Access management → Logout

Language

7

7.1 Language

Description

Select the local display language.

Setting	English; Deutsch
Default	English

Related

Language	Language

Support

A

A.1 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:**
  Support request (http://www.siemens.com/automation/support-request)
- 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 Technical support (http://support.automation.siemens.com/WW/view/en/16604318)

Service & Support on the Internet

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

Service and support (http://www.siemens.com/automation/service&support)

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:

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

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For more information

www.siemens.com/flow

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SITRANS F

Ultrasonic Flowmeters SITRANS FSS200

Installation Manual

7ME372 (HART/Modbus)

12/2019
A5E36255466-AD

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

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℗ 01/2020 Subject to change

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Introduction

1

Note

This manual applies to the SITRANS FSS200 ultrasonic clamp-on sensors only.

Use the device to measure process media in accordance with the information in the Operating Instructions.

In order to operate an ultrasonic flowmeter, you need both transmitter Operating Instructions and sensor Installation Instructions, see Flow documentation (https://support.industry.siemens.com/cs/products?pnid=17317&lc=en-WW).

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 Document history

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

Edition	Note
12/2019	• Support for external DSL functionality: path 3 and path 4, CH5 analog input. • Support for gas installations.
08/2017	• Added FST020 sensor installation procedures, Dry Film Couplant/Damping and Dry Coupling Pad installation procedures.
03/2017	• Second edition – Various Warning updates to meet FM/ATEX approval – Sensor name plate label
02/2017	First edition

1.3 Preliminary Information

The following information is specifically for the FSS200 sensors.

Clamp-on ultrasonic flowmeters can accommodate a wide range of fluid flow applications.

These instructions expect that only a technically instructed person will be installing these flowmeters. Knowledge about process conditions and application parameters are prerequisite, including knowledge of the functional principles of these flowmeters.

Further information:

Siemens provides special training and other information via the Internet, including helpful installation videos. Helpful links will be listed inside this manual separately.

1.4 Items supplied

Note

Scope of delivery may vary, depending on version and add-ons.

Note

Handle with care!

Impact and shock can damage the sensor connector or decouple the piezoelectric crystal located within the sensor.

- SITRANS FSS200 sensors with selected mounting hardware
- Sensor cables. One pair per sensor.
- Transmitter (not shown)
- Siemens Process Instrumentation documentation disk containing certificates, and manuals
- Mounting hardware

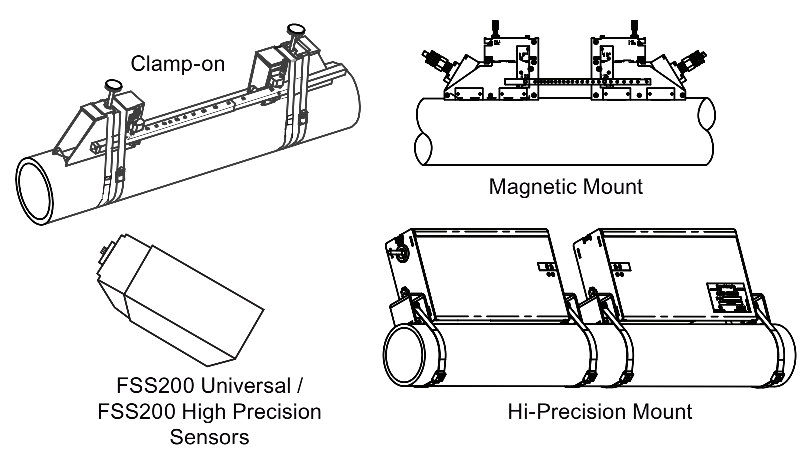


Figure 1-1 Mounting frames

1.5 Required Tools

It is helpful to have common electric and hand tools available for installation of the sensors.

- For easy programming, a PC would also be helpful and can be used later for diagnostics and documentation.
- Sensor cables are normally preassembled at the transmitter end.
- Hot-air gun if shrink sleeves are needed.
- A plastic hammer and bubble level should be used for sensor mounting and Vernier adjustment of sensor frames.
- For preparing irregular pipe surfaces that have old paint, corrosion, etc. an electric hand sander may be used.
- An optional circumference tape measure for pipe and sensor installation.

Note

Important

Never use an electric hand grinder or angle grinder when preparing pipe surfaces.

Incorrect bevel and chamfer angles at the pipe surface can disturb clear signal transmission.

- Use a thickness gauge to measure pipe wall thickness. If not available use pipe class tables or call technical support.
- Assorted sizes of screwdrivers, nut drivers and wrenches.

Optional mounting compounds

- P/N 7ME39600UC40 Dry couplant pads (Liquid installation only)
- P/N 7ME 39600UC20 Super Lube
- P/N 7ME39600UC32 Krytox GPL207

1.6 Checking the consignment

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

⚠ WARNING

Using a damaged or incomplete device

Risk of explosion in hazardous areas.

- Do not use damaged or incomplete devices.

1.7 Security information

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

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

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

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

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

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

Safety notes 2

2.1 Precondition for safe use

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

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

Symbol	Explanation
	Consult operating instructions

WARNING

Improper device modifications

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

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

2.2 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)

Further provisions for hazardous area applications are for example:

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

US Installations only: Federal Communications Commission (FCC) rules

Note

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

2.2.1 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
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
RoHS directive 2011/65/EU	Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

Note

CE declaration

The CE declaration certificate is available on the SensorFlash SD card delivered with the device.

2.3 Use in hazardous locations

Qualified personnel for hazardous area applications

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

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

WARNING

Use in hazardous area

Risk of explosion.

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

WARNING

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

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

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 87).

2.3.1 Special conditions for safe use

Specific conditions of use - US and Canada

1. Potential risk of sparking from aluminum alloy enclosure. In Division 1 or Zone 0 installations, equipment shall be installed in such manner as to prevent the possibility of sparks resulting from friction or impact against the enclosure.
2. Sensor surfaces shall be protected from side impact by using available mounting tracks, frames, mounting enclosures or other means. 7ME3950*LS0* Doppler sensors only require mounting straps.
3. Potential risk of electrostatic sparking. Clean only with a damp cloth.
4. The maximum permitted ambient temperature of the very high temperature sensor's terminal box is +60 ºC. To avoid the effects of process temperatures and other thermal effects, care shall be taken to ensure the surrounding ambient temperature does not exceed +70 ºC. Adherence to the manufacturer’s installation manual shall be followed for fulfillment of this requirement.
5. Shall be used with a galvanically isolated transmitter.
6. Refer to installation drawing A5E37305975A and certificate for temperature classes and ambient temperature ranges

Specific conditions of use - ATEX & IEC

1. Potential risk of sparking from aluminum alloy enclosure. In Zone 0 installations, equipment shall be installed in such manner as to prevent the possibility of sparks resulting from friction or impact against the enclosure.
2. Sensor surfaces shall be protected from side impact by using available mounting tracks, frames, mounting enclosures or other means. 7ME3950*LS0* Doppler sensors only require mounting straps.
3. Potential risk of electrostatic sparking. Clean only with a damp cloth.
4. The maximum permitted ambient temperature of the very high temperature sensor's terminal box is +60 ºC. To avoid the effects of process temperatures and other thermal effects, care shall be taken to ensure the surrounding ambient temperature does not exceed +70 ºC. Adherence to the manufacturer’s installation manual shall be followed for fulfillment of this requirement.
5. Shall be used with a galvanically isolated transmitter.
6. Refer to Document A5E36255466 and certificate for temperature classes and ambient temperature ranges.

Further information and instructions including approval-specific special conditions for safe use in Ex applications can be found in the certificates on the accompanying documentation disk and at Certificates.

⚠ WARNING
Laying of cables
Risk of explosion in hazardous areas. May cause death or serious injury.
Cable for use in hazardous areas must satisfy the requirements for having a proof voltage of at least 500 V AC applied between the conductor/ground, conductor/shield and shield/ground.
Connect the devices that are operated in hazardous areas as per the stipulations applicable in the country of operation.

⚠ WARNING
Field wiring installation
Risk of explosion in hazardous areas. May cause death or serious injury.
Ensure that the national requirements of the country in which the devices are installed are met.

2.4 Installation in hazardous areas

⚠ WARNING
Equipment used in hazardous areas
Risk of explosion in hazardous areas. Death or serious injury may occur.
Equipment used in hazardous areas must be Ex-approved for the region of installation and marked accordingly. It is required that the special conditions for safe use provided in the manual and in the Ex certificate are followed!

⚠ WARNING
Dust layers above 5 mm
Explosion Hazard - Can cause death or serious injury
Device may overheat due to dust build up. Remove dust layers in excess of 5 mm.

⚠ WARNING
Electrostatic Sparking
Explosion Hazard - Can cause death or serious injury
Clean only with a damp cloth.

Note

Important

The FST020 flowmeter is not suitable for use in hazardous areas.

Hazardous area approvals

The device is approved for use in hazardous area according to the lists below. Specific conditions of safe use specified by each approval authority are included in the relevant certificate.

Table 2-1 Ratings

Hazardous locations	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1 Class I, Zone 0 Class II, 20 and 21
Explosive Atmospheres	Ex II 1G Ex ia IIC T6…T4 Ga Ex II 1D Ex ia IIIC T70 – 110 °C Da
Temperature code	Varies by sensor and ambient temperature (see tables below)
Dust Temperature class	Tdust = Ta max + 10 °K (T70 °C for Ta = 60 °C, T110 °C for Ta = 100 °C)

Table 2-2 **FSS200 Size A and B High Precision Sensor; Entity Parameters: Ui = 17.44 V, Ii = 461 mA, Pi = 1.00 W**

MLFB Number	Type	Ci (nF)	Li (uH)	Temperature code
7ME3950aLbcd	Liquid	4.4	16	T5 for Ta ≤ 85 °C T4 for Ta ≤ 100 °C
7ME3950aGbcd	Gas	1	50	T5 for Ta ≤ 85 °C T4 for Ta ≤ 100 °C

Where,
a = Approval: 5 (FM/CSA/ATEX/IECEX)
b = G,H,J,K,L,or T
c = Temperature 0 (normal), 2 (104°C) or 3 (121°C)
d = Corrosion Protection: 0 (Standard) or 1 (Corrosion Resistant)

Table 2-3 **FSS200 Size C and D High Precision Sensors; Entity Parameters: Ui = 17.44 V, Ii = 461 mA, Pi = 1.00 W**

MLFB Number	Type	Ci (nF)	Li (uH)	Temperature code
7ME3950aLbcd	Liquid	3.4	0	T5 for Ta ≤ 85 °C T4 for Ta ≤ 100 °C
7ME3950aGbcd	Gas	56	0	T5 for Ta ≤ 85 °C T4 for Ta ≤ 100 °C

Where,
a = Approval: 5 (FM/CSA/ATEX/IECEX)
b = M,N,P,Q,U or R
c = Temperature 0 (normal), 2 (104 °C) or 3 (121 °C)
d = Corrosion Protection: 0 (Standard) or 1 (Corrosion Resistant)

Table 2-4 **FSS200 Size A,B,C, D, and E Universal Sensors; Entity Parameters: Ui = 17.44 V; Ii = 461 mA, Pi = 1.00 W**

MLFB Number	Type	Ci (nF)	Li (uH)	Temperature code
7ME3950aLbc	Liquid	8.1	28.4	T5 for Ta ≤ 60 °C T4 for Ta ≤ 100 °C
7ME3950aGbc	Gas	55	0	T5 for Ta ≤ 60 °C T4 for Ta ≤ 100 °C

Where,
a = Approval: 5 (FM/CSA/ATEX/IECEX)
b = Size: B0,B1,C0,C1,C2,D0,D1,D2,E0,E1,E2,F0,F1,F2
c = Corrosion Protection: 0 (Standard) or 1 (Corrosion Resistant)

Table 2-5 **FSS200 Doppler Sensors; Entity Parameters: Ui = 17.44 V, Ii = 461 mA, Pi = 1.00 W**

MLFB Number	Ci (nF)	Li (uH)	Temperature code
7ME3950aLS0b	123	0	T6 for Ta ≤ 60 °C T5 for Ta ≤ 100 °C

Where,
a = Approval: 5 (FM/CSA/ATEX/IECEX)
b = Corrosion Protection: 0 (Standard) or 1 (Corrosion Resistant)

Table 2-6 **FSS200 Very High Temperature Sensors; Entity Parameters: Ui = 17.44 V, Ii = 461 mA, Pi = 1.00 W**

MLFB Number	Ci (nF)	Li (uH)	Temperature code
7ME3950aLAb	0	0	T5 for Ta ≤ 85 °C T4 for Ta ≤ 100 °C

Where,
a = Approval: 5 (FM/CSA/ATEX/IECEX)
b = Size: 13,23,33,43,63,73,83

Note

Control drawing

* See Control drawing A5E37305975A

Installation variations

Note

Requirements for safe installation

- The sensors can be installed in Zone 0, Div. 1 as Intrinsically Safe.
- Standard remote installation with FST030 because the connection is certified Intrinsically Safe.

Note

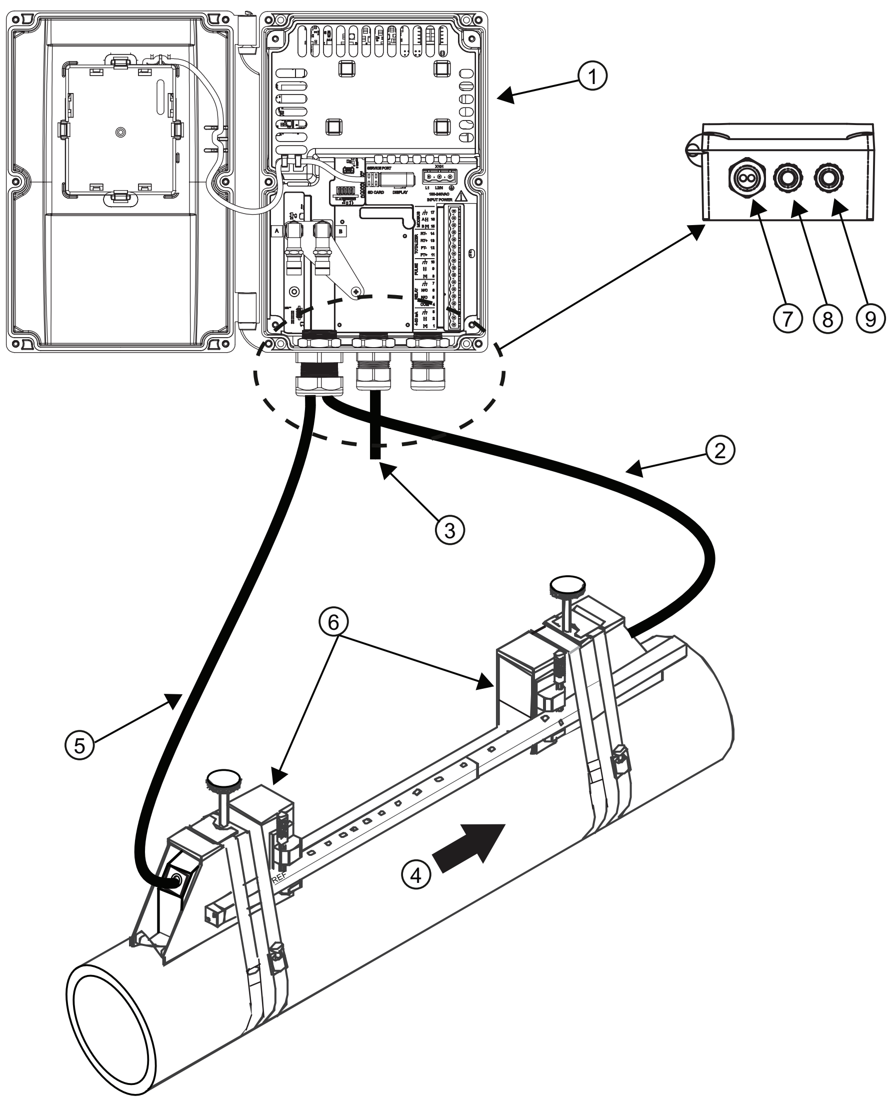
FST020 is not suitable for hazardous locations.

Installation overview

3

FST020 system

The illustration below shows a typical transmitter and clamp-on sensor flowmeter configuration.

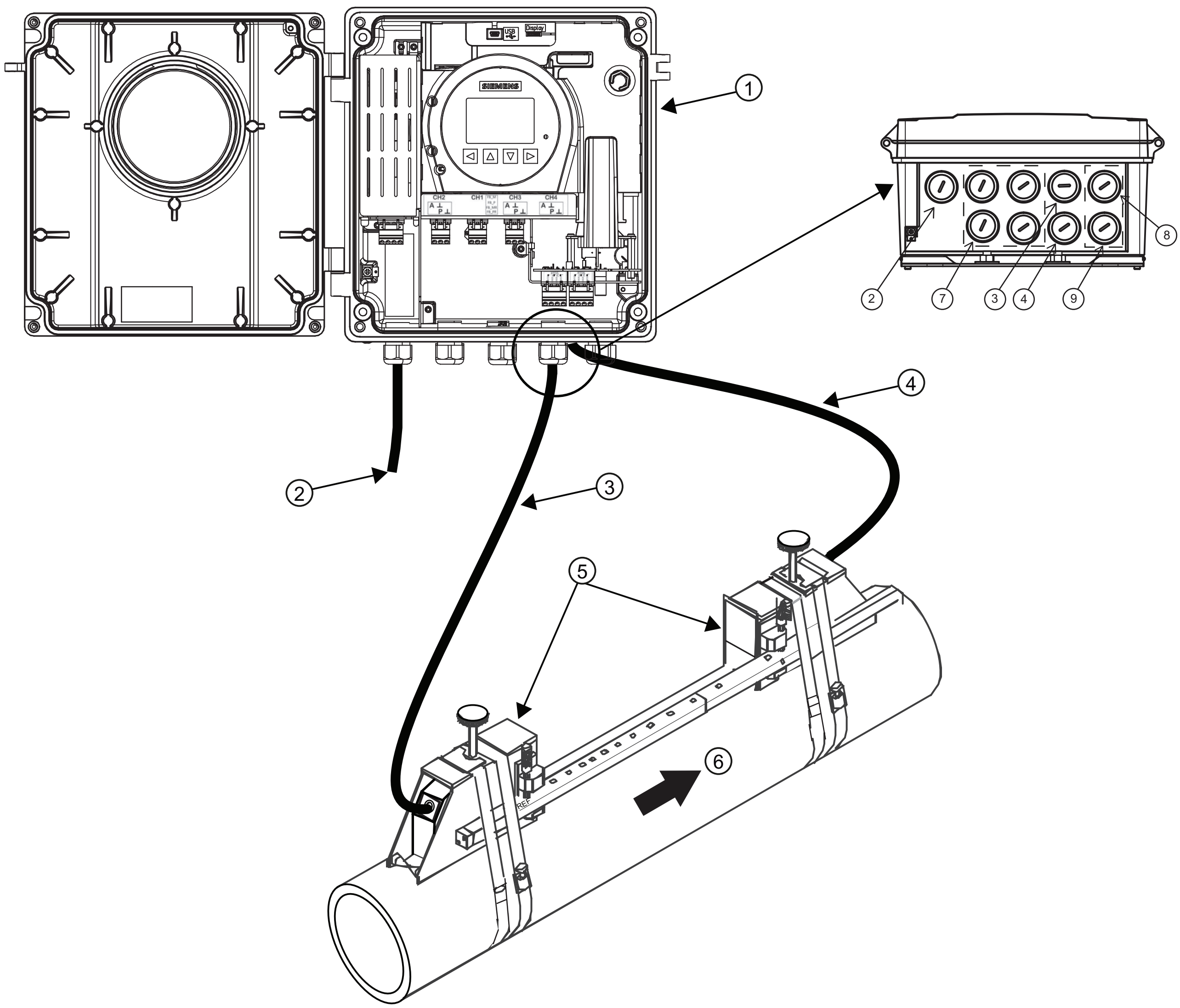


① FST020 wall mounted transmitter	⑤ Upstream sensor cable (1A) Path 1
② Downstream sensor cable (1B) Path 1	⑥ Sensors
③ Power cable	⑦ Sensor ports
④ Flow direction	⑧ Input power
	⑨ I/O port

Figure 3-1 Wall mount transmitter overview (Reflect mount)

System overview with internal DSL

The illustration below shows a typical transmitter and clamp-on sensor flowmeter configuration. You can also connect the transmitter to other flow ultrasonic sensors.



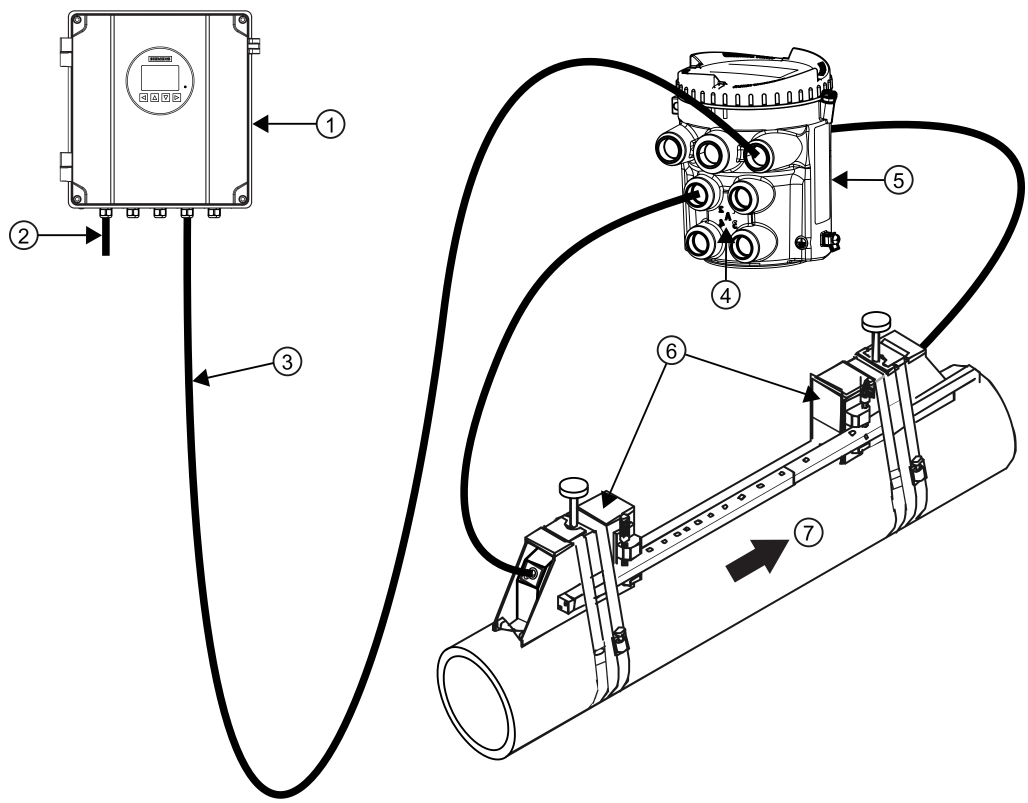
① FST030 wall mounted transmitter	⑤ Sensors
② Power cable	⑥ Flow direction
③ Path 1 - Upstream sensor cable (1A)	⑦ Ports for I/O, Communications, RTDs
④ Path 1 - Downstream sensor cable (1B)	⑧ Path 2 - Upstream (2A)
	⑨ Path 2 - Downstream (2B)

Figure 3-2 Wall mount transmitter overview (Reflect mount)

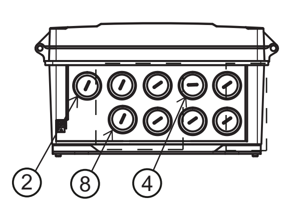
3.1 FST030 system overview with external DSL

System overview with external DSL

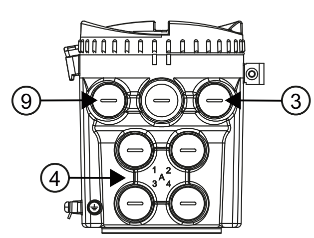
The illustration below shows a typical transmitter and clamp-on sensor flowmeter configuration with external DSL. You can also connect the transmitter to other flow ultrasonic sensors.



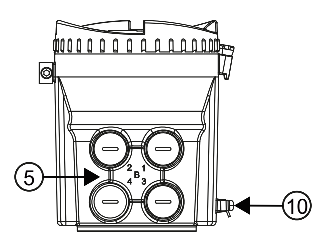
Wall mount transmitter overview with external DSL, example for FSS200



Transmitter bottom view



External DSL side view A



External DSL side view B

①	FST030 wall mounted transmitter	⑥	Sensors
②	Power cable	⑦	Flow direction
③	Cable connection between FST030 and external DSL, up to 150 m	⑧	Ports for I/O, Communications
④	Path 1-4 Upstream (A)	⑨	Ports for Analog input or RTDs
⑤	Path 1-4 Downstream (B)	⑩	Protective earth

Generally after deciding on the necessary flow measurements an evaluation should be done. In this way, the best economical solution can be obtained since configurations and accuracy measurement requirements can be in conflict with the overall system costs. In particular when using Clamp-on systems it's important to perform a very detailed evaluation. Later this will result in smooth installations and the highest customer satisfaction.

For example, a poor accuracy may result if the installed pipe size is different than actual pipe size. Although operation may still be achieved, accuracy can be compromised due to incorrect volume calculation.

3.2 System configuration

The SITRANS F US ultrasonic flowmeter systems consist of a transmitter, one or two sensor pairs and the connecting cables. The following table lists process temperatures for the available combinations of sensors and transmitters.

Transmitter	Sensor type	Temperature range
FST030 FST020	FSS200 Hi Precision - T1	-40°C to +65°C (-40°F - +149°F)
	FSS200 Hi Precision - T2	0°C to +120°C (32°F - +248°F)
	FSS200 Universal	-40°C to +120°C (-40°F - +248°F)
	FSS200 High Temperature	-40°C to +230°C (-40°F to +446°F)

Installing/mounting

4

This chapter describes how to install the sensors. The following installation steps must be carried out:

- Determine a suitable installation location for the sensors and transmitter. See Determining a location (Page 25).

  Note

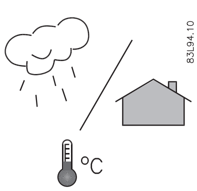
  IMPORTANT

  This step should have been done prior to ordering the clamp-on system

  ---

- Collect all relevant fluid and pipe data (pipe material and dimensions, fluid type or approximate sound speed, viscosity, etc.).
- Install and apply power to the transmitter, then follow the sensor setup wizard to determine the recommended sensor orientation and spacing. See Orienting the sensors (Page 28)
- Install the sensors using the supplied mounting hardware. See Mounting the sensors (Page 24)
- Connect the sensor cables.
- Complete the sensor setup wizard to begin measuring flow. See Installation instructions (Page 29)

4.1 Environment



SITRANS F flowmeters with minimum IP66/IP67/NEMA 4X enclosure rating are suitable for indoor and outdoor installations.

Process medium temperature

If applicable, make sure that specifications for rated medium temperature (TS) 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 87).

> **WARNING**
>
> **Installation in hazardous location**
>
> Risk of explosion in hazardous areas
>
> Special requirements apply to the location and installation of the device. See Installation in hazardous areas (Page 15).

4.2 Installation safety precautions

Special precautions must be taken when the flowmeter is mounted in applications with working pressures/media that can be dangerous to people, surroundings, equipment or others in case of pipe fracture.

- Take appropriate protective measures to avoid contact with surfaces with temperatures above 70 °C (155 °F).
- Prevent severe external stresses and loads from acting on the device.
- Do not install the flowmeter in the vicinity of strong electromagnetic fields, for example near motors, variable frequency drives, transformers etc.

Note

Material compatibility

Siemens can provide you with support concerning selection of sensors. However, you are responisible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

4.3 Sensor installation parameters

The following parameters are required for a correct sensor installation, ensuring the best possible flow measurement accuracy:

- **Pipe data:** material, outer diameter, wall thickness, Liner material and thickness (if applicable), pipe roughness, upstream and downstrream straight run (in pipe diameters).
- **Process conditions:** Type of fluid, fluid sound speed (if known), process temperature, fluid viscosity, positive flow direction.

- **Sensor data:** Sensor type and size (indicated on label), length of sensor cable pair.
- **Environment conditions:** Mounting location transmitter/sensors, distance and required cable lengths, temperature, sun protection/rain, protection against dirt, vibrations, corrosion, easy access for maintenance: ladder or scaffolding, below ground or submersible.

4.4 Determining a location

Introduction

There are a number of factors to consider when deciding on an installation location for the clamp-on sensors and transmitter. Primarily, the pipe section should remain completely full during normal operation and be in reasonable condition, without excessive corrosion (or scaling) which can interfere with ultrasound transmission into the fluid. Available straight pipe run and installation in hazardous areas are also important points to consider when selecting a location.

Hardware considerations

The following hardware characteristics need to be considered:

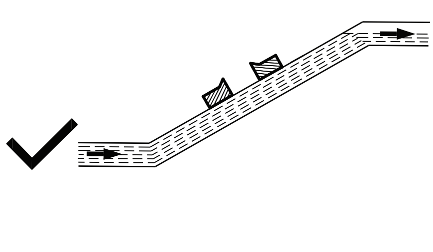
- **Transmitter:** Ingress protection rating, Hazardous area rating, ambient temperature range, maximum allowed sensor cable length. (Refer to appropriate transmitter Operating Instructions manual for details.)
- **Sensor:** Ingress protection rating, Operating temperature range, compatibility with pipe material and dimensions.
- **Mounting:** Corrosion resistance, vibration tolerance, direct burial, submersibility.
- **Sensor cables:** Ingree protection rating, temperature rating, electromagnetic compatibility.

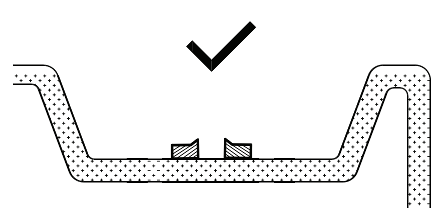
Typical sensor locations

Note

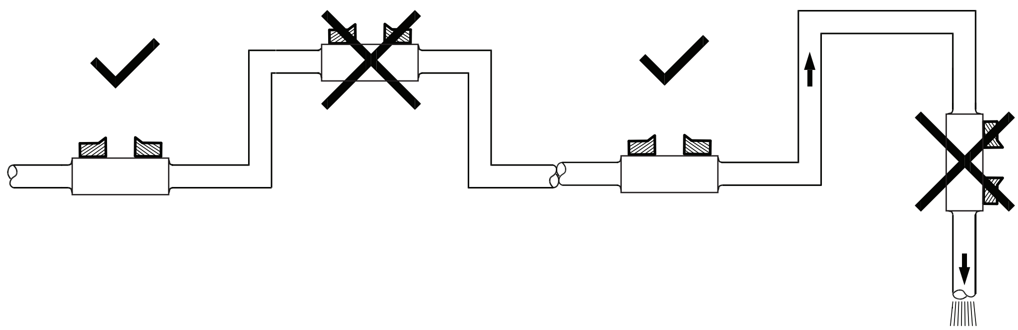
The pipe should always be completely filled with liquid.

- Locate the sensors in U-shaped pipes if pipes are only partially filled or have free outlet.





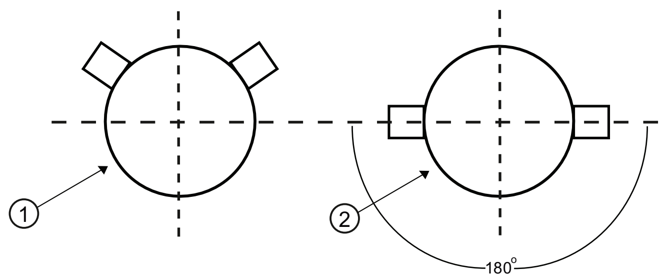
- Avoid, if possible, the following installations:
  - Installation at the highest point of the pipe system
  - Installation in vertical pipes with free outlet or downwards flow



Selecting a location for the sensors

1. Locate the sensors downstream from the center of the longest available straight run. A location ten pipe diameters or greater downstream from the nearest bend will provide adequate flow profile conditions.
2. Do not, if possible, install the sensors downstream from a throttling valve, a mixing tank, the discharge of a positive displacement pump or any other equipment that could possibly aerate the liquid. The best location will be as free as possible from flow disturbances, vibration, sources of heat, noise, or radiated energy.
3. Avoid mounting the sensors on a section of pipe with any external scale. Remove all scale, rust, loose paint, etc., from the location.
4. Do not mount the sensors on a surface aberration (pipe seam, etc.)

