SIEMENS

SITRANS F

Ultrasonic flowmeters SITRANS FSS100

Installation Manual

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7ME381 (SITRANS FSS100)

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 Aktiengesellschaft. 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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Getting started

1.1 Getting started

Condition

You have read the following safety instructions:

- General safety information (Page 15)
- Basic safety information: Installing/mounting (Page 29)
- Basic safety information: Connecting (Page 63)

Read the entire document in order to achieve the optimum performance of the device.

1.1 Getting started

Introduction

2.1 FSS100 manual usage

Note

This manual applies to the SITRANS FSS100 ultrasonic retrofit sensors only.

2.2 Designated use

Use the device in accordance with the information on the nameplate and in the Technical specifications (Page 79).

See also

Nameplate layout (Page 67)

2.3 Documents required

In order to operate an ultrasonic flowmeter, you need both transmitter Operating Instructions and sensor Installation Instructions, see Ultrasonic manuals (https://support.industry.siemens.com/cs/ww/en/ps/17369/man).

2.4 Scope of documentation (Optional)

Article number	Product
7ME381	FSS100 Sensor

2.5 Document history

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

Edition	Remark
03/2023	Updated Conformity with European directives in the Safety notes chapter. Updated nameplate in the Connecting chapter. Updated formulas in the Installing/Mounting chapter. Added Certificates and approvals topic in the Technical specifications chapter. QR code to ID link updated in Nameplate layout and Product documentation chapters.
12/2023	First edition

2.6 Product compatibility

The following table describes compatibility between manual edition, device revision, engineering system and associated Electronic Device Description (EDD).

Manual edition	Remarks	Device revision	Compatible version of device integration package		
03/2023	Updated man- ual	FST030 HART/Modbus FW: 1.07.00 or later	SIMATIC PDM V9.1	EDD: 1.07.00 or later	
		HW: 002 and 003	AMS Device Manager V14.0, V14.1		
		Device revision 7 or later	SITRANS DTM V4.2		
			Field communicator V3.8		
		FST020	SIMATIC PDM V9.1	EDD: 1.07.00 or later	
		FW: 2.01.00-04 HW: 3.00.02 or later Device revision ???	AMS Device Manager V14.0, V14.1		
			SITRANS DTM V4.2		
			Field communicator V3.8		
12/2023	First edition	FST030 HART/Modbus	SIMATIC PDM V9.1	EDD: 1.07.00 or later	
		FW: 1.07.00 or later HW: 002 and 003 Device revision 7 or later	AMS Device Manager V14.0, V14.1		
			SITRANS DTM V4.2		
			Field communicator V3.8		
		FST020	SIMATIC PDM V9.1	EDD: 1.07.00 or later	
		FW: 2.01.00-04 HW: 3.00.02 or later	AMS Device Manager V14.0, V14.1		
		Device revision ???	SITRANS DTM V4.2		
			Field communicator V3.8		

2.7 Items supplied

- Marking paper (1x) (up to DN 1000)
- Alignment tool (no. depends on pipe size by the order code)
- Transducer holder (quantity depends on the order code)

- Mounting plate (quantity depends on the order code)
- Transducer element (quantity depends on the order code)
- Terminal housing (quantity depends on the order code)
- Transducer coaxial cable (quantity depends on the order code)
- Transducer inserting tool (1x)
- Accessories (tool box)

Note

Depending on the ordered version of the FSS100, the scope of delivery may vary. The contents list in the package will show included parts.

2.8 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.

2.9 Industrial use note

NOTICE

Use in a domestic environment

This Class A Group 1 equipment is intended for use in industrial areas.

In a domestic environment this device may cause radio interference.

2.10 Security information

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

2.10 Security information

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

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

For additional information on industrial security measures that may be implemented, please visit

https://www.siemens.com/industrialsecurity.

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

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

https://www.siemens.com/cert.

NOTICE

Unauthorized product information or software

Use only authorized Siemens websites when accessing any product information or software, including firmware updates, device integration files (EDD, for example), as well as other product documentation. Using unauthorized product information or software could result in a security incident, such as breach of confidentiality, or loss of integrity and availability of the system.

For more information, see Ultrasonic on SIOS (https://support.industry.siemens.com/cs/ww/en/ps/17368/man).

2.11 Transportation and storage

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

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

NOTICE

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical specifications (Page 79).

2.12 Notes on warranty

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

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

2.12 Notes on warranty

Safety notes 3

3.1 Preconditions for use

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

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

3.1.1 Warning symbols on the device

Symbol	Explanation
<u> </u>	Consult operating instructions
	Hot surface
A	Dangerous electrical voltage
	Corrosive materials
	Toxic materials
•	Isolate the device from power using a circuit-breaker
9	Protect the device from impact otherwise loss of degree of protection
	Protective insulation; device in protection class II

3.1 Preconditions for use

Symbol	Explanation
	Electrostatic sensitive device
	Dispose of in an environmentally safe manner, and according to local regulations.

3.1.2 Laws and directives - including Korea

Observe the test certification, 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 Part I) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU and UK)
- For Korea only:

이 기기는 업무용(A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의

지역에서사용하는 것을 목적으로 합니다

3.1.3 Conformity with European directives

The product described in this document is in conformity with the relevant harmonization legislation, and its amendments, of the European Union.

Explosive atmospheres directive of the European Parliament and the Council on the hartive ATEX 2014/34/EU monisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres

Restriction of hazardous substances directive RoHS

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.

3.1.4 Improper device modifications



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.
Do not operate the device after unauthorized modifications.

3.2 Requirements for special applications

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

Note

Operation under special ambient conditions

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

3.3 Use in hazardous areas

Qualified personnel for hazardous area applications

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

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

3.3 Use in hazardous areas



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 specifications (Page 79).

Description

4.1 FSS100 overview

SITRANS FS Ultrasonic flowmeters measure different volume flow. Measurement is independent of changes in liquid temperature, density, pressure and conductivity. The flowmeter is designed for use on single phase liquids for measurement of:

- Volume flow
- · Flow velocity
- Sound velocity
- Mass flow
- Total volume or mass

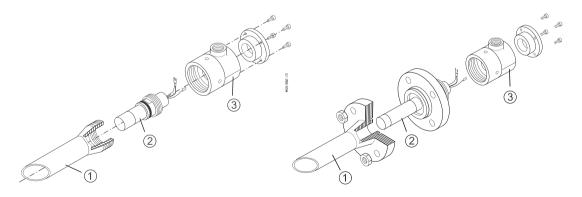
SITRANS FSS100 systems are maintenance free, self cleaning and have a service life of more than 10 years.

As with the SITRANS FS230 and FS220 clamp-on systems, the SITRANS FSS100 sensors can also be operated with the SITRANS FST020 and FST030 transmitters.

4.2 Design

All three FSS100 (standard non-Ex or Ex i, or Ex d) transducer types are available with O-ring. The transducer has a screwed union connection for fitting in a counterflange welded onto the pipe. The union and pipe are sealed with an O-ring.

Transducers are constructed in three parts:



FSS100 exploded views

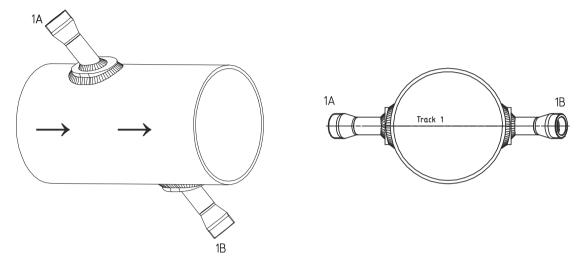
- Transducer holder
- (2) Transducer element (standard non-Ex, Ex i, or Ex d version)
- 3 Terminal housing (standard non-Ex, Ex i, or Ex d version)

4.2 Design

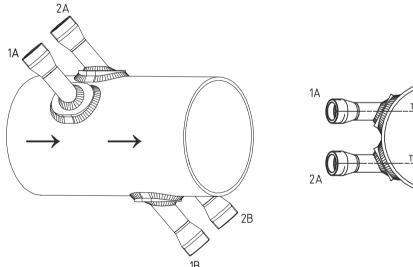
Flow direction

The SITRANS FS120 / SITRANS FS130 retrofit sensor kit is used for installing one to four sets of ultrasonic transducers type FSS100 in existing pipes made of steel or concrete.

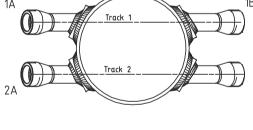
The images below show the position or transducers relative to flow direction.

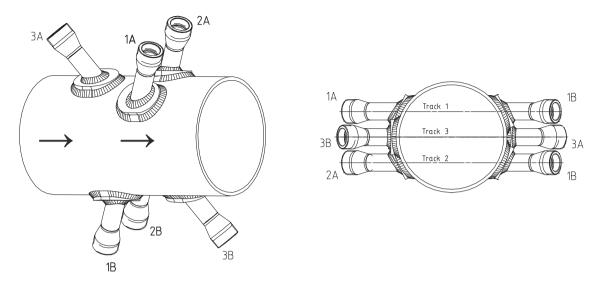


SITRANS FSS100 1-track flow direction

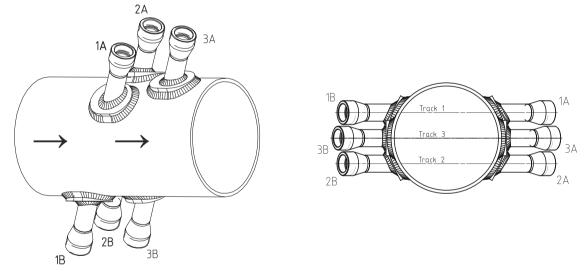


SITRANS FSS100 2-track flow direction



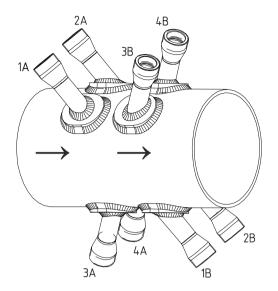


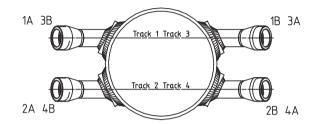
SITRANS FSS100 3-track flow direction



SITRANS FSS100 3-track alternative flow direction

4.2 Design





SITRANS FSS100 4-track flow direction

4.3 FS120 system overview (internal DSL)

The illustration below shows a typical FST020 transmitter and FSS100 sensor flowmeter configuration. You can also connect the transmitter to other ultrasonic flow sensors.

