

FLWSIC100 Flare-XT

Ultrasonic Mass Flow Measuring Device

Installation

Operation

Maintenance



Document information

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Warning symbols



IMMEDIATE HAZARD
of severe injuries or death



Hazard (general)



Voltage hazard



Hazard in potentially explosive atmospheres



Hazard through explosive substances/substance mixtures



Hazard by noxious substances



Hazard by toxic substances

Warning levels/signal words

DANGER

Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING

Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION

Hazard or unsafe practice which *could* result in less severe or minor injuries.

NOTICE

Hazard which *could* result in property damage.

Information symbols



Important technical information for this product



Supplementary information



Link referring to information at another place

1	About this document	9
1.1	Function of this document	10
1.2	Scope of application	10
1.3	Target groups	10
1.4	Data integrity	10
1.5	Further information	11
2	For your safety	13
2.1	Basic safety information	14
2.2	Intended use	14
3	System description	15
3.1	System components	16
3.2	Functional principle	17
3.3	System overview	18
3.4	System configuration	19
3.5	ASC technology (patented) – active sound correlation technology (optionally available)	20
4	Project planning	21
4.1	Overview	22
4.2	Determining the measuring and installation location for FLSE100-XT	23
4.2.1	General requirements	23
4.2.2	Additional requirements for optional spool piece	24
4.2.3	Installation location for external pressure and temperature transmitters (option)	24
4.2.4	Applications with wet gas	25
4.2.5	Clearance for fitting and removing the sender/receiver units	25
4.3	Determining the installation location of the Interface Unit	26
4.3.1	Installation location requirements	26
4.3.2	Clearance for fitting the Interface Unit	26
5	Installation FLSE100-XT	27
5.1	Intended use	28
5.2	Safety information	28
5.2.1	Hazards due to hot, cold (cryogenic) or aggressive gases, or high pressure	28
5.2.2	Hazard through electrical equipment	29
5.2.3	Hazards through explosive or ignitable gases	29
5.2.4	Hazards through electrostatic discharges	29
5.2.5	Retraction mechanism of the sender/receiver units	30
5.2.6	Operation in potentially explosive atmospheres	31
5.2.6.1	Specific conditions	32
5.2.6.2	Use of FLSE100-XT, depending on the temperature code and process temperature	32
5.2.6.3	Permissible gas temperature, depending on the temperature code of the sender/receiver units	33
5.2.7	Warning information on device	34
5.2.8	Requirements on the personnel's qualification	34
5.2.9	Restrictions on use	35

5.3	Product description	37
5.3.1	Product identification	37
5.3.2	Sender/receiver units	39
5.3.3	Material for parts with process gas contact.	42
5.4	Spool piece option	43
5.5	Transport and storage	44
5.5.1	Transport protection	44
5.5.2	Special notes for handling the spool piece option	44
5.6	Installation	46
5.6.1	Safety information	46
5.6.2	Scope of delivery	46
5.6.3	Fitting the spool piece (option)	47
5.6.4	Installation sequence	48
5.6.5	Geometry calculator in FLOWgate™	48
5.6.6	Installation accessories	49
5.6.6.1	Nozzles, blind flanges and seals	50
5.6.6.2	Ball valve	51
5.6.6.3	Nozzle installation tool	52
5.6.7	Fitting the nozzles on the pipeline (measuring system without spool piece option)	53
5.6.7.1	General preparation work	53
5.6.7.2	Determining the nozzle position for cross-duct versions	54
5.6.7.3	Determining the nozzle position for the probe version	56
5.6.7.4	Welding the nozzle on	57
5.6.8	Fitting the sender/receiver units	62
5.6.8.1	Calculating the wetted part length wL and geometric installation parameters	65
5.6.8.2	Tightening the self-cutting ring	68
5.6.8.3	Installing the sender/receiver units	71
5.6.8.4	Leak tightness check	74
5.6.9	Pulling the sender/receiver units back	75
5.6.10	Fitting the venting valve	76
5.6.11	Fitting the weatherproof cover for the sender/receiver unit	77
5.6.11.1	Overview	77
5.6.11.2	Fitting the weatherproof cover	78
5.7	Electrical installation	80
5.7.1	General instructions, prerequisites	80
5.7.2	Cable specification	80
5.7.3	Cable glands	81
5.7.4	Requirements for installation in the Ex zone	81
5.7.5	Connection overview	83
5.7.6	Connection diagrams	84
6	Installation Interface Unit	85
6.1	Intended use	86
6.2	Safety information	86
6.2.1	Hazard through electrical equipment	86
6.2.2	Hazard through electromagnetic interference	86
6.2.3	Hazards through explosive or ignitable gases	86
6.2.4	Hazards through electrostatic discharges	87
6.2.5	Operation in potentially explosive atmospheres	87
6.2.6	Warning information on device	87
6.2.7	Requirements on the personnel's qualification	87
6.2.8	Restrictions on use	89

6.3	Product description	90
6.3.1	Product identification	90
6.3.2	Type code	91
6.3.3	Device components	92
6.3.4	Device description	94
6.3.5	Interfaces	95
6.3.5.1	Basic equipment of mainboard	95
6.3.5.2	I/O module definition	95
6.4	Installation	96
6.4.1	Safety information	96
6.4.2	Scope of delivery	96
6.4.3	Tools required	96
6.4.4	Fitting the Interface Unit	97
6.4.4.1	Wall fitting	97
6.4.4.2	Option "Mounting kit 2-inch pipe mounting"	98
6.4.5	Fitting the weatherproof cover	100
6.4.5.1	Weatherproof cover for Interface Unit for wall fitting	100
6.4.5.2	Weatherproof cover for Interface Unit for fitting on a 2-inch pipe	101
6.4.6	Fitting the tag plate (available as option)	104
6.5	Electrical installation	106
6.5.1	Safety information	106
6.5.2	Cable specification	106
6.5.3	Cable glands	107
6.5.4	Requirements for installation in the Ex zone	108
6.5.5	Electrical connections of the Interface Unit	110
6.5.5.1	Overview of electrical connections	110
6.5.5.2	Device module configuration	111
6.5.6	Connection area for field-side wiring	112
6.5.7	Connection assignment of I/O modules	114
6.5.8	Electronics cover	115
6.5.9	Switching (Open Collector - Namur) on digital modules	116
6.5.10	Termination resistors of serial RS485 lines	116
6.5.11	Internal fuses	117
6.5.12	Torque values for screw connections	118
6.6	Connecting shielding terminals	119
7	Commissioning FLOWSIC100 Flare-XT	121
7.1	General information	122
7.2	Opening the display protective flap	122
7.3	Setting the display language	122
7.4	Commissioning with the FLOWgate™ operating software	123
7.4.1	Connect to the device	123