5. Do not mount sensors from different ultrasonic flowmeters on the same pipe. Also, do not run the sensor cables in common bundles with cables from other instrumentation. You can run these cables through a common conduit ONLY if they originate at the same flowmeter.
6. **Avoid mounting sensors on the top or bottom of a horizontal pipe**. The best placement on a horizontal pipe is either the ten o'clock and two o'clock position for Reflect mode, or one sensor at nine o'clock and one sensor at three o'clock for Direct Mode. Mounting on a vertical pipe is recommended only if flow is in the upward direction. When mounting on a vertical pipe flowing in a downward direction make sure there is sufficient back pressure in the system to maintain a full pipe.



① Dual path, Reflect mount

② Dual path, Direct mount

Figure 4-1 Sensor alignment (horizontal plane)

Transmitter mounting

Refer to the transmitter Operating Instructions for transmitter mounting.

Sensor mounting preparation

The transmitter independently calculates the best distance for the sensors on the pipe according to the selected parameters. A manual search for the best signal strength and signal quality is not necessary. To receive these calculations, certain parameters have to be programmed into the meter:

- Pipe outer diameter (e.g. selection by inside table > metric DIN100 -> 114.3 mm)
- Pipe wall thickness (DIN automatically 3.6 mm or by manual input)
- Pipe material - Steel or other materials from material tables
- Liner inside - (e.g. Cement - 5 mm)
- Medium settings - Liquid Class (Water 20°C or other kind of liquid by table or custom setting)
- Pipe Up- and Downstream conditions (only required if condition is not ideal)
- Sensor type - Sensor model (e.g. FSS200 Universal)
- Sensor size (e.g. C3 - see Sensor nameplate (Page 47))
- Automatic calculating for mounting and sensor distance (i.e. how many reflections, nominal distance, mounting frame index number (e.g. 16).

4.5 Orienting the sensors

Flow direction

There are no flow direction symbols shown in the sensors. Positive flow is defined as the movement of fluid from the upstream "A" sensor to the downstream "B" sensor, whereas negative flow is in the reverse direction.

Orienting the sensors

Siemens recommends orienting the sensors in one of the following ways:

Note

IMPORTANT

Avoid installing sensors on top or on the bottom of a horizantal pipe.

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1. Vertical orientation with an upwards flow in order to minimize the effect of gas / air bubbles in the media (sensors shown in Reflect Mount).

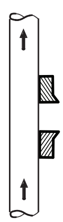
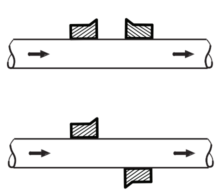


Figure 4-2 Vertical installation with an upwards flow

2. Horizontal orientation with sensors shown in Reflect Mount and Direct mount. Note that flow can move in either direction.



4.6 Installation instructions

4.6.1 Preliminary installation procedures

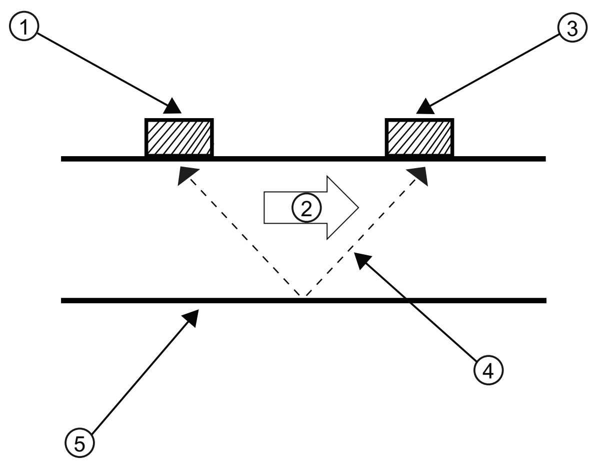
Introduction

To install the sensors these basic steps must be followed:

1. Program parameters into transmitter
2. Mount the sensors on pipe using parameters from transmitter
3. Connect sensor cables from sensor to transmitter

Clamp-on sensor mounting modes

All though the transmitter recommends a mounting mode after analyzing your pipe and liquid data entries you can still install clamp-on sensors in the way that best suits your application and the sensor type you have purchased.

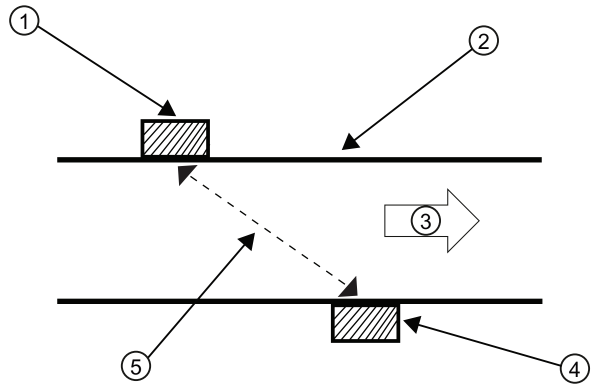


①	Upstream sensor	④	Sonic path
②	Flow direction	⑤	Pipe
③	Downstream sensor		

Figure 4-3 Reflect mount (Pipe shown from above in 12 o'clock position)

Reflect mount is recommended whenever possible. This is the simplest way to mount the sensors. Also, Reflect mount resists abnormal flow profile conditions such as cross-flow within the flow stream. In addition, Reflect mount may be the only possibility if conditions do not allow access to the opposite side of the pipe.

Direct mount provides a shorter sonic beam path. This usually improves performance with sonically attenuative liquids or pipe materials. Direct mount is recommended for plastic pipes. Compared to Direct mounting, Reflect mount requires almost double the amount of mounting length. Therefore, Direct mount may be the only option if the availability of mounting space is limited.



① Upstream sensor
② Pipe
③ Flow direction
④ Downstream sensor
⑤ Sonic path

Figure 4-4 Direct mount (Pipe shown from above in 12 o'clock position)

Mounting supplies

The following items will be needed to mount the sensors (most materials are supplied):

- Flat blade screwdriver
- Mounting frames or mounting tracks
- Tape, chalk and a ruler or measuring tape
- Mounting straps
- Spacer bar
- Mounting guide (for Direct mount)
- Ultrasonic coupling compound and/or coupling pads
- Sensors (matched set)

Mounting strap kits

The available mounting strap kits are listed below. Each kit comes with up to two band sizes to cover its designated pipe diameter range and a spacing guide for Direct mount. In most cases, the kits come with the mounting hardware.

Mounting strap kits	Pipe diameter	SAE band sizes (Qty.)
7ME396000SM00	50.8 mm (2-inch) to 177.8 mm (7-inch)	#88 (2) #128 (2)
7ME396000SM10	50.8 mm (2-inch) to 330.2 mm (13-inch)	#88 (2) #152 (2)
7ME396000SM20	330.2 mm (13-inch) to 609.6 mm (24-inch)	#188 (2) #280 (2)
7ME396000SM30	609.6 mm (24-inch) to 1219.2 mm (48-inch)	#152 (4) #312 (4)

Preparing the pipe

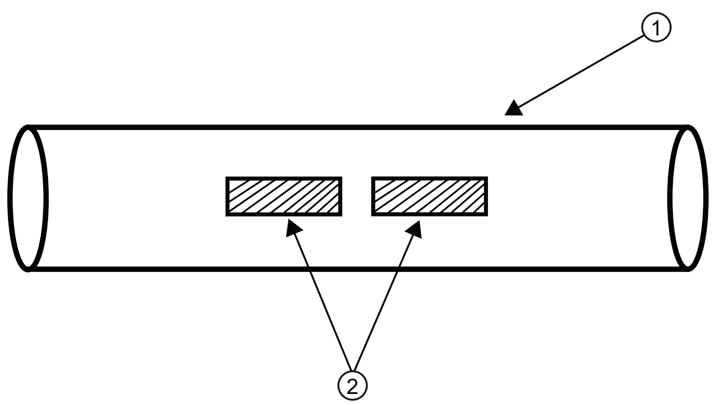
Note

Make sure you picked a mounting location with the longest straight run. You must have easy access to at least one side of your pipe. **The pipe at the mounting location must remain full**, even at zero flow.

1. After establishing the sensor location begin to prepare the pipe.
2. Decide on your mounting mode (Direct or Reflect). Always use Reflect mode whenever possible. You may only need to use Direct mode if your pipe is plastic.
3. After receiving the spacing dimensions from the Installation Menu, prepare the pipe surface. De-grease the surface, if necessary, and remove any grit, corrosion, rust, loose paint, etc. Use abrasive material provided to provide a clean contact surface for the sensors.

   Note

   Please note that the instructions show horizontal mounting for clarity purposes only. Do not install sensors on the top of a pipe.



① Pipe

② Cleaned areas

Figure 4-5 Pipe surface preparation

4. Clean an area 13 mm (1/2-inch) on either side of the sensors.
5. Clean an additional 13 mm (1/2-inch) along the length of the sensors.

4.6.2 Initial startup procedure

Refer to the Operating Instuctions manual Initial startup procedure to setup the basic transmitter parameters before preceding to the Wizard sensor setup procedure.

4.6.3 Wizard sensor setup procedure

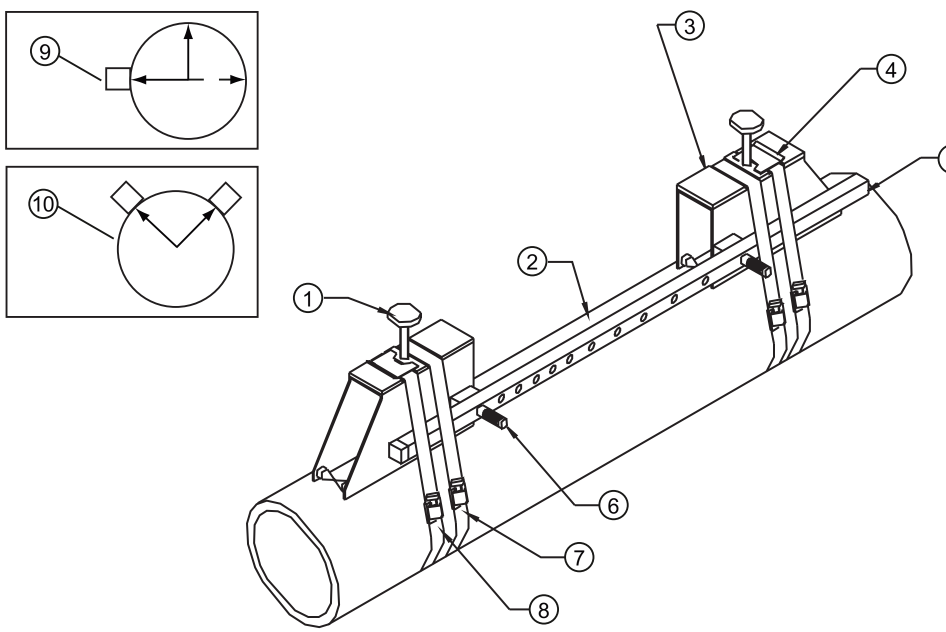
Referring to the Operation Instuction manual for your transmitter, use the Wizard sensor setup procedure to set up the clamp-on sensors for your unit.

4.6.4 Installing sensors in Reflect mount

Reflect mount - Sensor installation using mounting frames and spacer bar

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed then prepare the pipe surface area where the sensors will be mounted.

Before continuing refer to the Reflect mount installation diagram example below.

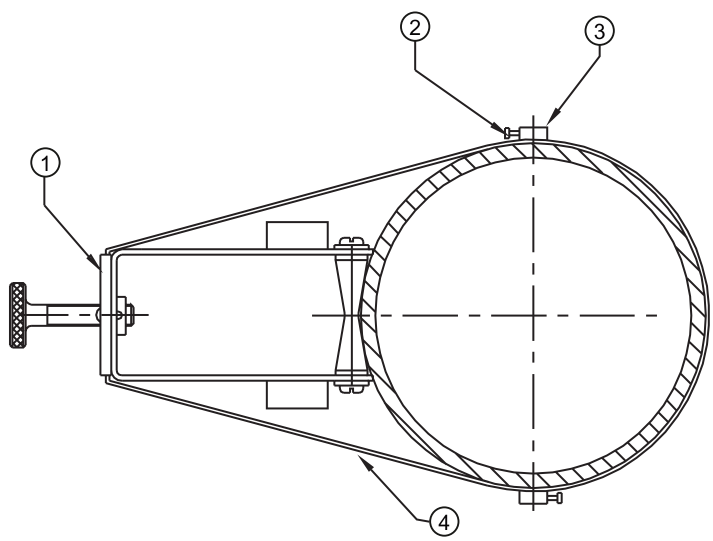


① Sensor clamping screw
② Customer pipe
③ 7ME39600*** Mounting Frame
④ Spring Clip (not present on some mounting frame models)
⑤ Spacer bar
⑥ Spacer bar pin and reference hole
⑦ Mounting strap
⑧ Larger pipes may need additional mounting straps
⑨ Orientation for Single path sensor at the 9 o'clock position
⑩ Orientation for Dual path sensor at the 10 and 2 o'clock positions

Figure 4-6 Reflect mount

Installing the mounting frames

1. On a flat surface, attach the spacer bar to a mounting frame so that the reference hole on the spacer bar aligns with the hole on the mounting frame and attach using supplied screw stored on end of spacer bar. Tighten the clamping screw.
2. Align second mounting frame with number on spacer bar that corresponds to the number index provided by transmitter and attach with second screw found on end of spacer bar. Then tighten the clamping screw. *Ensure that the angled sides of both frames face away from each other.*
3. Wrap a mounting strap around the pipe. Make sure to position it so there is easy access to the mounting strap adjusting screw.
4. At the mounting location, place the mounting frame/spacer bar assembly on the pipe so that it rests on the top of the pipe.
5. Engage the end of the mounting strap with the mounting strap adjusting screw.
6. Slide strap under the spring clip of one of the mounting frames.
7. Tighten the mounting strap screw enough to take up all of the slack, but not enough to prevent rotation of the assembly. *Repeat procedure for the other mounting frame*.
8. Rotate the assembly on the pipe to the final conditioned location, ensuring that it is straight along the pipe axis. (Refer to the sensor orientation diagram.)
9. Tighten the mounting straps to seat the assembly firmly on the pipe. Do not over tighten.



① Mounting frame and sensor (not shown)
② Mounting strap adjusting screw
③ Optional: On larger pipes multiple lengths of straps can be linked together
④ Mounting strap

Figure 4-7 Reflect mount with mounting frames

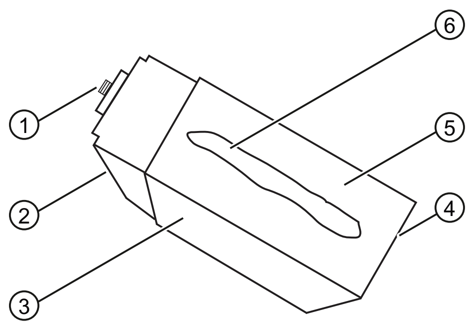
Installing the sensor

1. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface.

Note

Small diameter pipes

Use the tip of the finger to apply a light film of coupling compound on sensor emitting surfaces that are to be installed on small diameter pipes. Synchronous pipe noise is greatly increased when too much coupling compound is used for small pipes. This may result in a poor SNR (signal to noise ratio).



①	F-Connector	④	Front face
②	Connector end of sensor	⑤	Emitting surface
③	Sensor	⑥	Coupling compound

Figure 4-8 Sensor

2. Slide the sensor into the angledend of the mounting frame, with the sensor F-connector facing out. Keep sensor from making contact with the pipe until it butts up against the mounting frame stop. Push sensor down to mate with pipe.
3. Tighten the sensor clamping screws to hold the sensor firmly in place. *Repeat procedure for the other sensor.*
4. Proceed to Connecting (Page 45).

Additional installation instructions

For additional installation and sensor mounting instructions including direct mount, track mount, magnetic mount, Hi Precision mount and temperature sensor mounting refer to the Appendix - Additional installation instructions (Page 95).

Note

Temperature sensor mounting procedures are for FST030 only.

See also

Mounting temperature sensors (Page 56)

Preparing sensor cables (Page 48)

4.6.5 Dry Film Couplant/Damping Material

Siemens dry film couplant/damping material is an adhesive backed viscoelastic polymer sheet that provides excellent acoustic coupling without concern for couplant washout. For clamp-on gas applications this material effectively absorbs unwanted pipe noise to lower the minimum pressure required for flow measurement.

Note

In the following paragraphs, references to the 9 o’clock position indicate the section of horizontal pipe that is closest to you.

Preparing the pipe surface

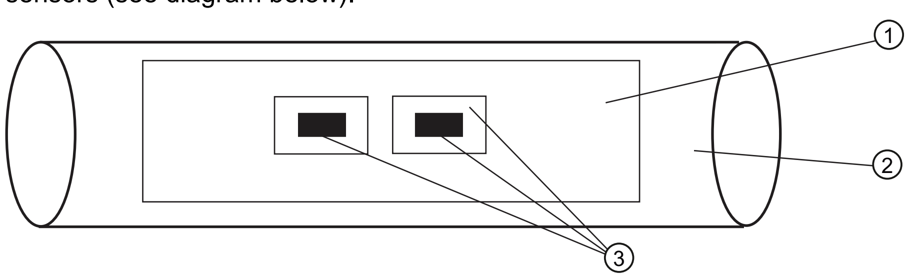
1. Pick a mounting location with the longest straight run. You must have easy access to at least one side of your pipe. For uninterrupted operation the mounting location must remain fully pres-surized, even at zero flow.
2. Decide on your mounting mode (direct or reflect). Always use Reflect Mode whenever possible or as recommended by the transmitter installation menu. You may only need to use Direct Mode if your pipe is plastic.
3. After receiving the spacing dimensions from the Installation Menu, prepare the pipe surface. Degrease the entire pipe surface where the damping material is to be applied and remove any grit, corrosion, rust, loose paint, etc.

   Note

   The effectiveness of the damping material is dependent on how well the adhesive bonds to the pipe surface.

   ---

4. If necessary, use the abrasive material provided to create a smooth contact surface for the sensors (see diagram below).



① Damping material
② Pipe
③ Smoothed Areas. If necessary, smooth an area large enough to accommodate sensors and also several centimeters (inches) around the locations where the sensors are to be mounted. Clean pipe again to remove any sanding residue.

Figure 4-9 Preparing the pipe surface

5. Make sure that you have a matched pair of sensors. They both should have the same S/N number but marked with either an "A" or "B" (e.g., 100A and 100B).

Dry film couplant/damping material

Each damping material kit contains one or more 229 mm x 914 mm (9" x 36") sheet(s) of film to be cut and applied to the surface of the pipe whose flow is to be measured.

Depending on the sensor size code multiple layers may be required for optimal damping. Refer to the table below for the correct kit P/N and final coating thickness specified for each sensor size.

Note

Each kit contains the correct number of damping sheets (packaged in a mailing tube) for the associated sensor size code.

Table 4-1 Damping material thickness for clamp-on gas systems

Sensor size	Kit P/N	Required layers	Final thickness (in)	Final thickness (mm)
B1H	7ME39600 DM10	1	0.027	0.69
B2H	7ME39600 DM10	1	0.027	0.69
B3H	7ME39600 DM10	1	0.027	0.69
C1H	7ME39600 DM10	1	0.027	0.69
C2H	7ME39600 DM10	1	0.027	0.69
D1H	7ME39600 DM20	2	0.054	1.37
D2H	7ME39600 DM30	3	0.081	2.06
D3H	7ME39600 DM20	2	0.054	1.37
D3H	7ME39600 DM40	4	0.108	2.74

Operating temperature range: -23 °C to 93 °C (-10 °F to 250 °F)
Installation temperature: 0 °C to 50 °C (32 °F to 120 °F)

Cutting and installing couplant sheets

Orientation of the damping material is not critical. Cut the sheet to achieve the best coverage and use of material. The full size (229 mm x 914 mm / 9" x 36") sheet may be difficult to apply. Cutting the sheet to manageable pieces will not affect efficiency. DO NOT INSTALL SENSORS ON SEAMS.

Sizing sheets for pipes 6 inches (15.24 cm) and under

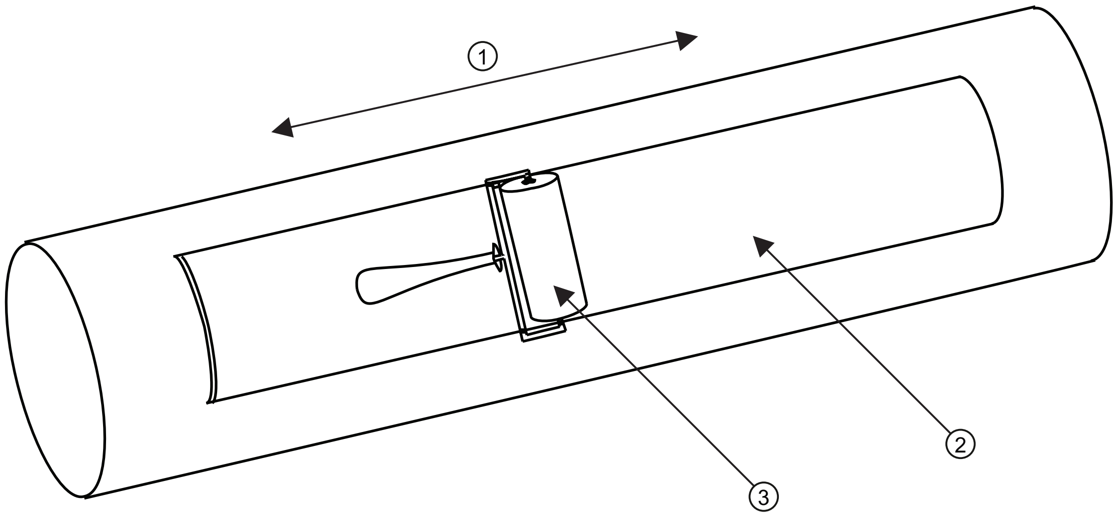
1. Cut the 36-inch (91.44 cm) sheet length in half. The 18-inch (45.72 cm) length will be applied along the axis of the pipe.
2. Leave the sheet at the full 9-inch (22.86 cm) width for pipes over 3 inches (7.62 cm) in diameter. Cut width as needed to avoid significant overlap on pipes under 3 inches in diameter.
3. Cut any additional sheets as required (see table above for proper number of layers).

Sizing sheets for pipes over 6 inches (15.24 cm)

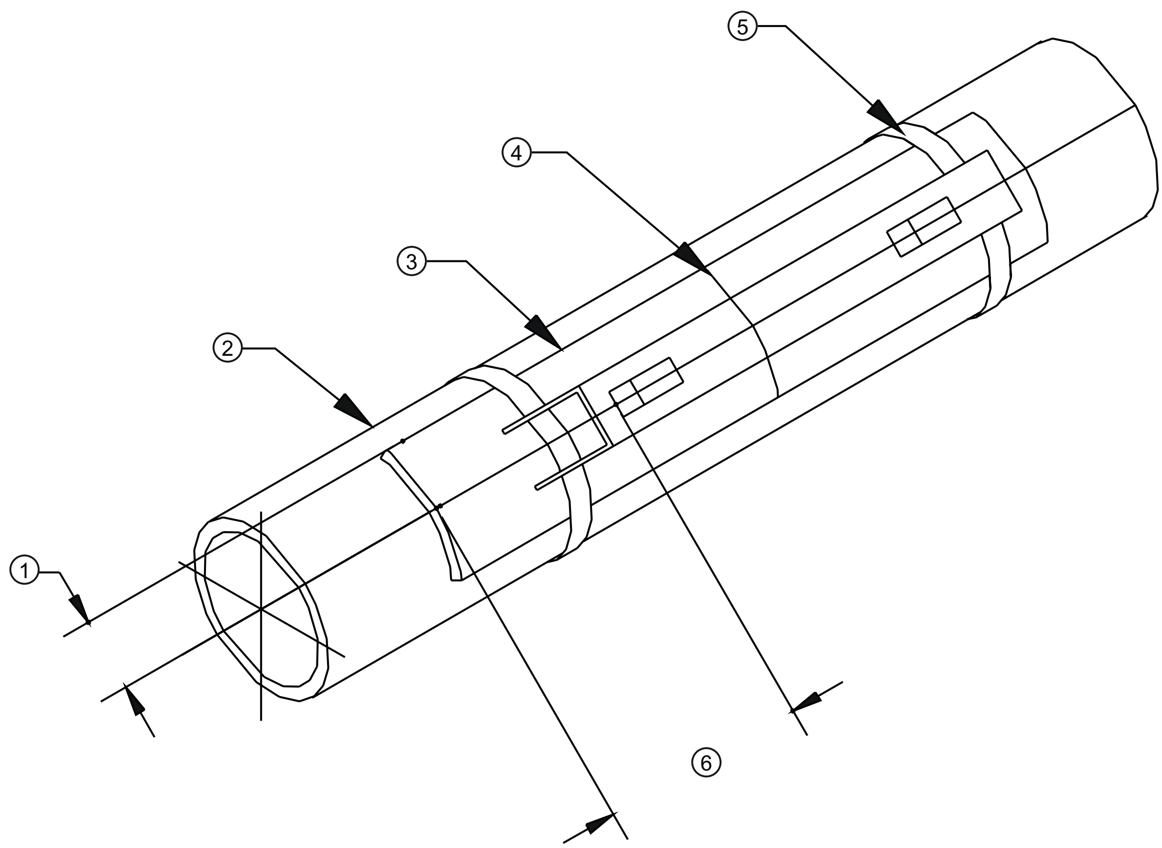
1. Use the full sheet dimensions. The 36-inch (91.44 cm) length will be applied along the pipe axis.
2. Depending on the sensor size code multiple layers may be required. Refer to table above for the correct number of layers to apply.

Applying couplant sheet to pipe

1. Verify that the ambient and pipe temperature fall within the temperature limits specified in table above. *Note that operating and installation temperatures are not the same.*
2. Determine the proper location of the sensors (refer to paragraph "Cutting and installing couplant sheets" above).
3. Thoroughly clean and degrease the selected pipe area with a suitable solvent (see "Cautions on the use of dry film couplant" below).
4. After determining the best sheet cutting pattern from suggestions above, mark the pipe for the starting edge of the dry couplant sheet position.
5. Partially peel the sheet backing 1 inch (2.54 cm) to 2 inches (5.08 cm) from the starting edge, then carefully locate and press against the pipe surface.
6. While pressing firmly and sliding your hand against the sheet (along the pipe surface), slowly peel away the backing such that it prevents the trapping of air.
7. Apply the film slowly and carefully so that the sheet does not wrinkle, stretch or overlap, especially under the sensor contacting surfaces.
8. Use the wooden hand roller supplied to smooth the film and assure adhesion to the pipe surface.
9. Apply additional layers (if required) while avoiding any seams under the sensors.
10. Use the wooden hand roller on each layer applied.
11. Record final thickness of material (from table above) for later entry into the transmitter.



①	Roll in line with pipe axis
②	Damping material
③	Wooden roller



①	At least 4 inches (10.16 cm) both sides	④	If film is applied in pieces, seam may be between, BUT NOT UNDER SENSORS.
②	Flowing pipe	⑤	Mounting assemblies and straps are installed after the film
③	Damping film	⑥	At least 2 inches (5.08 cm) both sides

Mounting sensors

Install the mounting assemblies and sensors directly on top of the damping material. Use liquid couplant (7ME396000UC20) for all clamp-on gas installations or if signal amplitude is low or marginal.

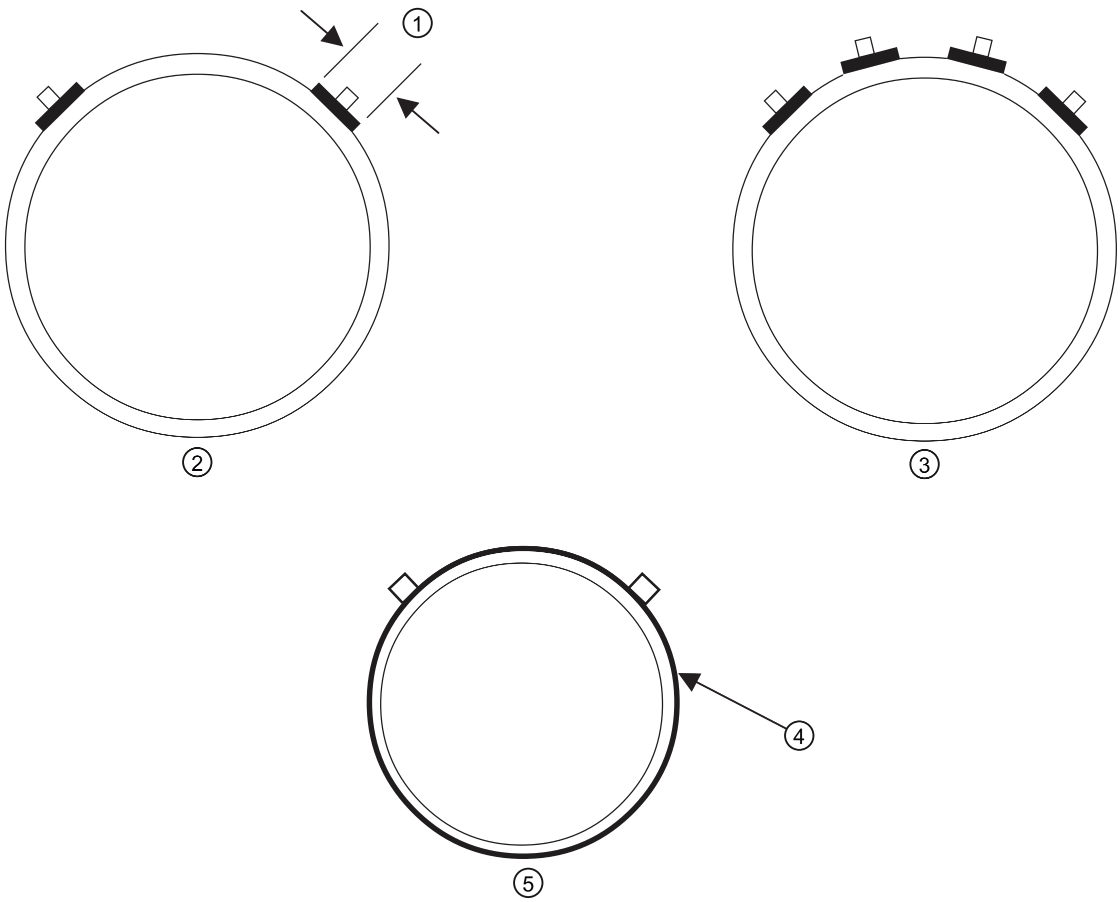
Follow the instructions in the manual for installing the sensors into the mounting assemblies and securing (see Installing sensors in Reflect mode (Page 32)).

1. Connect sensor cables.
2. Return to the transmitter and complete installation process.

Cautions on the use of dry film couplant

- **Don't** clean the sensors or pipe surface with MEK, acetone, trichloroethane, trichloroethylene, toluene, freon (and its vapors), chloroform, and xylene.
- **Don't** use on oily or greasy pipe surfaces. It will interfere with adhesion.

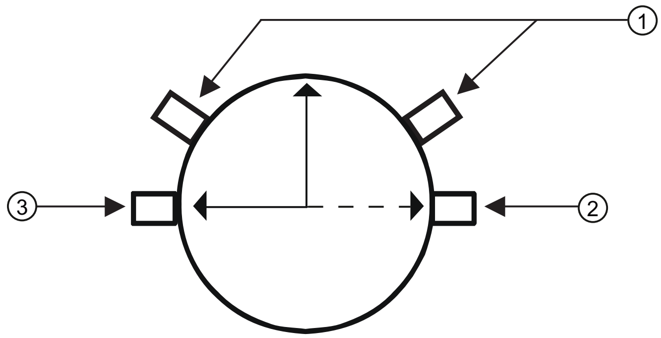
Multi-beam installations



①	Minimum 8 inches (20.32 cm) wide dry film
②	2-Beam
③	4-Beam
④	Wrap damping material all around pipe
⑤	Small pipes

Note

Contact Siemens Technical Services Group (1 800 275-8480) for additional recommendations on use of Dry Film Couplant/Damping Compound.