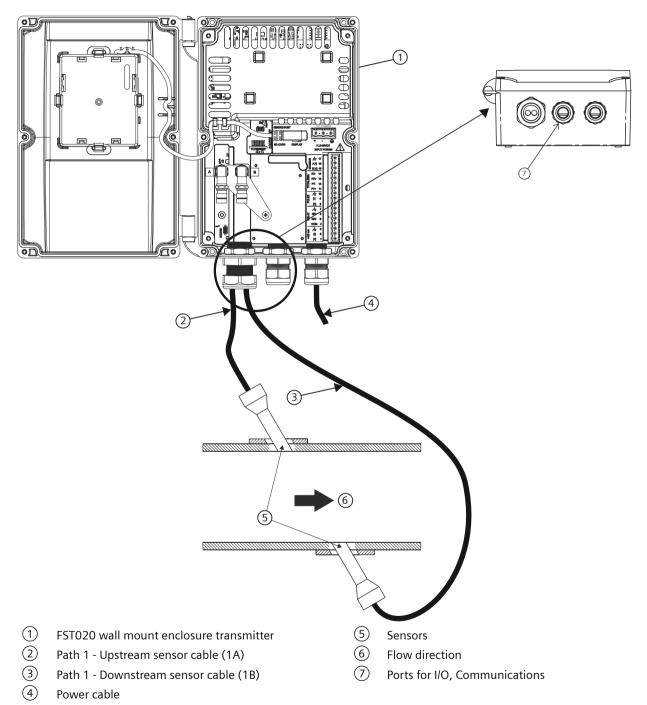
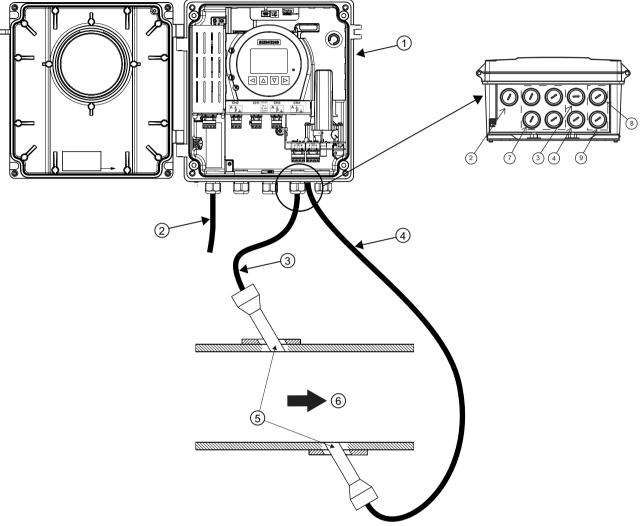


Figure 4-1 Wall mount enclosure transmitter overview with FSS100 - FS120

4.4 FS130 system overview (internal DSL)

The illustration below shows a typical FST030 transmitter and FSS100 sensor flowmeter configuration.



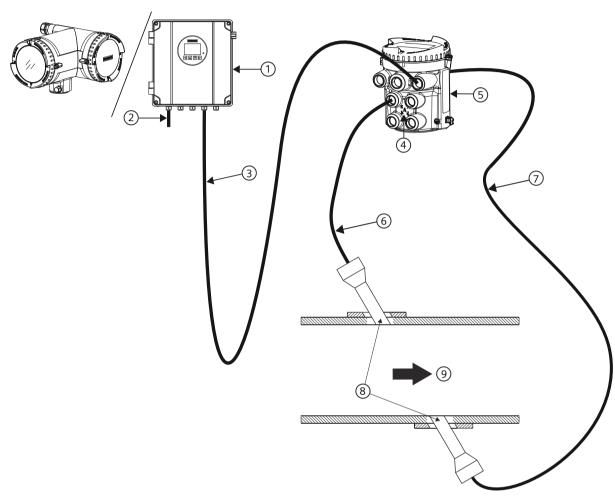
- 1) FST030 wall mount enclosure transmitter
- 2 Power cable
- 3 Path 1 Upstream sensor cable (1A)
- 4 Path 1 Downstream sensor cable (1B)
- (5) Sensors

- 6 Flow direction
- Ports for I/O, Communications, RTDs
- 8 Path 2 Upstream (2A)
- 9 Path 2 Downstream (2B)

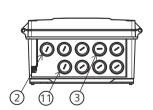
Figure 4-2 Wall mount enclosure transmitter overview with FSS100 - FS130

4.5 FS130 system overview (external DSL)

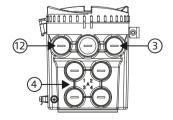
The illustration below shows a typical FST030 transmitter and FSS100 sensor flowmeter configuration with external DSL. You can also connect the transmitter to other flow ultrasonic sensors.



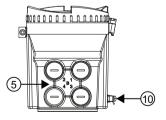
Wall mount transmitter overview with FS DSL11



Transmitter bottom view



External DSL side view A



External DSL side view B

4.6 Applications

- 1 FST030 wall mount or industrial enclosure transmitter
- (2) Power cable
- 3 Cable connection between FST030 and external DSL, up to 150 m
- 4 Path 1-4 upstream (A)
- 5 Path 1-4 downstream (B)
- 6 Path 1-4 upstream (A)

- 7 Path 1-4 downstream (B)
- 8 Sensors
- (9) Flow direction
- (10) Protective earth
- 11 Ports for I/O, Communications
- 12 Ports for analog input or RTDs

4.6 Applications

Measurement of liquid

SITRANS FS Ultrasonic flowmeters are suitable for measuring the flow of liquids with good acoustic permeability, independent of conductivity, viscosity, temperature, density and pressure.

The SITRANS FSS100 is ideal for installation in a new system. Compared to an ultrasonic clamp-on flowmeter, the sensors are installed directly into the existing pipe system. After installing the sensors and transmitter, you have an uncalibrated inline flowmeter. It is a much cheaper solution than installing an inline flowmeter with a tube into the system. The sensors for measurement are mounted directly in the pipe and send the ultrasonic signal through the medium. This enables very precise flow measurement and is independent of the pipe wall thickness. SITRANS FSS100 sensors can be installed in almost any pipe, e.g. concrete pipes or pipe systems that have a liner.

When installing on an existing system, it must be taken out of operation, the pipes emptied and, if necessary, decontaminated. The installation effort takes one to two days, depending on the number of sensors and the pipe system. Mechanical work on the pipe (drilling and welding) is required.

Applications and use of the SITRANS FSS100

- Raw water, water treatment, drinking water
- Water distribution
- Irrigation
- Power plants
- Thermal power plants and district heating supply
- Demineralized water

4.7 Measuring principle (FS)

Physical principle

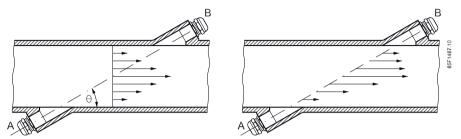


Figure 4-3 Velocity distribution along sound path

A sound wave travelling in the same direction as the liquid flow arrives at point B from point A in a shorter time than the sound wave travelling against the direction of flow (from point B to A).

The difference in sound transit time indicates the flow velocity in the pipe.

Since delay time is measured at short intervals both in and against flow direction, temperature has no influence on measurement accuracy.

SITRANS FS Ultrasonic flowmeters

In SITRANS FS Ultrasonic flowmeters the ultrasonic transducers are placed at an angle θ in relation to the pipe axis. The transducers function as transmitters and receivers of the ultrasonic signals. Measurement is performed by determining the time the ultrasonic signal takes to travel with and against the flow. The principle can be expressed as follows:

$$v = K \times (t_{B,A} - t_{A,B}) / (t_{A,B} \times t_{B,A}) = K \times \Delta t / t^2$$

where

v = Average flow velocity

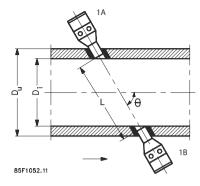
t = Transit time

K = Proportional flow factor

This measuring principle offers the advantage that it is independent of variations in the actual sound velocity of the liquid, that is independent of the temperature.

The proportional flow factor K is determined by wet calibration or calculated by "AUTO" in case of manual programming of mechanical/geometrical pipe data (Retrofit only). The transducer angle (θ), distance between sensors (L) and pipe dimension (D_i and D_u) are shown in the figure below.

4.9 Approvals



The ultrasonic signal is sent directly between the transducers. The advantage gained sending signals from point to point is an extremely good signal strength.

4.8 Measurement accuracy

Due to the direct measurement in the medium, the measurement is more accurate than a clampon measurement.

The measurement accuracy for a 2-path measurement is +/-0.5 -1.5% with a flow speed of 0.5 m/s up to 10m/s. A higher number of measurement paths (e.g. 4 path measurement) leads to an improvement in the measurement result. The flow profile at the measuring point can be better recorded by the transmitter if there are several measuring paths. Flow profile disturbances are detected and corrected by the transmitter, thereby increasing the measurement accuracy.