7.5	Field setup wizard	124
7.5.1	Path setup	124
7.5.2	Identification	125
7.5.3	System/archives	125
7.5.4	Installation	126
7.5.5	Pressure/temperature sensor	127
7.5.6	I/O configuration	128
7.5.6.1	Ethernet	128
7.5.6.2	RS485/RS232	128
7.5.6.3	DI/DO (layout depending on the selected configuration)	128
7.5.6.4	AI/AO	130
7.5.6.5	FFBUS	131
7.5.7	Molar mass	132
7.5.7.1	Algorithm for calculating the molar mass	132
7.5.7.2	Compressibility	135
7.5.8	Application	135
7.5.9	User Management	136
7.5.10	Completion	136
7.6	Function checks after commissioning	136
8	Operation	137
8.1	Operating concept	138
8.2	Display and operating elements	138
8.3	Display in the symbol bar	138
8.4	Menu navigation	139
8.5	Status LEDs on the mainboard	140
9	Maintenance	141
9.1	Safety information	142
9.2	General information	142
9.3	Routine checks	142
9.3.1	Function check on the display	143
9.3.2	Function check with FLOWgate™	143
9.4	i-diagnostics™ Software-Plug-in (optional)	143
9.4.1	One-click verification	143
9.4.2	Trend analysis – predictive maintenance	144
9.5	Cleaning	145
9.5.1	Cleaning the FLSE100-XT sender/receiver units	145
9.5.2	Cleaning the Interface Unit	145
9.6	Exchanging the battery	145
9.6.1	Battery types	145
10	Troubleshooting	147
10.1	Detecting malfunctions	148
10.2	Error signaling on the display	148
10.3	Contacting Customer Service	148
10.4	Starting a diagnostic session	148

11	Decommissioning	151
11.1	Returning	152
11.1.1	Contact	152
11.1.2	Packaging	152
11.2	Disposal information	152
11.2.1	Materials	152
11.2.2	Disposal	152
12	Technical data	153
12.1	System FLOWSIC100 Flare-XT	154
12.2	FLSE100-XT sender/receiver units	155
12.2.1	F1F-S	156
12.2.2	F1F-M	157
12.2.3	F1F-H	157
12.2.4	F1F-P	158
12.3	Interface Unit	159
12.4	Application Evaluation Datasheet (example)	163
12.5	Applications of FLOWSIC100 Flare-XT in a regulated environment	165
12.6	Application ranges	165
12.7	Derating pressure resistance	167
12.8	Dimension drawings	169
12.8.1	Dimension drawings of FLSE100-XT sender/receiver units	169
12.8.2	Dimension drawings Interface Unit	171
13	Spare parts	173
13.1	Recommended spare parts for FLSE100-XT sender/receiver units	174
13.2	Recommended spare parts for Interface Unit	174
14	Accessories (optional)	175
14.1	Accessories for FLSE100-XT sender/receiver units	176
14.2	Accessories for Interface Unit	176
15	Annex	177
15.1	Compliances	178
15.1.1	Compliances of FLSE100-XT sender/receiver units	178
15.1.1.1	CE declaration	178
15.1.1.2	Standards compatibility and type approval	178
15.1.2	Compliances of Interface Unit	178
15.1.2.1	CE declaration	178
15.1.2.2	Standards compatibility and type approval	179
15.2	Wiring examples	180
15.3	Control drawings	182
15.4	Gasket installation	187

FLOWSIC100 Flare-XT

1 About this document

Function of this document

Scope of application

Target groups

Data integrity

Further information

1.1 **Function of this document**

These Operating Instructions describe for the FLOWSIC100 Flare-XT measuring system with FLSE100-XT sender/receiver units and Interface Unit:

- Device components
- Installation
- Operation
- Maintenance work required for reliable operation

For detailed information on functional checks/device settings, data backup, software update, malfunction and error handling and possible repairs, see the Service Manual.

Retention of documents

- ▶ Keep these Operating Instructions and all associated documents available for reference.
- ▶ Pass the documents on to a new owner.

1.2 **Scope of application**

These Operating Instructions apply exclusively to the FLOWSIC100 Flare-XT measuring system with the described system components.

They are not applicable to other SICK measuring devices.

These Operating Instructions cover standard applications which conform with the technical data specified. Additional information and assistance for special applications are available from your SICK representative.

It is generally recommended to take advantage of qualified consulting services provided by SICK experts for your specific application.

1.3 **Target groups**

This Manual is intended for persons installing, operating and maintaining the device.

Operation

The device may only be operated by authorized persons who, based on their training on, and knowledge of the specific device, as well as knowledge of the relevant regulations can assess the tasks given and recognize the hazards involved.

Installing and maintaining

Skilled persons are required for installation and maintenance.

Please observe the information at the beginning of the respective Sections.

1.4 **Data integrity**

SICK Engineering GmbH uses standardized data interfaces such as standard IP technology, in its products. The focus here is on the availability of the products and their properties.

SICK Engineering GmbH always assumes that the customer is responsible for the integrity and confidentiality of data and rights involved in connection with using the products.

In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and patch management.

1.5

Further information



NOTICE:

Observe all supplied documents.

FLOWSIC100 Flare-XT

2 For your safety

Basic safety information
Intended use

2.1 Basic safety information

Observe the safety information here and the warning information in the following Sections of these Operating Instructions to reduce health risks and avoid dangerous situations.

In the case of warning symbols on the devices, the Operating Instructions must be consulted to determine the nature of the potential hazard and the actions required to avoid the hazard.

- ▶ Only put the FLOWSIC100 Flare-XT into operation after reading the Operating Instructions.
- ▶ Observe all safety information.
- ▶ If there is something you do not understand: Contact SICK Customer Service.
- ▶ Only use the FLOWSIC100 Flare-XT measuring system as described in these Operating Instructions. The manufacturer bears no responsibility for any other use.
- ▶ Do not attempt any work on or repairs to the FLOWSIC100 Flare-XT unless described in this Manual.
- ▶ Do not modify the FLOWSIC100 Flare-XT in any way unless specifically instructed and permitted to do so by the manufacturer.
- ▶ Only use accessories approved by the manufacturer.
- ▶ Do not use damaged components or parts.
- ▶ If you do not follow these guidelines, the following applies:
 - Any warranty by the manufacturer becomes void,
 - The FLOWSIC100 Flare-XT can become dangerous
 - The approval for use in potentially explosive atmospheres is no longer valid.