① Recommended sensor placement for Dual Beam Reflect mount
② Sensor located at 3 o'clock
③ Sensor located at 9 o'clock

Figure 4-10 End view (Horizontal plane)

Grace ice and water shield damping material

An alternate pipe damping material referred to as "Grace Ice and Water Shield" can be considered for use with clamp-on gas systems. This opaque material has a black tar like appearance with a very tenacious adhesive backing. Its lower operating temperature range and difficult removal from the pipe must be considered before installing this alternate material. Refer to the web site (www.graceconstruction.com) for a local distributors of this roofing underlayment material.

The installation and sizing of the Grace material is identical to that of Siemens damping material. Refer to table below for the recommended number in layers for each sensor size. (Operating / Installation temperature ranges can be found just below table.)

Table 4-2 Grace ice and water sheild damping material thickness for clamp-on gas systems

Sensor size	Required layers of Grace	Final Thickness (in)	Final Thickness (mm)
B1H	1	0.038	0.97
B2H	1	0.038	0.97
B3H	1	0.038	0.97
C1H	1	0.038	0.97
C2H	1	0.038	0.97
D1H	1	0.038	0.97
D2H	2	0.076	2.93
D3H	1	0.038	0.97
D4H	3	0.114	2.90

Operating temperature range: -23 °C to 65°C (-10 °F to 150 °F)
Installation temperature: 0 °C to 50 °C (32 °F to 120 °F)

4.6.6 Sensor Dry Coupling Pad Installation Procedure

The following illustrates the proper procedure for installing a dry coupling pad between the sensor and pipe surface. The dry coupling pads replace the standard grease coupling supplied with the sensor.

Note

In some rare cases the dry pad may yield a lower than expected signal strength. If this occurs it is recommended to apply a small amount of grease coupling to both sides of the pad and re-install.

Note

Due to vendor supply differences the dry pads may be provided with a clear plastic backing. If plastic backing is present ensure removal before use.

Guidelines for Use

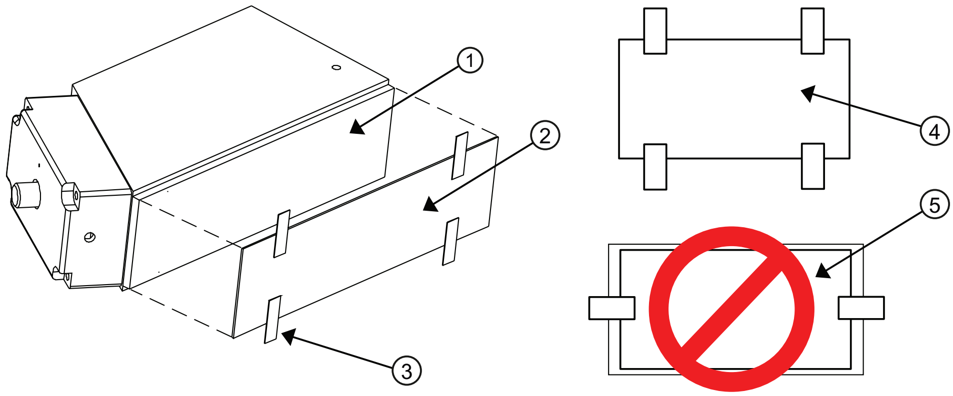
1. Intended for any liquid, clamp-on transit-time application where environmental conditions warrant use of more durable coupling material. Not for use outside temperature limits of material stated below, regardless of the sensor temperature range.
2. Temperature Range -34°C to +200°C (-30°F to +392°F).
3. Not intended for gas applications where CC129 pipe damping material is specified.

Required Mounting Items

1. Dry Coupling Pads - 7ME39600UC40 (Use one per sensor.)
2. Scissors or razor knife (not supplied)
3. Adhesive tape (not supplied)

Installation Procedure

Refer to the figure below during installation.



① Sensor Emitter Surface

② Dry Coupling Pad, with backing removed

③ Adhesive Tape in correct position.

④ Correct tape placement

Trim pad to length of sensor; cover entire length, not shorter.

Apply tape to long side of sensor only, just enough to hold pad in place during installation.

⑤ Incorrect tape placement

Pad too short; do not place tape on short side of sensor.

Figure 4-11 Dry Coupling Pad Installation

1. Before installation, remove clear backing from pads, if present.
2. Trim the pad to the size of the bottom dimensions of the sensor emitting surface. Use care not to exceed the length of the sensor.
3. Place one (1) dry coupling pad over the bottom surface of the sensor. Pad should be clean and dry during installation.
4. To secure dry coupling pad to sensor during mounting, attach the trimmed pad to the bottom of sensor using small pieces of tape on long side of sensor.
5. Install sensor on pipe, in accordance with operating instructions manual, with dry coupling pad in between sensor and pipe.

Note

Adhesive tape may remain on sensor and pipe after installation is complete. Tape should not protrude more than 6 mm (1/4-inch) from sensor sides.

Refer to the appropriate Operating Instructions manual for the final sensor installation procedure. For additional technical support: *http://www.siemens.com/automation/support-request*

5 Connecting

5.1 Chapter overview

This chapter describes how to wire the sensors for operation with a wall mounted transmitter.

1. Sensor wiring (Page 48)
2. Connecting sensors to transmitter (Page 60)

5.2 Basic safety notes

WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Finalizing cable wiring (Page 59).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.

WARNING

Lack of equipotential bonding

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

- Ensure that the device is potentially equalized.

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

WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

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

WARNING

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas.

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

WARNING

Connecting device in energized state

Risk of explosion in hazardous areas.

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

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.
- Exceptions for type of protection "Increased safety ec" (Zone 2) are regulated in the relevant certificate.

WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

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

WARNING

Incorrect conduit system

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

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

Note

Electromagnetic compatibility (EMC)

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

For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Connecting sensor cables to transmitter (Page 60).

Hazardous area applications

Note

Important

For FST030 transmitter only.

Sensors must be connected to a transmitter suitable for hazardous area locations.

Special requirements apply to the location and interconnection of sensor and transmitter. See Preparing sensor cables (Page 48).

WARNING

Transmitter housing

Risk of explosion in hazardous areas. Death or serious injury may occur.

Before opening the terminal box check that:

- No explosion hazard exists
- All connection leads are potential free

WARNING

Grounding

The mains protective earth wire must be connected to the PE terminal.

Death or serious injury may occur.

5.3 Sensor nameplate

Clamp-on sensors have one nameplate that shows the following information:

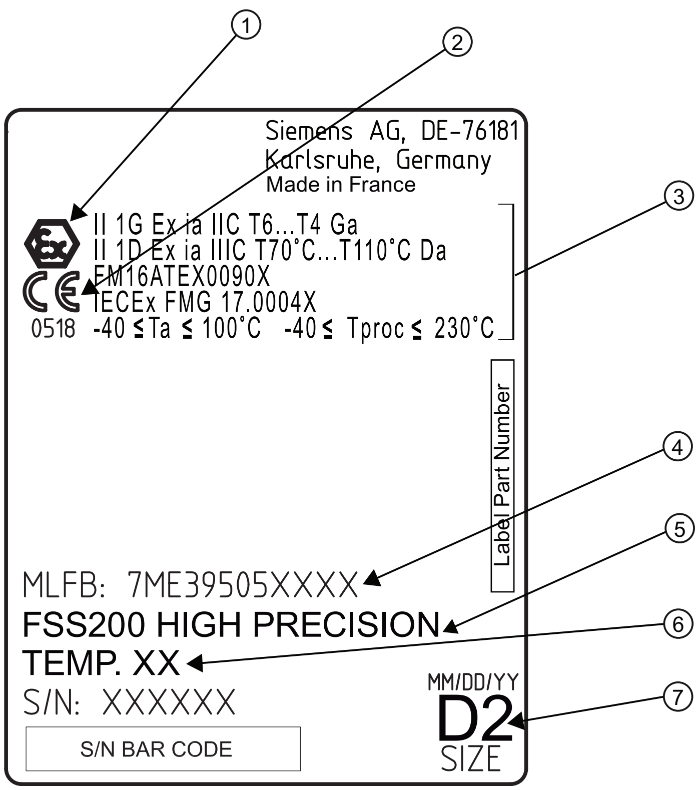
- product identification
- product specifications
- certificates and approvals

The transmitter is identified as "Ultrasonic transmitter SITRANS FST030 or FST020" and the sensors as "Ultrasonic sensor SITRANS FSS200".

Sensor nameplate

Note

Check to make sure that the sensors are a matched set with the same serial numbers and marked with an "A" and "B" (e.g., 19256A and 19256B).



① Ex mark
② CE declaration
③ Ex approvals
④ MLFB
⑤ Sensor model
⑥ Temperature code
⑦ Sensor size

Figure 5-1 Sensor identification nameplate example

5.4 Preparing sensor cables

The sensor wiring steps depend on the configuration.

- Sensor cable types (Page 49)
- Coaxial cables (Page 50)

- Triaxial cable (Page 52) (for FST030 only)
- RTD Sensor cables (Page 55) (for FST030 only)
- Finalizing cable wiring (Page 59)

5.4.1 Sensor cable types

For the system to function properly the coaxial or optional triaxial sensor cables must be prepared and connected correctly. Please note that both sensors (A and B) for each path must be connected to the same port numbers (e.g. 1A and 1B or 2A and 2B).

Note

Important

The sensor cables are supplied with only one F-connector attached. The F-connector at the opposite end of each cable must be installed.

Note

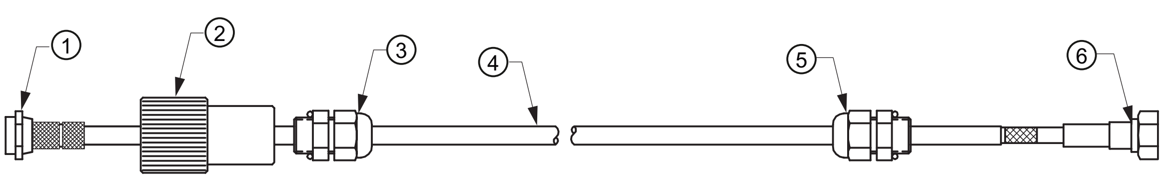
Shortening sensor cables

If sensor cables are to be shortened they must be cut and stripped to approximately the same length, to minimize any zero flow offset.

Note

Important

When cables are installed with cable glands, glands must be threaded onto the cable from the unterminated end prior to the assembly of the F-connector. If cables are ordered without cable glands, user supplied glands must also be installed onto the cable from the unterminated end prior to the assembly of the F-connector.



①	F-connector (Supplied lose in kit)	④	Sensor cable
②	NPT adapter	⑤	Transmitter side cable gland
③	Cable gland	⑥	F-connector (attached)

Figure 5-2 Typical Sensor cable assembly

5.4.2 Coaxial cable

5.4.2.1 Preparing coaxial sensor cable

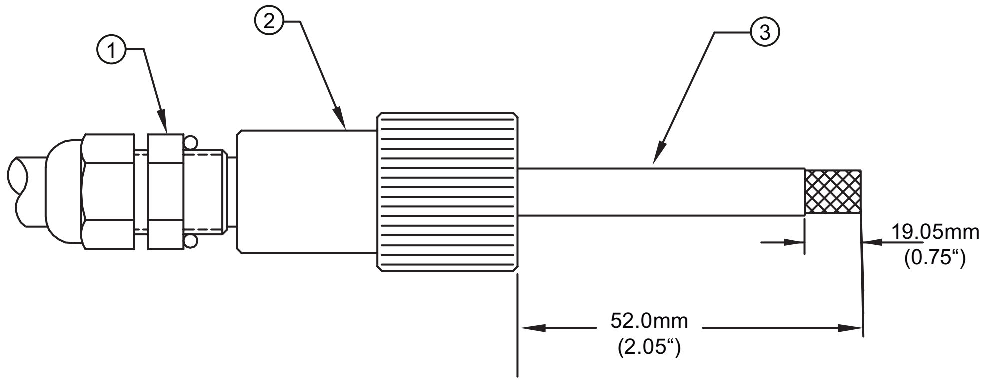
Note

IMPORTANT

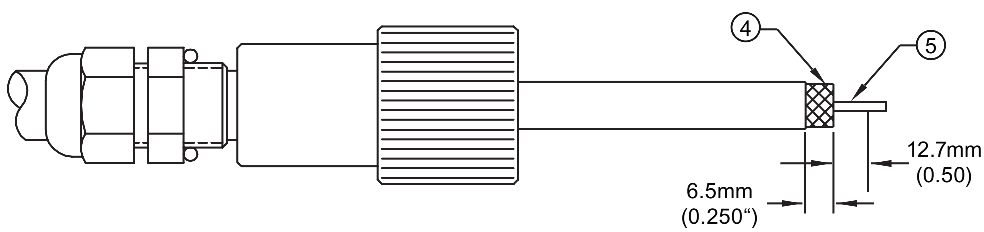
Make sure the cable gland ① and NPT Adapter ② have been threaded onto the sensor cable BEFORE beginning to strip cable.

Prepare unterminated coaxial cable ends as follows:

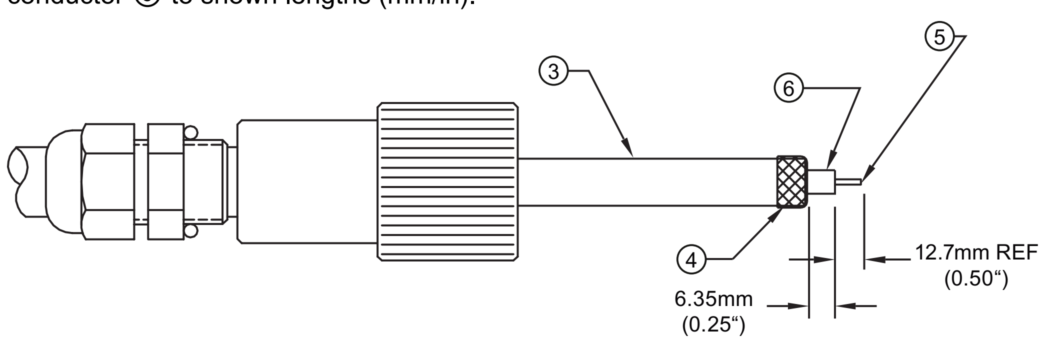
1. Strip unterminated outer jacket ③ to shown lengths (mm/in).



2. Trim exposed inner shield ④ and dielectric to shown length (mm/in) to expose the center conductor ⑤.

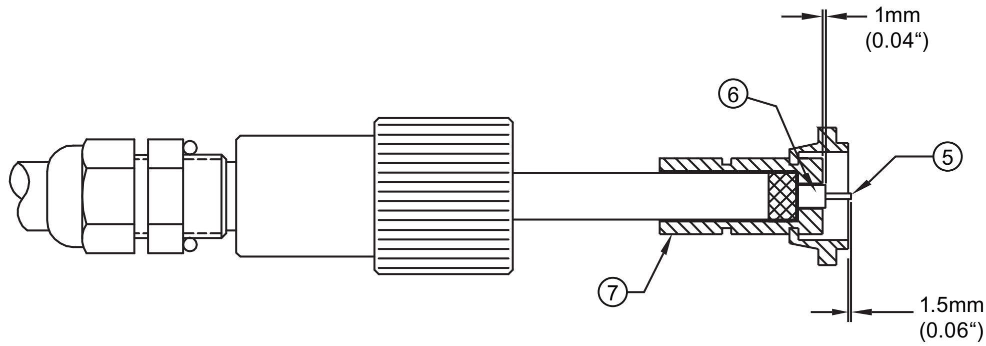


3. Fold back exposed inner shield ④ over outer jacket ③ and trim dielectric ⑥ and center conductor ⑤ to shown lengths (mm/in).



Assemble the cable and F-connector as follows:

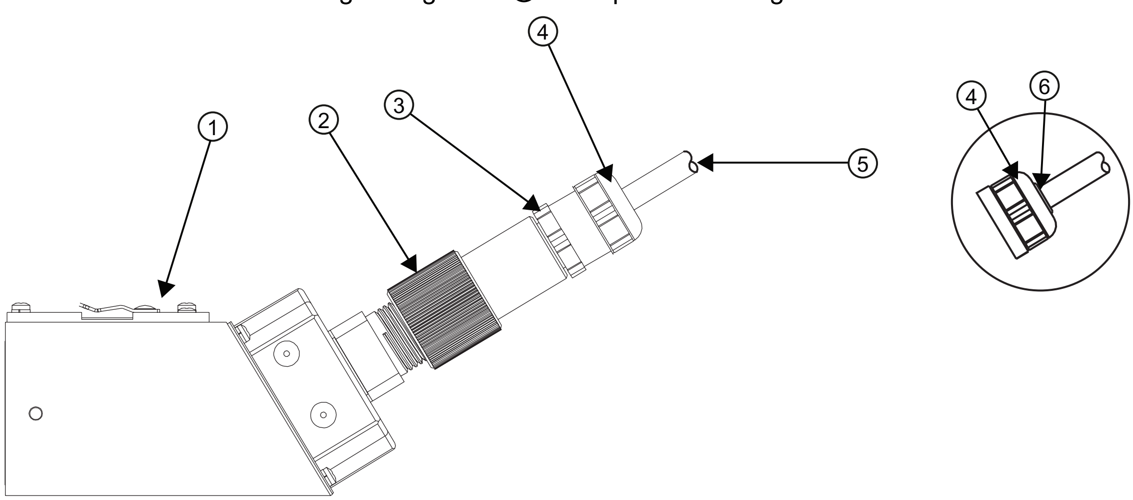
4. Push and twist the F-connector ⑦ on the cable until secure.



5. Ensure the dielectric ⑥ is flush to 1mm (.04 in) beyond barrel end and that the center conductor ⑤ is 1.5mm (0.06 in) beyond the F-connector body ⑦.

5.4.2.2 Connecting coaxial cable

1. Take the prepared sensor cable end and fill the F-connector with Super Lube coupling compound, then screw it onto the sensor ① and hand tighten.
2. Coat the NPT Adapter ② with Super Lube coupling compound, screw it onto the sensor ① and hand tighten.
3. Screw the cable gland body hex into the NPT Adapter. Tighten the Gland body hex ③ until it butts up against the NPT Adapter end (approx. 8Nm).
4. Using an adjustable wrench, screw on the gland cap nut ④ and tighten to obtain optimum sealing. The gasket ⑥ must protrude along the cable as shown.



5.4.3 Triaxial cable

5.4.3.1 Preparing Triaxial sensor cable

Note

Triaxial cables are optionally available for the FST030 only.

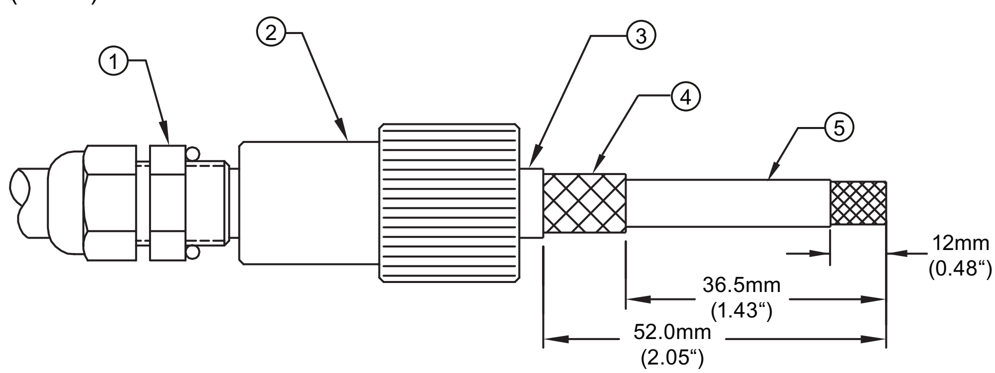
Note

IMPORTANT

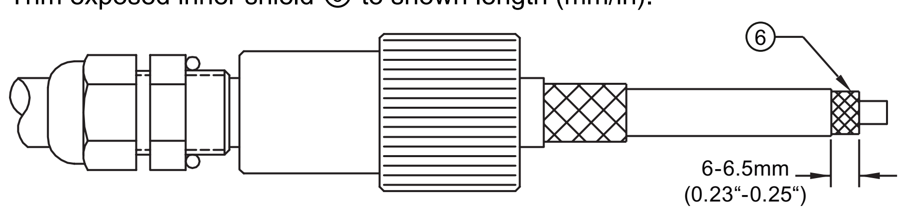
Make sure the cable gland ① and NPT Adapter ② have been threaded onto the sensor cable BEFORE beginning to strip cable.

Prepare unterminated cable ends as follows:

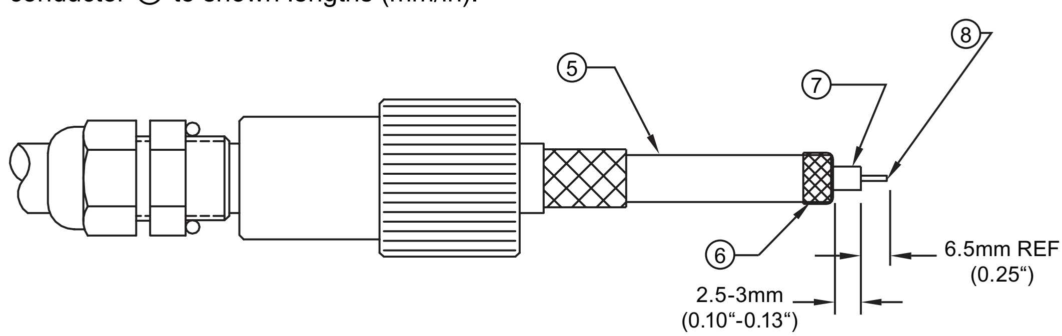
1. Strip unterminated outer jacket ③, outer shield ④, and inner jacket ⑤ to shown lengths (mm/in).



2. Trim exposed inner shield ⑥ to shown length (mm/in).



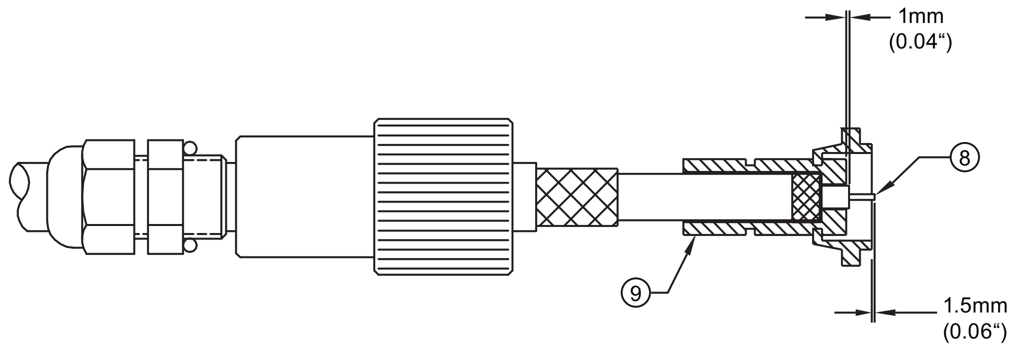
3. Fold back exposed inner shield ⑥ over inner jacket ⑤ and trim dielectric ⑦ and center conductor ⑧ to shown lengths (mm/in).



Triaxial cable and F-connector assembly

Assemble the cable and F-connector as follows:

1. Push and twist the F-connector ⑨ on the cable until secure.



2. Ensure the dielectric ⑦ is flush to 1mm (.04 in) beyond barrel end and that the center conductor ⑧ is 1.5mm (0.06 in) beyond the F-connector body ⑨.

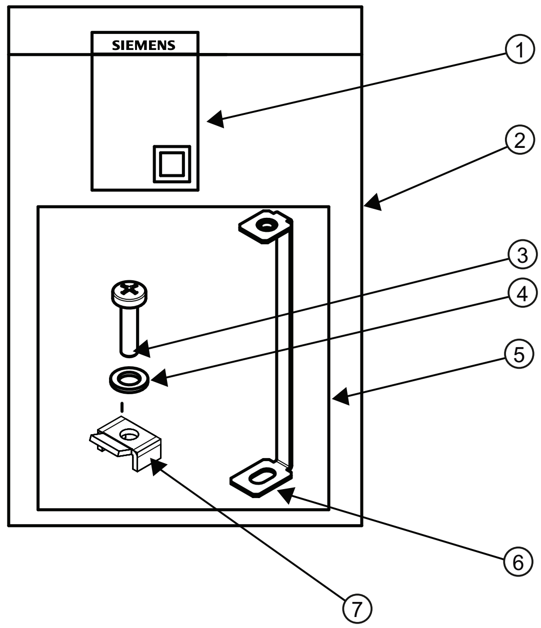
5.4.3.2 Connecting triaxial cables

Sensor grounding wire clamp components

Note

Triaxial cables are optionally available for the FST030 only.

The triaxial sensor cable must have a grounding connection from the cable gland to earth ground. The cable is shipped with the grounding clamp parts and instructions sealed in a separate plastic bag.

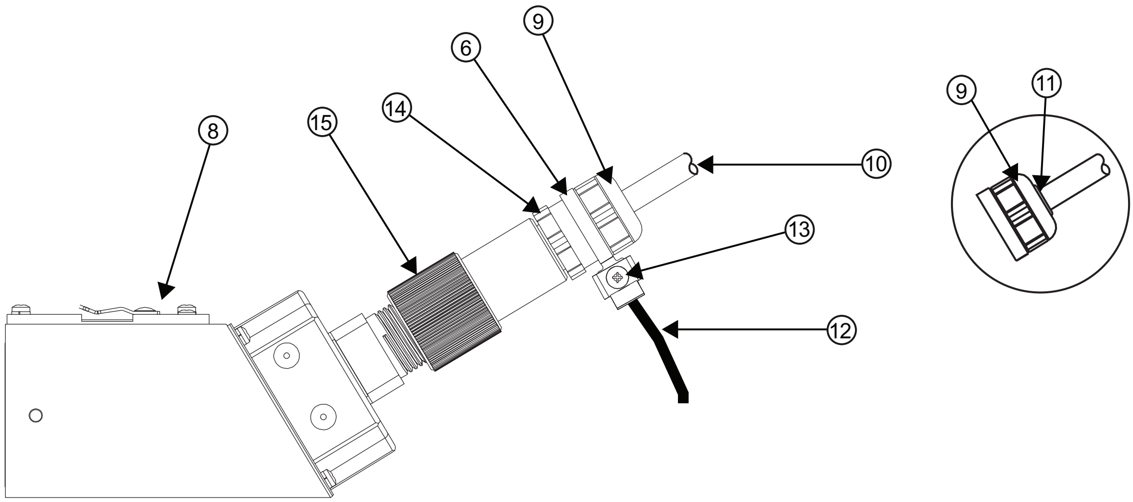


①	Label	⑤	Instruction sheet
②	Plastic bag	⑥	Earth clamp
③	Screw - ISO 7045	⑦	U-clamp
④	Spring washer DIN 127B		

Figure 5-3 Triaxial ground wire clamp parts

Ground wire clamp assembly

1. Take the prepared sensor cable end and fill the F-connector with Super Lube coupling compound, then screw it onto the sensor ① and hand tighten.
2. Coat the NPT Adapter ⑮ with Super Lube coupling compound, screw it onto the sensor ⑧ and hand tighten.
3. Screw the cable gland body hex ⑭ into the NPT Adapter. Tighten the gland body hex until it butts up against the NPT Adapter end (approx. 8Nm).
4. Using an adjustable wrench, screw on the gland cap nut ⑨ and tighten to obtain optimum sealing. The gasket ⑪ must protrude along the cable as shown.
5. Form the Earth clamp ⑥ around the gland cap nut ⑨ as shown.



⑧ Sensor
⑨ Gland cap nut
⑩ Sensor cable
⑪ Sealing gasket
⑫ User supplied ground wire (see note)
⑬ Screw, spring washer and U-clamp
⑭ Gland body hex
⑮ NPT Adapter

Figure 5-4 Cable gland clamp and ground wire

Note

Important

The user supplied grounding wire that is connected to earth ground must be 4mm^2 (10 AWG) or larger.

5.4.4 Preparing RTD sensor cables

RTD Sensor Cable

Note

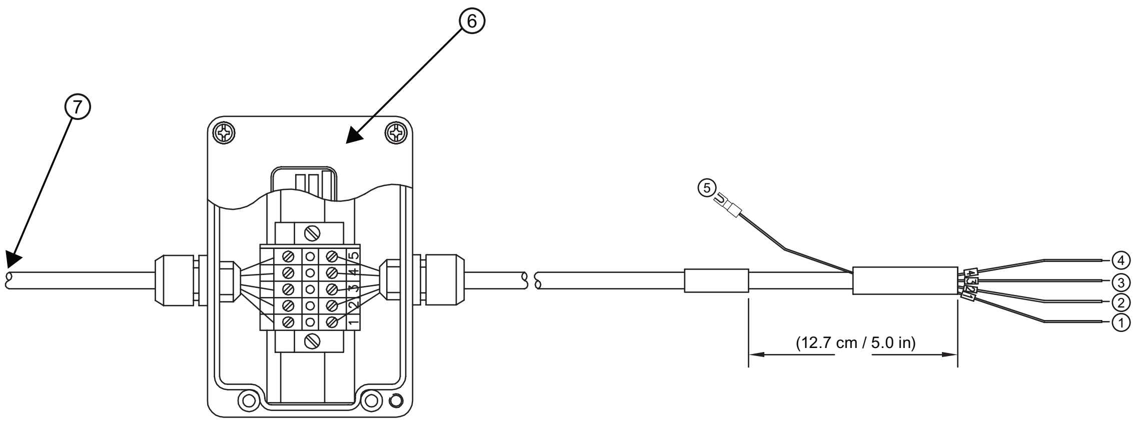
RTD temperature sensor cables are only available for the FST030.

The temperature sensor cable includes the following:

- Optional cable lengths include: 6.1m (20 ft), 15.24m (50ft), 30.48m (100ft), 45.72m (150ft), 60.96m (200ft) and 91.44m (300ft).
- A sealed parts bag that includes an insulating sleeve (15.24cm / 6.0in), crimp lug (for wall mount RTD ground wire) and 5 crimp lugs for assembling legacy RTD cables, if needed.

Preparing the cable

1. Slide the insulated sleeve onto the cable over wires ①, ②, ③ and ④ but NOT the blue wire ⑤. Fold back the blue wire.
2. Attached the wall mount RTD crimp lug to the blue wire ⑤ on the cable using a crimping tool or equivalent.
3. Set aside all remaining parts left in the parts bag.



①	Black (I+) RTD current high	⑤	Blue - Ground (add crimp lug - A5E39272102)
②	White (V+) RTD voltage high	⑥	Junction box
③	Green (I-) RTD voltage low	⑦	To sensor with BNC connector or to submersible sensor
④	Red (V-) RTD current low		

Figure 5-5 RTD sensor cable

4. Proceed to the Mounting temperature sensor (Page 56) section.

5.4.5 Mounting temperature sensors

Note

RTD temperature sensors are for the FST030 transmitter only.

FST020 transmitter does not accommodate temperature sensors.

Temperature is used to normalize the liquids sonic velocity in order to properly determine interfaces and for density determination. Temperature sensors are available in clamp-on style or in insert (Thermowell) style. Refer to the table below. Both styles incorporate 1000 ohm platinum RTD's for high precision.

Note

Optional equipment

Temperature sensors are optional equipment. After installation proceed to Commissioning in the transmitter Operating Instructions.