If very high measurement accuracy is required, the flowmeter can be additionally calibrated after installing the sensors in the pipe. This additional service can be carried out by a certified calibration service provider.

4.9 Approvals

Note

For further details see Ultrasonic certs on SIOS (https://support.industry.siemens.com/cs/ww/en/ps/17368/cert).

The device is available with approvals for general purpose and for hazardous areas. In all cases, check the nameplate on your device, and confirm the approval rating.

Installing/mounting 5

5.1 Chapter overview

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 Location in the system (Page 35).
- Collect installation data as required using the Sensor geometry measurement report (Page 89).

Note

IMPORTANT

This step should have been done prior to ordering the system.

- Install the sensors using the supplied mounting hardware. See Installation instructions (Page 40).
- Connect the sensor cables.
- Complete the sensor setup wizard to begin measuring flow. See the relevant transmitter Operating Instructions manual.

5.2 Basic safety notes



DANGER

Pressure applications

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

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



WARNING

Wetted parts unsuitable for the process media

Risk of injury or damage to device.

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

• Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical specifications (Page 79).

5.2 Basic safety notes

Note

Material compatibility

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



WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

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

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

See also

Technical specifications (Page 79)



WARNING

Exceeded maximum permissible operating pressure

Risk of injury or poisoning.

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

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical specifications (Page 79).



CAUTION

Hot surfaces resulting from hot process media

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

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Technical specifications (Page 79).



External stresses and loads

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

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

5.2.1 Damage from electrostatic discharge (ESD) - CAUTION note



CAUTION

Damage from electrostatic discharge (ESD)

Some components in the device (such as communication cards, or memory cards) are sensitive to electrostatic discharge and could be damaged. Be sure to handle such components in a manner that avoids any potential damage due to ESD.

5.2.2 Installation location requirements



WARNING

Insufficient air supply

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

- Install the device so that there is sufficient air supply in the room.
- Observe the maximum permissible ambient temperature. Refer to the information in the section Technical specifications (Page 79).

NOTICE

Aggressive atmospheres

Damage to device through penetration of aggressive vapors.

• Ensure that the device is suitable for the application.

5.2 Basic safety notes

NOTICE

Direct sunlight

Damage to device.

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

- · Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical specifications (Page 79).

NOTICE

Strong vibrations

Damage to device.

• In installations with strong vibrations, mount the device in a low vibration environment.

5.2.3 Proper mounting



WARNING

Incorrect mounting at Zone 0

Risk of explosion in hazardous areas.

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

NOTICE

Incorrect mounting

The device can be damaged, destroyed, or its functionality impaired through improper mounting.

- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Technical specifications (Page 79).

5.3 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 $^{\circ}$ C (155 $^{\circ}$ 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.

5.4 Basic installation requirements

Installation location



The FSS100 sensor can be installed both indoors and outdoors, even in exposed surroundings.

The enclosure rating of the transducer is IP67 or optionally IP68.

Media, surface and ambient temperatures

	Std. ¹⁾ [°C /°F]	High temp. ²⁾ [°C /°F]	Ex-d ³⁾ [°C /°F]	Ex i ⁴⁾ [°C /°F]
Media / surface	-20+100 °C	-20+200 °C	-20+180 °C	-10+190 °C
temperature	-4+212 °F	-4+392 °F	-4+356 °F	+14+374 °F
Ambiente	-20+60 °C	-20 +60 °C	-20 +60 °C	-20 +60 °C
temperature sen- sor	-4+140 °F	-4 +140 °F	-4 +140 °F	-4 +140 °F

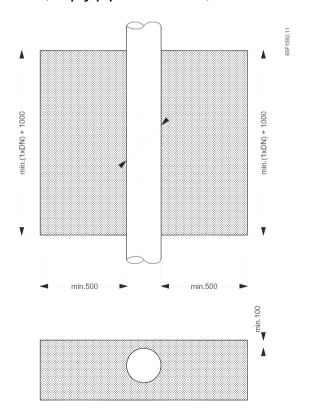
¹⁾ Transducer Type and Approval 1 and 3

The temperature range is stated on the data plate on the transducer.

NOTICE

In case of large temperature differences between the medium and the environment, the transducer must be isolated to avoid 2-phase flow which will result in inaccurate measuring results.

Space requirements (empty pipe installation)



²⁾ Transducer Type and Approval 4

³⁾ Transducer Type and Approval 2

⁴⁾ Transducer Type and Approval 5

Note

The dimensions are minimum values stated in mm. Different space requirements apply when retrofitting takes place in pressurized pipes or when the transducers are exchanged under pressure.

5.5 Location in the system

NOTICE

The sensor must always be completely filled with liquid.

Optimal location

• Locate the flowmeter in U-shaped pipes if pipes are only partially filled or have free outlet.

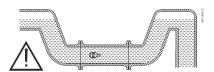


Figure 5-1 Sensor filled with liquid 1-track

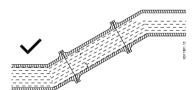


Figure 5-2 Sensor filled with liquid 2-track

Avoid the following installations:

- Installation at the highest point of the pipe system
- Installation in vertical pipes with free outlet

5.6 Sensor orientation

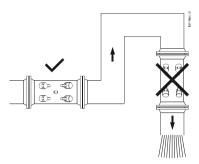


Figure 5-3 Location in U-shaped tube (2) 2-track

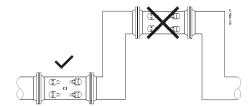
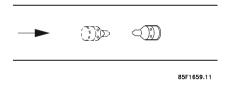


Figure 5-4 Location in U-shaped tube (1) 2-track

5.6 Sensor orientation

Horizontal (recommended)



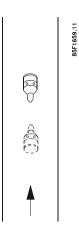
Note

Liquids containing abrasive or other particles:

Mount sensor in vertical or inclined pipe position to minimize wear.

Vertical

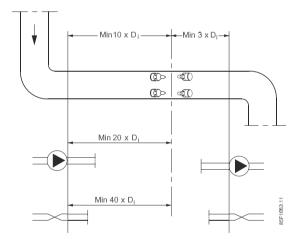
The vertical transducers can be oriented in vertical position with upwards flow.



Note

Indicate the flow direction with an arrow

5.7 Inlet and outlet conditions



- Ensure sufficient distance between meter and bends, pump and valves.
- Install valves influencing the flow profile after the flowmeter. The only exception is installation of the sensor in a vertical pipe (upwards flow direction). In installations in a vertical pipe a valve below the sensor is required to allow zero-point adjustment.

Note

Select a valve not altering flow when fully opened.

Recommended inlet	
Fully open valve, ie no flow restriction	Min. 10 × pipe diameter
Partially open valve	Min. 40 × pipe diameter

5.9 Necessary tools

Recommended inlet	
Pumps	Min. 20 × pipe diameter
Single bends	Min. 10 × pipe diameter
Recommended outlet	3 × pipe diameter

Note

By more than one bend, the optimal inlet is min. $40 \times pipe$ diameter.

5.8 General information

Installation and assembly of the FSS100 retrofit sensor kit occurs in 5 steps:

- 1. Calculating the transducer holder position
- 2. Installing the transducer holders
- 3. Determining sensor data
- 4. Connecting the transducer
- 5. Entering the transducer geometry data into the transmitter

Note

Step 5 is only described in the relevant transmitter Operating Instructions

5.9 Necessary tools

Basic tools

- Angle iron of a length approximately corresponding to the outer diameter of the pipe
- Measuring tape
- · Scriber, pencil or the like
- Pocket calculator
- Calipers
- Sliding gauge
- Hammer
- Centre punch
- Spirit level
- Roll of adhesive tape

Tools for installation on steel pipe

- Flame cutter or drill with 60 mm drill bit for making holes in steel pipes
- Electric or TIG welder for welding the mounting plate and the transducer holder

Tools for installation on concrete pipe

• Special drill unit for drilling 46 mm holes in concrete.

The unit is not part of the mounting kit, but can be rented from companies specializing in construction equipment.



The unit contains a core drill bit, an ordinary handheld drill and a device for fastening the unit to the pipe wall.

The unit is fastened to the pipe wall by means of vacuum or clamping band.

Filler

Note

A suitable filler or mortar does not shrink when setting. A comparatively short setting time is preferred.

5.10.1 Step 1: Transducer holder position

The first step in the installation procedure is to calculate the transducer holder position. The step is completed by the following actions:

1	Determination of wall thickness and circumference of the pipe	
2	Marking of the top line of the pipe	
3	Pipes up to DN 1000:	Pipes larger than DN 1000:
	Marking the transducer holder position on the pipe using paper	Marking the transducer holder position directly on the pipe

Note

The actual procedure depends on the size of the pipe

- DN ≤ 1000: Calculation by use of paper
- DN > 1000: Calculation without use of paper

Determining wall thickness and circumference

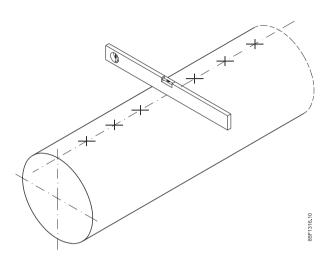
The following pipe dimensions must be known before calculating the transducer position.

- 1. Circumference (C)
- 2. Wall thickness (t)
- 3. Outer diameter of the pipe $(D_u) = C/\pi$

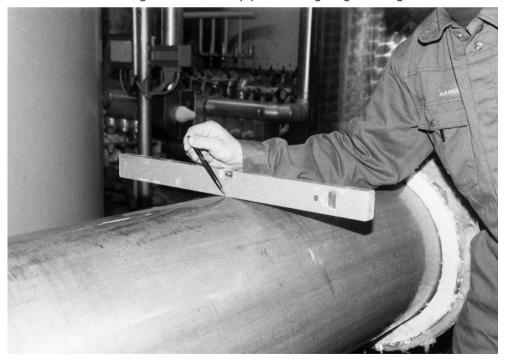
The circumference is determined using the measuring tape. Make sure that the pipe's surface is plane and free of dirt etc. The measuring tape must fit snugly around the pipe. Read the circumference (C). Repeat the measurement several times to avoid inaccuracies.