Special local requirements

Follow all local laws, regulations and company policies applicable at the respective installation location.

2.2 Intended use

Use the system components of the FLOWSIC100 Flare-XT measuring system only as described in this document.

Do not exceed the maximum permissible pressure and temperature values shown on the type plates of the FLSE100-XT sender/receiver units in operation.

The manufacturer bears no responsibility for any other use.

- FLSE100-XT sender/receiver units: → p. 28, §5.1
- Interface unit: → p. 86, §6.1

FLWSIC100 Flare-XT

3 System description

System components
Functional principle
System configuration

3.1

System components

The FLOWSIC100 Flare-XT measuring system comprises the components:

- FLSE100-XT sender/receiver unit (details → p. 27, §5)
For transmitting and receiving ultrasonic pulses, signal processing and controlling the system functions
- Control unit Interface Unit (details → p. 85, §6)
For control, evaluation and output of the sensor data connected via the RS485 interface
- Installation accessories (e.g., nozzle, nozzle installation tool, ball valve)
- Connection cable between sender/receiver units
- Connection cable between sender/receiver units and Interface Unit
- Spool piece option
Spool piece preassembled for installation in an existing pipeline (flange connection or welded connection) including assembly means for installing the sender/receiver units.



Measuring systems with spool piece option additionally available as:

- Dry calibrated (high precision measured system, geometric uncertainties are minimized.)
- Flow calibrated (the complete measuring system has been calibrated on a flow test bench.)

Both variants reduce measurement uncertainty.

- External temperature and pressure transmitters available on request

3.2

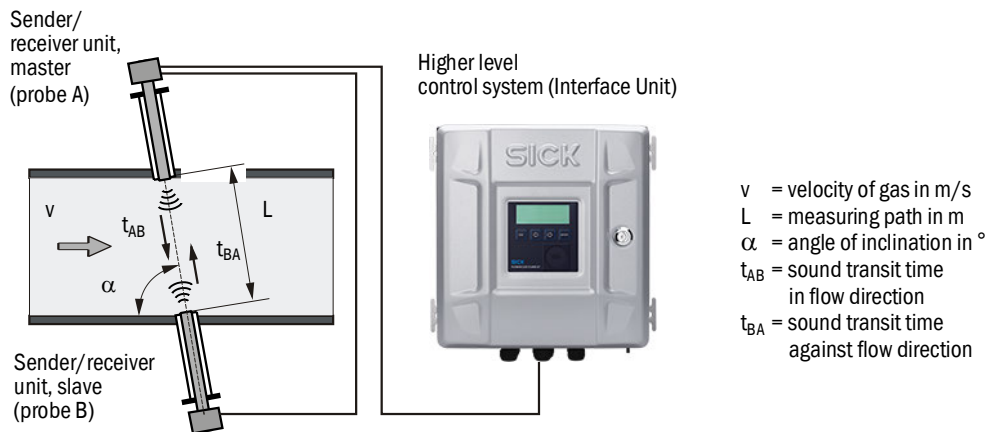
Functional principle

The FLOWSIC100 Flare-XT gas flow rate measuring devices operate according to the principle of ultrasonic transit time difference measurement. Sender/receiver units are mounted on both sides of a pipeline at a certain angle of inclination to the gas flow (Fig. 1). These sender/receiver units contain piezoelectric ultrasonic transducers that function alternately as senders and receivers. The sound pulses are emitted at an angle α to the flow direction of the gas. Depending on angle α and gas flow rate v , the transit time of the respective sound direction varies as a result of certain "acceleration and braking effects". The higher the gas velocity and the smaller the angle to the flow direction, the more the transit times of the sound pulses differ.

Gas flow rate v is calculated from the difference between both transit times, independent of the sound velocity value. With this measuring method, changes of the sound velocity due to pressure or temperature variations therefore have no influence on the gas velocity determined.

Fig. 1

Functional principle FLOWSIC100 Flare-XT

**Linearization**

Further process values are required to calculate mass flow, molecular weight, gas density and Reynolds number. Especially pressure, temperature and viscosity have a significant influence. The best accuracy is achieved when externally installed pressure and temperature sensors can be connected to the measuring system. The viscosity can be configured as a medium constant value.

$$Re = \frac{v \cdot D \cdot \rho}{\eta}$$

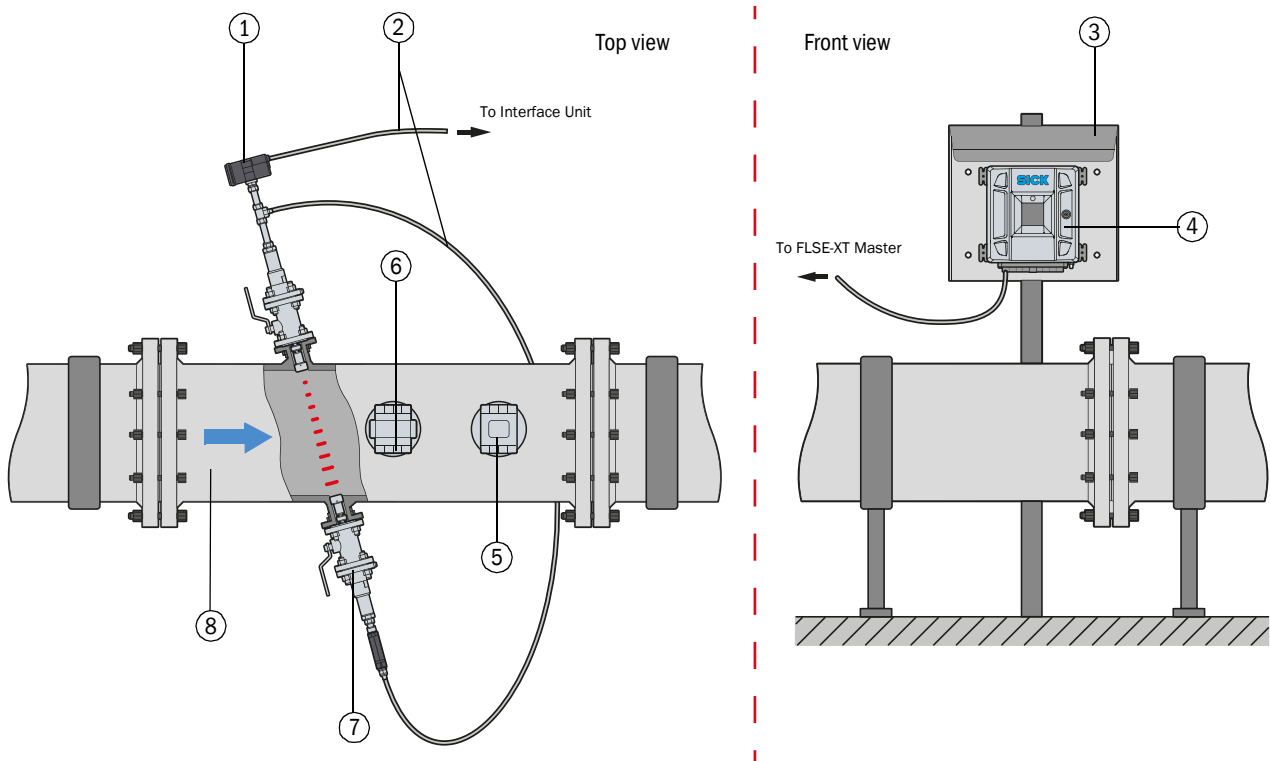
- v = Speed of sensor
- D = Inner pipe diameter
- ρ = Density of medium
- η = Viscosity of medium