Table 5-1 Temperature sensors

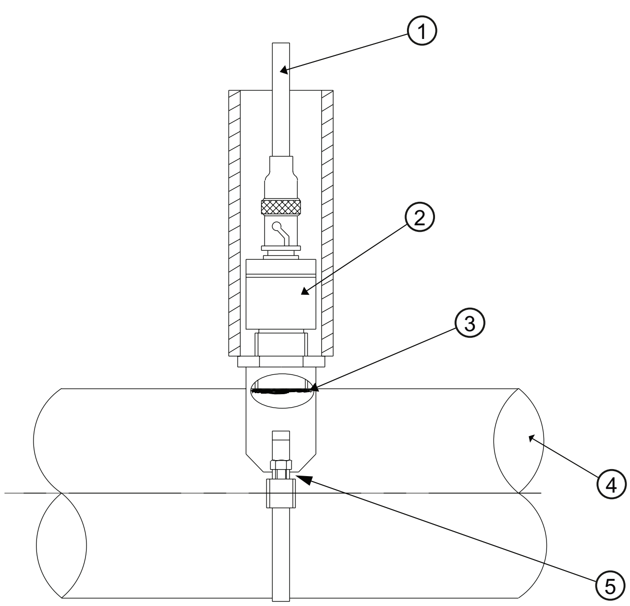
Description	Part number
Standard clamp-on RTD	7ME39501TA00
Submersible clamp-on RTD	7ME39501TB00
Standard clamp-on RTD pair for energy system	7ME39501TA10
Insertion style RTD (size 1): 140 mm (5.5 in)	7ME39501TJ00
Insertion style RTD (size 2): 216 mm (8.5 in)	7ME39501TJ01
Insertion style RTD (size 3): 292 mm (11.5 in)	7ME39501TJ02
Insertion style RTD (size 4): 368 mm (14.5 in)	7ME39501TJ03
Insertion style RTD pair (size 1), 140 mm (5.5 in)	7ME39501TJ10
Insertion style RTD pair (size 2), 216 mm (8.5 in)	7ME39501TJ11
Insertion style RTD pair (size 4), 368 mm (14.5 in)	7ME39501TJ13

Clamp-on temperature sensors (RTDs)

Note

RTD temperature sensors are for the FST030 only.

Clamp-on style temperature sensors are mounted on the surface of the monitored pipe using mounting assemblies. Apply a generous quantity of the thermal couplant provided to the tip of the sensor and attach it securely to the cleaned pipe surface with the proper mounting assembly. Temperature measurement anomalies resulting from variations in the ambient conditions can be minimized by insulating the pipe and sensor after installation.



①	7ME39600CR series cable	③	Thermal couplant
②	Clamp-on temperature sensor	④	Pipe
		⑤	Mounting assembly

Figure 5-6 Clamp-on temperature sensor

RTD cable to wall mount transmitter wiring

Note

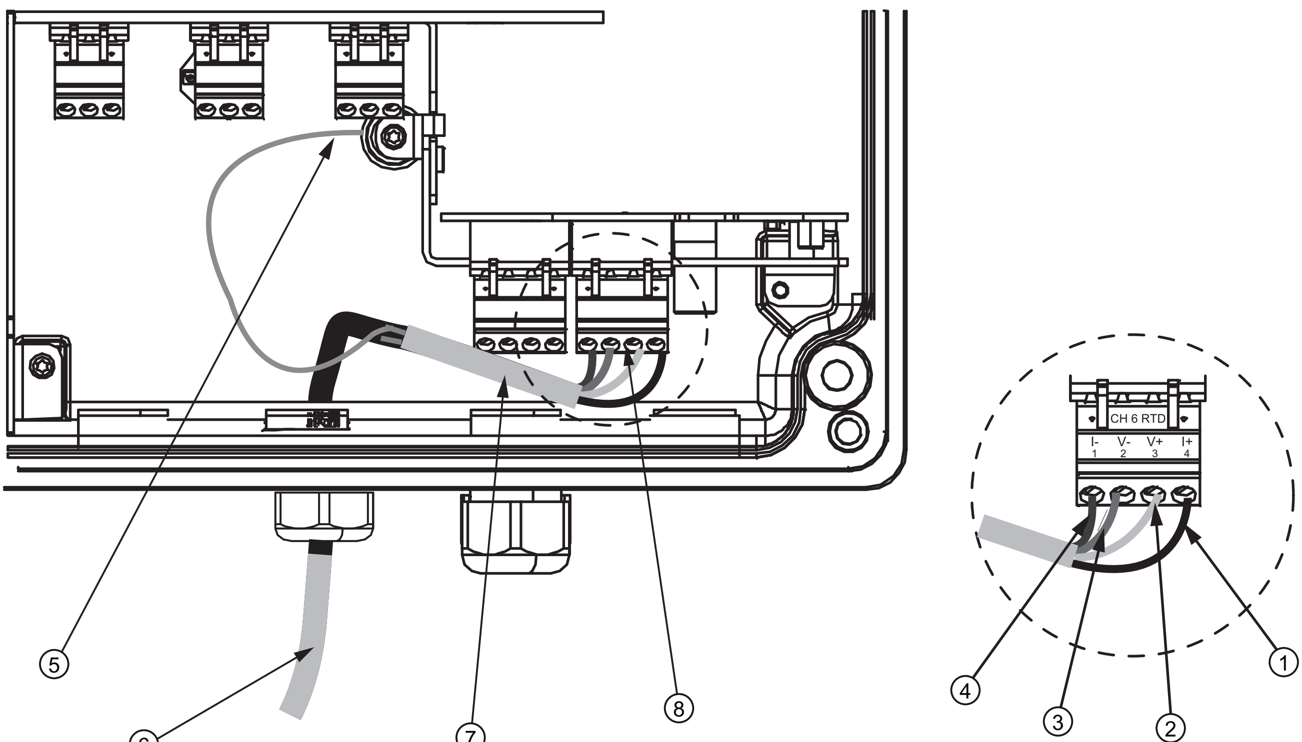
RTD temperature sensor are for the FST030 only.

Note

RTD Channels 5 and 6

RTD sensors can be connected to Channel 5, Channel 6 or to both channels depending on the application. The following example shows the RTD sensor connections to Channel 6.

1. Prepare the RTD cable. Make sure that the insulated sleeve is placed over the cable and the correct crimp lug (A5E39272102) is connected to the blue ground wire.
2. Attach the wires of the cable to the RTD connector to the transmitter as shown.



①	Black - I+ (RTD high current)	⑤	Blue - ground wire with crump lug
②	White - V+ (RTD high voltage)	⑥	RTD cable
③	Green - V- (RTD voltage low)	⑦	Insulated Sleeve (8.89cm / 3.5in)
④	Red - I- (RTD current low)	⑧	RTD connector (CH 6 RTD)

Figure 5-7 RTD connections

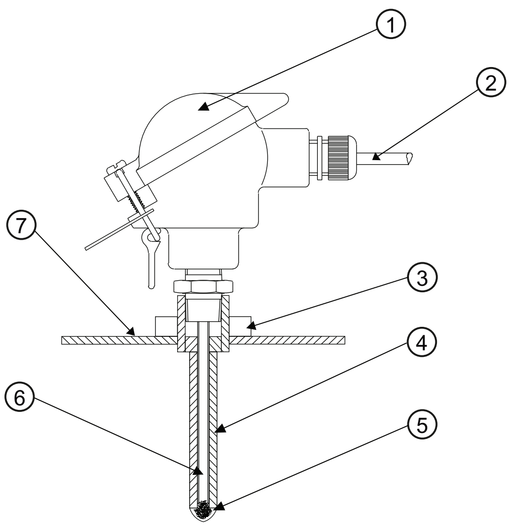
3. Connect the wires at the other end of the RTD cable to the appropriate connections on temperature sensor that has been selected.
4. Proceed to I/O Wzard in the transmitter FST030 Operating Instructions for enabling temperature functions.

Insert temperature sensors

Note

RTD temperature sensors are for the FST030 only.

Insert sensors are designed to be used in pipes equipped with Thermowells. These are spring-loaded, 6.35 mm (1/4") diameter sensors with 12.7 mm (1/2") NPT integral connection heads, available in several lengths to accommodate a range of pipe sizes.



- ① Temperature sensor connector head assembly
- ② 7ME39600CR series cable
- ③ Threaded pipe fitting
- ④ Thermowell
- ⑤ Thermal couplant
- ⑥ Spring loaded sensing element
- ⑦ Pipe wall

Figure 5-8 Insert temperature sensor

5.4.6 Finalizing cable wiring

Tighten the cable glands to obtain optimum sealing. The gaskets must protrude along the cable as shown.

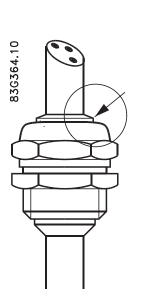
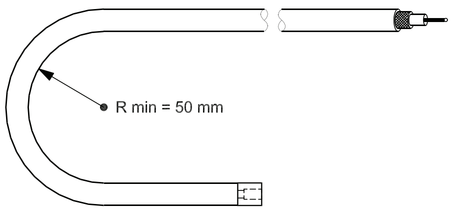


Figure 5-9 Correct cable sealing

Ensure that sensor cables are not overbent. Minimum cable bend radius is 50 mm (1.9 inches).



5.5 Connecting sensor cables to transmitter

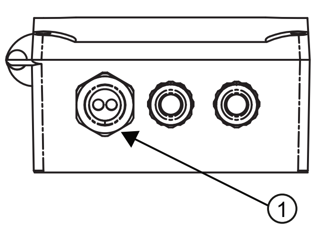
5.5.1 Transmitter FST020

Preparing for the connection

1. Loosen the six lid screws.
2. Open the lid.

Connecting the flow sensor cables

For the system to function properly, the sensor cables must be connected correctly. The sensor cables should be connected as upstream 1A and downstream 1B.



① Sensor I/O port

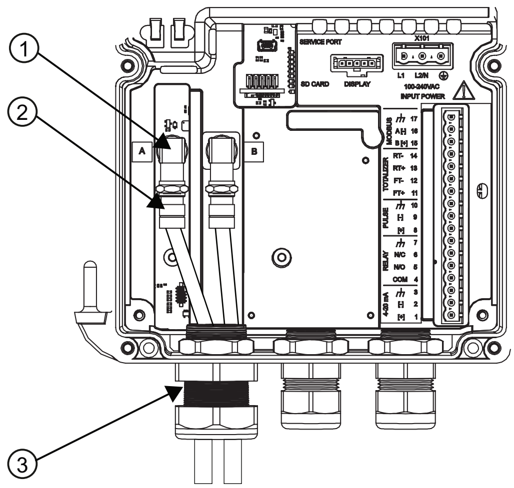
The sensor cables are delivered with a premounted F-connector at the transmitter end.

1. Remove the sensor blind plug from wall mount housing.
2. Feed the unterminated end of the cables through the two holes in the gland until 100mm of cable with the F-connector is remaining.
3. Feed the the cables though the hole in the transmitter case and then through the gland nut.
4. Screw the cable end into the right-angle F-connector (supplied with the transmitter).

5. Push the right-angle F-connector onto to the connector on the transmitter PC board.
6. Screw the gland and nut together to secure the cables.

Note

Sensor ports are labeled A and B.



①	Right-angle F-connector
②	F-connector
③	I/O cable gland

5.5.2 Transmitter FST030

Preparing for the connection

1. Loosen the four lid screws.
2. Open the lid.
3. Remove F-connector tool from wall mount enclosure.

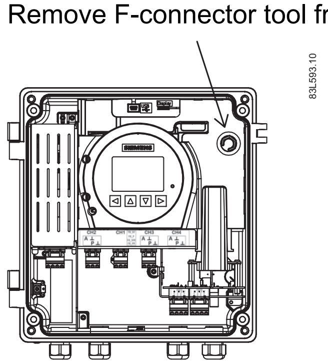
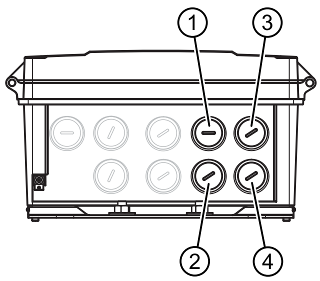


Figure 5-10 F-connector tool location

Connecting the flow sensor cables

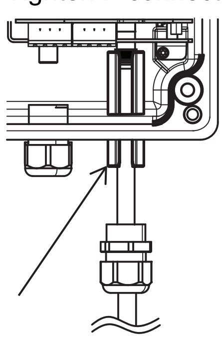
When connecting the sensors it is required for the system to function that the sensor cables are connected correctly. Both sensor cables for each path must be connected to the same port numbers (1A and 1B or 2A and 2B) on the transmitter.



①	Path 1 - Upstream sensor cable (1A)	③	Path 2 - Upstream (2A)
②	Path 1 - Downstream sensor cable (1B)	④	Path 2 - Downstream (2B)

The sensor cables are delivered with a premounted F-connector at transmitter end.

1. Remove blind plug from wall mount enclosure.
2. Slide the cable gland back onto the cable and allow access for ther F-connector tool.
3. Place F-connector tool around cable and slide up to engage F-connector nut.
4. Push cable through gland opening. Ensure that center lead is aligned with connector port in transmitter.
5. Tighten F-connector using tool until you meet mechanical stop.



6. Remove F-connector tool.
7. Mount and tighten cable gland.

Repeat these steps for each sensor cable.

5.6 Connecting sensor cables to sensor

5.6.1 Wall mount FST020

Connecting to FST020 transmitter

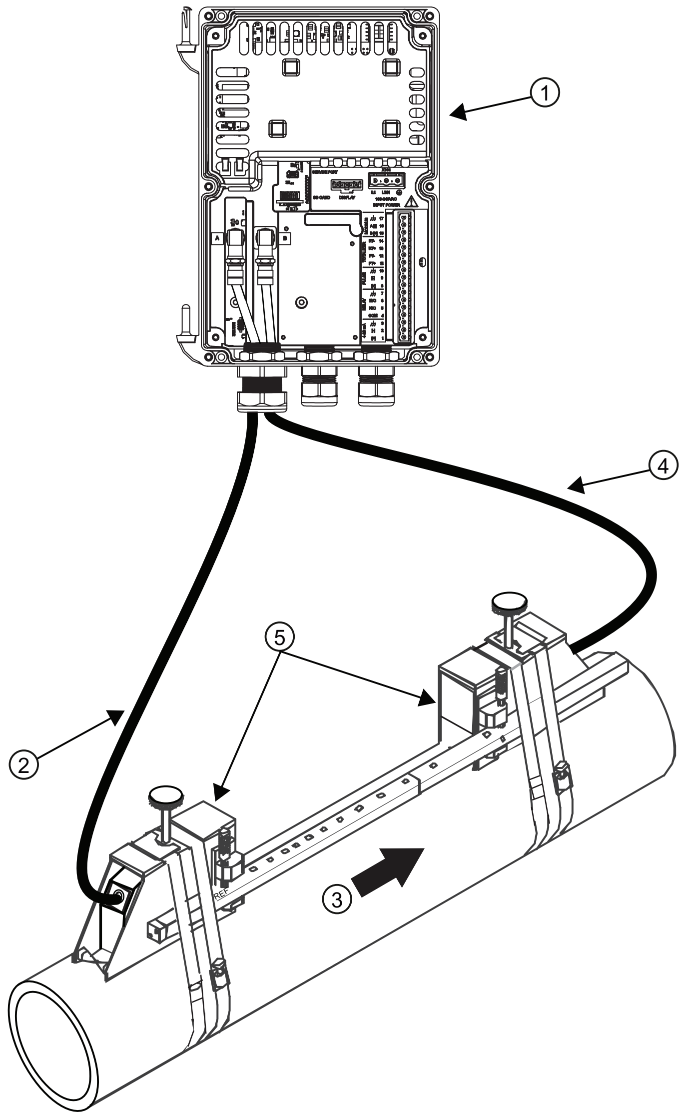
Note

The following example is shown in the Reflect mount sensor configuration.

Connect sensor cables to the wall mounted transmitter as follows:

1. Refer to Transmitter FST020 (Page 60) sensor cable preparation and connections.
2. To connect the sensor cables to the sensors, fill sensor connector end with Super Lube prior to connecting.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Observing the upstream and downstream orientation ③, connect upstream sensor cable ④ from the transmitter port (1A) and make connection snug.

5. Connect the downstream sensor cable ② from the transmitter port (1B) and make connection snug.



① Wall mounted transmitter
② Upstream sensor cable (1A) Path 1
③ Flow direction
④ Downstream sensor cable (1B) Path 1
⑤ Sensors

Figure 5-11 Wall mount housing with transmitter-to- sensor cable connections

6. Tighten all cable glands to obtain optimum sealing.
7. Refer to transmitter FST020 Operating Instructions to program transmitter.

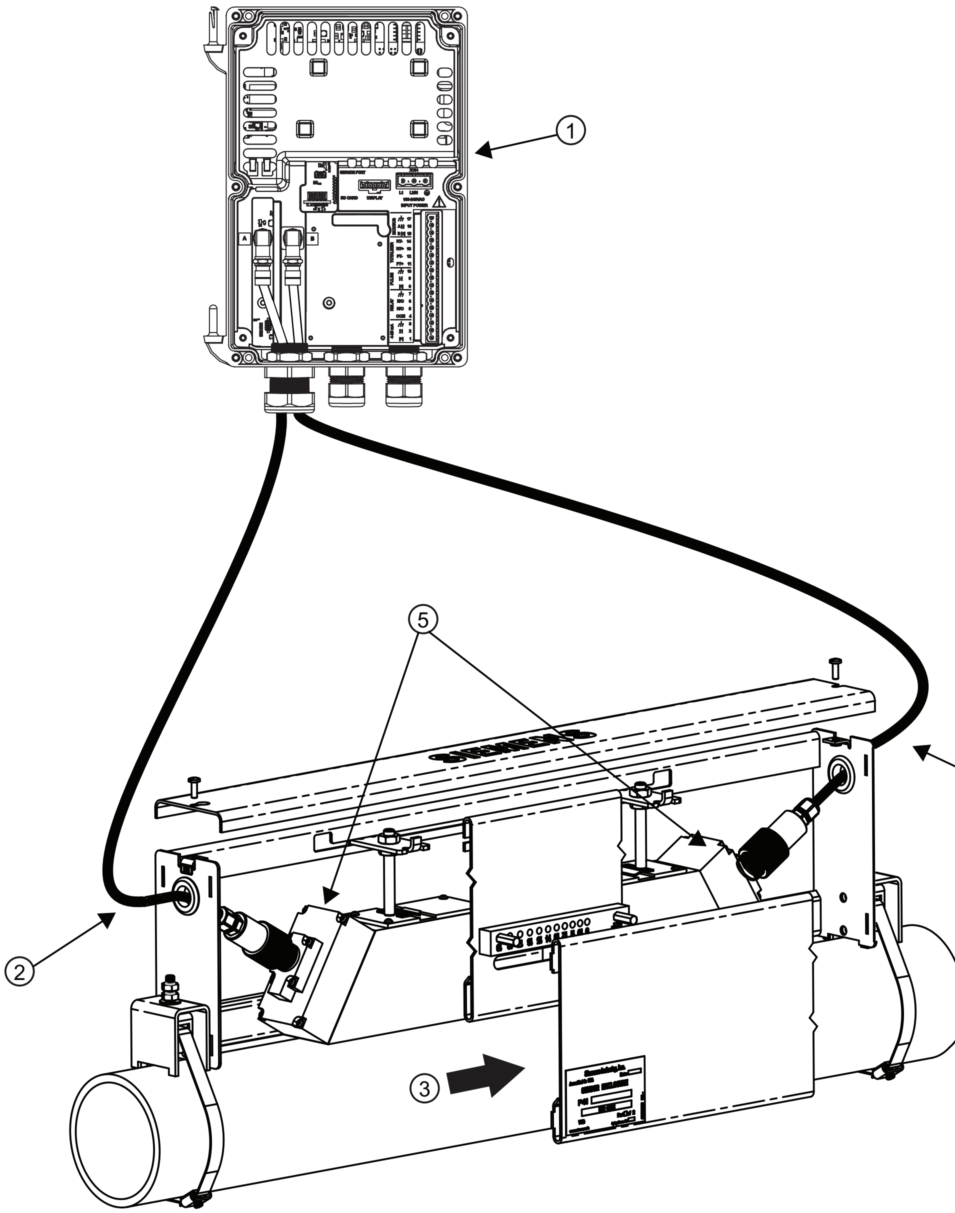
5.6.2 HI Precision mount FST020

Single enclosure Reflect mount wiring

Connect sensor cables to the transmitter as follows:

1. Refer to Transmitter FST020 (Page 60) sensor cable preparation and connections.
2. To connect the sensor cables to the sensors, fill connector end with Super Lube prior to connecting.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Observing the upstream and downstream orientation ③, connect upstream sensor cable ② from transmitter port (1A) and make connection snug.

5. Connect downstream sensor cable ④ from the transmitter port (1B) and make connection snug.



① Wall mounted transmitter	③ Flow direction
② Upstream sensor cable to transmitter port (1A) Path 1	④ Downstream sensor cable to transmitter port (1B) Path 1
	⑤ Hi Precision mounted sensors

Figure 5-12 Hi Precision Reflect mount single enclosure wiring

6. Tighten all cable glands to obtain optimum sealing.
7. Refer to transmitter FST020 Operating Instructions to program transmitter.

Dual enclosure Reflect mount wiring

Referring to the Hi Precision single enclosure reflect mount figure above, connect the Hi Precision mount reflect Dual enclosure sensor cables from the transmitter ports as follows:

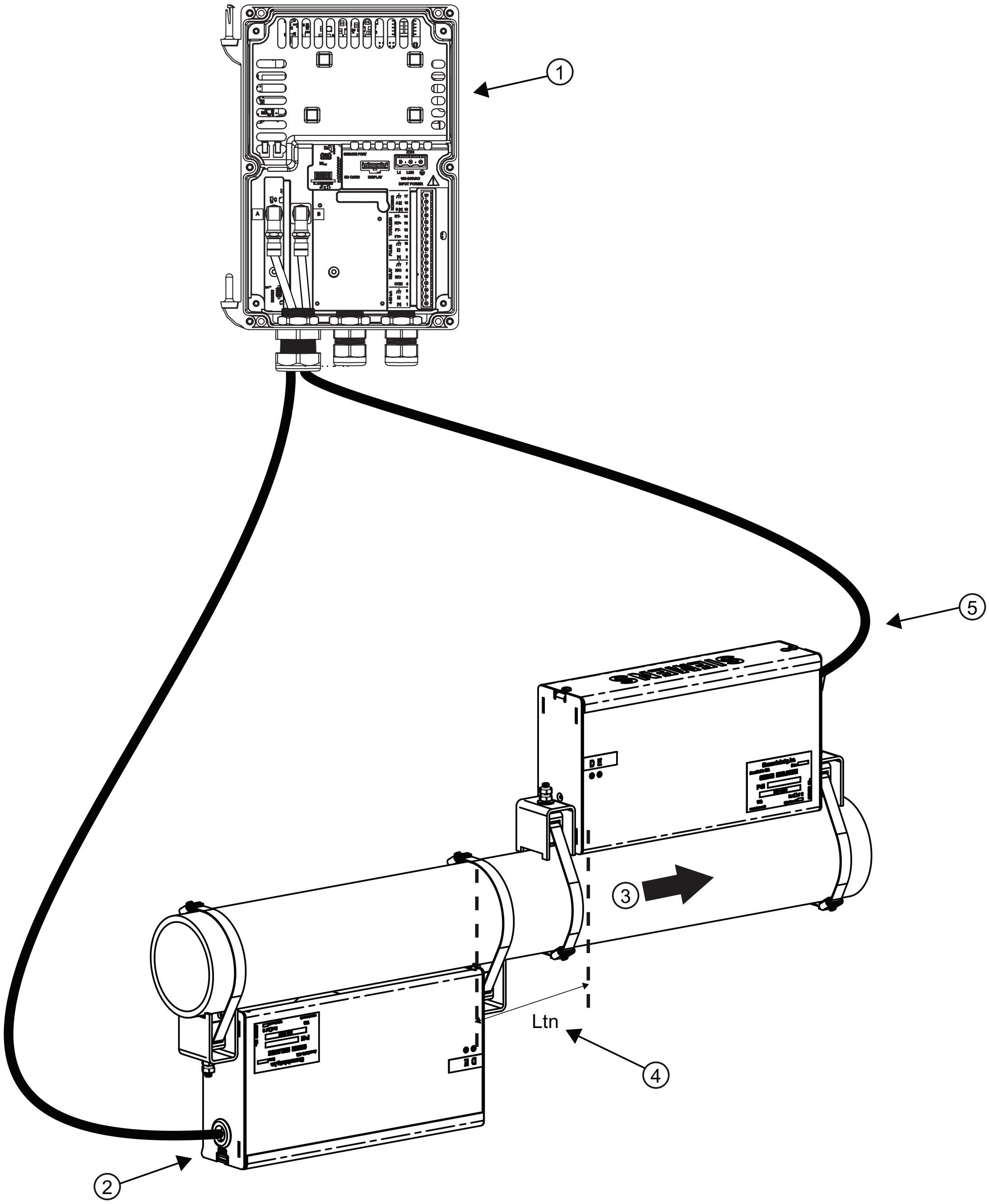
1. Observing the upstream and downstream orientation ③, connect sensor cables from transmitter ports.
2. Tighten all cable glands to obtain optimum sealing.
3. Refer to transmitter FST020 Operating Instructions to program transmitter.

Dual enclosure direct mount wiring

Connect sensor cables to the transmitter as follows:

1. Refer to Transmitter FST020 (Page 60) sensor cable preparation and connections.
2. To connect the sensor cables to the sensors, fill connector end with Super Lube prior to connecting.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Observing the upstream and downstream orientation ③, connect upstream sensor cable ② from transmitter port (1A) and make connection snug.

5. Connect downstream sensor cable ⑤ from transmitter port (1B) and make connection snug.



①	Wall mounted transmitter	③	Flow direction
②	Upstream sensor cable to transmitter port (1A) Path 1	④	Ltn (spacing distance between sensors)
		⑤	Downstream sensor cable to transmitter port (1B) Path 1

Figure 5-13 HI Precision Direct mount Dual enclosure sensor wiring

6. Tighten all cable glands to obtain optimum sealing.
7. Refer to transmitter FST020 Operating Instructions to program transmitter.

5.6.3 Wall mount FST030

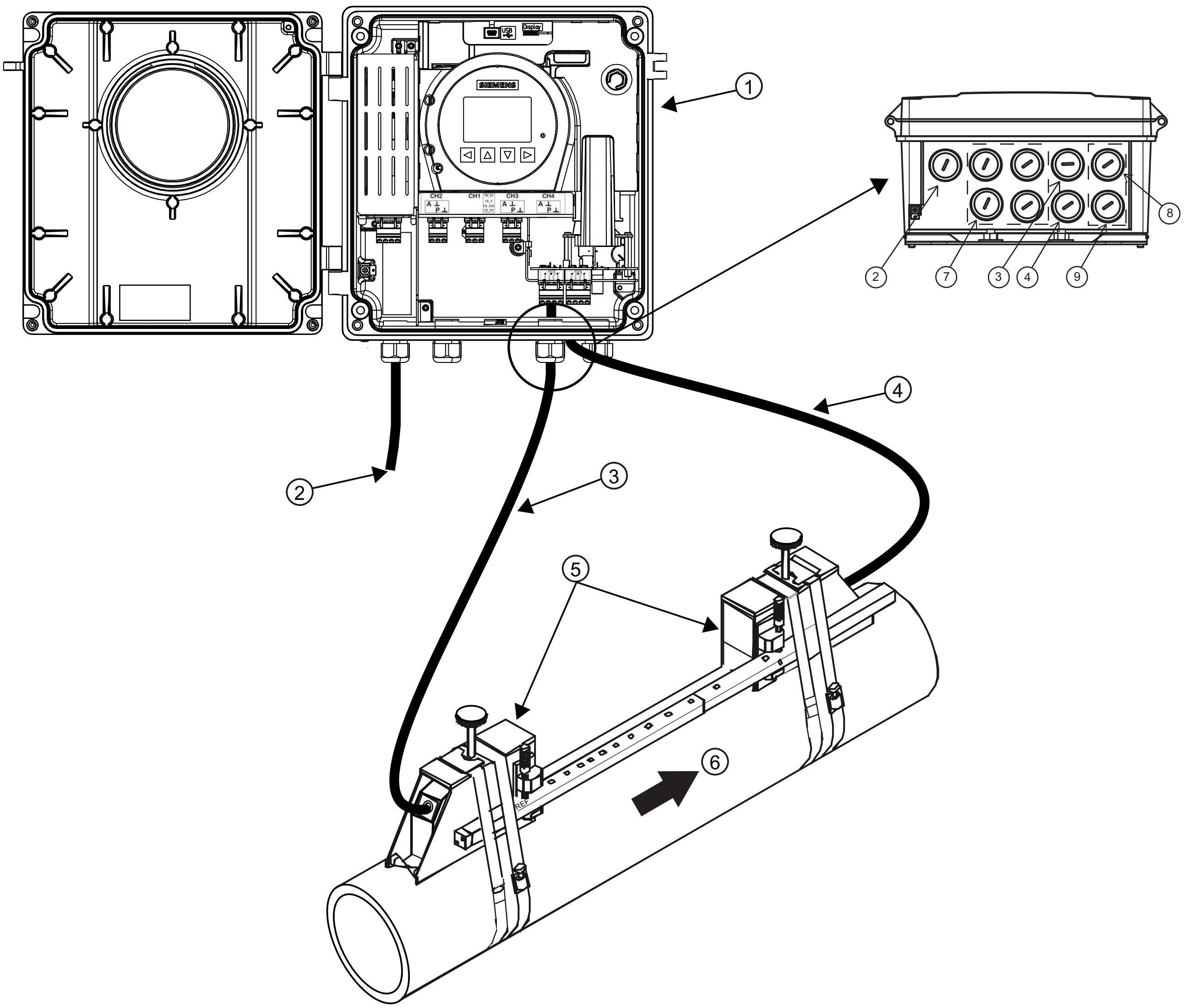
Note

The following example is shown in the Reflect mount sensor configuration.

Connect sensor cables to the sensor as follows:

1. Fill connector end with the supplied grease prior to connecting.
2. Apply the supplied grease to the internal threads at the large end of the thread connector.
3. Observing the upstream and downstream orientation ⑥, connect upstream sensor cable ③ from the transmitter port (1A) to the sensor ⑤ and make connection snug.

4. Connect the downstream sensor cable ④ from the transmitter port (1B) to the sensor ⑤ and make connection snug.



①	Wall mounted transmitter	⑤	Sensors
②	Power cable	⑥	Flow direction
③	Path 1 - Upstream sensor cable (1A)	⑦	Ports for I/O, Communications, RTDs
④	Path 1 - Downstream sensor cable (1B)	⑧	Path 2 - Upstream (2A)
		⑨	Path 2 - Downstream (2B)

Figure 5-14 Wall mount enclosure with transmitter-to- sensor cable connections

5. Tighten all cable glands to obtain optimum sealing.

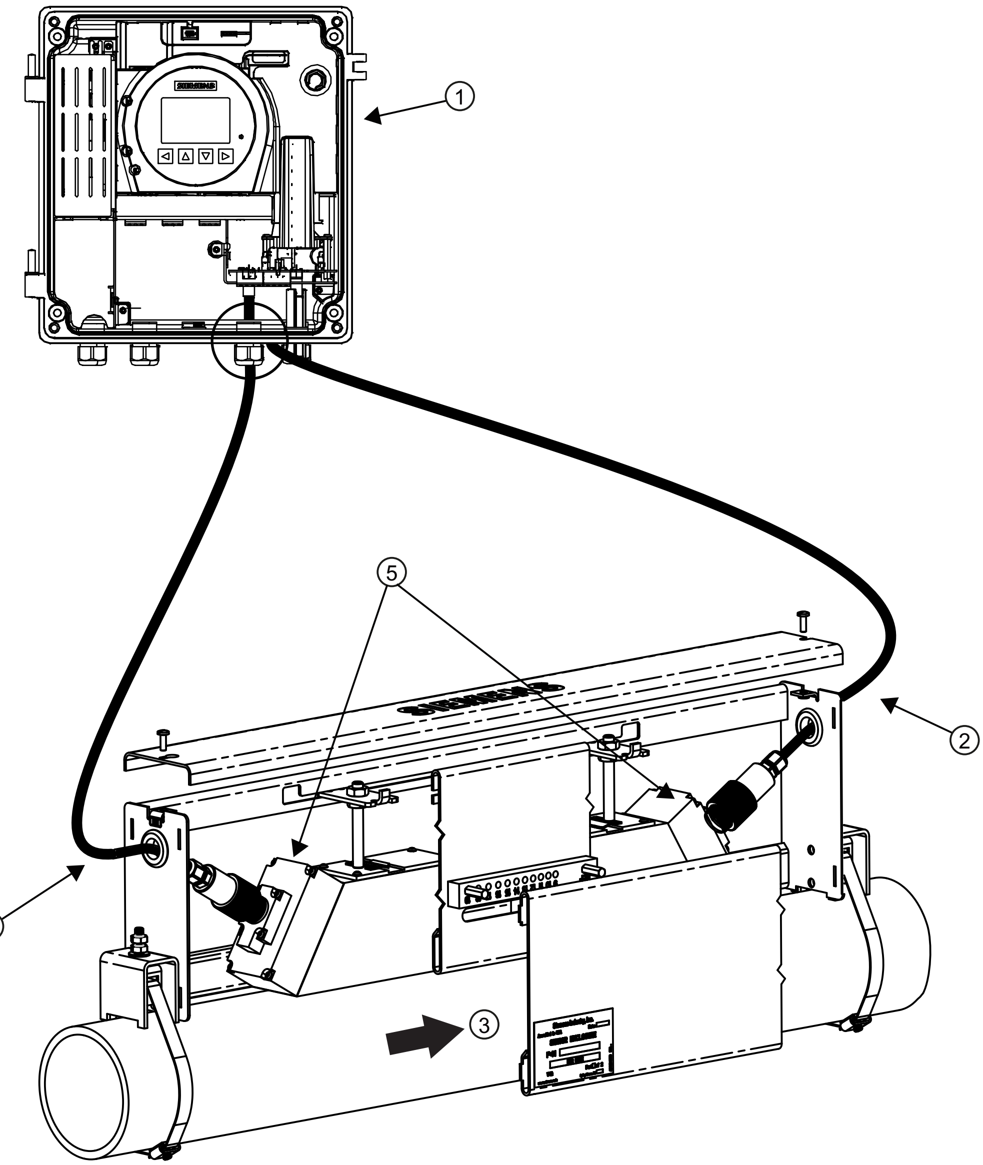
5.6.4 HI Precision mount FST030

Single enclosure Reflect mount wiring

Connect sensor cables to the sensor as follows:

1. Fill connector end with Super Lube prior to connecting.
2. Apply Super Lube to the internal threads at the large end of the thread connector.
3. Observing the upstream and downstream orientation ③, connect upstream sensor cable ④ from transmitter port (1A) and make connection snug.