The wall thickness is obtained by measuring a similar pipe whose wall thickness is accessible, or by consulting the relevant standard.

Marking the pipe top line



- 1. Remove any rust or dirt from surface of pipe.
- 2. Find top line X X using a spirit level. Place spirit level on top of pipe. When perfectly balanced in horizontal position, it intersects the top line.
- 3. Mark 4 -5 points on pipe top line using this method.
- 4. Draw a line X X through the marked top points using length of angle iron.



5.10.1.1 Pipes up to DN 1000

Up to DN 1000 the transducer position is calculated using the roll of paper supplied with the mounting kit.

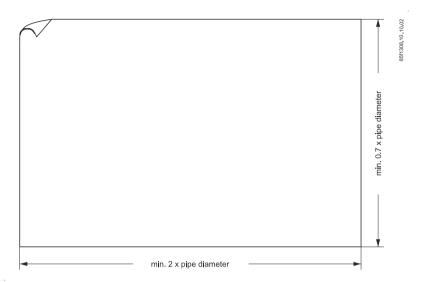


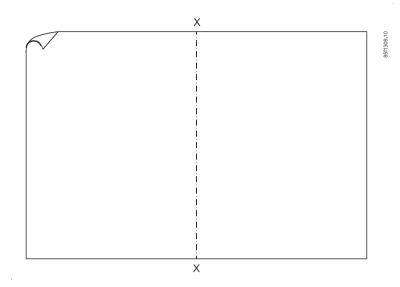
Figure 5-5 Drawing paper (supplied with the FSS100 up to DN 1000).

Note

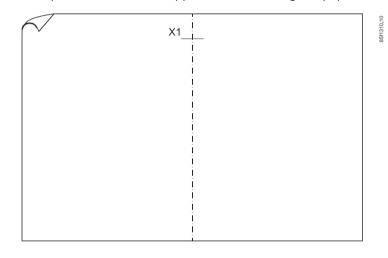
For installations larger than DN 1000, mark directly on the pipe.

Marking the paper

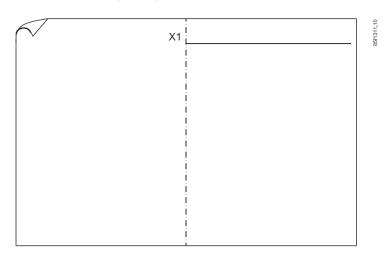
1. Draw a line x-x through the middle of the paper. Ensure that the line x-x is right-angled to edge of paper.



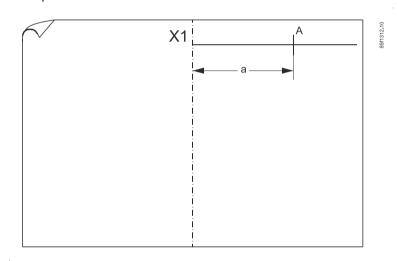
2. Mark a point X1 on line x-x approx 5 cm from edge of paper.



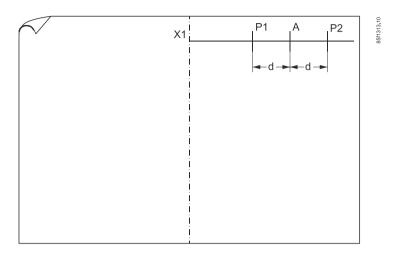
3. Draw a line X1 at right angles to x-x.



4. Mark a point A on line X1.
 Calculate distance a from X1 to A as follows: a = 0.25 x C
 C = Pipe circumference



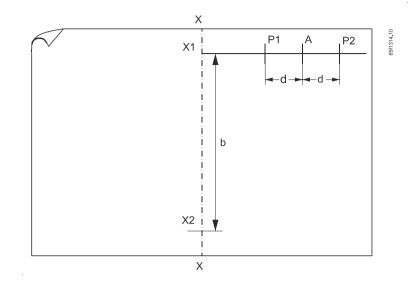
5. Mark point P1 and P2 at a distance b from point A. Calculate d using the formula: d = 0.0815 x C - 0.5621 x t



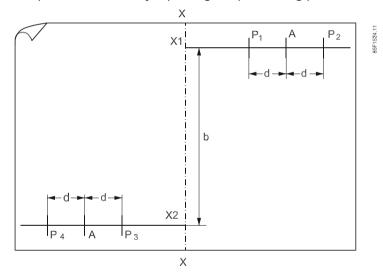
Note

It is useful to draw a circle around P1 and P2 (\emptyset = 60 mm, r = 30 mm)

6. Mark point X2 on the line x-x at a distance b from point X1. Calculate b using the formula: $b = 0.1603 \times C + 0.2886 \times t$



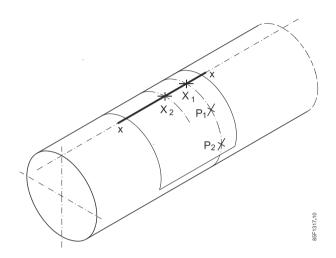
7. Mark points P3 and P4 by repeating the proceeding procedure



The drawing on the paper is now finished.

Marking the pipe

1. Place the paper on the pipe in such a way that the line X - X on the pipe coincides with the top line X1 - X2 on the paper
Fix paper to pipe with adhesive tape





2. Punch points P1, P2, P3 and P4 onto the pipe with centre punch. Ensure that lines dissecting the points can be redrawn once the paper is removed.



3. Remove the paper.

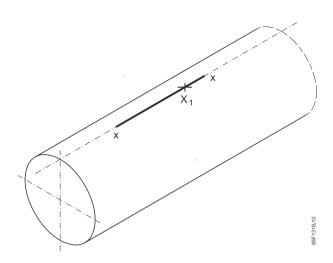
Note

When preparing a steel pipe, it is useful to draw a circle with a radius of 30 mm around points P using the centre punch. This facilitates cutting the holes with a flame cutter.

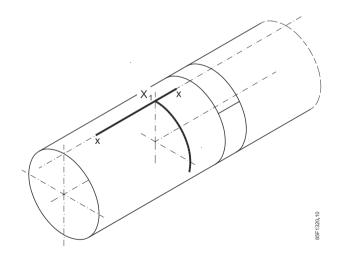
5.10.1.2 Marking directly on the pipe (DN > 1000)

After marking the top line (see above under 5.3.2) following steps should be done:

1. Mark a point X_1 on top line X - X.



2. Draw a line at right angles to the top line X - X through point X_1 .



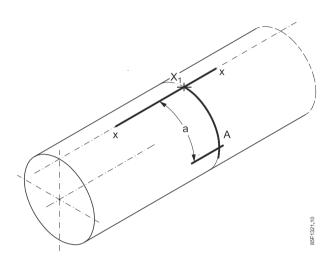
Note

To construct the line through X_1 place a strip of metal foil around the pipe, thus ensuring that the line is at right angles to the pipe

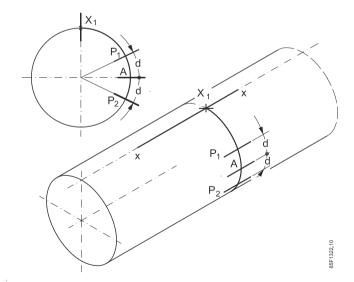
3. Mark point P₁ on the line at distance **a** from X₁. Distance **a** is calculated as follows:

 $a = 0.25 \times C$

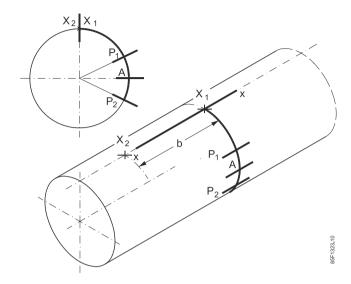
C = Circumference of the pipe



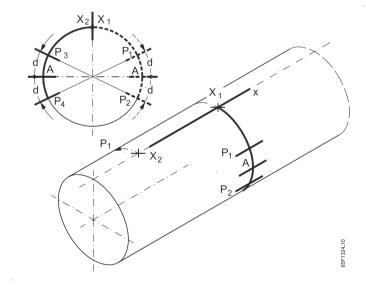
4. Mark points P1 and P2 at a distance d from point A. Calculate d using the formula: d = 0.0815 x C - 0.5621 x t



5. Mark point X_2 on line X-X at distance **b** from point X_1 . Calculate b using the formula: $b = 0.1603 \times C + 0.2886 \times t$



6. Mark P₃ and P₄ by repeating the proceeding procedure on the opposite side of the pipe.



5.10.2 Step 2: Installing the transducer holders

The second step in the installation procedure is to install the transducer holders. In the following it is described how to:

• Install the holders on steel pipes

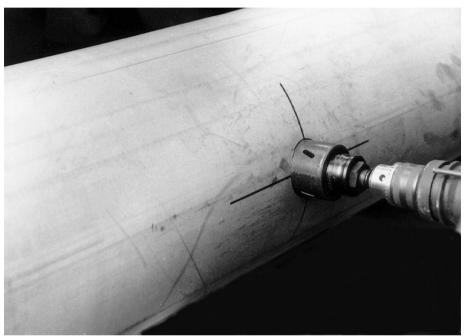
Or alternatively how to

• Install the holders on concrete pipes.