**NOTICE:**

The correct evaluation of the Reynolds number is decisive for the determination of the correct calibration function. The Reynolds number must be determined with an accuracy of 20% in order to achieve the device accuracy offered by SICK.

3.3 System overview

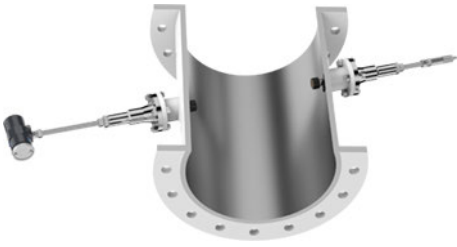
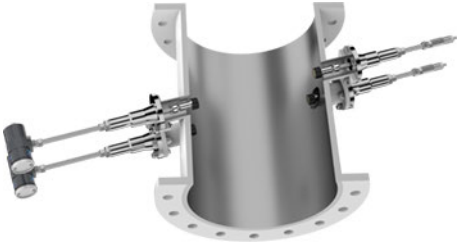
Fig. 2 System overview FLOWSIC100 Flare-XT



- | | |
|---|--------------------------------------|
| 1 Sender/receiver unit FLSE-XT Master | 5 Temperature sensor |
| 2 Connection cable | 6 Pressure sensor |
| 3 Weatherproof cover for Interface Unit | 7 Sender/receiver unit FLSE-XT Slave |
| 4 Interface Unit | 8 Optional spool piece |

3.4 System configuration

FLOWSIC100 Flare-XT is available as 1- or 2-path measuring system. The following Figures show cross-duct installations (F1F-S, F1F-M, F1F-H). In principle, the configuration also applies to one-sided installation (F1F-P).

Configuration	Description
1-path measurement	<p>Two sender/receiver units are mounted on the pipeline. The measuring path is positioned across the center of the pipeline. Special operating conditions can make it necessary to position the path outside the pipeline center (shortens the measuring path). A probe version can also be used instead of two sender/receiver units (type F1F-P).</p> 
2-path measurement	<p>Two pairs of sender/receiver units are installed at the same measuring location and are connected to the same Interface Unit. Both measuring paths are positioned outside the center of the pipeline and run parallel to one another. The Interface Unit calculates a measuring result from both measuring paths. 2-path measurement is used to achieve higher measurement accuracy or when flow conditions are complicated.</p> 

3.5 **ASC technology (patented) – active sound correlation technology (optionally available)**

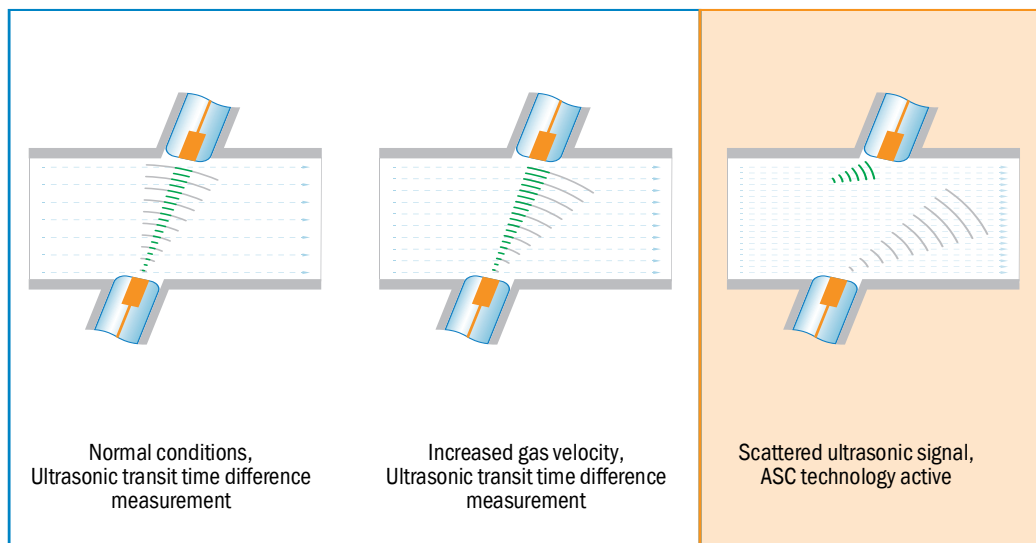
If the ultrasonic signal is scattered due to extreme gas velocity, the ASC technology (active sound correlation technology) takes over.

The ultrasonic transducer works like a microphone and correlates the strong noises at high flow rates to gas velocity.

This ensures measurement is still available even for extreme flare gas behavior.

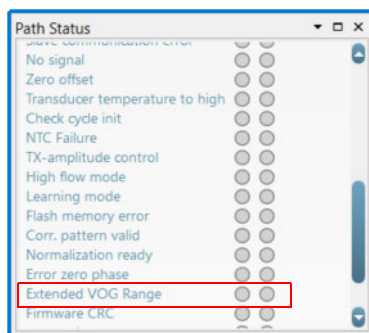
Measurement uncertainty is higher as compared to ultrasonic transit time difference measurement, see technical data, → p. 153, §12.

Fig. 3 ASC technology



“Extended VOG Range” is signalled in the path status of FLOWgate™ when the ASC technology is active.

Fig. 4 Signaling “Extended VOG Range” in the path status



FLWSIC100 Flare-XT

4 Project planning

Overview

Determining the measuring and installation location for FLSE100-XT

Determining the installation location of the Interface Unit

4.1 Overview

The following Table provides an overview of the project planning work necessary as prerequisite for trouble-free assembly and subsequent device functionality.