4. Connect downstream sensor cable ② from transmitter port (1B) and make connection snug.



① Wall mounted transmitter
② Path 1 - Downstream sensor cable to transmitter port (1B)
③ Flow direction
④ Path 1 - Upstream sensor cable to internal DSL port (1A)
⑤ Hi Precision mounted sensors

Figure 5-15 Hi Precision Reflect mount single enclosure wiring

5. Tighten all cable glands to obtain optimum sealing.

Dual enclosure Reflect mount wiring

Referring to the Hi Precision single enclosure reflect mount figure above, connect the Hi Precision mount reflect Dual enclosure sensor cables from the transmitter ports as follows:

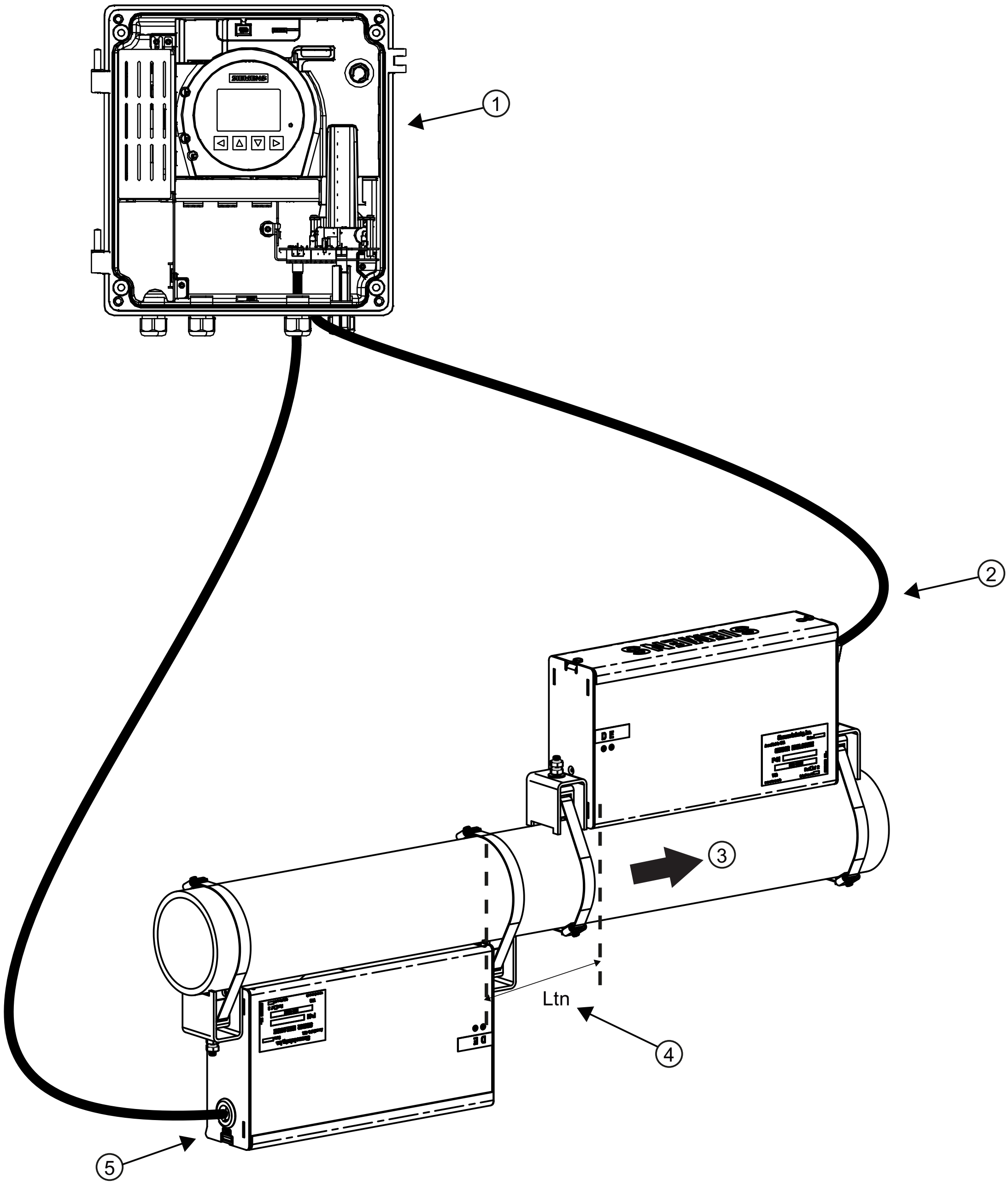
1. Observing the upstream and downstream orientation ③, connect sensor cables from transmitter ports.
2. Tighten all cable glands to obtain optimum sealing.
3. Refer to transmitter FST030 Operating Instructions to program transmitter.

Dual enclosure direct mount wiring

Connect sensor cables to the DSL and transmitter as follows:

1. Fill connector end with Super Lube prior to connecting.
2. Apply Super Lube to the internal threads at the large end of the thread connector.
3. Observing the upstream and downstream orientation ③, connect upstream sensor cable ⑤ from transmitter port (1A) and make connection snug.

4. Connect downstream sensor cable ② from transmitter port (1B) and make connection snug.



① Wall mounted transmitter	③ Flow direction
② Path 1 - Downstream sensor cable to transmitter port (1B)	④ Ltn (spacing distance between sensors)
	⑤ Path 1 - Upstream sensor cable to internal DSL port (1A)

Figure 5-16 HI Precision Direct mount Dual enclosure sensor wiring

5. Tighten all cable glands to obtain optimum sealing.
6. Refer to transmitter FST030 Operating Instructions to program transmitter.

5.7 Connecting the external DSL

For configurations with external DSL first prepare the connections in the external DSL enclosure. Afterwards proceed with the connections in the FST030 transmitter enclosure.

In the external DSL it is possible to connect sensor cables from up to four measurement paths.

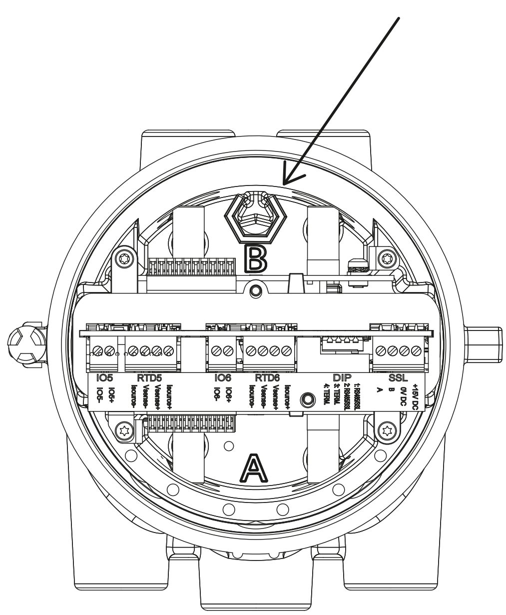
Furthermore, external measurements from up to two optional devices can be connected: 4 to 20 mA current input (passive) and/or resistive temperature device (RTD)

The DSL wiring comprises the following steps:

1. Preparing for the DSL connections (Page 75)
2. Connecting the sensor cables (Page 76)
3. Channel 5 and 6 input configuration (Page 77)
4. Connecting the SSL cable (Page 81)
5. Finishing the DSL connection (Page 83)

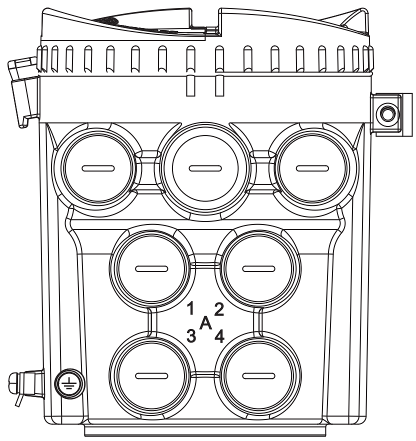
5.7.1 Preparing for the DSL connections

1. Remove lid from DSL
2. Remove F connector tool from DSL and use it to connect the sensor cables.

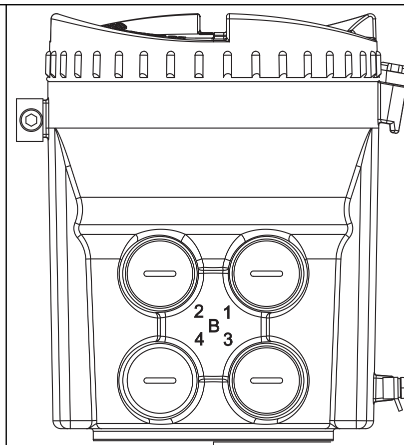


5.7.2 Connecting the sensor cables

When connecting the sensor to the DSL make sure that you connect the sensor cables for each path to the corresponding numbers on the DSL (A and B).



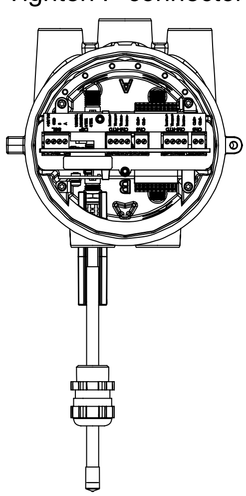
External DSL side A



External DSL side B

The sensor cables are delivered with a pre-mounted F-connector at transmitter end.

1. Remove blind plug from external DSL enclosure.
2. Slide the cable gland back onto the cable and allow access for the F-connector tool.
3. Place F-connector tool around cable and slide up to engage F-connector nut.
4. Push cable through gland opening. Ensure that center lead is aligned with connector port in external DSL.
5. Tighten F-connector using tool until you meet mechanical stop.



6. Remove F-connector tool.
7. Mount and tighten cable gland.

Repeat these steps for each sensor cable.

5.7.3 Channel 5 and 6 input configuration

Note

Connection of optional devices

The external DSL provides the option of connecting two additional devices to channels 5 and 6. Do not connect two devices to one channel.

Note

Analog input on channel 6

Hardware version 2 and below does not support analog input on channel 6.

Input configuration

Connect the two, three or four wires to the terminal block as shown below. Short-circuit terminals as required.

Note

The terminal connector is detachable

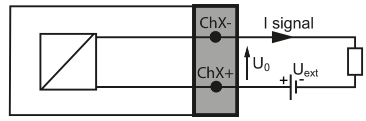
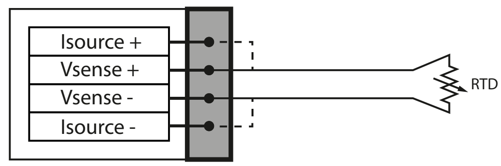
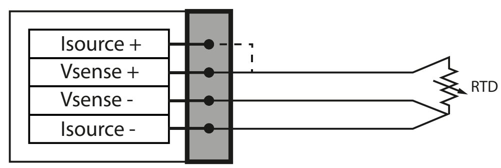
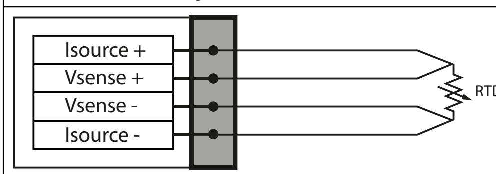
For easier access unplug the terminal connector. After connecting the wires, plug the terminal connector back in.

Note

RTD shield grounding

Make sure that the RTD cable shield is properly grounded. Consult the FSS200 Installation Manual on how to ground the RTD cable shield.

Table 5-2 Channels 5 and 6 configuration

Configuration	Software configuration	Connection diagram
Input Passive	Current input	
RTD input	Pt100 Pt500 Pt1000	---- Short  2-wire RTD configuration
		---- Short  3-wire RTD configuration
		 4-wire RTD configuration

Connecting 4 to 20 mA current input cable (passive)

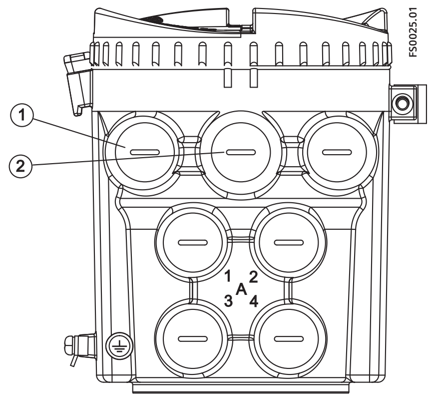
Note

Connection of optional devices

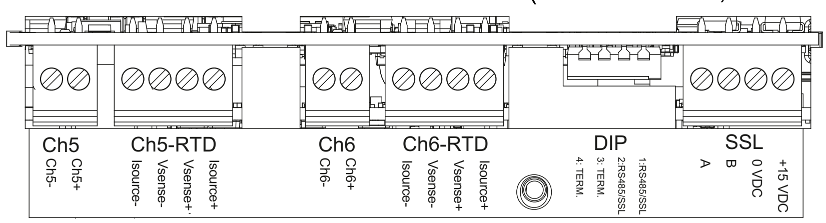
The DSL provides the option of connecting two additional devices to channels 5 and 6. Do not connect two devices to one channel.

Perform the following steps for each current input cable.

1. Remove cap and ferrule from cable gland and slide onto cable.
2. Remove one of the blind plugs (① or ②) and fit cable gland.



3. Push cable through gland opening.
4. Ground current input cable shield using the ground clamp inside the external DSL.
5. Connect the two wires to two-terminal block (Ch5+ and Ch5-, or Ch6+ and Ch6-).

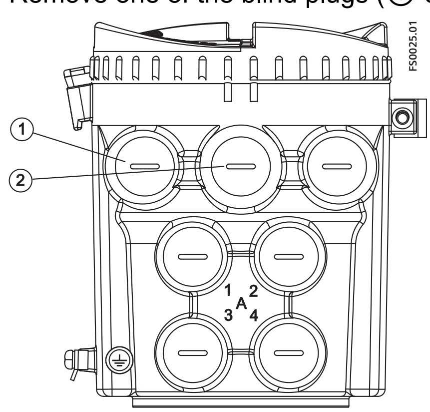


6. Assemble and tighten cable gland.

Connecting RTD cable

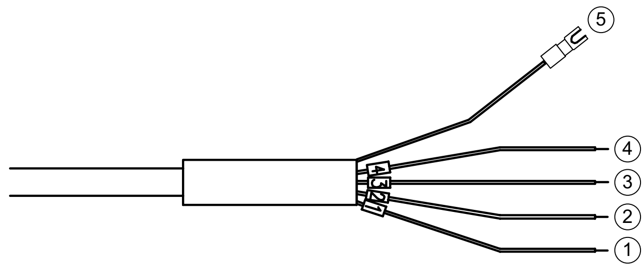
Perform the following steps for each RTD cable.

1. Remove cap and ferrule from cable gland and slide onto cable.
2. Remove one of the blind plugs (① or ②) and fit cable gland.



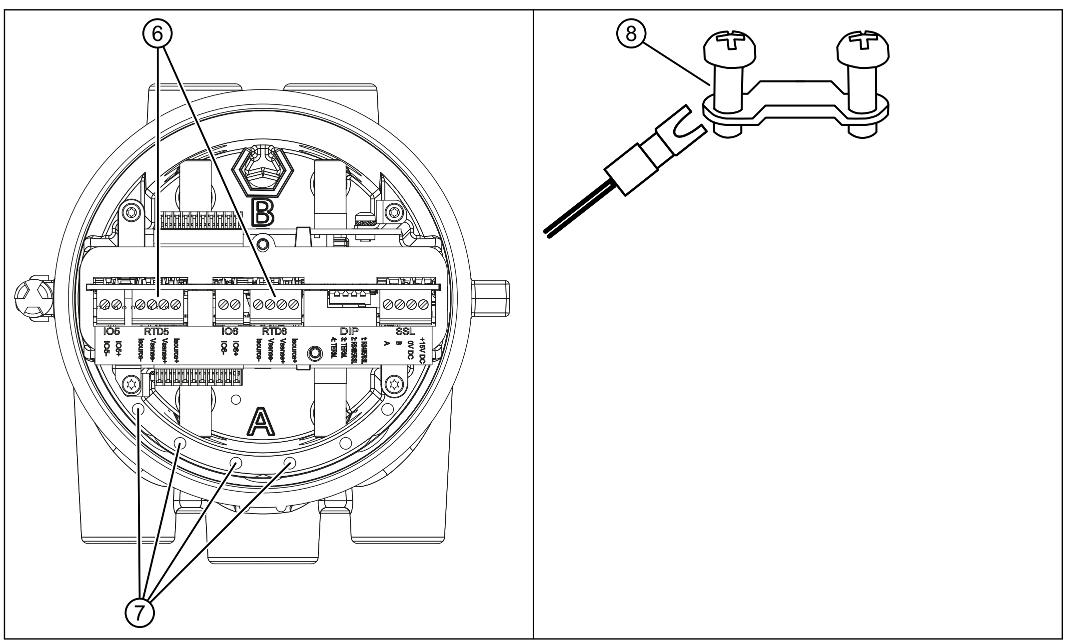
3. Push cable through gland opening.

4. Attach an RTD cable crimp lug on the blue wire ⑤ of the cable by using a crimp tool or equivalent.

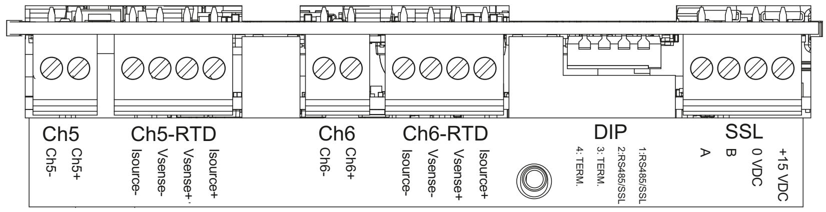


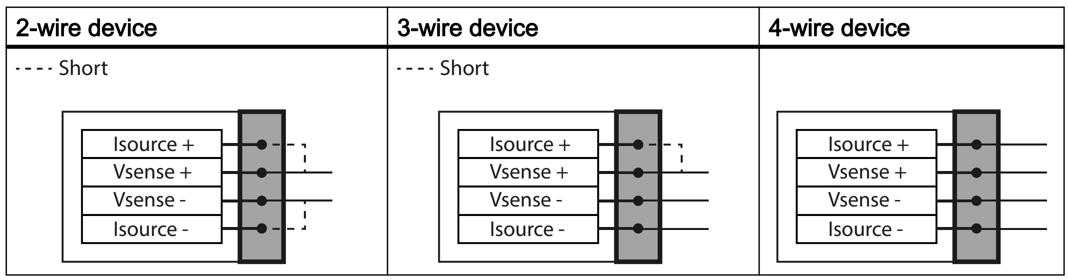
① Wire to Isource + (black)	④ Wire to Vsense - (red)
② Wire to Vsense + (white)	⑤ Wire to ground (blue)
③ Wire to Isource - (green)	

5. Ground the RTD cable shield in the external DSL ⑦, by sliding the crimp lug on wire ⑤ onto one of the installed strain reliefs screws ⑧.



6. Connect the two, three or four wires to four-terminal block (Ch5-RTD or Ch6-RTD) ⑥. Short-circuit terminals as required.





7. Assemble and tighten cable gland.

5.7.4 Connecting the SSL cable

M12 connector version

The SSL cable is provided with M12 style stainless steel plugs.

The cable shield is physically and electrically terminated within the body of the plug.

Note

Never pull the cable by the plug - only by the cable itself.

1. Connect DSL using the supplied 4-wire cable with M12 connectors to both the external DSL and the transmitter.

   Note

   Grounding

   The DSL cable shield is only mechanically connected to the grounding terminal (PE), when the M12 plug is correctly tightened.

M20 connector version

1. Prepare SSL cable by stripping it at both ends.

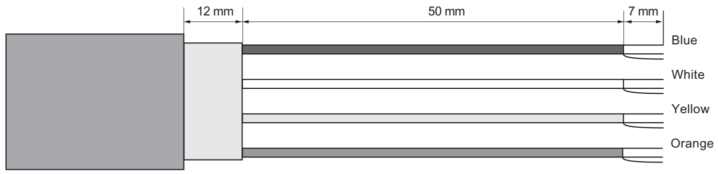
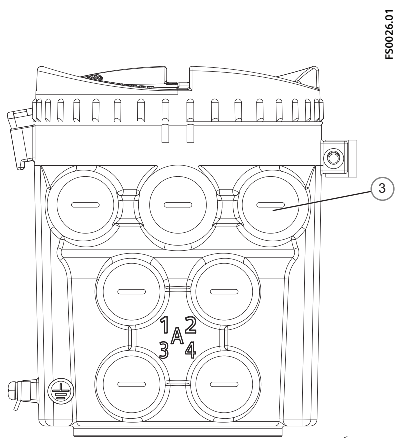
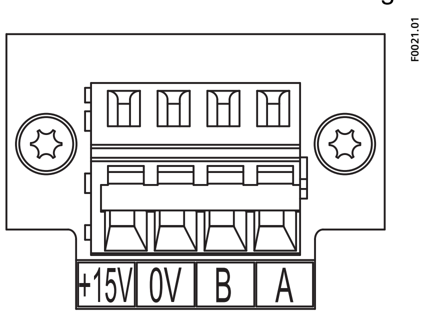


Figure 5-17 Cable end

2. Remove cap and ferrule from cable gland and slide onto cable.
3. Remove blind plug (③) and fit cable gland.



4. Push cable through gland opening.
5. Connect the four wires according to list below.

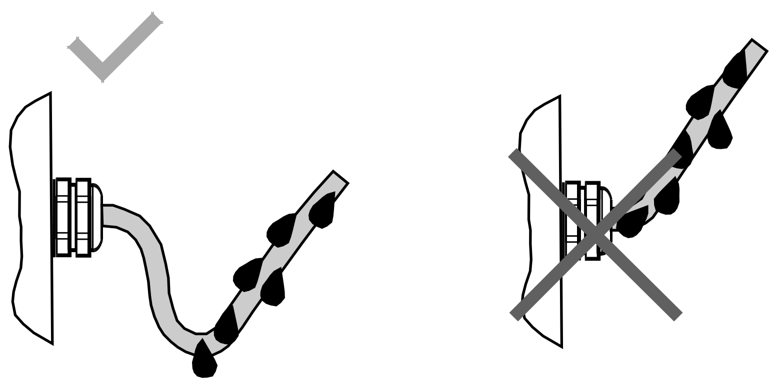


Terminal number	Description	Wire color
1	+15 V DC	Orange
2	0 V DC	Yellow
3	B	White
4	A	Blue

6. Assemble and tighten cable gland.

5.7.5 Finishing the DSL connection

1. Place F connector tool in DSL.
2. Check individual wire installation by tugging firmly.
3. Firmly tighten cable glands and insert blanking plugs in unused cable entries.
4. Remove O-ring from lid.
5. Reinstall lid and screw in until mechanical stop. Wind back lid by one turn.
6. Mount O-ring by pulling it over the lid and tighten lid cover until you feel friction from the O-ring on both sides. Wind lid further by one quarter of a turn to seal on the O-ring.
7. Ensure that moisture does not penetrate to inside of DSL enclosure by creating a drip loop (bend cables downward) immediately before cable glands.



Note

Protection class

The DSL is IP68 only if the lid is properly mounted and all M20 holes are closed with appropriate blind plugs or cable glands.

Service and maintenance 6

6.1 Basic safety instructions

⚠ WARNING
Impermissible repair of the device
• Repair must be carried out by Siemens authorized personnel only.

⚠ WARNING
Impermissible repair of explosion protected devices
Risk of explosion in hazardous areas
• Repair must be carried out by Siemens authorized personnel only.

6.2 Recalibration

Siemens offers to recalibrate the system. The following calibrations are offered as standard:

- Standard intrinsic calibration
- Accredited flow calibration

Note

For recalibration the transmitter must always be returned with the sensors.

6.3 Maintenance and repair work

6.3.1 Maintenance

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

An inspection can include, for example, check of:

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

6.4 Return procedures

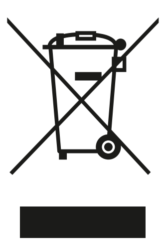
6.4.1 Return procedure

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

6.5 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/)

7 Technical data

7.1 Sensor specifications

Note

Based on pipe wall thickness (steel pipes only)

Note

All sensors are stainless steel construction.

Table 7-1 Hi Precision sensors

Sensor Size	Pipe wall (mm)		Pipe wall (inch)	
Pipe wall	**min.**	**max.**	**min.**	**max.**
A1H	0.64	1.02	0.25	0.04
A2H	1.02	1.52	0.04	0.06
A3H	1.52	2.03	0.06	0.08
B1H	2.03	3.05	0.08	0.12
B2H	3.05	4.06	0.12	0.16
B3H	2.7	3.3	0.106	0.128
C1H	4.06	5.84	0.16	0.23
C2H	5.84	8.13	0.23	0.32
D1H	8.13	11.18	0.32	0.44
D2H	11.18	15.75	0.44	0.62
D3H	7.4	9.0	0.293	0.354
D4H	15.75	31.75	0.62	1.25

7.2 Sensor markings

Sensor markings and explanations

Hazardous locations	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1 Class I, Zone 0 Class II, 20 and 21
Explosive Atmospheres	Ex II 1G Ex ia IIC T6…T4 Ga Ex II 1D Ex ia IIIC T70 – 110 °C Da

Temperature code	Varies by sensor and ambient temperature (see Installation in hazardous areas (Page 15))
Dust Temperature class	Tdust = Ta max + 10 °K (T70 °C for Ta = 60 °C, T110 °C for Ta = 100 °C)

7.3 Rated operating conditions

Table 7-2 Ambient temperatures

Version	FSS200
Operation • Transmitter • Display • Sensors	 -40 to +60 °C (-40 to +140 °F) (humidity max. 95 %) -20 to +60 °C (-4 to +140 °F) T1 usable from -40 to +120 °C (-40 to +248 °F), but best for Ø temperature < 80 °C (< 176 °F) T2 usable -40 to +120 °C (-40 to +248 °F), but best for Ø temperature > 80 °C (> 176 °F) High temperature usable above -40 to +120 °C (-40 to +248 °F) to max. temperature 232 °C (450 °F) Sensors for use in Hazardous locations / Explosive Atmospheres shall not be used above 100°C (212 °F)
Storage • Transmitter	 -40 to +70 °C (-40 to +158 °F) (humidity max. 95 %)

Table 7-3 Environment

Version	FSS200
Environmental conditions acc. to IEC/EN/UL 61010-1	• Altitude up to 2000 m • Pollution degree 2 • Overvoltage category II

7.4 Coaxial cable specifications

Submersible coaxial cable	
Cable (93 Ω)	coaxial cable terminated at both ends with F connectors
Outside diameter	Ø 10 mm (0.24")
Length	10m (32.81 ft), 20m (65.62 ft)
Material (outside jacket)	HDPE - High Density Polyethylene
Ambient temperature	-55 - +80°C (-67 - +176°F)

Plenum high temperature coaxial cable	
Cable (93 Ω)	coaxial cable terminated at both ends with F connectors
Outside diameter	Ø 5.18mm (0.204")
Length	20m (65.62 ft)

Plenum high temperature coaxial cable	
Material (outside jacket)	FEP - Fluorinated Ethylene Propylene
Ambient temperature	-70 - +200°C (-94 - +400°F)

Armored coaxial cable	
Cable (93 Ω)	Triaxial cable terminated on both ends with F connectors
Outside diameter	Ø 10 mm (0.24")
Length	1, 3, 5, 10, 20m (3.28, 9.84,16.40, 32.81, 65.62 ft) between sensor and transmitter.
Material (outside jacket)	Black LSZH jacket
Ambient temperature	-25 - +80°C (-13 - +176°F)

7.5 Triaxial cable specifications

Note

Important

Triaxial cables are for FST030 only.

Submersible triaxial cable	
Cable (75 Ω)	Triaxial cable terminated on one end with F connector
Outside diameter	Ø 7.5 mm (0.295")
Length	1, 3, 5, 10, 20m (3.28, 9.84,16.40, 32.81, 65.62 ft) between sensor and transmitter.
Material (outside jacket)	Black Polyethylene (PE) jacket
Ambient temperature	-55 - +80°C (-67 - +176°F)

High Temperature triaxial cable	
Cable (75 Ω)	Triaxial cable terminated on both ends with F connectors
Outside diameter	Ø 7.0 mm (0.276")
Length	5, 20m (16.40, 65.62 ft) between sensor and transmitter.
Material (outside jacket)	Yellow FEP Perfluorethylenpropylen jacket
Ambient temperature	-55 - +204°C (-67 - +400°F)

Dimensions and weight 8

8.1 Sensor dimensions

Note

Sensors are supplied in matched pairs. Each sensor in a matched pair has the same serial number and is marked with an "A" and "B" (e.g., 19256A and 19256B).

Part Number *	Length		Width		Height		Weight
	mm	inch	mm	inch	mm	inch	Net Weight (Pair)
1011HNFS - A1 / A2 / A3 **1011GCHNFS - A1 / A2 / A3** 7ME39505LB* 7ME39505LG* 7ME39505LH* 7ME39505LJ*	56	2.2	28	1.1	43	1.7	0.23 kg (0.5 lbs)
1011HNF - B1 / B2 / B3 **1011GCHNF - B2 / B3** 7ME39505LC* 7ME39505LL* 7ME39505LT*	84	3.3	28	1.7	43	1.7	0.36 kg (0.8 lbs)
1011GCHNFS - B1 7ME39505LK*	66	2.6					0.32 kg (0.7 lbs
1011HNFS - C1 / C2 **1011GCHNFS - C2** 7ME39505GN* 7ME39505LD* 7ME39505LM* 7ME39505LN*	127	5.0	33	1.3	56	2.2	0.86 kg (1.9 lbs
1011GCHNFS - C1 7ME39505GM*	104	4.1					0.64 kg (1.4 lbs)

<table>
<tr><th rowspan="2">Part Number *</th><th colspan="2">Length</th><th colspan="2">Width</th><th colspan="2">Height</th><th>Weight</th></tr>
<tr><th>mm</th><th>inch</th><th>mm</th><th>inch</th><th>mm</th><th>inch</th><th>Net Weight (Pair)</th></tr>
<tr><td>1011HNFS - D1 / D2 / D3 / D4
1011GCHNFS - D2 / D4
7ME39505GQ*
7ME39505GR*
7ME39505GU*
7ME39505LE*
7ME39505LP*
7ME39505LQ*
7ME39505LR*
7ME39505LU*</td><td>191</td><td>7.5</td><td rowspan="2">51</td><td rowspan="2">2.0</td><td rowspan="2">84</td><td rowspan="2">3.3</td><td>2.2 kg
(4.9 lbs)</td></tr>
<tr><td>1011GCHNFS - D1 / D3
7ME39505GP*
7ME39505GU*</td><td>173</td><td>6.8</td><td>1.9 kg
(4.2 lbs)</td></tr>
</table>

* Sensor part numbers vary with the operating frequency and application temperature.