5.10.2.1 Installation on steel pipes

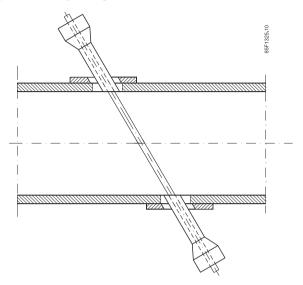
Drilling

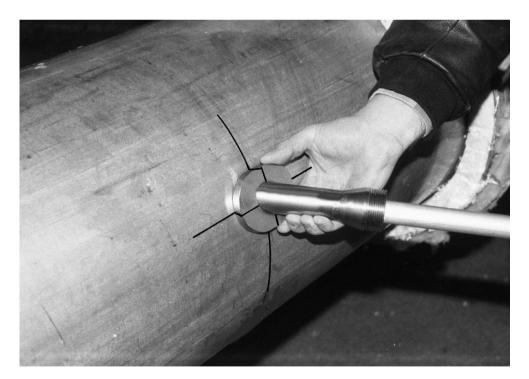
1. Cut or drill 4 holes centred on P1 and P2. Dimension of the holes: 60 mm +5/-0.



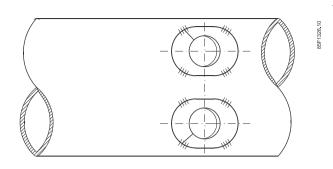
Installing the mounting plates

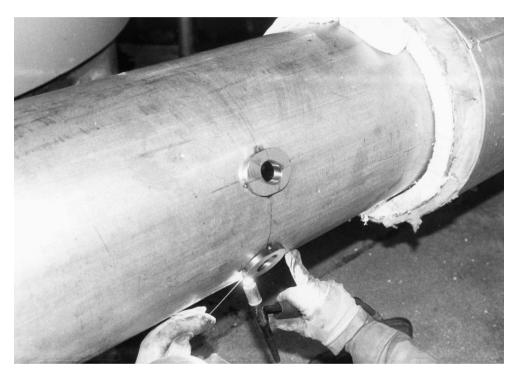
1. Place a set of transducer holders and mounting plates on the mandrel (supplied with the kit) without permanently fixing them.



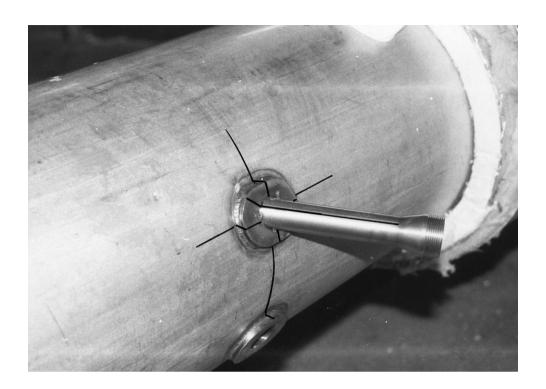


2. Tack-weld the mounting plates in at least 3 places with transducer holders and mandrels mounted.





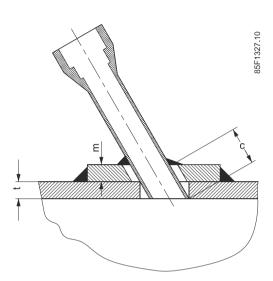
3. Remove transducer holders and mandrel, and weld the mounting plates completely onto the pipe.



Mount the transducer holders

1. Mark a point on the transducer holders marking line at distance c. Determine c by measuring wall thickness t and mounting plate m.
Calculate c using the following formula:

$$c = (t + m) \times 1.15$$



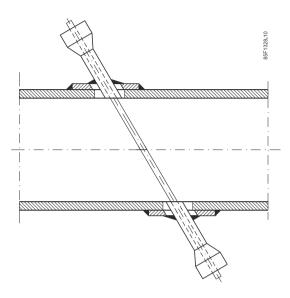
- 2. Insert the transducer holders. Ensure that they flush with the inner surface of the pipe.
- 3. Tack-weld the correctly positioned transducer holders in at least 3 places with mandrels inserted.
- 4. Remove mandrel and fully weld transducer holders.

Note

Make sure that the transducer holders are bent as little as possible by the heat generated during welding.

Installation inspection

1. Check if the mandrel can still pass through transducer holders. If necessary correct the alignment of the transducer holders. Use a $1\frac{1}{2}$ " protection nut to protect the transducer holders' thread and a hammer.



5.10.2.2 Installation on concrete pipe

Making the holes

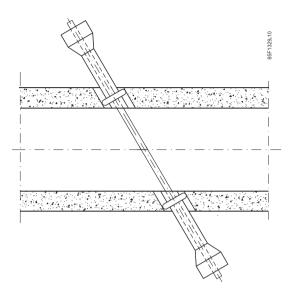
Drill holes at the marked positions, ø 46 mm, into the pipe wall at an angle of 60°.

Note

It is recommended to use special drill units, see above: Necessary tools (Page 38)

Mounting the transducer holders

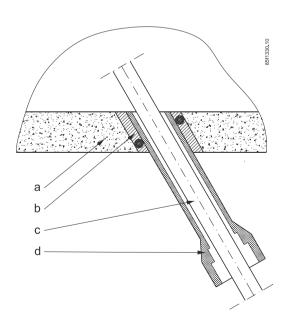
- 1. After having drilled the four holes, mount transducer holders with the mandrel inserted.
- 2. Use O-rings to seal transducer holders.



3. Fix the transducer holder to the pipe by means of mortar.

Note

Make sure that mandrel is not exposed to mortar as this might result in mandrel getting stuck to transducer holders. Mandrel keeps transducer holders in place until mortar has set.



a = Concrete pipe

b = Repair mortar

c = Mandrel

d = Transducer holder

5.10.2.3 Determening sensor data

Step 3: Determining sensor data

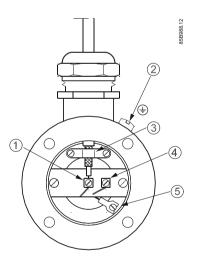
Several sensor dimensions must be accurately measured to maximize the accuracy of the flow measurement.

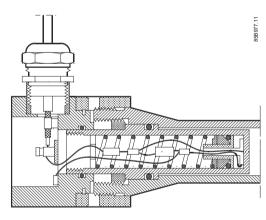
Note

Inaccuracy in sensor measurement may lead to flow error.

To help with the installation precision, see Sensor geometry measurement reports (Page 89). Use it to write measured value into the appropriate field and populate the transmitter wizard with these measurements afterwards.

5.10.3 Step 1: Transducer wiring





Transducer cut-away

Electrical connection of transducer

- 1. Remove the lid of the terminal housing.
- 2. Connect the wire without a spade terminal to 4.
- 3. Connect the wire with a spade terminal to \bigcirc 5 (the transducer housing).
- 4. Connect the wire of the transducer coax cable to (1).

- 5. Fix the shield of the coax cable with (3) (the cable clip).
- 6. Remount the lid.
- 7. For stainless steel terminal housing connect the PE terminal 2. On the polyamide terminal housing there is no PE terminal. It is recommended to ensure a suitable grounding of the sensor. A direct ground connection of sensor and transmitter is recommended.



WARNING

Potential equalization

Ex version: According to the Ex requirements, the PE terminals on transmitter and on sensors (PE terminals of the FSS100 Ex d/i transducer terminal housings) must be potentially equalized (min. 4 mm²). A direct ground connection of sensor and transmitter is recommended.



CAUTION

Protect connection wires

Avoid stress on the connection wires when passing them through the terminal box.

Disassembling the terminal box

- Loosen the wires from the connection board. It is not necessary to remove the transducer
- Support the terminal box while loosening the union. Then remove the terminal box from the transducer holder.



CAUTION

Unsuitable turning of terminal box

Risk of device malfunction due to damaged wires inside the terminal box

• Do not turn the terminal box

Disassembly 5.11



▲ WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

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

In order to disassemble correctly, observe the following:

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

5.11 Disassembly

Connecting

6.1 Chapter overview

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

The connection steps depend on the transmitter type and DSL type (external or internal).

- 1. FS120 system overview (internal DSL) (Page 23)
- 2. FS130 system overview (internal DSL) (Page 24)
- 3. FS130 system overview (external DSL) (Page 25)

6.2 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 Technical specifications (Page 79).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.



WARNING

Incorrect conduit system

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

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

6.2 Basic safety notes



WARNING

Hazardous contact voltage

Risk of electric shock in case of incorrect connection.

- For the electrical connection specifications, refer to the information in Technical specifications (Page 79).
- At the mounting location of the device observe the applicable directives and laws for installation of electrical power installations with rated voltages below 1000 V.



WARNING

Missing PE/ground connection

Risk of electric shock.

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

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



WARNING

Improper power supply

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

• Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Technical specifications (Page 79) or on the nameplate.



WARNING

Lack of equipotential bonding

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

- Ensure that the device is potentially equalized
- The cable cross-section of the equipotential bonding cable must be greater than or equal to the connecting cable of the electronics



WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

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



⚠ WARNING

Improper laying of shielded cables

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

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



WARNING

Uncovered non-intrinsically safe circuits

Risk of explosion in hazardous areas or electric shock when working on non-intrinsically safe circuits.

If intrinsically safe and non-intrinsically safe circuits are operated in an enclosure with the type of protection "Increased safety Ex e", the connections of the non-intrinsically safe circuits must be additionally covered.

- Ensure that the cover of the non-intrinsically safe circuits complies with degree of protection IP30 or higher according to IEC/EN 60529.
- Separate connections of the non-intrinsically safe circuits 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.

6.2.1 Connecting or disconnecting in explosive environments



WARNING

Connecting or disconnecting in explosive environments

Connecting or disconnecting a powered device in explosive environments can lead to an explosion.