Task	Requirements		Work step	
Determine measuring and installation locations	Flow distribution, inlet and outlet piping	Lowest possible influence on the measurement accuracy	Follow specifications for new equipment; select best possible location for existing equipment	<input type="checkbox"/>
	Access, accident prevention	Easy and safe	Provide platforms or pedestals as required.	<input type="checkbox"/>
	Installation free of vibrations	Acceleration < 1 g	Avoid/reduce vibrations through adequate measures.	<input type="checkbox"/>
	Ambient conditions	Limit values in accordance with Technical Data	If necessary: Provide weatherproof covers / sun protection, enclose or lag device components.	<input type="checkbox"/>
Select device components	Internal pipe diameter	Sender/receiver unit type	Select components according to the Configuration Table and information as from → p. 49, §5.6.6. as well as the Application Evaluation Sheet	<input type="checkbox"/>
	Gas temperature	Sender/receiver unit type		
	Gas composition	Material of duct probe and transducer		
	Fitting locations	Cable lengths		
Plan power supply	Operating voltage, power requirements	According to Technical Data	Plan adequate cable cross-sections and fuses	<input type="checkbox"/>

4.2

Determining the measuring and installation location for FLSE100-XT

Measurement accuracy is influenced, among other things, by flow behavior and the position of the measuring axis. Large cross-section variations, curved pipes, fittings, air flaps or inlets can cause profile deformations or turbulences with a negative effect on the accuracy of the measuring result.

Select the FLSE-XT installation location at a position with as little interference as possible to ensure best possible device performance.

4.2.1

General requirements

Criteria		Requirements
Measuring location	Flow behavior	Position with twist-free as well as rotationally symmetrical flow profile Balanced, uniform profiles are most likely to be expected for long inlet and outlet piping
	Pipeline design	Whenever possible, no deflections, cross-section variations, curves, feed and drain lines, flaps or fittings in the area of the inlet and outlet piping
	Inlet and outlet piping lengths	Isometric conditions at the measuring point are most important for determining the required inlet and outlet piping and should be investigated carefully. The conditions depend on the specific application and the device configuration. Typically, an upstream 20 D straight pipe section and a downstream 5 D straight pipe section are required. <ul style="list-style-type: none"> ● Uncritical flow inlet conditions require straight inlet piping. ● More complex inlet disturbances require longer inlet and outlet piping. ● If the 2-path configuration is used, the needed minimum inlet and outlet sections can be further reduced compared to 1-path measurement with the same measurement uncertainty. ● SICK offers expertise support for optimal adjustment of the meter for the given inlet and outlet piping conditions.
Installation location		Pipelines with vertical, horizontal or inclined direction
		Pipelines with horizontal or vertical direction <ul style="list-style-type: none"> ● Horizontal installation: Align the spool piece so that the planes formed by the measuring paths are horizontal. This minimizes the problem of dirt in the pipeline entering the transducer ports. ● Vertical installation: Only possible if the measuring system is used for dry, non-condensing gases.
		Installation free of vibrations, acceleration < 1 g
		Largest possible distance to control valves or other noisy fixtures
Working platform		With electrical connections and lighting
		Easy and safe access for installation and maintenance work of the sender/receiver units
		Platform secured by a railing to prevent possible accidents
Wall and insulation thickness		Sufficient clearance to fit/remove the sender/receiver units
		<ul style="list-style-type: none"> ● Maximum wall thickness 15 mm Larger wall thicknesses require customer-specific solutions (available on request only). ● Minimum wall thickness depends on pressure, temperature, pipe size and static/dynamic load at the measurement location (contact SICK for support). Nozzles may only be isolated when the gas temperature is < 100 °C. Ball valve, venting valve and electronics must not be insulated.

4.2.2 Additional requirements for optional spool piece

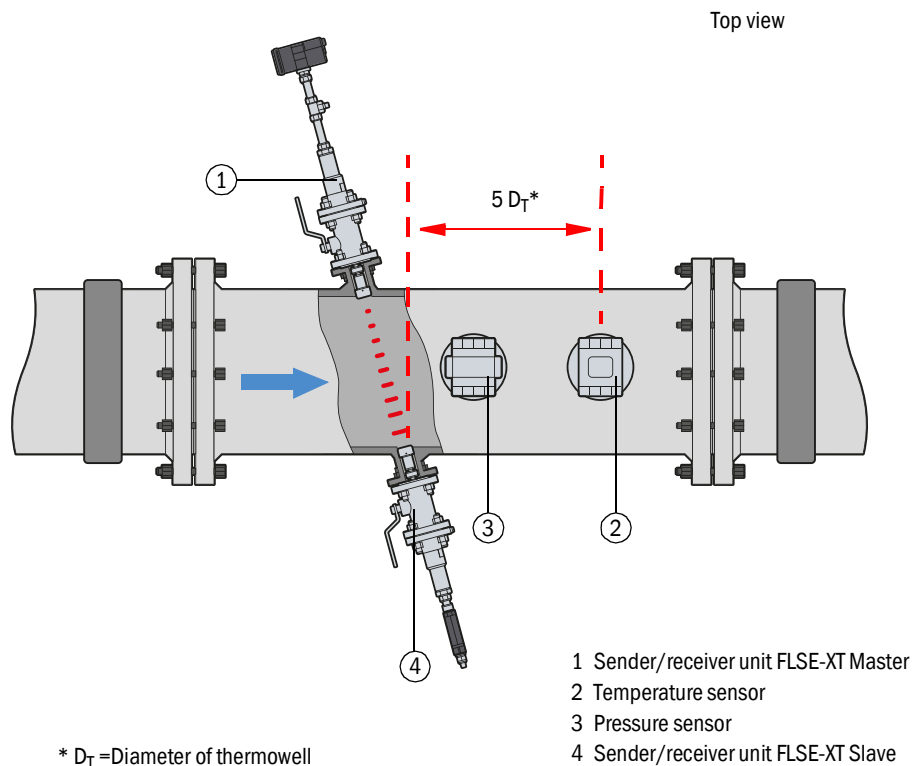
Criteria	Requirements
Pipeline design	<ul style="list-style-type: none"> ● Same nominal size of adjacent pipes and spool piece. ● Differences of internal diameters of inlet pipe and spool piece < 1%. ● No welding beads and burrs on the flanges of the inlet pipe
Gas flow	Free from any foreign material, dust and liquids. Otherwise, filters and traps shall be used.
Seals between spool piece and pipeline	Must not protrude into the pipeline. Any protrusion into the flowing gas stream may change the flow profile and thus may adversely affect measuring accuracy.
Pressure sensor	Pressure tapping over the measuring path
Temperature sensor	Spool piece with standard installation length with integrated pressure tapping, temperature sensor $5 D_T$ (= 5 * diameter of the thermowell) in the outflow area
Fastening and sealing material	Bolts, nuts and flange seals used must be suitable for the operational conditions and comply with legal regulations and relevant standards.