Product documentation and support A

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

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

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

Product documentation by serial number

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

Entering a serial number

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

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

Scanning a QR code

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

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

A.2 Technical support

Technical support

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

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

Service & support on the Internet

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

Additional Installation Instructions B

Additional installation and sensor mounting instructions including direct mount, track mount, magnetic mount, Hi Precision mount and temperature sensor mounting are listed in this appendix.

B.1 Direct mount

Sensor installation using mounting frames, spacer bar and spacing guides

The combination of mounting frames, spacer bar and spacing guides is the recommended way to mount Direct mode sensors. The mounting frame establishes the axial alignment of the sensors and allows you to remove and replace either sensor while preserving their exact mounting location.

For Direct mode mounting, a spacer bar is used to establish the distance between sensors and a spacing guide to locate the sensors at the nine o’clock and three o’clock positions. Should the distance between sensors be beyond the span of a spacer bar, a measuring tape can be used. The Mylar spacing guide comes in various lengths and widths to accommodate most pipe sizes.

Spacing Guide Sizes	
Metric	**English**
5.08 cm x 66.04 cm	2" x 26"
5.08 cm x 114.3 cm	2" x 45"
10.16 cm x 393.7 cm	4" x 155"
15.2 cm x 497.8 cm	6" x 196"

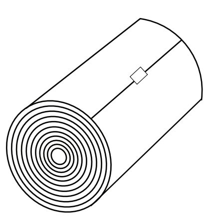
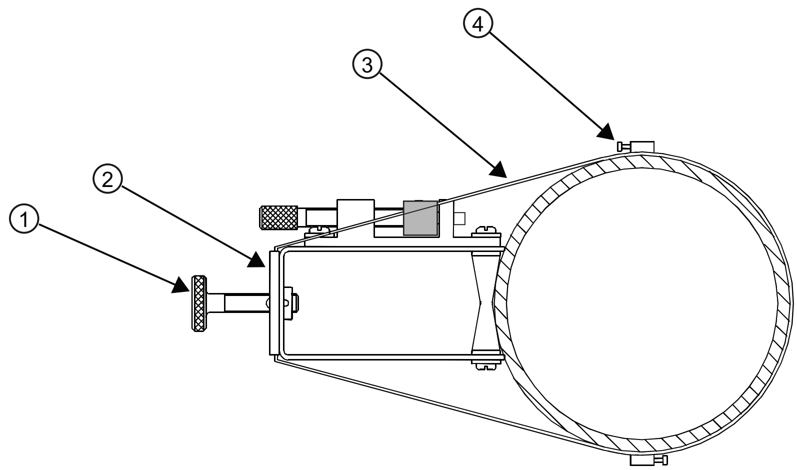


Figure B-1 Mylar spacing guide

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed then prepare the pipe surface area where the sensors will be mounted.
3. Degrease the surface and remove any grit, corrosion, rust, loose paint, etc.
4. Check to ensure that you have a matched set of sensors. They both should have the same S/N number but marked with either an "A" or "B" (e.g., 100A and 100B).

5. Temporarily position one of the frames on the pipe where you will be mounting it. Ensure that this is a smooth area without any raised areas (seams, etc.). With a pencil or chalk, mark a generous area of 13 mm (1/2") all around the frame. Remove the assembly.
6. Prepare the area you marked by de-greasing surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive material provided.
7. Put a mounting strap around the pipe and engage an end into adjusting screw (screw should be pointing up). Position frame in the middle of area you have cleaned and centered on the pipe with its angled end facing away from where the other frame will sit.

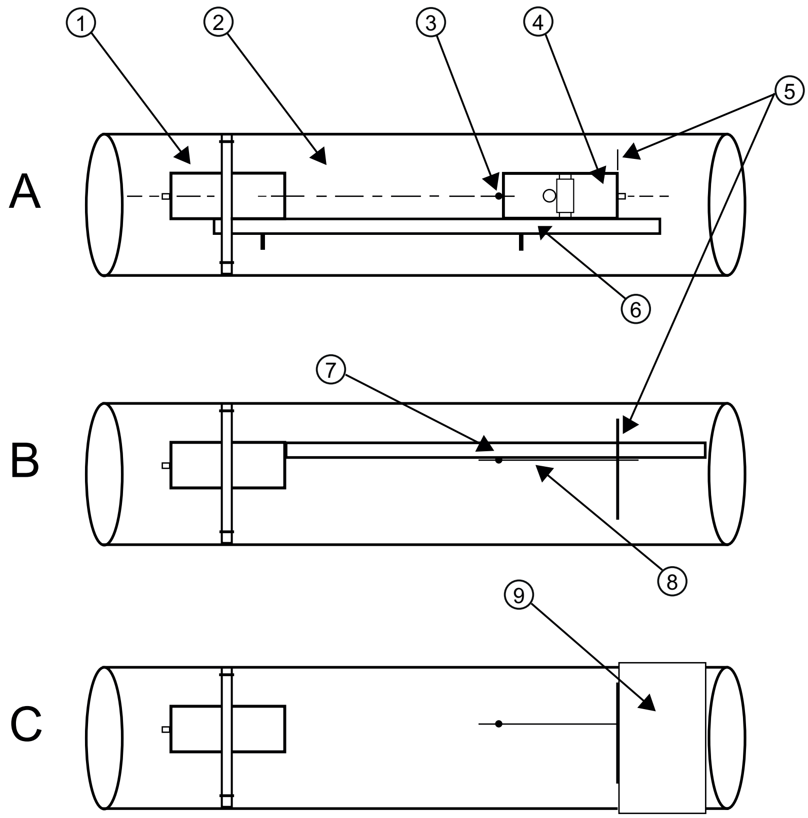


①	Sensor clamping screw	③	Mounting strap
②	Spring clip	④	Mounting strap adjusting screw

Figure B-2 Wrap strap under pipe and attach to adjusting screw

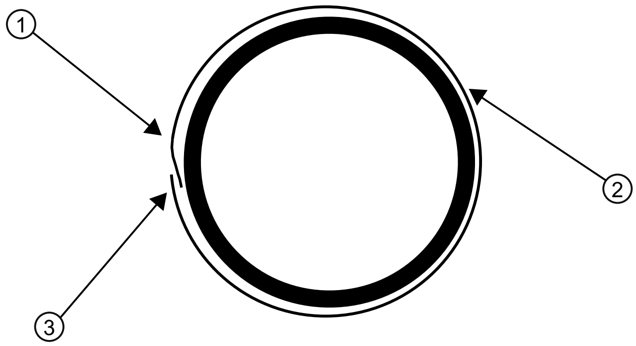
8. Slide the mounting strap over it (and under the clip if there is one) and tighten with a screwdriver. While tightening, check to ensure that the center of the tapered roller is centered on the pipe.
9. Attach the second frame to the spacer bar with an index spacer screw placed into the index hole specified in Step 2. The angle on the frame should be facing away from the direction that the length of the bar is going.

10. Now attach the free end of the spacer bar by inserting an index spacer screw through the REF hole on the spacer bar and then into the hole on the mounted frame. Tighten. Sight to ensure that this frame is lined up in center of pipe and while holding alignment, place a dot (with pencil or chalk) in the center of the tapered roller at the bottom of the frame (see A below). While holding, also mark along the front edge of the frame with pencil or fine chalk line (see B below).



①	Sensor 1	⑤	Sensor edge line
②	Pipe	⑥	Spacer bar
③	Dot	⑦	Dot
④	Sensor 2	⑧	Line
		⑨	Mylar spacing guide

11. Disassemble the spacer bar and the unmounted frame. Use the bar as a straight edge and, with one edge against the mounted frames tapered roller center and the other crossing the dot you drew, draw a line crossing the dot (see "B" above). Set the bar aside.



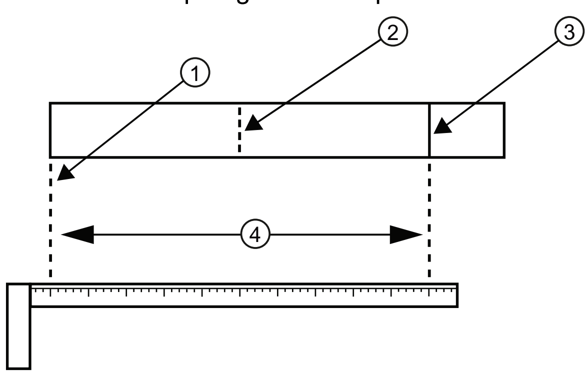
① Trim material from inner edge if necessary
② Mylar Spacing Guide
③ 8 cm (3-inch) Overlapping Edge

Figure B-3 Wrapping the Mylar spacing guide around the pipe (end view)

12. Wrap the Mylar spacing guide around the pipe so that the left edge is against the sensor edge mark (see "C" above). Arrange so that one end overlaps the other by at least three inches. Trim to fit if necessary, but be sure not to trim at the overlapping end in order to keep it square.

13. Realign left edge of the guide with the sensor edge mark. Line up both vertical edges of the guide and ensuring that it is snug around the pipe, mark along the overlapping edge.

14. Remove Mylar spacing guide and lay it out on a flat surface. Either measure the exact distance half-way between the overlap edge and the mark at the overlap, or fold the guide from the overlap edge to overlap mark and draw a line at the fold or halfway point.

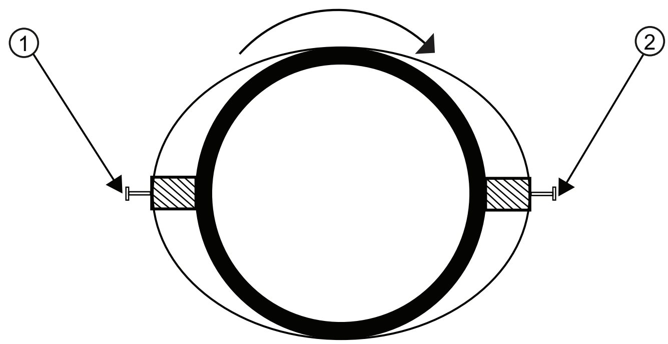


①	Overlap edge	③	Spacing guide
②	Mark (or fold) exactly at half-way point	④	Circumference

Figure B-4 Finding the halfway distance

15. Reinstall the spacing guide; its left edge abutting the sensors edge mark on the pipe and the overlapping edge in line with the dot (now a line) on the pipe (see "C"). Tape it in this position on the pipe. Take the second frame and place it against the edge of the guide with its tapered roller centered on the center mark on the guide.

16. Temporarily position the frame (in the 3 o’clock position opposite the mounted frame - see below) where it will be mounted. Ensure that this is a smooth area without any raised spots (seams, etc.). Mark a generous area of 13 mm (1/2-inch) all around the mounting frames with a pencil or chalk. Remove the frame and the Mylar guide.



① 9 o'clock sensor

② 3 o'clock sensor

Figure B-5 Aligning the sensors for Direct Mode operation (end view)

17. Prepare the area you marked by de-greasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided. Clean the pipe of any debris and abrasive particles.
18. Replace the Mylar guide back in the same position it was in and retape it to the pipe
19. Put a mounting strap around the pipe and engage an end into adjusting screw (screw should be pointing up).
20. Position frame in the middle of area you have cleaned and centered on the pipe with its angled end facing away from where the other frame will sit and aligned with the edge and center marks on the guide. Slide the mounting strap over it (and under the clip if there is one) and tighten with a screwdriver. While tightening, check to ensure that the center of the tapered roller is centered on the pipe.
21. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface.
22. Tighten the sensor clamping screws to hold the sensor firmly in place. *Repeat procedure for the other sensor.*
23. Slide sensor into the angled mounting frame with the sensor F-connector facing out.
24. Keep sensor from making contact with the pipe until it butts up against the mounting frame stop. Push sensor down to mate with pipe.
25. Proceed to Sensor wiring (Page 48).

B.2 Mounting tracks for Size A and B sensors

Using sensor mounting tracks

The FSS200 Universal and Hi Precision mounting tracks provide a rigid mounting platform for Series 1011 Universal or Hi Precision size A or B sensors. The mounting tracks service pipe sizes up to a maximum of 140 mm (5.00") outer diameter. The mounting tracks support both Direct and Reflect mounting modes. The transmitter recommends the appropriate sensors, mounting track and mounting mode, based on the pipe data entries.

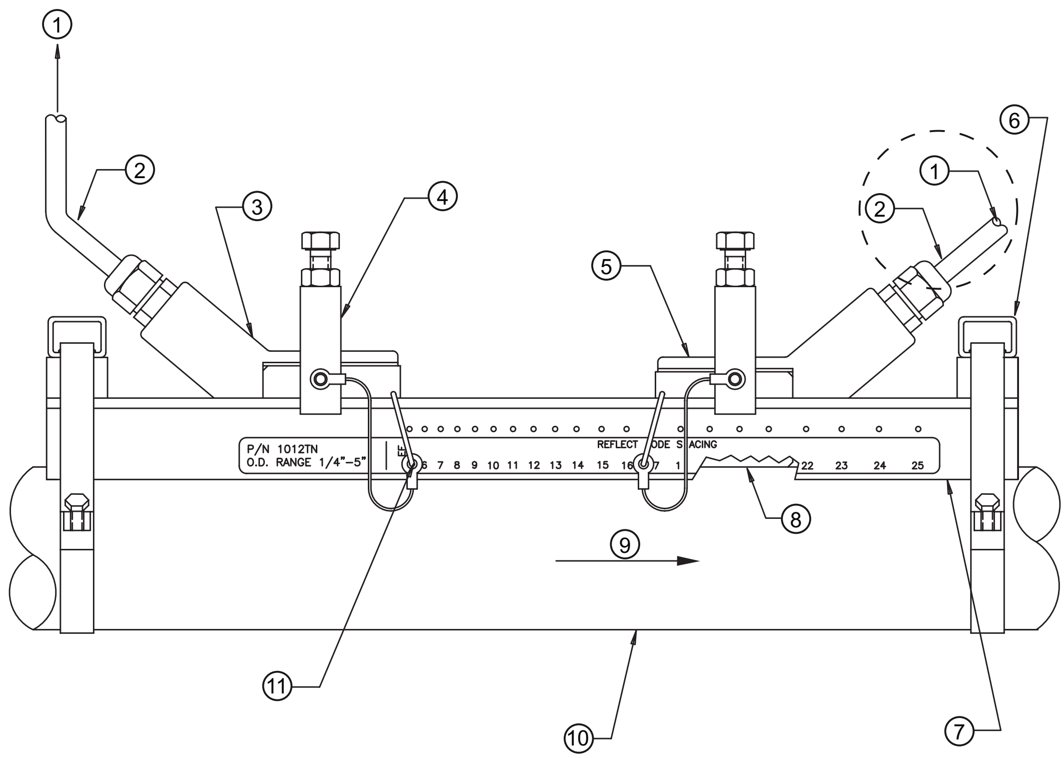
Installing a mounting track in Reflect mode

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.
3. Prepare the pipe surface. De-grease the surface, if necessary, and remove any grit, corrosion, rust, loose paint, etc. Use abrasive material provided to provide a clean contact surface for the sensors.

4. Check to ensure that you have a matched set of sensors. They both should have the same serial number but marked with either an "A" or "B" (e.g. 100A and 100B).

Note

Index pins are used as stops against each sensor inserted at the reference hole for one sensor and the number index hole for the other sensor (see ⑪ in figure below).



①	To SITRANS FST030 transmitter	⑥	Mounting strap guide
②	7ME39600CK series cable	⑦	7ME39600M series mounting track
③	7ME3950 series sensor upstream	⑧	Couplant compound
④	Sensor clamp	⑨	Flow direction
⑤	7ME3950 series sensor downstream	⑩	Pipe
		⑪	REF hole index pin

Figure B-6 Reflect mount with mounting track (side view)

5. Place the track rail assembly on the top surface of the pipe at the location where you have determined it would be mounted. Ensure that it is a smooth area without any raised spots or seams.
6. Holding the mounting track assembly in place, loop one of the strap clamps under the pipe, pull it around and maintain tension while slipping a link over the tension screw hook. Tighten the tension screw enough to hold the assembly on the pipe, but still allow rotation. Repeat for the other mounting strap.
7. Rotate the track rail assembly to the intended mounting position on the pipe, then tighten both tension screws just enough to prevent rotation. Do not over tighten.
8. With a pencil or chalk mark a generous area around the perimeter of the track assembly. Loosen and move the assembly away from marked area.

9. Prepare the area you marked by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided. Clean the pipe of all debris and abrasive particles.
10. Rotate the track into the position that was just cleaned. Insert the index pin into the REF hole.
11. Insert the index pin into the reference hole.
12. Select a sensor and apply a thin band of couplant compound to the sensor's emitting surface.
13. Place the sensor between the track rails, slightly behind the pin and under the clamping screw assembly. Slide it forward until it butts up firmly against the reference pin.
14. Once the sensor is in place secure it with the sensor clamping screw. Do not over tighten.
15. Repeat the procedure for the number index sensor making sure to insert an index pin into the correct number index hole. Refer to the mounting track (side view) figure above.
16. Fill connector end with Super Lube prior to connecting.
17. Apply Super Lube to the internal threads at the large end of the thread connector.
18. Observing the upstream and downstream orientation, attach the 1A (upstream) and 1B (downstream) cables to the sensors and make snug. Attach other ends of cables to the transmitter at 1A and 1B terminals of the transmitter.

Installing a mounting track in Direct mode

The sensor installation procedures show how the automatic selection of sensors, mounting mode and spacing method are established. Note the automatic assignment of model numbers for the sensor and mounting track, plus the designation of the number index.

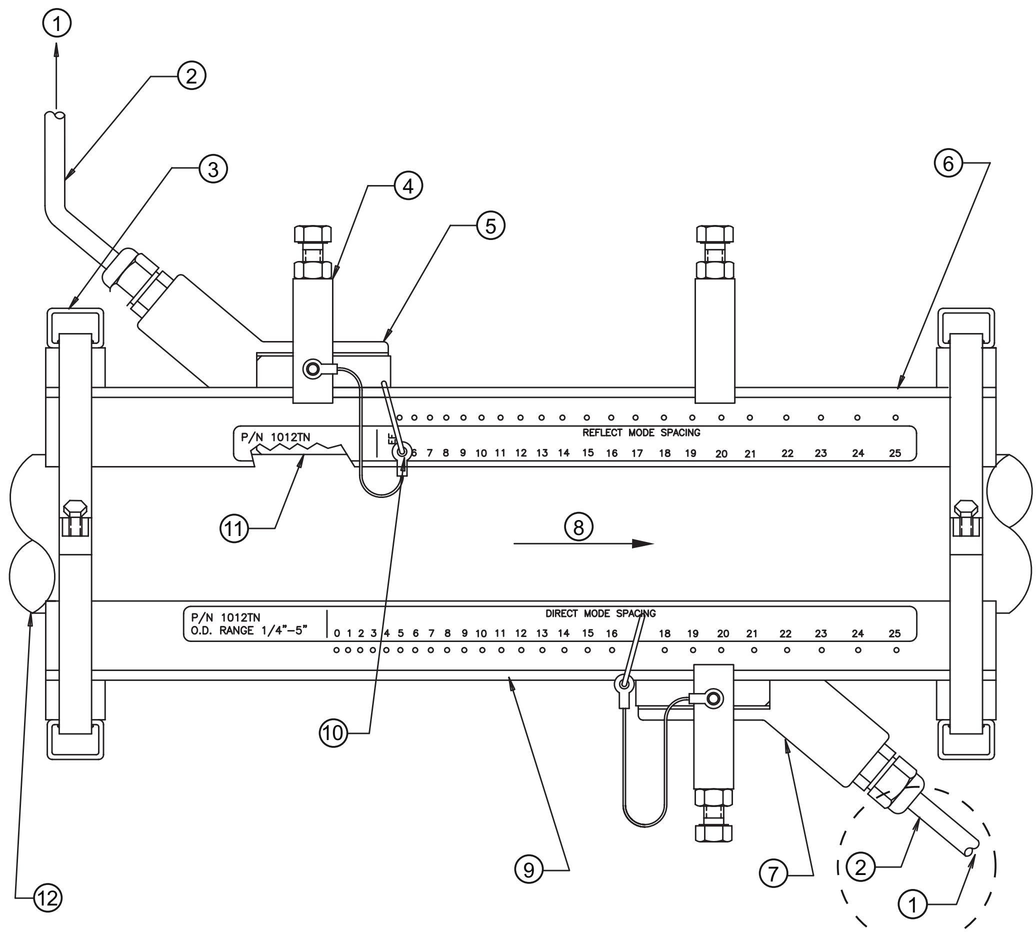
The combination of two mounting tracks and a spacer guide is the recommended way to mount sensors in the Direct mode. This method ensures that sensors will align exactly 180° from each other and remain spaced the proper distance apart.

The Direct mount configuration uses a set of two track rail assemblies; one for each sensor, installed 180° apart on the pipe. The set includes:

- Reflect mode track assembly - This track rail includes the tension screw and REF hole to position one sensor.
- Direct mode track assembly - This track rail has number index holes for inserting an index pin to position the other sensor.

Note

A pin will be inserted into the hole designated by the number index on the Direct mode track rail to position one of the sensors (see ⑩ in figure below).



①	To SITRANS FST030 transmitter	⑦	7ME3950 series sensor downstream
②	7ME39600CK series cable	⑧	Flow direction
③	Mounting strap guide	⑨	7ME39600M series mounting track
④	Sensor clamp	⑩	REF hole index pin
⑤	7ME3950 series sensor upstream	⑪	Couplant compound
⑥	7ME39600M series mounting track	⑫	Pipe

Figure B-7 Direct Mount 180° opposed with Mounting Tracks

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.
3. Check to ensure that you have a matched set of sensors. They both should have the same serial number but marked with either an "A" or "B" (e.g. 100A and 100B).

   Note

   Some sensors require a right-angle adapter. This adapter should be installed before placing the sensors in the tracks.

4. Prepare pipe for the track mounts by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided.
5. If this is a horizontal pipe, place the track rail assembly against the pipe. While holding track, place second track on pipe directly underneath (180°) and hold together in place.
6. Wrap the mounting strap around the pipe and through the strap guide.

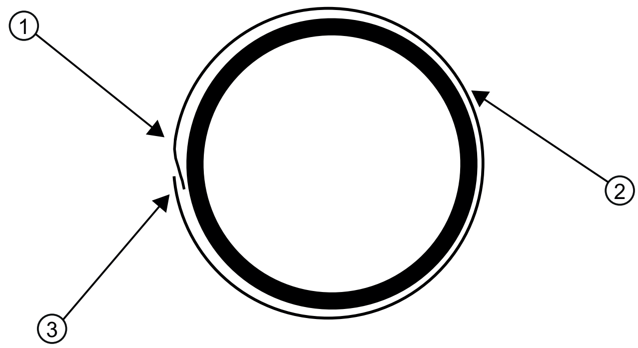
   Note

   For a vertical pipe installation, use a tie, tape or bungee cord to hold the two tracks in place while mounting.

7. Finger-tighten the Tension Screw to secure the strap and tracks to the pipe.

Positioning track assemblies

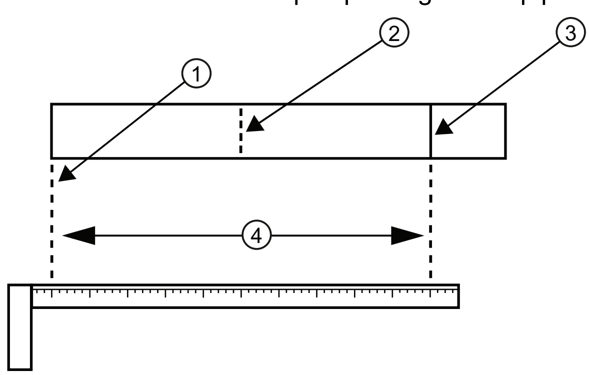
1. Wrap a length of the Mylar spacing guide around the pipe and against the end of the track assemblies. Ensure that the spacer guide edges on both sides align. Arrange so that one end overlaps the other by at least 8 cm (3 inches). Trim to fit if necessary, but in order to keep the end square, be sure not to trim at the overlapping end.



① Trim material from inner edge if necessary
② Mylar Spacing Guide
③ 8 cm (3-inches) Overlapping Edge

Figure B-8 Wrapping the Mylar spacing guide around the pipe (end view)

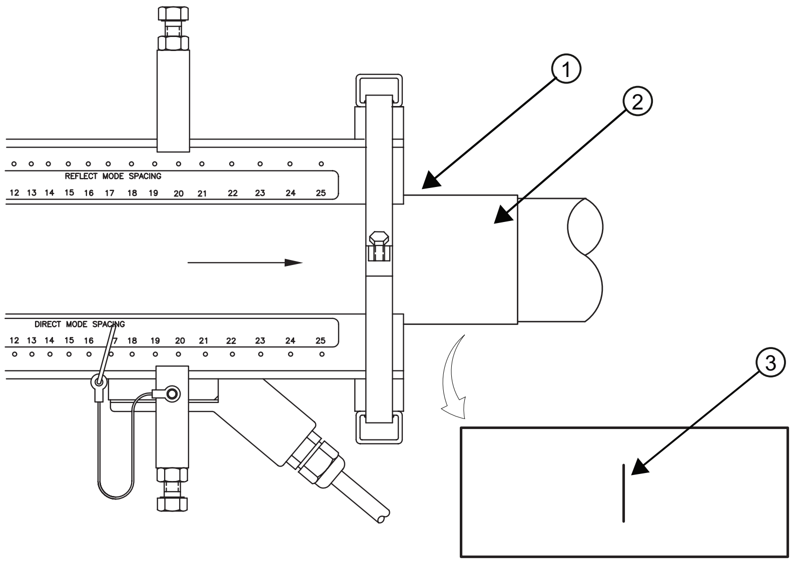
2. Remove the spacer guide. Measure or fold spacer guide to find its halfway distance. Mark a center line and then tape spacer guide to pipe.



① Overlap Edge
② Mark (or fold) exactly at half-way point
③ Mark on Spacing Guide
④ Circumference

Figure B-9 Finding the halfway distance

3. Use the edge of the spacer guide as a stop for both tracks to keep them parallel. Adjust tracks as necessary.



① Align tracks with spacer guide edge

② Mylar spacer guide

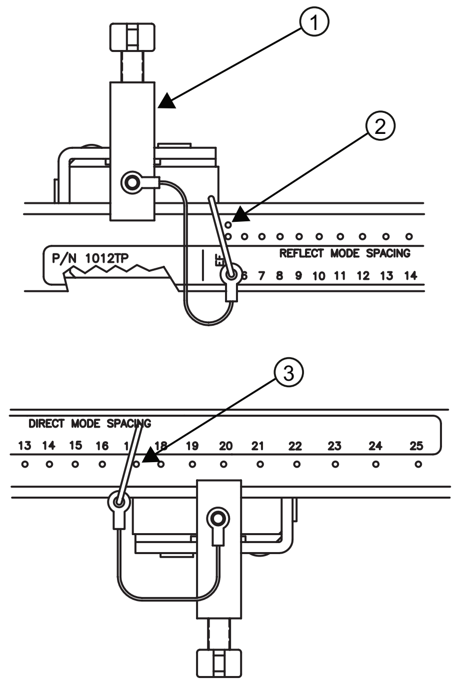
③ Halfway distance of spacer guide

Figure B-10 Track rail alignment

4. Loosen the mounting straps enough to allow you to rotate the track assembly until the center of one track aligns with the center line on the spacer guide and the center of the other track aligns at the point where the spacer guide ends meet. The tracks should now be 180° apart. Tighten both chains but not too tight.

Sensor installation

1. Insert an index pin into the REF hole of the track marked "Reflect Mode Spacing."
2. Take one of the sensors and insert it between the track rails and to the left of the index pin with the cable connector pointing away from the pin. Move the sensor until the pin stops it. Hold sensor in place. Move sensor clamping screw over the sensor and tighten.



① Sensor clamping screw
② REF hole
③ Number Index hole

Figure B-11 REF and Number Index pin locations

3. Insert the other index pin into the correct Number Index hole on the other track marked "Direct Mode Spacing."
4. Insert the second sensor into the track rail with its cable connector pointing away from the pin. Move the sensor until it’s stopped by the pin. Move sensor clamping screw over the sensor and tighten.
5. Using a pencil or chalk, mark a generous area around where the sensors contact the pipe.
6. Release the tension on the sensors and remove them.
7. Loosen the mounting straps and rotate the track assembly on the pipe so you can gain access to the areas marked.
8. Prepare the areas you marked by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided.
9. Rotate the track assemblies into their original position on the pipe. Use the edge of the Mylar guide as a stop for both tracks and keep them parallel. Align each track with the "center line" you previously marked on the Spacing Guide. Tighten tracks securely.

10. This time, before installing each sensor, apply a 3mm (1/8-inch) continuous bead of couplant compound along the center (the long way) of the contact surface of the sensor. Also, keep the sensors lifted slightly from the pipe when installing until the sensor is against the pin; then push down against the pipe.

Note

Remember to install the sensors with the cable connectors facing away from each other.

11. Once the sensors are in place, secure with its clamping screws. Do not over tighten.
12. Fill connector end with Super Lube prior to connecting.
13. Apply Super Lube to the internal threads at the large end of the thread connector.
14. Observing the upstream and downstream orientation, attach the upstream (1A) and downstream (1B) cables to the other sensors and make snug. Attach the other ends to the transmitter at the 1A and 1B terminals of the transmitter.
15. Proceed to Sensor wiring (Page 48).

B.3 Magnetic mounting

B.3.1 Pre-assembly procedures

The following instructions are for installing the Magnetic mounting frames on 8-inch (DN200) or larger size carbon steel pipes in the Reflect and Direct modes. The mounting frames are compatible with all Siemens SITRANS F clamp-on C, D and E FSS200 Universal and FSS200 Hi Precision sensors.

Unpacking

Note

Refer to Figure 1-1 when unpacking unit, if necessary.

⚠ WARNING

Strong magnetic fields present

Magnetic fields may cause death or serious injury.

Do not locate near pacemakers or equipment that is sensitive to magnets.

1. Unpack and disassemble the Magnetic mounting frames.

⚠ WARNING
Impact hazard
Magnets may shatter during installation and may cause injury. KEEP FRAMES SEPARATED (until installation) in order to prevent the magnets from colliding with excessive force. This may cause the magnets to shatter.

2. The box should contain two Magnetic mounting frames, two sensor clamp plate assemblies and four C-size sensor spacer plates.
3. Retain all additional sensor spacer plates and their retaining screws, if not used.

⚠ WARNING
Pinch hazard
Frame installation may cause Injury to hands. Exercise CAUTION to avoid pinching hands and fingers when installing the frames in the desired location, as the frame magnets are very strong.

Required tools

1. Felt marker or grease pencil
2. Tape measure

B.3.2 Preliminary procedures

Pipe and flowmeter setup

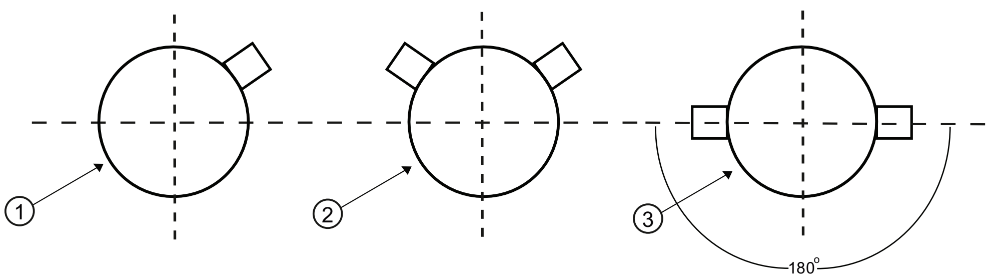
1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.
3. Referring to the transmitter Operating Instructions manual, confirm that the appropriate sensor settings have been selected for operation on the chosen pipe.
4. Select the mounting location on the pipe.
5. Choose a pipe location that remains full at zero flow.
6. Where possible, locate enclosure housing 10 pipe diameters or more from elbow or valve to ensure fully developed and stable flow profile.
7. On horizontal pipe sections, select a horizontal plane to avoid sediment or gas blockage of ultrasonic signal path.