- Connect and disconnect in **non**-explosive environments.
 - or-
- Remove power to the device before connecting or disconnecting in explosive atmosphere.

6.2 Basic safety notes



WARNING

Connecting or disconnecting device in energized state

Risk of explosion in hazardous areas.

- Connect or disconnect devices in hazardous areas only in a de-energized state.
- Install a suitable switch-off device.

Exceptions:

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



WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

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



WARNING

Eliminating or reducing the sources of ignition within the equipment

Potential fire hazard.

- The product must be connected to an energy-limited circuit.
- Connect the device according to the information in Technical specifications (Page 79).

NOTICE

Ambient temperature too high

Damage to cable sheath.

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

NOTICE

Condensation in the device

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

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

Note

Electromagnetic compatibility (EMC)

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

Metal enclosures ensure improved electromagnetic protection from high frequency radiation. This protection can be increased by grounding the enclosure.

See also

Basic safety notes (Page 63)

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- · Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical specifications (Page 79).
- Use shielded cables to guarantee the full specification according to HART/PA/FF/Modbus/ EIA-485/Profibus DP.

6.3 Nameplate layout

Each FSS100 Ultrasonic flowmeter sensor has a nameplate showing the following information:

- product identification
- product specifications
- · certificates and approvals

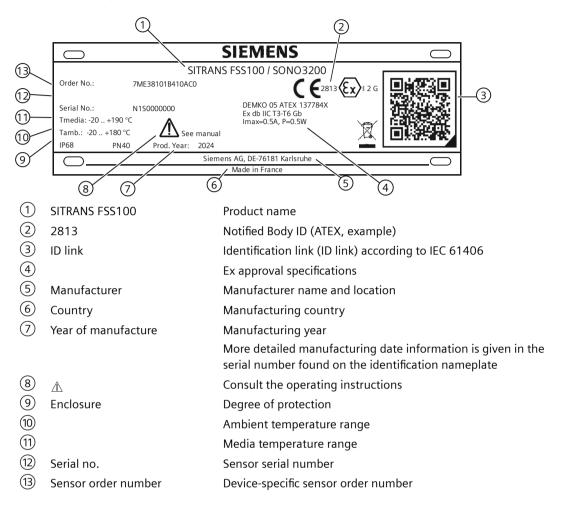
Note

Identification

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

6.3 Nameplate layout

SITRANS FSS100 sensor: Nameplate with specific information



Sensor serial number construction

The sensor serial number is constructed as follows:

PPYMDDxxxxxx

where

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

Y = Production year (for encryption, see below)

M = Production month (for encryption, see below)

DD = Production day (for encryption, see below)

xxxxxx = Sequential number

Encryption:

Calendar year (Y)	Code
1950, 1970, 1990, 2010	Α
1951, 1971, 1991, 2011	В
1952, 1972, 1992, 2012	C

6.3 Nameplate layout

1052 1072 1002 2012	5
1953, 1973, 1993, 2013	D
1954, 1974, 1994, 2014	E
1955, 1975, 1995, 2015	F
1956, 1976, 1996, 2016	H (G)
1957, 1977, 1997, 2017	J
1958, 1978, 1998, 2018	K
1959, 1979, 1999, 2019	L
1960, 1980, 2000, 2020	M
1961, 1981, 2001, 2021	N
1962, 1982, 2002, 2022	P
1963, 1983, 2003, 2023	R
1964, 1984, 2004, 2024	S
1965, 1985, 2005, 2025	T
1966, 1986, 2006, 2026	U
1967, 1987, 2007, 2027	V
1968, 1988, 2008, 2028	W
1969, 1989, 2009, 2029	X
Month (M)	Code
January	1
February	2
March	3
April	4
May	5
June	_
54.1.6	6
July	
	6
July	6 7
July August	6 7 8
July August September	6 7 8 9
July August September October	6 7 8 9 O
July August September October November	6 7 8 9 O N
July August September October November December	6 7 8 9 O N D

6.3 Nameplate layout

Service and maintenance

Basic safety notes 7.1

Note

The device is maintenance-free.

7.1.1 Maintenance

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

An inspection can include:

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



▲ WARNING

Dust layers above 5 mm

Risk of explosion in hazardous areas.

Device may overheat due to dust build up.

Remove dust layers in excess of 5 mm.



WARNING

Use of a computer in a hazardous area

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

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



CAUTION

Releasing button lock

Improper modification of parameters could influence process safety.

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

7.3 Maintenance and repair work

NOTICE

Penetration of moisture into the device

Damage to device.

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

7.2 Cleaning

Cleaning the enclosure

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



WARNING

Electrostatic charge

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

• Prevent electrostatic charging in hazardous areas.

7.3 Maintenance and repair work



WARNING

Impermissible repair of the device

Repair must be carried out by Siemens authorized personnel only.



WARNING

Impermissible repair and maintenance of the device

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



▲ WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

Repair must be carried out by Siemens authorized personnel only.



WARNING

Maintenance during continued operation in a hazardous area

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

- Isolate the device from power.
- or -
- Ensure that the atmosphere is explosion-free (hot work permit).



▲ WARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

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



▲ WARNING

Humid environment

Risk of electric shock.

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

7.3 Maintenance and repair work



WARNING

Enclosure open

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

To open the device in a hazardous area:

- 1. Isolate the device from power.
- 2. Observe the wait time specified in Technical specifications (Page 79) or on the warning sign before opening the device.
- 3. Visually inspect sensor inlet and outlet.

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



WARNING

Improper connection after maintenance

Risk of explosion in areas subject to explosion hazard.

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

Refer to Connecting (Page 63).



WARNING

Hot, toxic, or corrosive process media

Risk of injury during maintenance work.

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

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



CAUTION

Hot surfaces

Risk of burns during maintenance work on parts having surface temperatures exceeding 70 $^{\circ}$ C (158 $^{\circ}$ F).

- Take corresponding protective measures, for example, by wearing protective gloves.
- After carrying out maintenance, remount touch protection measures.



Hot parts in the device

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

• Observe the waiting time specified in Technical specifications (Page 79) or on the device before starting with maintenance work.



CAUTION

Hazardous voltage at open device

Risk of electric shock when the enclosure is opened or enclosure parts are removed.

- Before you open the enclosure or remove enclosure parts, de-energize the device.
- If maintenance measures in an energized state are necessary, observe the particular precautionary measures. Have maintenance work carried out by qualified personnel.

7.4 Ordering of spare parts

Condition

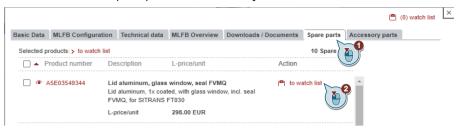
• You have a Siemens Industry Mall account.

Procedure

- 1. Open the PIA Life Cycle Portal (https://www.pia-portal.automation.siemens.com).
- 2. Select the desired language.
- 3. To find spare parts for your device, do one of the following:
 - Enter the complete order number of your device (e.g. 7ME4633-4KA51-8DC3-Z A05+B11+E06+F11) into the "Product number" field and click "Go".
 - Enter the serial number of your device (e.g. N1KXXXXXXX) in the "Serial number" field and click "Go".
 - If you do not know the product or serial number, search for your device under "Product family".

7.6 Return procedure

4. Navigate to the "Spare parts" tab.
You see the list of spare parts available for your device.



- 5. Select a spare part and add it to your watch list. The watch list opens.
- 6. Click "Add to cart of Industry Mall".



The Siemens Industry Mall opens and you can order your spare part.

7.5 Replacing the device



CAUTION

Corrosive substances

Risk of chemical burns when replacing the sensor.

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

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

7.6 Return procedure

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

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

NOTICE

Decontamination

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

7.7 Disposal



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

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

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

Note

Special disposal required

The device includes components that require special disposal.

 Dispose of the device properly and environmentally through a local waste disposal contractor. 7.7 Disposal

Technical specifications

8.1 Parts in contact with medium

SITRANS FSS100	
Material	Transducer (Stainless steel)
	O-ring (FFKM)
	Transducer holder (Stainless or carbon steel)
Max pressure	40 bars
Altitude	2000 m above sea level
Relative Humidity	95% without condensation

8.2 Weight

SITRANS FSS100			
No. of tracks	Cable length	Options	Expected weight
1 track	3 m	Without options	6 kg
4 tracks	120 m	Full options	62 kg

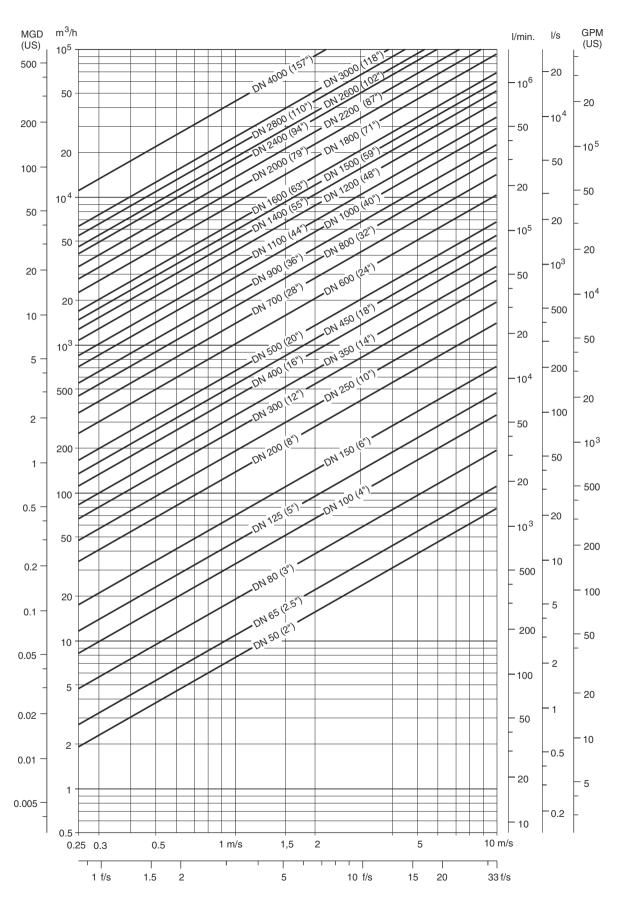
8.3 Sizing table

The following table shows the relationship between flow velocity V, flow rate Q and sensor dimension DN.