4.2.3 Installation location for external pressure and temperature transmitters (option)

Pressure tapings and thermowells for external transmitters have to be installed in the following way:

- Pressure tapping connection: Directly at the measuring point, centrally above the measuring path, on the top of the pipeline
- Thermowell: Outlet section with distance $5 D_T$ (= 5 * thermowell diameter), measured from the middle of the measuring path, on the top of the pipeline

Fig. 5 Installation location



The Table shows for which calculations the use of external pressure and temperature transmitters is required.

Calculation of	External pressure transmitter	External temperature transmitter
Volumetric flow in standard condition	x	x
Mass flow	x	x
Molecular weight	—	x
Reynolds number	x	x

4.2.4 Applications with wet gas

Condensate can accumulate in the nozzle pipes. The following solutions can help to prevent measurement problems (malfunctions caused by solid-borne noise, see Service Manual), or damage when removing the sender/receiver unit (condensate runs out).

- Use a nozzle position which prevents accumulations of condensates in nozzle pipes.
- Use a closed continuous or periodical condensate drain with backflow to the pipeline.
- Isolate the nozzle pipe to reduce dew point underruns (only for low gas temperatures < 100 °C).

4.2.5 Clearance for fitting and removing the sender/receiver units



NOTICE:

Observe the dimension drawings in → p. 169, §12.8.1.

4.3 Determining the installation location of the Interface Unit

4.3.1 Installation location requirements

- ▶ Fit the Interface Unit in an easily accessible and protected position.
- ▶ Observe the information in → p. 96, §6.4.

Providing suitable cables are used, the Interface Unit can be installed up to 1000 meters from the sender/receiver units. The installation of a flameproof version of the interface unit directly on site is therefore unnecessary in many situations. For easier access to the Interface Unit, we recommend installation in a control room (measuring station or similar). This considerably simplifies communication with the FLOWSIC100 Flare-XT for configuration or location of failure or error causes.

**NOTICE:**

The Interface Unit is only suitable for vertical installation.

4.3.2 Clearance for fitting the Interface Unit

**NOTICE:**

Observe the dimension drawings in → p. 171, §12.8.2.

FLWSIC100 Flare-XT

5 Installation FLSE100-XT

Intended use
Product description
Installation
Electrical installation

5.1 Intended use

FLSE100-XT sender/receiver units may only be used to measure the gas velocity, gas volume, mass flow and molecular weight in pipelines.

Do not exceed the maximum permissible pressure and temperature values shown on the type plates of the FLSE100-XT sender/receiver units in operation.

Using the device for purposes other than those intended can lead to safety-critical conditions. The manufacturer bears no responsibility for any other use.

5.2 Safety information

5.2.1 Hazards due to hot, cold (cryogenic) or aggressive gases, or high pressure

The FLSE100-XT sender/receiver units are mounted directly on the gas-carrying pipeline. On equipment with low hazard potential, e.g., non-toxic, aggressive or explosive gases, gases not hazardous to health, uncritical pressure, moderate gas temperature (not hot, very low/cryogenic), the installation or removal can be performed while the equipment is in operation, however only as far as the valid regulations and equipment safety notices are observed and suitable protective measures are taken. Special regulations that apply to the plant must be observed.



WARNING: Gas hazard

- ▶ Activities on equipment with increased hazard potential, e.g. by toxic, aggressive, explosive gases, health endangering, higher pressure, high temperatures, low temperature (cryogenic), have to follow legitimate regulations, general standards and guidelines as well as plant operator instructions. Only authorized personnel with special qualification for fitting using the "Hot Tapping" method may install the devices when the plant is in operation (requirements on the qualification of the personnel, see → p. 34, §5.2.8). Otherwise, serious injuries might occur, e.g. poisoning, burns etc. These persons must be trained and technically adept in "hot tapping" installation work and must know and implement legal as well as generally applicable regulations and in-house regulations.
- ▶ The express approval of the plant operator in written form is required for installations on running equipment at all times. The plant operator carries the responsibility for professional implementation alone. All safety requirements relevant for the equipment must be observed as well as essential and suitable protective measures taken. All regulations/special regulations that can be applicable for the plant must be observed.

5.2.2 Hazard through electrical equipment

**WARNING: Danger through power voltage**

- ▶ Disconnect power supply lines before working on power connections or parts carrying power voltage.
- ▶ Refit any contact protection removed before switching the power voltage back on again.

5.2.3 Hazards through explosive or ignitable gases

FLSE100-XT sender/receiver units may be used in potentially explosive atmospheres only according to the respective specifications.

**WARNING: Hazards through explosive or ignitable gases**

- ▶ In potentially explosive atmospheres, only use the version of the FLSE100-XT sender/receiver units specified for such use (→ p. 37, §5.3).
- ▶ Observe the information on → p. 37, §5.3 during installation work on running equipment ("hot tapping" method).

5.2.4 Hazards through electrostatic discharges

The electronic housing of the sender/receiver units and the optionally available spool piece are painted by the manufacturer with a layer thickness of max. 0.2 mm as standard.

**WARNING: Ignition hazard through electrostatic discharge**

- Ignition hazards through electrostatic discharges exist when FLSE100-XT sender/receiver units with special paintwork and a layer thickness > 0.2 mm are used in applications with ignition group IIC according to ATEX and IECEx.
- ▶ For installation, the risk of electrostatic charging of the surface must be reduced to a minimum.
 - ▶ Use appropriate caution when performing maintenance and cleaning work. For example, the surfaces should only be cleaned with a damp cloth. The respective devices will be identified by the manufacturer with a warning sign.

5.2.5

Retraction mechanism of the sender/receiver units

The retraction mechanism serves to remove and fit complete sender/receiver units of the FLSE100-XT for maintenance or replacement without relieving pressure in the pipeline in which the measuring system is fitted. Sender/receiver units with ball valve must be installed to use the retraction mechanism.

This allows maintenance work without having to interrupt the process.