8. Prepare the surface of the pipe. De-grease the surface, if necessary, and remove any grit, corrosion, rust, loose paint, etc. Use abrasive material provided to provide a clean contact surface for the sensors.
9. Mounting mode applications - see figures below.

Note

Do not mount frames over frost.

Do not mount frames on the seam of pipe.



① Single path, Reflect mode
② Dual path, Reflect mode
③ Single and Dual path Direct X mode

Figure B-12 Horizontal sensor mounting

B.3.3 Reflect mount

B.3.3.1 Magnetic mounting frame procedures

Reflect mount

The Magnetic mounting frames establish the axial alignment of the sensors and allow the removal and replacement of either sensor while preserving their exact mounting location.

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.

3. Determine which sensor type will be installed into the magnetic mounting frame.

Note

C and D-size FSS200 Universal sensor mounting

To mount C or D-size FSS200 Universal sensors the spacer plates must be attached to the side panels of the mounting frames. The Clamp Plate Assembly has to be place in the C-ALL slot for C-size FSS200 Universal sensors and in the D-ALL slot for D-size FSS200 Universal sensors. Refer to figure for spacer plate locations and figures below for Clamp Plate slot and optional Clamp-on mounting strap slot locations.

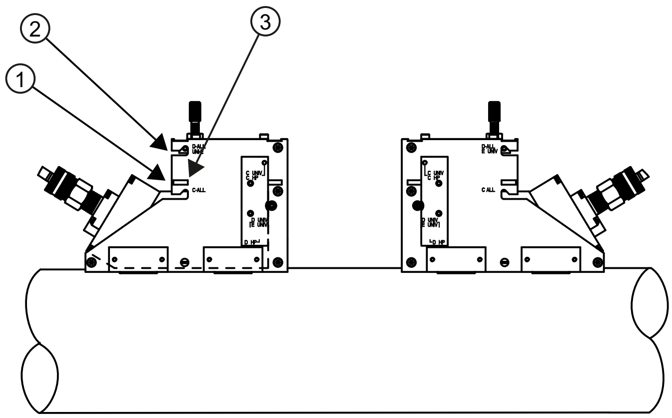


Figure B-13 Sensor clamp plate assembly location

①	Insert Clamp Plate assembly in the C-ALL slot for C-size FSS200 Universal and Hi Precision sensors.
②	Insert Clamp Plate assembly in the D-ALL/UNI-E slot for D-size FSS200 Hi Precision, Universal and E-size FSS200 Universal sensors.
③	Slots for optional clamp-on mounting straps.

4. Check to ensure that you have a matched set of sensors. They both should have the same serial number but marked with either an "A" or "B" (e.g., 100A and 100B).
5. The sensor selection will determine which Spacer Bar mounting frame holes will be used when attaching the spacer bar. Refer to the table below for selecting the appropriate spacer bar sensor positioning hole.

For C-size FSS200 Universal or C-size FSS200 Hi Precision sensors	Select hole marked **C UNIV / C HP**
For D-size FSS200 Universal and E-size FSS200 Universal sensors	Select hole marked **D UNIV / E UNIV**
For D-size FSS200 Hi Precision sensors	Select hole marked **D HP**

Mounting frame assemblies without a spacer bar

The recommended procedure to mount the frame assemblies is by using a spacer bar. If this is not available you can mount the Magnetic frame assemblies using the following method.

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.
3. Select a mounting location on the pipe for the Reference frame assembly. (Refer to the sensor orientation diagram below.)

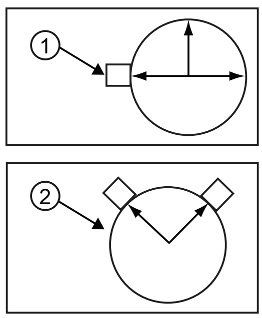


Figure B-14 Sensor orientation diagram

①	Single Channel sensors at 9 o'clock position.
②	Dual Path sensors at 10 and 2 o'clock positions.

4. At the desired mounting location, carefully place the frame assembly so that it rests on the pipe and is straight along the axis of the pipe.
5. With a pencil or marker, mark a generous area of 13 mm (1/2") all around the frame. Remove the frame assembly.
6. Prepare the area you marked by de-greasing surface, and if needed, by removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive material provided.

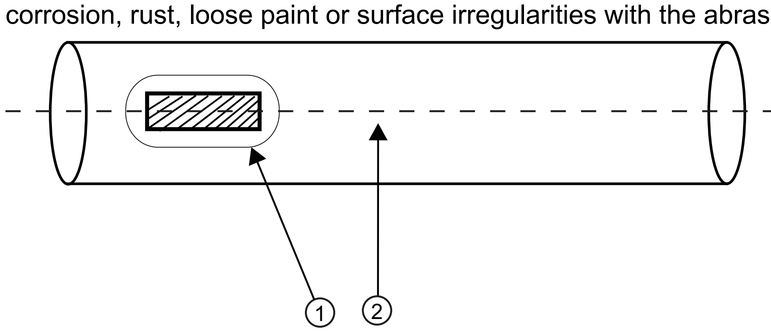


Figure B-15 Pipe preparation and frame alignment

①	Clean area of the pipe
②	Center line of horizontal pipe axis

7. Carefully place the frame assembly on the cleaned pipe location. Ensure that the frame assembly is straight along the pipe axis.

8. Temporary insert a sensor into the frame assembly and push it up to the frame stop.

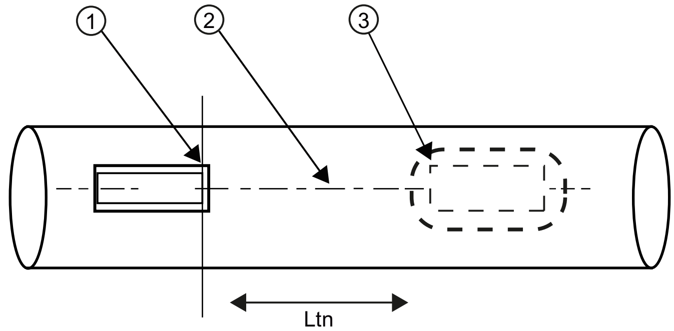


Figure B-16 Finding the second frame location

①	Measure from front of sensor
②	Horizontal pipe axis
③	Approximate location of second frame and sensor assembly

9. With a measuring tape, measure the length of the Ltn from the inside edge of the sensor to an approximate location for the second frame assembly.

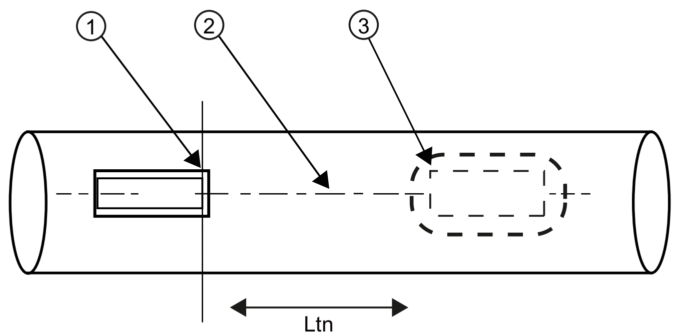


Figure B-17 Finding the second frame location

①	Measure from front of sensor
②	Horizontal pipe axis
③	Approximate location of second frame and sensor assembly

10. Carefully place the second frame assembly on the pipe in the approximate location and align it with the axis of the pipe.
11. With a pencil or marker, mark a generous area of 13 mm (1/2") all around the frame. Remove the frame assembly.
12. Prepare the area you marked by de-greasing surface, if needed, and by removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive material provided.
13. Carefully place the second frame assembly on the pipe. Temporarily insert the sensor into the frame and push it up to the frame stop.
14. If feasible, use a non-metallic straight edge (length of wood, plastic ruler) to adjust the two mounting frames so they are aligned with each other and the horizontal axis of the pipe.

15. Using a measuring tape, measure the Ltn distance from sensor to sensor.

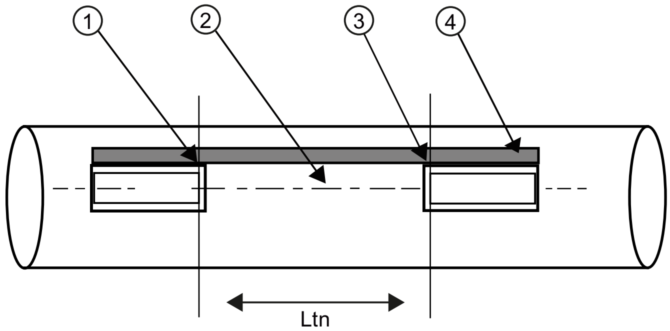


Figure B-18 Side view of pipe

①	Front of the Reference sensor
②	Horizontal axis line of the pipe
③	Front of the second sensor
④	Straight edge used for aligning frame assemblies

16. Adjust the second frame assembly as needed.

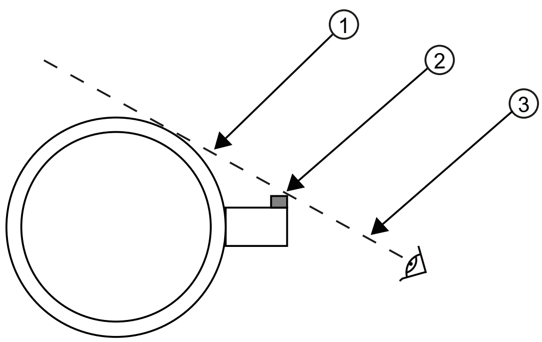


Figure B-19 Aligning frames with horizontal pipe axis

①	Aligning sensors with pipe
②	Straight edge used for aligning frame assemblies
③	Line of sight

17. If optional clamp-on mounting straps are needed install them now or proceed to Installing the sensors (Page 116).

Optional clamp-on mounting straps

Note

IMPORTANT

If magnetic mounting frames are to be used in temperatures above 100°C (212°F) clamp-on mounting straps are recommended.

The use of clamp-on mounting straps to mount the frames to the pipe is optional. Their use is dependent upon the environment and location of the pipe.

Note

Only use worm-gear style mounting straps.

1. Once the mounting frames are at the final mounting location, slide the mounting straps through the strap slots on the frame and then around the pipe.

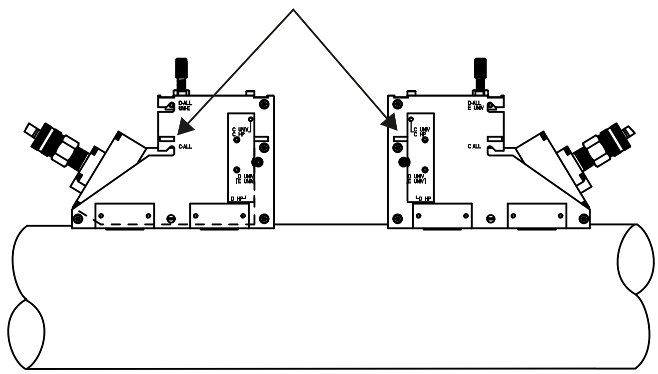


Figure B-20 Mounting strap slots

2. Tighten the mounting straps to seat the mounting assembly firmly on the pipe. Do not over tighten.

Mounting with spacer bar

Magnetic frames can be installed with a spacer bar, if available. Refer to Reflect mount (Page 32) for installation instructions.

B.3.4 Direct mount

B.3.4.1 Installation instructions

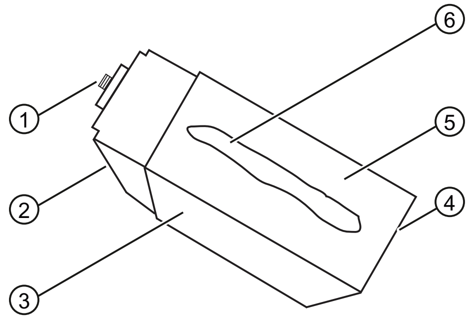
The Magnetic mounting frames establish the axial alignment of the sensors and allow the removal and replacement of either sensor while preserving their exact mounting location.

For Direct mount installation instructions refer to Direct mount (Page 95).

B.3.5 Installing the sensors

Sensor installation

1. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface



① F-connector	④ Front face
② Angled edge	⑤ Emitting surface
③ Sensor	⑥ Coupling compound

Figure B-21 Sensor

2. Slide sensor into the angled end of the Reference mounting frame, with the sensor F-connector facing out. Keep sensor from making contact with the pipe until it butts up against the mounting frame stop. Push sensor down to mate with pipe.

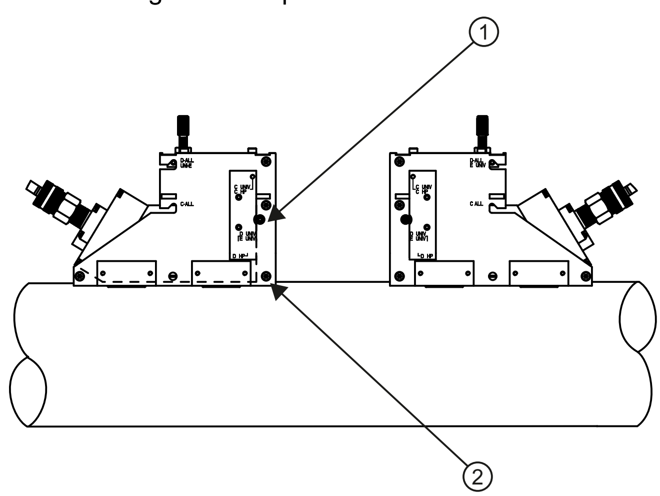


Figure B-22 Sensor mounting top locations

①	Stop location for D and E-size FSS200 sensors
②	Stop location for C-size FSS200 sensor

3. Align the mounting pins of the clamp plate assembly with the frame and insert into the frame.

4. Select the desired sensor hole and screw in the Clamping Screw.

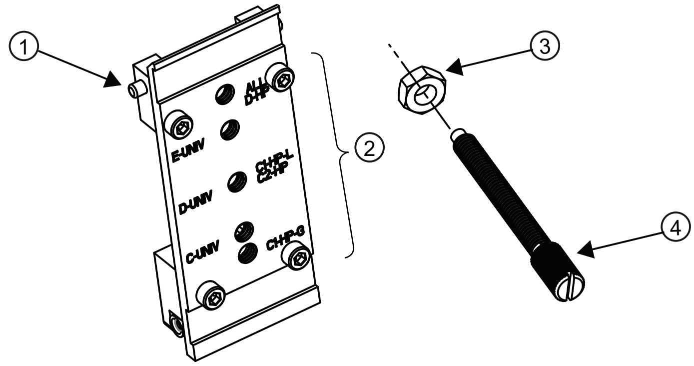


Figure B-23 Clamp plate assembly

①	Mounting pins
②	sensor selection positioning holes
③	Locking nut
④	Clamping screw

5. Tighten the sensor clamping screw to hold the sensor firmly in place. Tighten the clamping screw locking nut but not so tight that the magnetic frame lifts off the pipe. *Repeat procedure for the other sensor.*
6. Fill connector end with Super Lube prior to connecting.
7. Apply Super Lube to the internal threads at the large end of the thread connector.
8. Observing the upstream and downstream orientation, attach the upstream (1A) and Downstream (1B) cables to the sensors and make snug. Attach other ends to the transmitter at 1A and 1B terminals of the transmitter.
9. Proceed to Sensor wiring (Page 48).

See also

Mounting temperature sensors (Page 56)

B.4 Hi Precision mount

B.4.1 Pre-assembly procedures

The following instructions are for installing Hi Precision mounts on various size pipes in the Reflect and Direct modes.

Note

It is recommended that two persons be available to perform these installation procedures.

Unpacking

Note

Refer to Figure 2-1 when unpacking unit, if necessary.

1. Unpack and disassemble the clamp-on sensor enclosure(s). Cut away plastic tie-wraps using a pair of cutting pliers.
2. Remove enclosure housing covers. To remove covers, loosen screws then lift and slide covers through keyways. The screws do not need to be removed.
3. Loosen the sensor Clamp Plate nut and set screws.
4. Remove Strap Retainer nuts and washers from enclosure housing(s) stand offs and lift off housing(s).
5. Retain all removed hardware.

Required tools

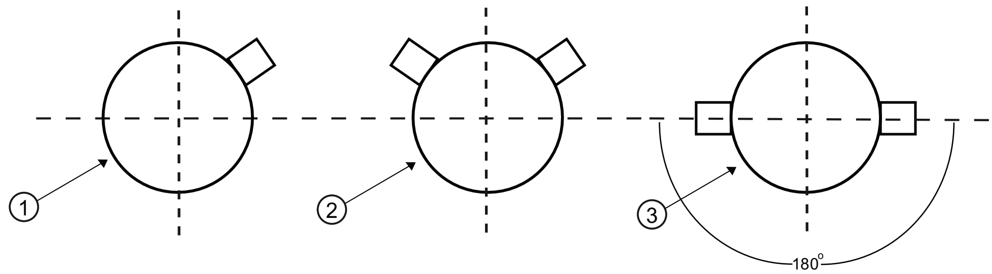
- Hex Key set S.A.E 5/32 and 1/8-inch
- Phillips Head #2 screwdriver
- 7/16-inch deep socket
- 7/16-inch open end wrench
- Flat blade screwdriver
- Torque limiting drive/wrench (in/lbs)
- Cutting pliers
- Felt marker or grease pencil
- Mylar template material (for Direct mounting)
- Masking tape (for Direct mounting)
- Tape measure

B.4.2 Pipe preparation and flowmeter setup

Preliminary pipe and flowmeter setup

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. Refer to the transmitter to confirm that the appropriate sensors and enclosure settings have been selected for operation on the chosen pipe.
3. Select the mounting location on the pipe.
4. Choose a pipe location that remains full at zero flow.

5. Where possible, locate enclosure housing 10 pipe diameters or more (20 diameters for gas applications) from elbow or valve to ensure fully developed and stable flow profile.
6. On horizontal pipe sections, select a horizontal plane to avoid sediment or gas blockage of ultrasonic signal path.
7. Mounting mode applications - see figures below.



① Single path, Reflect mode
② Dual path, Reflect mode
③ Single and Dual path direct X mode

Figure B-24 Horizontal sensor housing mountinging

8. Prepare pipe for mounting the enclosure housing by removing grit, corrosion, coating or heavy paint. Avoid grinding which can cause distortion of the pipe surface.
9. Clean and degrease pipe surface.

Note

Do not mount enclosure housings over frost.

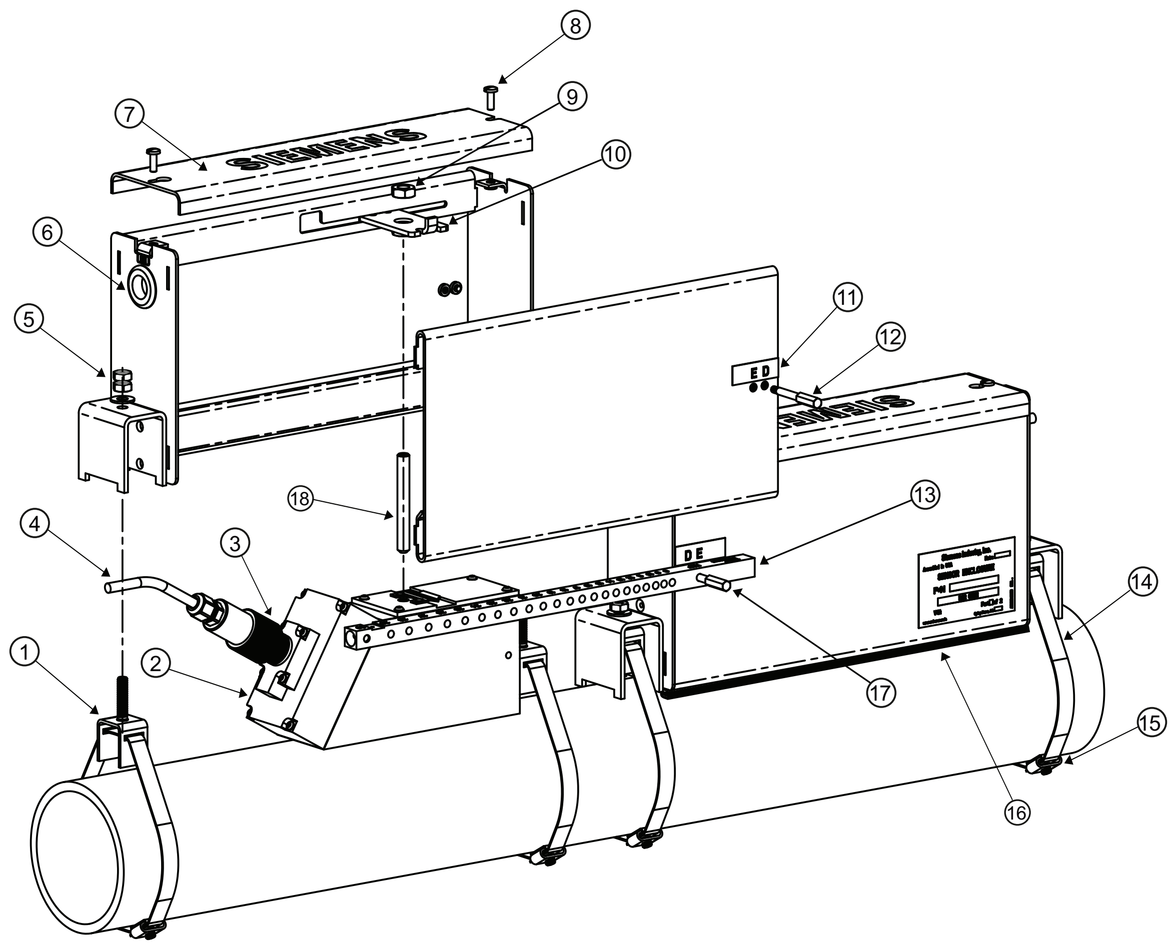
Do not mount enclosure housings on the seam of pipe.

10. Smooth the surface to accept sensors by using the supplied abrasive pad.

B.4.3 Reflect mount

B.4.3.1 Reflect mount installation

Overview



①	Strap retainer
②	Sensor
③	Cable gland
④	Sensor cable
⑤	Stand Off strap retainer nuts and washer
⑥	Sensor cable hole and grommet
⑦	Enclosure housing cover
⑧	Cover screw
⑨	Clamp plate nut
⑩	Clamp plate
⑪	D and E name plate
⑫	REF sensor spacer bar screw
⑬	Spacer bar
⑭	Strap
⑮	Strap fastener and set screw (180° from strap retainer)
⑯	Typical sealant application
⑰	Sensor spacer bar screw
⑱	Clamp plate screw

Figure B-25 Overview - Dual enclosure Reflect mount

Note

Applying sealant - Refer to ⑯ in figure above.

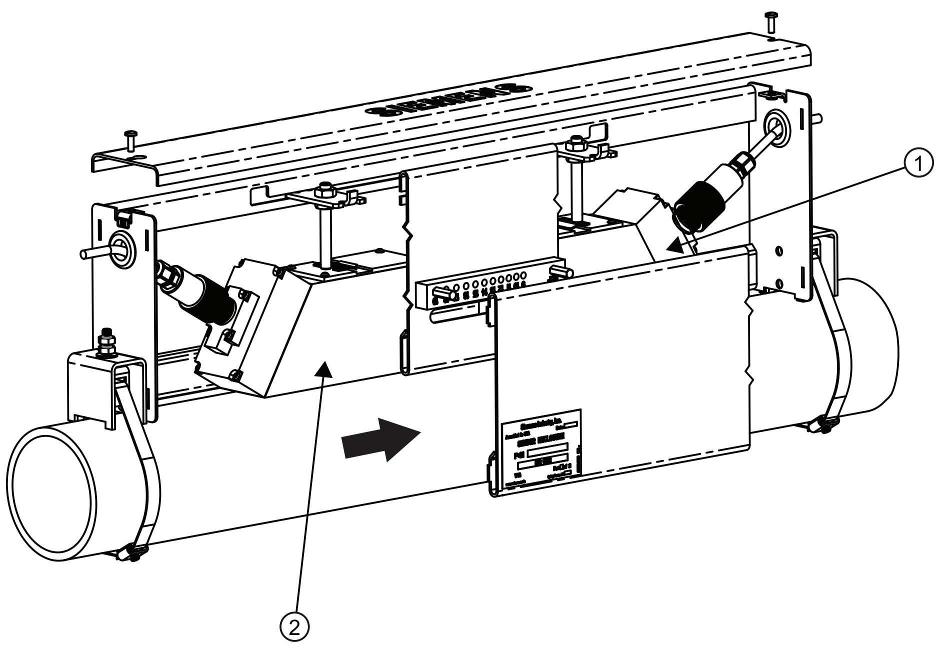
In environmentally challenging conditions it is an accepted practice to apply a heavy bead of sealant material such as silicone caulking or other environment appropriate material between the enclosure and the pipe surface that leaves an area at the lowest elevation free for drainage.

Note

Always mount sensors above the horizontal plane of the pipe. Avoid mounting directly on top or bottom of horizontal pipes.

Single enclosure Reflect mount

Sensor locations



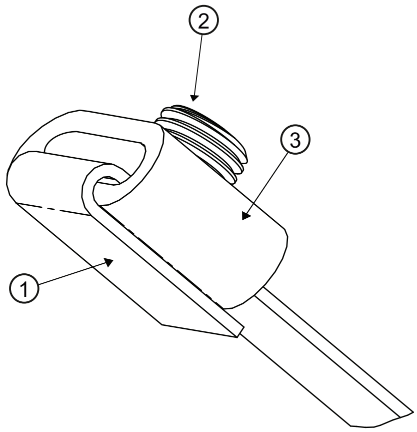
① Downstream sensor
② Reference sensor (REF) or fixed sensor

Figure B-26 Single enclosure - Reference sensor location

Mounting straps for Reflect mount - Single enclosure

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. Determine the correct sensor spacing as indicated by the transmitter.
3. Place the enclosure housing on the pipe and mark pipe at each strap location using chalk or a grease pencil.

4. Prepare straps for mounting by cutting to required length. Strap length should be twice the pipe circumference plus 15.24 cm (6 inches).
5. Remove set screw from strap fastener. Retain set screw.
6. After strap is cut to correct length feed strap into strap fastener (small set-screw clamp). Bend 2.54 cm (1-inch) of the end lip around the strap fastener.



① Bend strap over
② Set screw
③ Strap fastener

Figure B-27 Bending strap end

Note

For Reflect mount, install strap retainer for each path (i.e. Single path Reflect mount will have one strap retainer, Dual path Reflect mount will have two strap retainers at each strap location). For Direct mount, install two strap retainers at each strap location.

---

7. Mount the straps at the previously marked locations. Loop strap around pipe and feed the open end of the strap through the strap fastener and strap retainer. Pull loose end of strap to remove slack.

8. Repeat for second strap by looping strap around pipe and feeding open end through strap fastener and strap retainer. Pull loose end of strap tight to remove slack.

Note

Keep strap fastener in the center between the two strap retainers. See figure below.

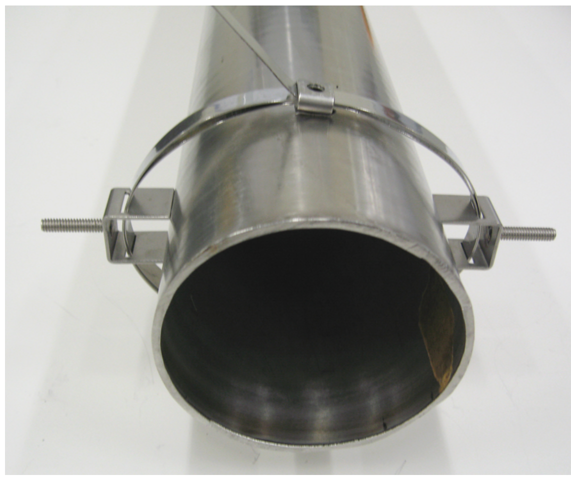


Figure B-28 Typical strap and strap retainer setup

9. Take up the slack in the strap and position the strap retainer(s) at the selected plane(s); either single or dual path.
10. Position the strap fastener away from the strap retainer for single path or at the best location.
11. Bend the loose end of the strap to prevent it from loosening. Retrieve the strap fastener set screw and install and tighten the set screw using the hex key.
12. Recheck alignment. Strap retainers should be aligned with each other and inline with the pipe axis. The straps should now be mounted correctly for the selected path.

Mounting straps for Reflect mode - Dual enclosure

Note

Refer to Reflect mount overview figure as needed.

Follow the same mounting strap procedures used above for a Single enclosure housing but add two more straps and two more strap retainers per strap.

B.4.3.2 Single enclosure - Reflect mount

Installation procedure

1. Place the enclosure housing over the strap retainers and slip into place. It may be required to align or adjust the strap retainer studs to fit into their respective stand off holes. Be aware of the flow direction and the upstream side (reference) and downstream side (adjustable).

Figure B-29 Stand off adjustment

Note

When more than one path is installed, position the enclosure housing so the Reference sensor (REF) of each path is on the same end of the pipe. Sensor ends should be facing each other.

---

2. Install strap retainer nuts and washers at every stand off location.
3. Tighten one end of the enclosure housing just enough to keep housing from moving. Continue to reposition the other end of the enclosure housing until the housing is centered.
4. Tighten the other strap retainer nut just enough to keep enclosure housing from moving while maintaining alignment of stand offs.
5. Visually verify that the enclosure housing is in line with the pipe axis by comparing the top edge of the housing to the linear axis of the pipe. Adjust if necessary.
6. Repeat above steps for all remaining paths.

7. Fully tighten and torque all stand off strap retainer nuts to approximately 2.25 - 2.8 newton/meters (20-25 in/lbs). **Lock stand offs in place with second nut.**

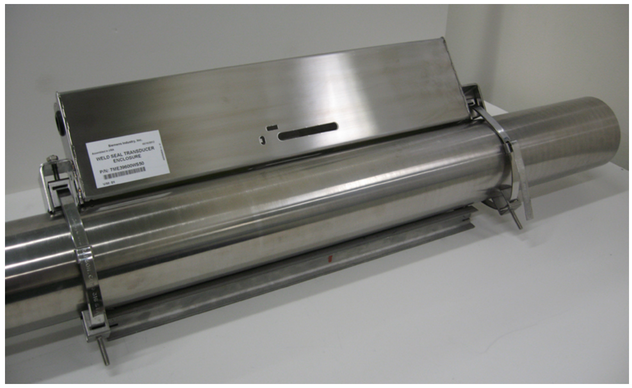


Figure B-30 Installed Hi Precision mount single enclosure housing

8. Proceed to installing Sensors - Single enclosure. (Page 127)

B.4.3.3 Dual enclosure - Reflect mount

Installation procedure

1. Install strap retainers and straps on pipe as shown.

Note

Where possible adjust the strap retainers in the 10 and 2 o'clock positions. See figure below.

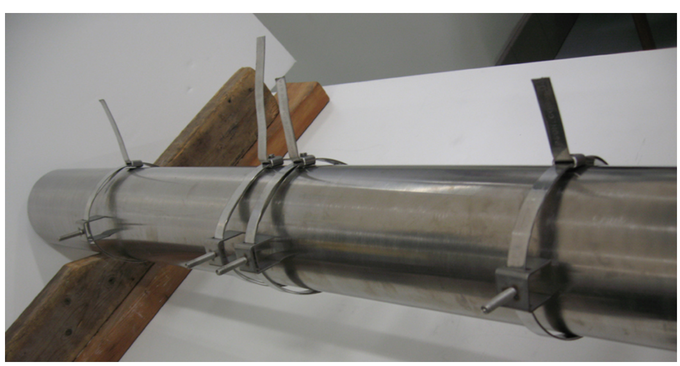


Figure B-31 Strap retainer and strap installation

2. Place the first enclosure housing stand offs over the strap retainers and slip into place. It may be required to align or adjust the strap retainer studs to fit into their respective stand off holes. Be aware of the flow direction and the upstream side (reference) and downstream side (adjustable).