Flow velocity calculation formula:

$$V = \frac{1273.24 \times Q [l/s]}{Di^2[mm]} [m/s] \text{ or } V = \frac{353.68 \times Q [m^3/h]}{Di^2[mm]} [m/s]$$

8.3 Sizing table



8.4 FS120 wall housing

SITRANS FSS100 (1 path measuring) with SITRANS FST020 wall housing

The SITRANS FST020 transmitter in combination with the SITRANS FSS100 is called SITRANS FS120.





SITRANS FST020

SITRANS FSS100 1-track

Description	Specification
SITRANS FS120	Wall housing
MLFB SITRANS FSS100	7ME3813-0XXXX1
Transmitter	SITRANS FST020
MLFB SITRANS FST020	7ME3570-2JX40-0AA1
Measurement paths	1 path
1 path measurement	
Sensor	2 transducers
Pipe size	Min. DN 100 (4") up to DN 400 (16")
-	recommended
Measurement accuracy at flow rate	• +/-1 - 3%
	• 0,5 m/s < v < 10 m/s
	Without calibration
Repeatability ISO 11631	< 0,25%
Wall thickness steel pipe	Up to 20 mm (0,79")
Wall thickness of concrete pipe	Up to 200 mm (7,9") > DN600
Cable length sensor	• Min. 3 m
	• Max. 90 m
Connection sensor to transmitter	Analog
Ex approval	Not available

8.5 FS130 wall housing and internal DSL

SITRANS FSS100 (1 or 2 path-measuring) with SITRANS FST030 wall housing (internal DSL)

The SITRANS FST030 transmitter in combination with the SITRANS FSS100 is called SITRANS FS130.







SITRANS FSS100 2-path

Description	Specification	
SITRANS FS130	Wall housing	
	Internal DSL	
MLFB SITRANS FSS100 (1 path)	7ME3813-0XXXX1	
MLFB SITRANS FSS100 (2 path)	7ME3813-0XXXX2	
Transmitter	SITRANS FST030	
MLFB SITRANS FST030	7ME3721-0AA00-0UX3-Z B11	
Measurement paths	1 or 2 path	
1 path measurement		
Sensor	2 transducers	
Pipe size	Min. DN 100 (4") up to DN 400 (16") recommended	
Measurement accuracy at flow rate	• +/-1 - 3%	
	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
2 path measurement		
Sensors	4 transducers	
Pipe size	Min. DN 100 (4") up to DN 1200 (48") recommended	

Description	Specification
Measurement accuracy at flow rate	• +/-0,5 - 1,5%
	• 0,5 m/s < v < 10 m/s
	Without calibration
Repeatability ISO 11631	< 0,25%
Wall thickness steel pipe	Up to 20 mm (0,79")
Wall thickness of concrete pipe	Up to 200 mm (7,9") > DN 600
Cable length sensor	• Min. 3 m
	• Max. 15 m
Connection sensor to transmitter	Analog
Ex approval SITRANS FSS100	Ex-i or Ex-d Zone 1 (Optional)
Ex approval SITRANS FST030	Ex Zone 2 (Optional)

8.6 FS130 wall housing and external DSL

SITRANS FSS100 (1 up to 4 path-measuring) with SITRANS FST030 wall housing and FS DSL

The SITRANS FST030 transmitter in combination with the SITRANS FSS100 is called SITRANS FS130.







SITRANS FS DSL



SITRANS FSS100 2-path

Description	Specification
SITRANS FS130	Wall housing
	• External FS DSL
MLFB SITRANS FSS100 (1-4 path)	7ME3813-0XXXXP
Transmitter	SITRANS FST030
MLFB SITRANS FST030	• 7ME3721-0AA00-0WX3-Z B11
	 Terminal connection FS DSL

8.6 FS130 wall housing and external DSL

Description	Specification	
MLFB SITRANS FST030	• 7ME3721-0AA00-0VX3-Z B11	
	M12 plug connection FS DSL	
Measurement paths	1 to 4 paths	
1 path measurement	21	
Sensor	2 transducers	
Pipe size	Min. DN 100 (4") up to DN 400 (16") recommended	
Measurement accuracy at flow rate	• +/-1 - 3%	
	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
2 path measurement		
Sensors	4 transducers	
Pipe size	Min. DN 100 (4") up to DN 1200 (48") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
Medsurement accuracy at now rate	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
Nepeatability 130 1 1031	C0,23 N	
3 path measurement		
Sensors	6 transducers	
Pipe size	Min. DN 600 (24") up to DN 2400 (96") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
4 path measurement		
Sensors	8 transducers	
Pipe size	Min. DN 300 (12") up to DN 2400 (96") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
•	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
Repeatability ISO 11631 Wall thickness steel pipe	< 0,25% Up to 20 mm (0,79")	

Description	Specification
Cable length sensor to FS DSL	• Min. 3 m
	• Max. 15 m
Connection sensor to FS DSL	Analog
Cable length FS DSL to FST030	• Min. 5 m
	• Max. 150 m
Connection FS DSL to FST030	Digital (SSL – Siemens Sensor Link)
Ex approval SITRANS FSS100	Ex-i oder Ex-d Zone 1 (Optional)
Ex approval SITRANS FS DSL	Ex Zone 1 (Optional)
Ex approval SITRANS FST030	Ex Zone 2 (Optional)

8.7 FS130 industrial housing and external DSL

SITRANS FSS100 (1 up to 4 path-measuring) with SITRANS FST030 industrial housing and FS DSL

The SITRANS FST030 transmitter in combination with the SITRANS FSS100 is called SITRANS FS130.







SITRANS FST030 Industrial housing

SITRANS FS DSL

SITRANS FSS100 2-path

Description	Specification
SITRANS FS130	Industrial housing
	External FS DSL
MLFB SITRANS FSS100 (1-4 paths)	7ME3813-0XXXXP
Transmitter	SITRANS FST030
MLFB SITRANS FST030	• 7ME3721-0AA00-0KX3-Z B11
	 Terminal connection FS DSL
MLFB SITRANS FST030	• 7ME3721-0AA00-0GX3-Z B11
	 M12 plug connection FS DSL

8.7 FS130 industrial housing and external DSL

Description	Specification	
Measurement paths	1 to 4 paths	
1 path measurement		
Sensor	2 transducers	
Pipe size	Min. DN 100 (4") up to DN 400 (16") recommended	
Measurement accuracy at flow rate	• +/-1 - 3%	
	• 0,5 m/s < v < 10 m/s	
	 Without calibration 	
Repeatability ISO 11631	< 0,25%	
2 path measurement		
Sensors	4 transducers	
Pipe size	Min. DN 100 (4") up to DN 1200 (48") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
3 path measurement		
Sensors	6 transducers	
Pipe size	Min. DN 600 (24") up to DN 2400 (96") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatabilityt ISO 11631	< 0,25%	
4 path measurement		
Sensors	8 transducers	
Pipe size	Min. DN 300 (12") up to DN 2400 (96") recommended	
Measurement accuracy at flow rate	• +/-0,5 - 1,5%	
·	• 0,5 m/s < v < 10 m/s	
	Without calibration	
Repeatability ISO 11631	< 0,25%	
Wall thickness steel pipe	Up to 20 mm (0,79")	
Wall thickness of concrete pipe	Up to 200 mm (7,9") > DN 600	
Cable length sensor to FS DSL	• Min. 3 m	
	• Max. 15 m	
Connection sensor to FS DSL	Analog	

Description	Specification
Cable length FS DSL to FST030	• Min. 5 m
	• Max. 150 m
Connection FS DSL to FST030	Digital (SSL – Siemens Sensor Link)
Ex approval SITRANS FSS100	Ex-i oder Ex-d Zone 1 (Optional)
Ex approval SITRANS FS DSL	Ex Zone 1 (Optional)
Ex approval SITRANS FST030	Ex Zone 1 (Optional)

8.8 Certificates and approvals

SITRANS FSS100	
"Intrinsic safety" type of protection	
ATEX DEMKO05ATEX137784X	II 2 G Ex db IIC T6T3 Gb
 UKCA Certification UL22UKEX2645X 	