**WARNING: Hazard through incorrect use of the retraction mechanism**

The retraction mechanism may only be used when the sender/receiver unit is fitted with a ball valve. The retraction mechanism must not be used when a ball valve is not installed.

Only operate the retraction mechanism within the following pressure ranges:

- Maximum operating pressure
 - For use of the retraction mechanism: 0.5 bar (g)
 - With additional fitting tool (SICK Service only): 8 bar (g)

- Temperature range:

For health and safety reasons (high/low temperatures), SICK recommends only operating the retraction mechanism in the temperature range 0 °C ... 70 °C.

**WARNING: Hazardous gas (possibly explosive or toxic)**

Small gas quantities escape during the removal and installation of the transducer assemblies. When used correctly, the gas amount enclosed in the retraction nozzle is max. 0.81 dm³ with F1F-P and max. 0.27 dm³ with F1F-S, F1F-M and F1F-H.

- ▶ Personnel performing tasks on plants with poisonous or other gases dangerous to health must use suitable safety equipment to prevent personal injuries.

**WARNING: Hazardous gas (possibly explosive or toxic)**

The retraction nozzle of the sender/receiver units has a connection for optional venting.

- ▶ This connection is closed with a blind plug at the factory.
- ▶ The blind plug may only be removed when a venting valve is installed, → p. 76, §5.6.10.

5.2.6 **Operation in potentially explosive atmospheres**

Depending on the respective device version, the FLSE100-XT sender/receiver units are designed for use in potentially explosive atmospheres:

Table 1 Device versions

Version	Approval		
	IECEX	ATEX	NEC/CEC (USA/CA)
F1F-S	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [ia Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb Ex ia IIC T6/T4 Ga	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb II 1G Ex ia IIC T6/T4 Ga	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4
F1F-M	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [ia Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb Ex ia IIC T6/T4 Ga	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb II 1G Ex ia IIC T6/T4 Ga	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4
F1F-H	Ex db IIC T6/T4 Gb	II 2G Ex db IIC T6/T4 Gb	Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA IIC, T4
F1F-P	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [ia Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4

5.2.6.1

Specific conditions

Specific conditions of use denoted by X after the certificate number.

Specific conditions relating to all FLSE models

- As an option, offshore painting is used, where the layer thickness exceeds the limit of 0.2 mm for Gas group IIC (see Table 8 in IEC 60079-0:2011). In this case, the device is marked with a warning label according to IEC 60079-1, Table 16 g).
Under certain extreme circumstances, the device may generate an ignition-capable level of electrostatic charge. Therefore, the device shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. In addition, the device shall only be cleaned with a damp cloth (see clause 7.4.2 of IEC 60079-0:2011).
- The ultrasonic transducers are manufactured from titanium. In rare cases, ignition sources could arise due to impact or friction sparks. The user must ensure the enclosure and ultrasonic transducers are adequately protected against danger arising from impacts or friction (see Section 8.3 of IEC 60079-0:2011).
- The lengths of the flameproof joints are sometimes longer and the widths of the flameproof joints are sometimes shorter than required in Table 2 or 3 of IEC 60079-1: 2014. Flameproof joints are not intended to be repaired. Contact the manufacturer when dimensional information of flameproof joints is needed.

Specific conditions relating to the FLSE100-XT with intrinsically safe transducers

- The device contains a shunt zener diode, which requires connection to a barrier ground in accordance with IEC 60079-14. The protective ground conductor terminals of the device are to be connected to the potential equalization system of the installation area.
- The maximum permitted voltage in the safe area (U_m) must not exceed the rated 125 V AC. Connect the device only to device which does not carry voltage higher than 125 V AC. Use SELV power supplies and device that meet the requirements of IEC/EN 60950 or IEC/EN 61010-1.
- The maximum piezo-electric energy released by an impact on the ultrasonic transducers exceeds the limit for Gas Group IIC specified in Clause 10.7 of IEC 60079-11:2011. The user must ensure that the ultrasonic transducers are suitably protected against danger from impact.
- The sender/receiver units with the intrinsically safe transducers may be installed into a duct wall separating Zone 0 from another area, e. g. Zone 1. The user must ensure that the material of the ultrasonic transducers shall not be subject to environmental conditions, e.g. chemical exposure or abrasion, which might adversely affect their enclosure and in particular their membrane.

5.2.6.2

Use of FLSE100-XT, depending on the temperature code and process temperature**Installation and use of sender/receiver units - electronics and transducers parts in the same area**

This area is a hazardous area, i.e. Zone 1 or Zone 2 in which an explosive atmosphere exists under normal atmospheric conditions of:

- Specified ambient temperature -40 ... +70 °C for T4 or -40 ... +55 °C for T6, Optionally minimum ambient temperature -50 °C
- Ambient pressure 80 kPa (0.8 bar) to 110 kPa (1.1 bar)
- Air with normal oxygen content, typically 21 percent by volume.

5.2.6.3 **Permissible gas temperature, depending on the temperature code of the sender/receiver units**

Case 1 (see → Table 2):

Under normal atmospheric conditions, an explosive atmosphere categorized as Zone 1 or Zone 2 exists outside the pipeline. Process conditions in the pipeline can differ from the atmospheric conditions. Process conditions can be in the range specified on the type plate of the sender/receiver units. In this case the gas or gas mixture can be combustible but must not be explosive.

Case 2 and 3 (see → Table 2):

On both sides of the pipeline an explosive atmosphere exists under normal atmospheric conditions. The pipe wall separates different zones, i.e. Zone 1 exists inside the pipe and Zone 2 outside. This means gas temperature and line pressure may not exceed the specified ambient values.



NOTICE:

The pipe wall can separate different hazardous areas (zones).

Table 2 Permitted gas temperature for temperature code

	Case 1	Case 2	Case 3
Classified temperature code in the hazardous area	<ul style="list-style-type: none"> ● Ultrasonic sensor outside explosive atmosphere Zone 1 or 2 ● Electronics in explosive atmosphere Zone 1 or 2 ● Gas pressure and gas temperature according to specification on device label 	<ul style="list-style-type: none"> ● Ultrasonic sensor in explosive atmosphere Zone 1 or 2 ● Electronics in explosive atmosphere Zone 1 or 2 ● Gas pressure and gas temperature according to ambient specification of device 	<ul style="list-style-type: none"> ● Ultrasonic sensor in explosive atmosphere Zone 0 ● Electronics in explosive atmosphere Zone 1 or 2 ● Gas pressure atmospheric, gas temperature max +60 °C ● Not for F1F-H
The sender/receiver units can be used with the following gas temperatures:			
T6	-196 ¹⁾ ... +80 °C	-196 ¹⁾ ... +55 °C	-50 ... +55 °C
T4	-196 ¹⁾ ... +130 °C	-196 ¹⁾ ... +70 °C	-50 ... +70 °C
T3	-196 ¹⁾ ... +195 °C	-196 ¹⁾ ... +70 °C	-50 ... +70 °C
T2	-196 ¹⁾ ... +280 °C	-196 ¹⁾ ... +70 °C	-50 ... +70 °C

¹⁾ For F1F-H: -70 °C

**NOTICE: Observe the ambient temperature**

Be aware that the ambient air around the pipeline might heat up.