Note

When mounting enclosures maintain alignment of strap retainers. When more than one path is installed, position the enclosure housing so the Reference sensor (REF) of each path is on the same end of the pipe. Sensor ends should be facing each other.

3. Install strap retainer nuts and washers at every stand off location.

4. Tighten one end of the enclosure housing just enough to keep housing from moving. Continue to reposition the other end of the enclosure housing until the housing is centered.
5. Tighten the other strap retainer nut just enough to keep enclosure housing from moving.
6. Visually verify that the enclosure housing is in line with the pipe axis by comparing the top edge of the housing to the linear axis of the pipe. Adjust if necessary.
7. Repeat above steps for all remaining paths.
8. Tighten and all stand off strap retainer nuts.
9. **Repeat installation for second enclosure housing.**
10. Attach spacer bar by inserting reference sensor pin into the REF hole. Insert Index Number pin into appropriate Index Number hole.

Note

There are two threaded holes in each enclosure housing, labeled "D" and "E". Use the hole that matches the sensor size.

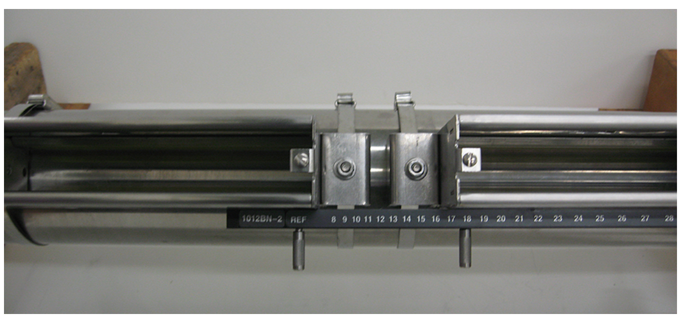


Figure B-32 Spacer bar setup

11. Fully tighten and torque all stand off strap retainer nuts to approximately 2.25 - 2.8 newton/ meters (20-25 in/lbs). **Lock stand offs in place with second nut.**
12. Proceed to installing Sensors - Dual enclosure (Page 130).

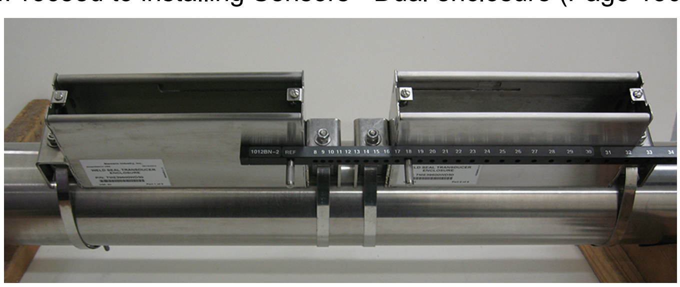


Figure B-33 Installed Hi Precision mount dual enclosure housings

B.4.3.4 Sensors - Single enclosure

Installation procedure

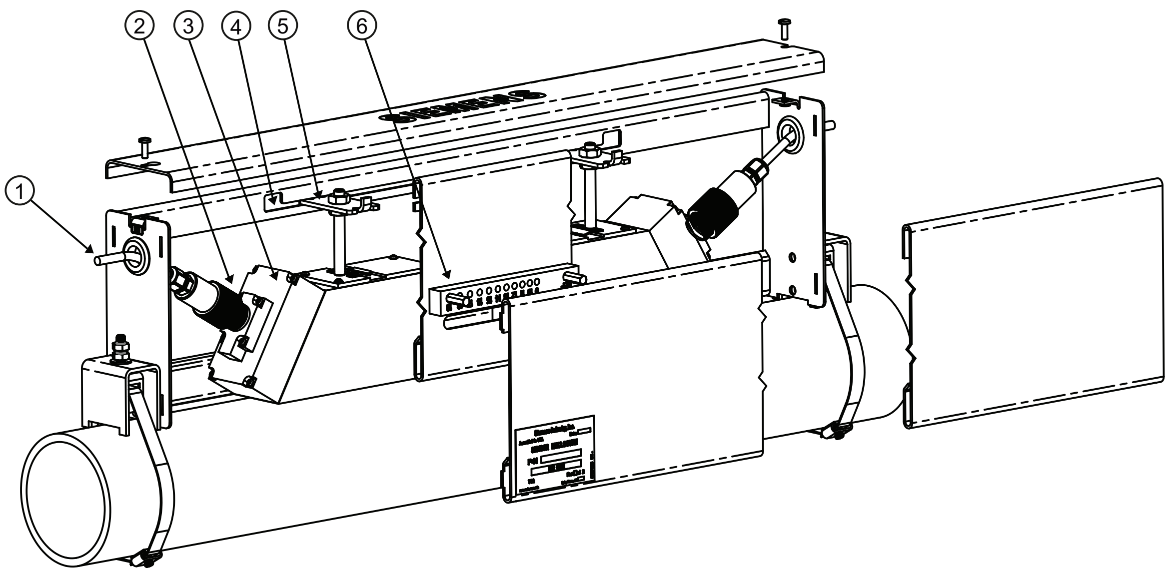
Note

In the following procedure use the coupling compound that is supplied with your sensor.

1. Thread unterminated sensor cable through enclosure housing grommet and terminate cable end with F-connector and cable gland assembly. For sensor cable selection refer to Technical data (Page 87). For sensor assembly instructions refer to Sensor wiring (Page 48).

   Note

   If required, replace supplied grommet with conduit fitting on cable gland.



①	Sensor cable and grommet	④	Notch
②	Cable gland	⑤	Clamp plate, screw and nut
③	Sensor	⑥	Spacer bar and screw pins

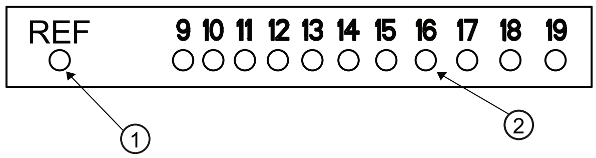
Figure B-34 Hi Precision mount Single enclosure sensor installation

2. Fill connector end with Super Lube prior to connecting.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Connect cable to sensor and then thread cable gland on to sensor.
5. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface.

   Note

   Within the side walls of the enclosure housing there is a short vertical slot and a long horizontal slot. The short vertical slot is the reference sensor position (REF).

6. Place the spacer bar on the enclosure side wall and insert the screw pin through the REF hole of the spacer bar.
7. Lower the fixed reference sensor into the enclosure housing with one hand and then, with the other hand, insert the threaded end of the screw pin through the REF slot and into the sensor. Make sure sensor does not make contact with the pipe at this time.



① Reference hole (REF)

② Index numbers

Figure B-35 Spacer bar

Note

Be careful not to catch or compromise the yellow insulating tape while inserting the sensor. The insulating tape is used to insulate metal components of the sensor for cathodically protected pipe.

---

8. Mate the sensor to the pipe.

Note

Do not smear couplant while mating sensor to pipe.

---

9. Position clamp plate screw assembly into notch and slide over sensor.

Figure B-36 Sensor clamp plate screw and locking nut

Note

Each enclosure will have one sensor from each opposing sensor set; i.e. The enclosure housing at path 1 will have the "A" sensor from set 1 mounted in the upstream location and the "B" sensor from set 2 will be mounted in the downstream location. The enclosure housing for path 2 will have the "A" sensor from set 2 mounted in the upstream location and the "B" sensor from set 1 will be mounted in the downstream location.

---

10. Tighten clamp plate screw to secure sensor and torque to 1.7 newton/meters (15 in/lbs). Ensure plate screw aligns with detent in top of sensor. Secure with locking nut.

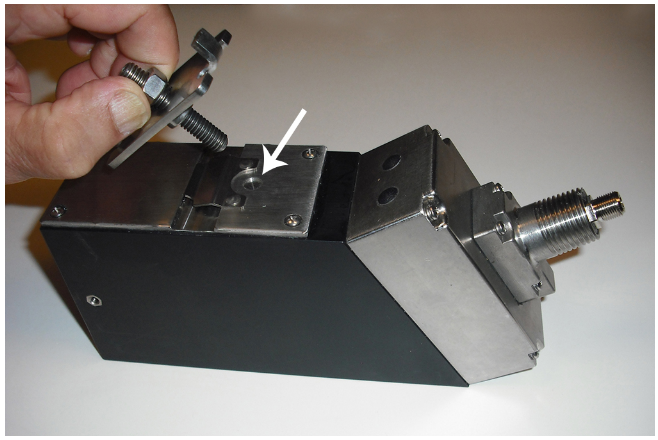


Figure B-37 Sensor detent

11. Insert second unterminated sensor cable through other enclosure housing grommet and terminate cable. (Refer to previous cable instructions.)
12. Insert the second sensor into the enclosure housing and align with the spacing number index hole on the spacer bar. Correct index hole will be provided by transmitter during install process.
13. Insert the index pin into the proper hole in the spacer bar, align the sensor with the hole and screw in pin.

Figure B-38 Spacer bar

14. Mate the sensor to the pipe.

Note

Do not smear couplant while mating sensor to pipe.

15. Position clamp plate screw assembly into notch and slide over sensor.
16. Tighten clamp plate screw to secure sensor and torque to 1.7 newton/meters (15 in/lbs). Secure clamp plate screw with locking nut.

17. Install enclosure housing cover using a flat blade screwdriver and cover screws.

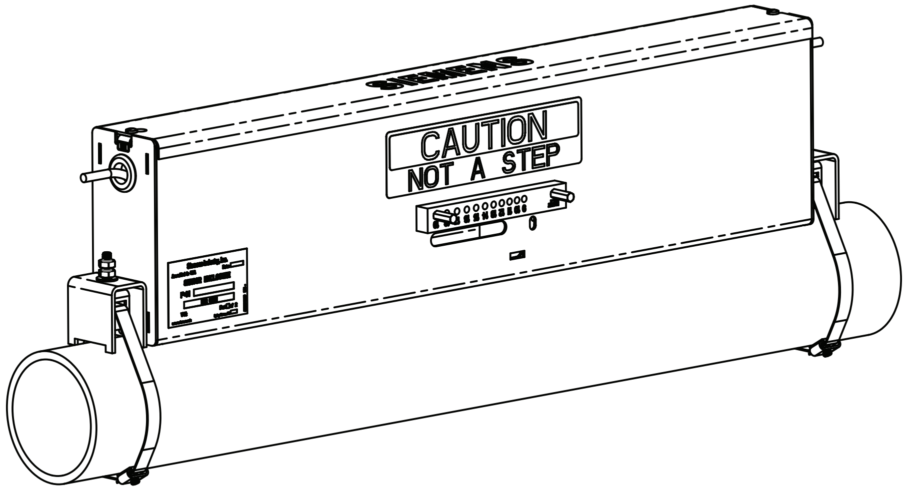


Figure B-39 Installed Hi Precision mount single enclosure

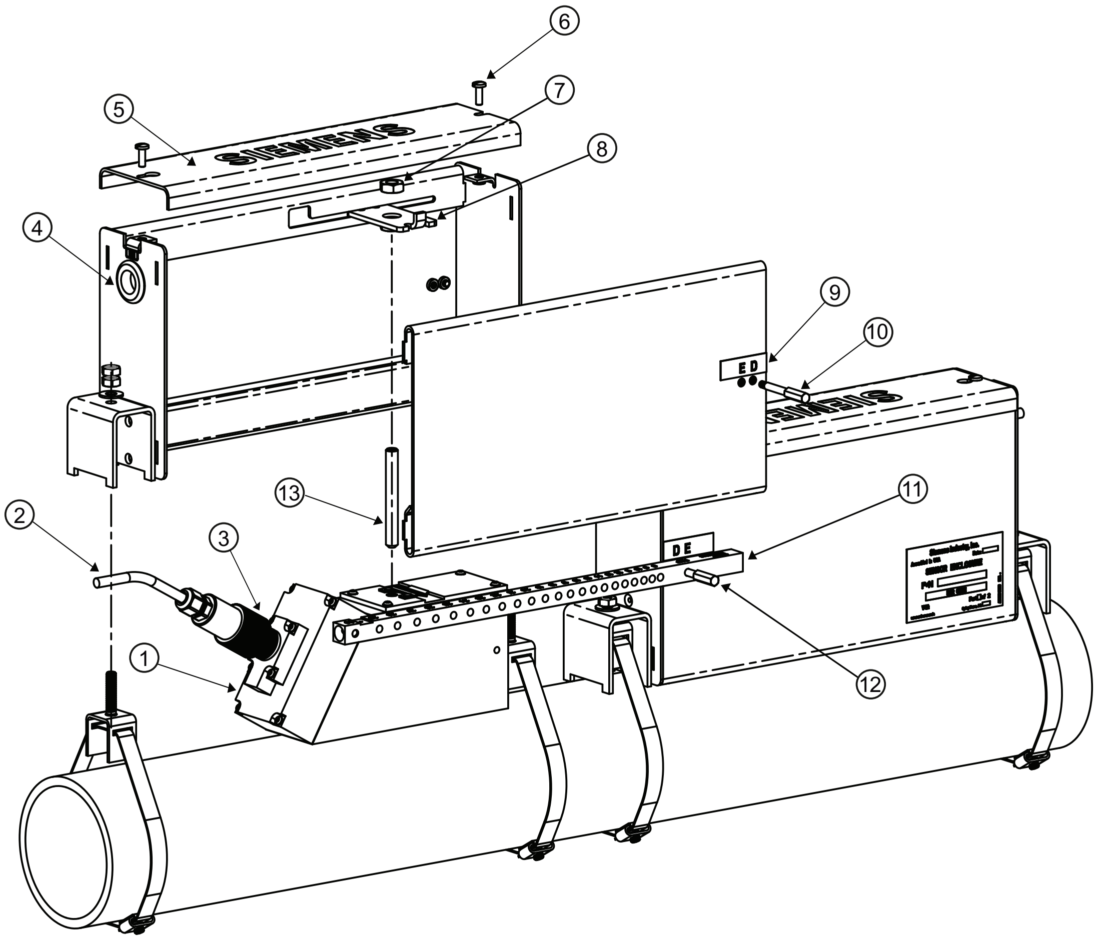
18. Proceed to Sensor wiring (Page 48) to connect sensor cables to the transmitter.
19. Complete the flowmeter make-up process and verify that the sensor installation is complete before continuing to the final step. Adjustment of the index pins may be required.
20. The installation of the sensors is now complete.
21. Return to transmitter and finalize programming.

B.4.3.5 Sensors - Dual enclosure

Installation procedure

Note

In the following procedure use the coupling compound that is supplied with your sensors.



①	Fixed reference sensor	⑦	Clamp plate nut
②	Sensor cable	⑧	Clamp plate
③	Cable gland	⑨	D and E name plate
④	Grommet	⑩	REF sensor spacer bar screw
⑤	Enclosure housing cover	⑪	Spacer bar
⑥	Cover screw	⑫	Sensor spacer bar screw
		⑬	Clamp plate screw

Figure B-40 Sensor installation - Hi Precision mount dual enclosure

1. Thread unterminated cable through enclosure housing grommet and terminate cable end with F-connector and cable gland assembly. For sensor cable selection refer to Technical data (Page 87). For sensor assembly instructions refer to Sensor wiring (Page 48).

Note

If required, replace supplied grommet with fitting on cable gland.

2. Fill connector end with Super Lube prior to connecting. Install sensor cable.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Attach cable to sensor and then attach cable gland and screw on.

5. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface.

Note

Within the side walls of the enclosure housing there is a short vertical slot and a long horizontal slot. The short vertical slot is the reference sensor position (REF).

6. Place the spacer bar on the enclosure side wall and insert the screw pin through the REF hole of the spacer bar.
7. Lower the fixed reference sensor into the enclosure housing and push the sensor back against the end plate. Then insert the threaded end of the screw pin through the REF hole in the spacer bar and into the enclosure housing. Make sure sensor does not make contact with the pipe at this time.

Note

Make sure to align sensor in enclosure housing flush against alignment dimple in end plate opposite cable end.

Note

Be careful not to catch or compromise the yellow insulating tape while inserting the sensor. The insulating tape is used to insulate metal components of the sensor for cathodically protected pipe.

8. Mate sensor with pipe.

Note

Do not smear couplant while mating sensor to pipe.

9. Position clamp plate screw assembly into notch and slide over sensor.

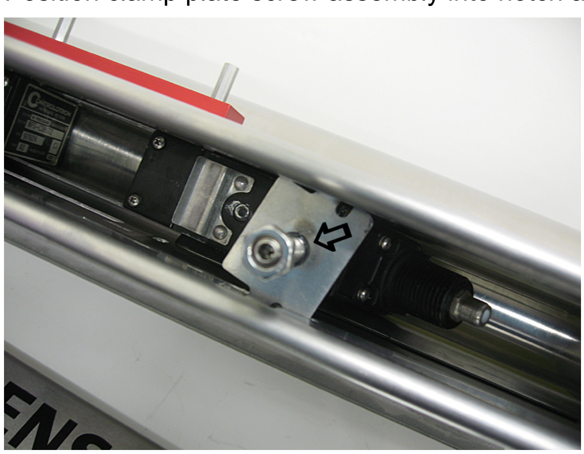


Figure B-41 Sensor clamp plate screw and locking nut

10. Tighten clamp plate screw to secure sensor and torque screw to 1.7 newton/meters (15 in/lbs). Ensure plate screw aligns with detent in top of sensor. Secure with locking nut.

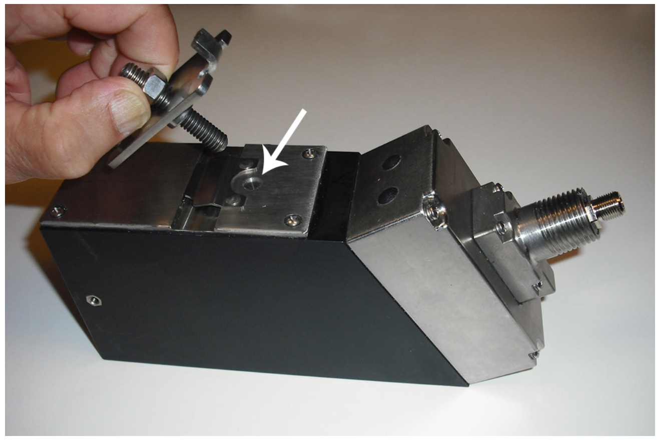


Figure B-42 Sensor detent

11. Thread second unterminated sensor cable through enclosure housing grommet and terminate cable. (Refer to previous cable instructions.)
12. Install second sensor as described above.
13. Install enclosure housing covers using a flat blade screwdriver and cover screws.

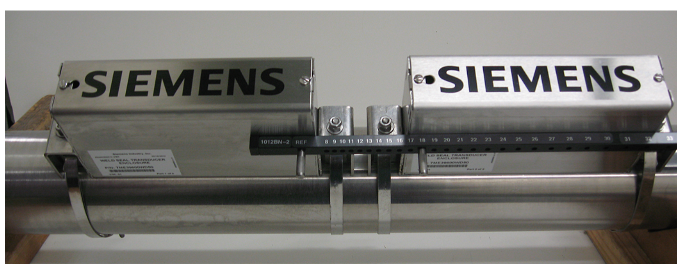


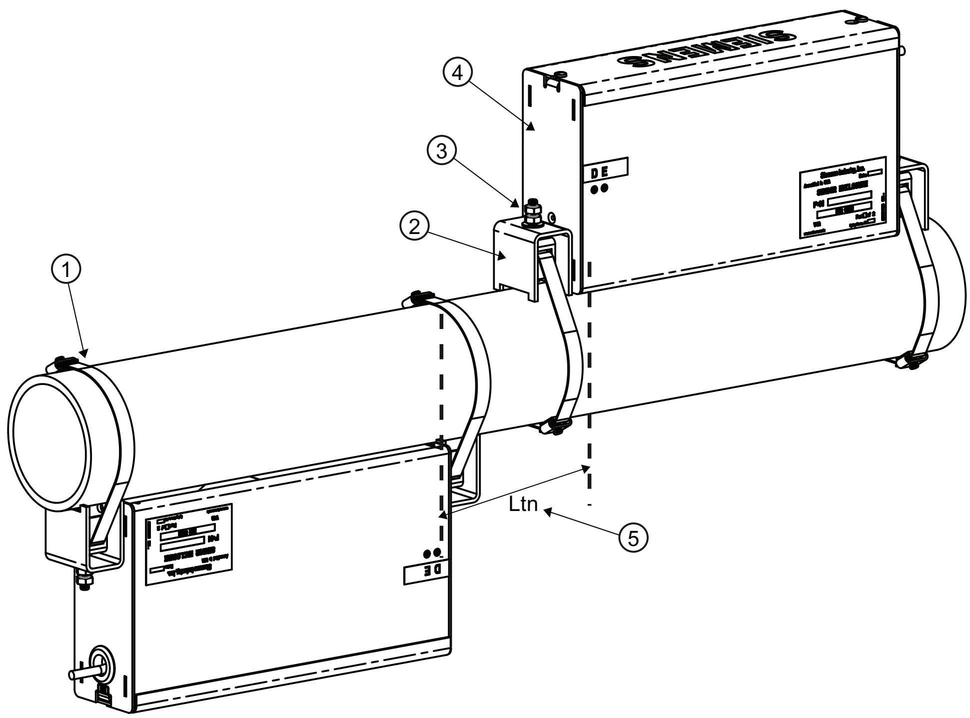
Figure B-43 Installed Hi Precision mount dual enclosure

14. Proceed to Sensor wiring (Page 48) to connect the sensor cables to the transmitter.
15. Complete the flowmeter make-up process and verify that the sensor installation is complete before continuing to the final step. Adjustment of the index pins may be required.
16. Installation of the sensors is now complete.
17. Return to transmitter and finalize programming.

B.4.4 Direct mount

B.4.4.1 Direct mount installation

Direct mode - Dual enclosure



① Strap
② Stand off
③ Stand off strap retainer nuts and washer
④ Enclosure housing
⑤ Spacing index

Figure B-44 Hi Precision mount Direct mode Dual enclosure (for index spacing greater than minimum values)

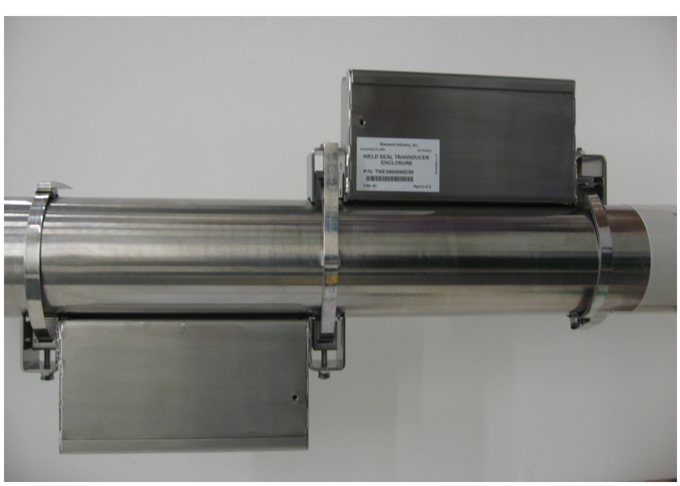


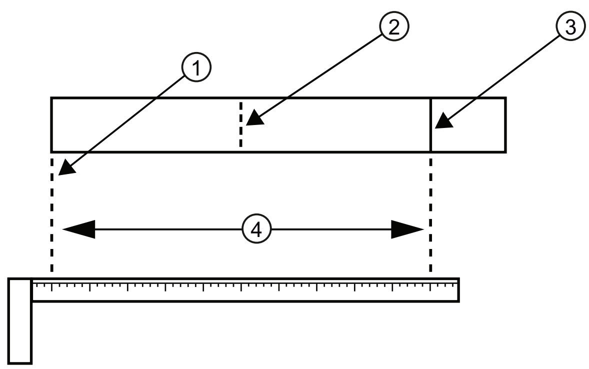
Figure B-45 Hi Precision mount Direct mode Dual enclosure (for minimum index spacing)

B.4.4.2 Positioning strap retainers and straps

Installation procedure

Straps should be cut to length and installed with strap retainers on the pipe.

1. Roughly position the strap retainers on the horizontal plane of the pipe with the strap fastener located at the top of pipe.
2. Using the provided Mylar material, make a template by wrapping the Mylar strip around the pipe and overlap the ends.



①	Overlap edge	③	Spacing guide
②	Mark (or fold) exactly at halfway point	④	Circumference

Figure B-46 Finding the halfway distance

3. Tape the ends together. Mark the Mylar template where the ends overlap with a marker.
4. Remove the template from the pipe.
5. Align the mark with the other end of the Mylar strip and then fold the Mylar strip keeping the ends aligned.
6. Using a marker, mark the fold crease.
7. Reinstall the Mylar template on the pipe and tape it together.

8. Align the marks on the template with the horizontal plane of the pipe. Align the strap retainers, on center, with the marks on the Mylar template.

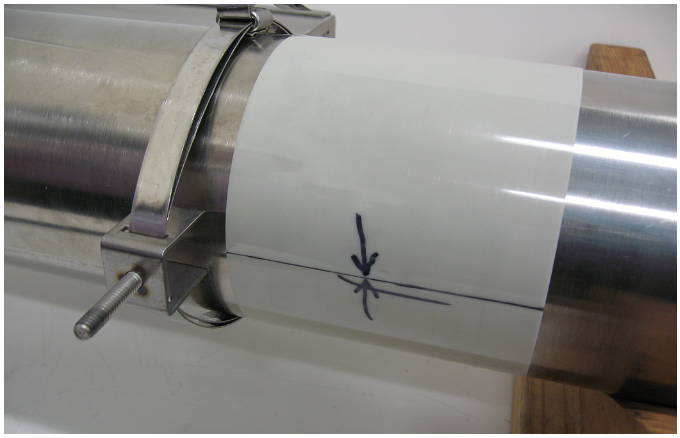


Figure B-47 Mylar template

9. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
10. Check index spacing on the flowmeter and adjust strap retainers for the correct spacing between the sensors.

B.4.4.3 Direct mount enclosure housings

Installation procedure

1. Install the first enclosure housing and align it with the center line of the Mylar template.
2. Fully tighten and torque all stand off strap retainer nuts to approximately 2.25 - 2.8 newton/meters (20-25 in/lbs). **Lock stand offs in place with second nut.**

Note

Maintain the alignment of the stand offs throughout the remaining installation procedures. This is the reference point used when mounting the sensor housing and aligning the remaining stand offs and strap retainers.

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3. Loosely install the second enclosure housing. Position it 180° from the Mylar template center line.
4. Fully tighten and torque all stand off strap retainer nuts to approximately 2.25 -2.8 newton/meters (20-25 in/lbs). **Lock stand offs in place with second nut.**

B.4.4.4 Sensor installation - Dual enclosure direct mount

Installation Procedure

1. Thread unterminated cable through first enclosure housing grommet and terminate cable end with F connector and cable gland assembly. For sensor cable selection refer to Technical data (Page 87). For sensor assembly instructions refer to Sensor wiring (Page 48).
2. Fill connector end with Super Lube prior to connecting. Install sensor cable.
3. Apply Super Lube to the internal threads at the large end of the thread connector.
4. Attach cable to sensor and then attach cable gland and screw on.
5. Take either sensor and apply a continuous lengthwise 3 mm (1/8-inch) bead of coupling compound across the center of the sensor emitting surface.

Note

Be careful not to catch or compromise the yellow insulating tape while inserting the sensor. The insulating tape is used to insulate metal components of the sensor for cathodically protected pipe.

6. Align sensor in enclosure housing flush against alignment dimple in end plate opposite the cable end.
7. Mate sensor with pipe.

Note

Do not smear couplant while mating sensor to pipe.

8. Position clamp plate assembly into notch and slide over sensor.

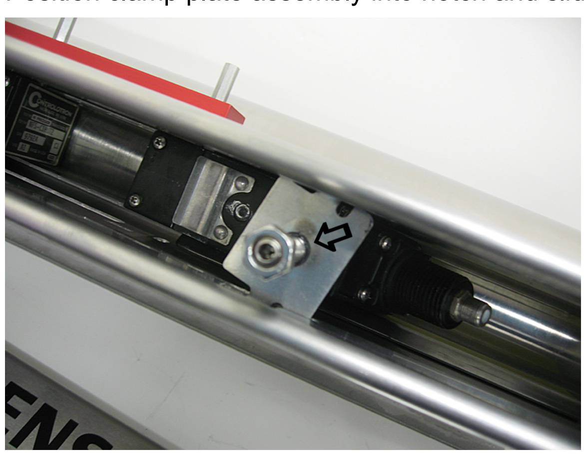


Figure B-48 Sensor clamp assembly screw and locking nut

9. Using the hex key tighten clamp plate screw to secure sensor and torque screw to 1.7 newton/meters (15 in/lbs). Ensure that center plate screw is aligned with the sensor detent. Secure with locking nut.

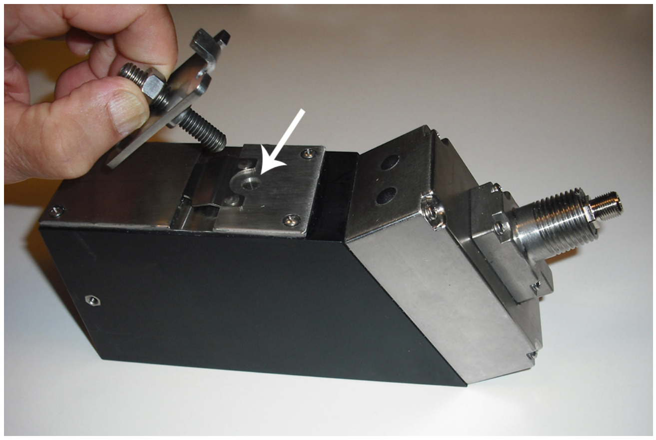


Figure B-49 Sensor detent

10. Fully tighten and torque all stand off strap retainer nuts for second enclosure housing to approximately 2.25 - 2.8 newton/meters (20-25 in/lbs). **Lock stand offs in place with second nut.**
11. Repeat sensor installation procedure for second sensor.
12. Install enclosure housing covers using a flat blade screwdriver and cover screws.
13. Proceed to Sensor wiring (Page 48) to connect sensor cables to the transmitter.
14. Complete the flowmeter make-up process and verify that the sensor installation is complete before continuing to the final step.
15. Return to transmitter and finalize programming.

B.4.4.5 Direct-X mount - Dual enclosure

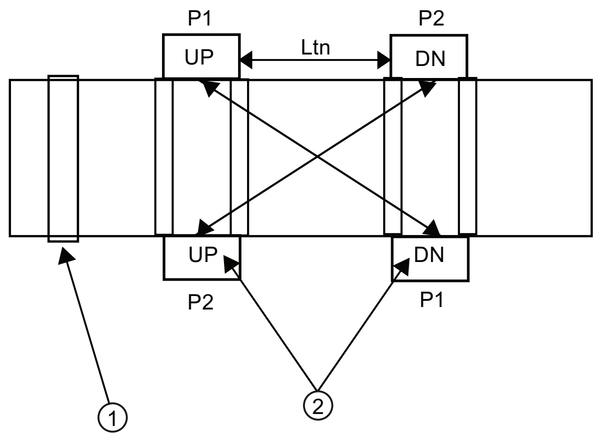
Installation procedure

Note

Hi Precision mount Direct-X mode can only be used for installations when the spacing index is greater than 7.62 cm (3 inches).

1. **Use the Wizard setup procedure to program the transmitter for the sensors that were selected.**
2. After receiving the spacing number index from the transmitter, make a note of the number displayed.

3. Referring to figure below, install straps for UP/DN path and then set the second set of straps for the DN/UP path. Refer to the index spacing to space the second set of straps.



① Mylar strip

② Paths

Figure B-50 Direct-X paths

4. Using a marker, mark locations for placing all four straps.
5. Place enclosure housing over the UP/DN path straps. Install the enclosure housing and tighten straps.
6. Loosely install second enclosure housing.
7. Check the index spacing and move enclosure housing to index spacing mark on the pipe.
8. Remove the enclosure housing and tighten straps and then re-install enclosure housing.
9. Check index spacing and ensure enclosure housing is axially aligned with the pipe.
10. Proceed to Sensor wiring (Page 48).

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