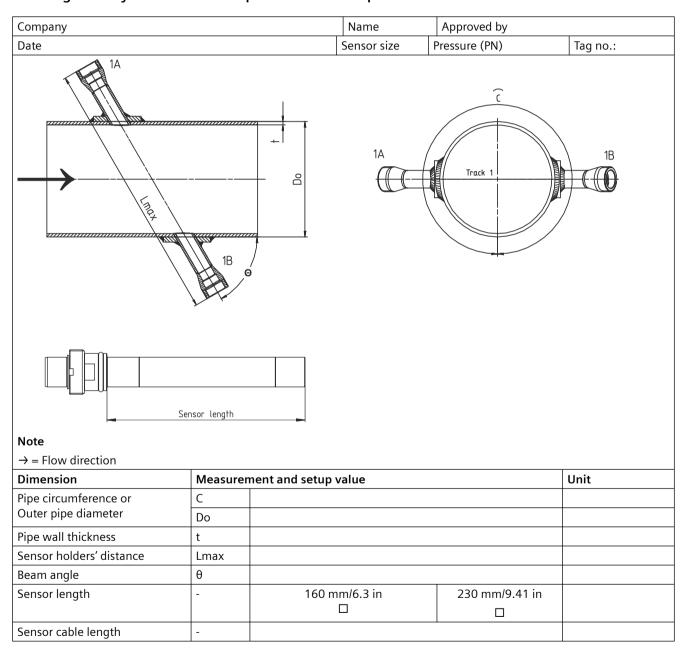
8.8 Certificates and approvals

Dimension drawings

9

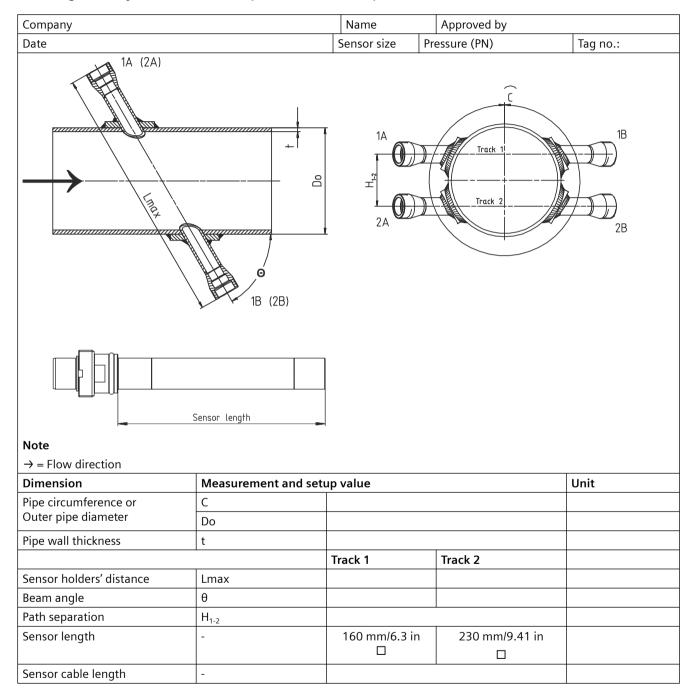
9.1 Dimension drawing 1-path

Sensor geometry measurement report for FSS100 1-path



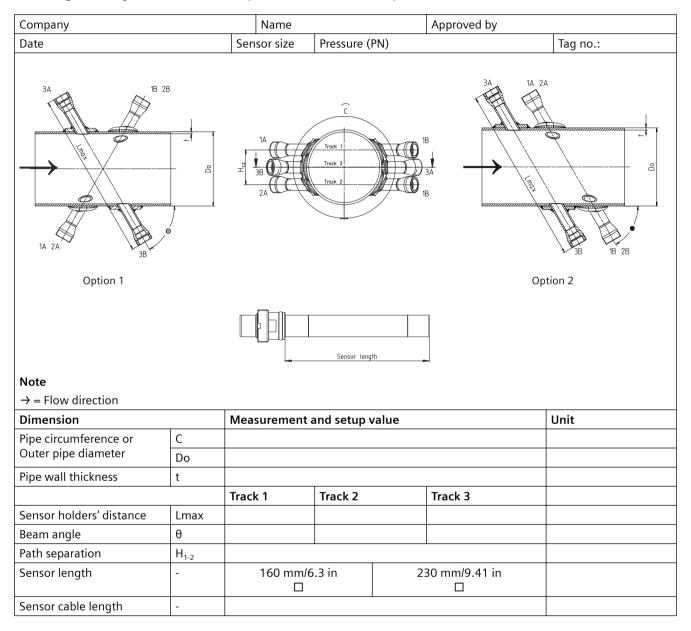
9.2 Dimension drawing 2-path

Sensor geometry measurement report for FSS100 2-path



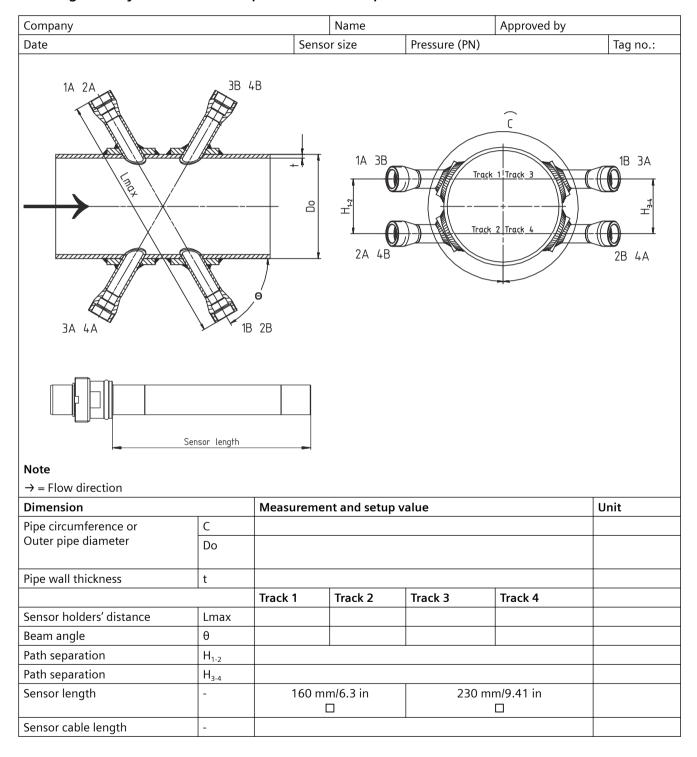
9.3 Dimension drawing 3-path

Sensor geometry measurement report for for FSS100 3-path



9.4 Dimension drawing 4-path

Sensor geometry measurement report for FSS100 4-path



Product documentation and support



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 ID link.

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 ID link

- 1. Scan the ID link 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).

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

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

Service & support on the Internet

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

Contact

If you have further questions about the device, contact your local Siemens representative, by doing the following:

- 1. Visit Contact at Siemens (http://www.automation.siemens.com/partner).
- 2. Select "All Products and Branches" > "Products & Services" > "Industrial automation".
- 3. Choose either "Process analytics" or "Process instrumentation", depending on your product.
- 4. Select the product category ("Pressure measurement", for example), then select your product.
- 5. Click "Search".

 The contacts for your product in all regions display.

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

B.1 Typical dimension dependent settings, FSS100

Nominal size		Max. vol.	Pipe	Path	Path	Path
[mm]	[inch]	flow	diameter	displacement	angle	length
		[m³/h]	[m]	[m]	[°]	[m]
DN 200	8	380	0.2083	0.0510	60	0.2257
DN 250	10	600	0.2604	0.0638	60	0.2782
DN 300	12	850	0.3098	0.0759	60	0.3279
DN 350	14	1000	0.3396	0.0832	60	0.3579
DN 400	16	1300	0.3904	0.0956	60	0.4090
DN 450	18	1700	0.4500	0.1103	60	0.4690
DN 500	20	2200	0.4920	0.1205	60	0.5113
DN 550	22	2600	0.5500	0.1348	60	0.5697
DN 600	24	3200	0.6016	0.1474	60	0.6216
DN 650	26	3600	0.6500	0.1593	60	0.6704
DN 700	28	4200	0.6952	0.1703	60	0.7159
DN 750	30	4800	0.7500	0.1838	60	0.7710
DN 800	32	5500	0.7968	0.1952	60	0.8181
DN 900	36	7500	0.9100	0.2230	60	0.9321
DN 1000	40	9000	1.0000	0.2450	60	1.0227
DN 1100	44	10000	1.1000	0.2695	60	1.1233
DN 1200	48	13200	1.2000	0.2940	60	1.2240
DN 1300	52	14000	1.3000	0.3185	60	1.3246
DN 1400	56	16800	1.4000	0.3430	60	1.4253
DN 1500	60	19000	1.5000	0.3675	60	1.5259
DN 1600	64	22800	1.6000	0.3920	60	1.6266
DN 1700	68	25000	1.7000	0.4165	60	1.7273
DN 1800	72	27600	1.8000	0.4410	60	1.8279
DN 1900	76	31000	1.9000	0.4655	60	1.9286
DN 2000	80	36000	2.0000	0.4900	60	2.0292
DN 2100	84	37000	2.1000	0.5145	60	2.1299
DN 2200	88	42000	2.2000	0.5390	60	2.2306
DN 2300	92	45000	2.3000	0.5635	60	2.3312
DN 2400	96	51000	2.4000	0.5880	60	2.4319
DN 2500	100	53000	2.5000	0.6125	60	2.5325
DN 2600	104	60000	2.6000	0.6370	60	2.6332
DN 2700	108	62000	2.7000	0.6615	60	2.7338
DN 2800	112	72000	2.8000	0.6860	60	2.8345
DN 2900	116	71000	2.9000	0.7105	60	2.9352

B.1 Typical dimension dependent settings, FSS100

Nominal size		Max. vol.	Pipe	Path	Path	Path
[mm]	[inch]	flow	diameter	displacement	angle	length
		[m³/h]	[m]	[m]	[°]	[m]
DN 3000	120	78000	3.0000	0.7350	60	3.0358
DN 3100	124	82000	3.1000	0.7595	60	3.1365
DN 3200	128	85000	3.2000	0.7840	60	3.2371
DN 3300	132	92000	3.3000	0.8085	60	3.3378
DN 3400	136	100000	3.4000	0.8330	60	3.4384
DN 3500	140	100000	3.5000	0.8575	60	3.5391
DN 3600	144	110000	3.6000	0.8820	60	3.6398
DN 3700	148	120000	3.7000	0.9065	60	3.7404
DN 3800	152	130000	3.8000	0.9310	60	3.8411
DN 3900	156	130000	3.9000	0.9555	60	3.9417
DN 4000	160	144000	4.0000	0.9800	60	4.0424

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