- The ambient temperature around the electronic housing may not exceed +70 °C for the sender/receiver unit marked with T4.
- The ambient temperature around the electronic housing may not exceed +55 °C for the sender/receiver unit marked with T6.

The compliance with these requirements is the sole responsibility of the user. A temperature fuse protects the transmitter/receiver unit electronics against impermissible high temperatures. The temperature fuse interrupts the function of the electronics should such high temperatures occur. The switch-off reaction of the temperature fuse is permanent and can only be reset by the manufacturer through repair.

5.2.7

Warning information on device**WARNING: Danger identification on device**

The following symbol draws attention to important dangers directly on the device:



- ▶ Consult the Operating Instructions in all cases where the symbol is attached to the device or shown on the display.

5.2.8

Requirements on the personnel's qualification**Designated users**

The FLSE100-XT sender/receiver units may only be installed and operated by skilled technicians who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved. Skilled persons are persons according to DIN VDE 0105, DIN VDE 1000-10 or IEC 60050-826 or directly comparable standards.

The named persons must have exact knowledge of operational hazards caused, e.g., by low voltage, hot, toxic, explosive gases or gases under pressure, gas-liquid mixtures or other media as well as adequate knowledge of the measuring system gained through training.

Specific requirements for use of devices in hazardous areas

- ▶ Cabling/installation, device setup, maintenance and testing may only be carried out by experienced persons familiar with the rules and regulations for hazardous areas, in particular:
 - Degree of protection
 - Fitting instructions
 - Area definition
- ▶ Regulations to be applied:
 - IEC 60079-14
 - IEC 60079-17
 or comparable national regulations.

5.2.9

Restrictions on use

**WARNING: Hazard through pressure/temperature**

- ▶ Use the FLSE100-XT sender/receiver units only within the pressure and temperature limits as specified in these Operating Instructions and on the device type plate.
- ▶ The selected materials must be resistant to the process gases. It is the responsibility of the plant operator to ensure this.

**WARNING: Dangerous voltage**

- The rated voltage U_M may not exceed 125 V in the safe area for use of the sender/receiver units F1F-S, F1F-M and F1F-P for Zone 1. Higher voltages can jeopardize intrinsic safety of the ultrasonic transducer circuit when errors occur.
 - ▶ Ensure the rated voltage U_M used in the safe area does not exceed 125 V.
- The FLSE100-XT sender/receiver units are not equipped with a main power switch for switching off the operating voltage.
 - ▶ Plan and install a suitable switching off device.

The sender/receiver units are intended for installation in gas-carrying pipelines. It is not absolutely necessary that atmospheric conditions prevail within the pipeline. The pipe wall is then a zone-separating wall, i.e. no Ex zone is defined within the pipeline, at least temporarily (→ Table 2, Case 1).

**WARNING: Leakage hazard**

Operation with leakage is not permitted.

- The metallic and hermetically sealed, fully welded enclosure and the seal must comply with all safety requirements which must also be fulfilled by the pipeline itself with respect to design pressure and temperature and compatibility of the material with the medium.
- The ultrasonic transducers with their gas-tight and pressure-proof enclosures must be installed in the pipeline gas-tight and pressure-tight. The FLSE100-XT is fitted with standardized sealing flanges for this purpose.
- The sealing itself must consist of material which is compatible with the medium and is suitable for the application conditions.
 - ▶ Check the sealing surfaces and elements for intactness before installation.
 - ▶ Check the sealing effect with suitable methods after installation.
 - ▶ Leak tightness is to be checked regularly during operation and the seal replaced, as required.
- Before every re-installation new seals have to be used in the required design.

Application limitations for use in Ex zone 1

- ▶ Ultrasonic probes made of titanium may be used in Zone 1 only when risks of ignition arising from impacts or friction on the sensor enclosure can be ruled out.
- ▶ When ultrasonic probes are installed in pipelines with a defined hazardous area, solid parts, e.g. dust or other particles may not cause an ignition hazard.

Application limitations for use in hazardous area classification Ex zone 0 in the pipeline

Use in applications of Zone 0 is generally only possible for device types F1F-S, F1F-M and F1F-P under consideration of the application limitations described in these Operating Instructions.



- Ultrasonic probes can also be operated in Zone 0 under atmospheric conditions (ambient temperature -40°C to $+70^{\circ}\text{C}$ and ambient pressure 0.8 bar to 1.1 bar absolute). The devices must be labeled at least with the information Ex ia.
- Ultrasonic probes made of titanium may be used in Zone 0 only when no rigid components transported through the medium (e.g. dust and other particles) are present and the ultrasonic probes are fitted in Zone 0 in a way (e.g. inside a pipeline) that risks of ignition arising from impacts or friction can be ruled out. The intrinsically safe ultrasonic transducers with their gas-tight and pressure-proof enclosures must be installed gas-tight and pressure-tight in the zone-separating wall to Zone 0. The wall must be thicker than 3 mm. The requirements in EN 60079-26 Section 4.6 must be adhered to.







5.3 Product description

5.3.1 Product identification

Product name:	FLSE100-XT
Manufacturer	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany

Type plate

Fig. 6 Type plate example FLSE100-XT-S







 FLSE100-XT-S	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany	 II 1/2 G Ex db [ia Ga] IIC T6 Ga/Gb TÜV 09 ATEX 554975 X Ex db [ia Ga] IIC T6 Ga/Gb IECEx TUN 09.0015X	  0044
	F1F-SSADCYA1AN1IA6RASBFNNNNNN Part No. 1088828 Serial No. 12345678 Made in Germany		
T _{amb} -40 °C...+55 °C @ T6 T _{amb} -40 °C...+70 °C @ T4		WARNING: Explosion Hazard Read Operation Instructions before installation.	
Process conditions: See operating instructions! P _{max} 20,0 bar @ +38 °C T _{gas} -196 °C...+280 °C P _{max} 10,9 bar @ +280 °C Flange size: 2" / CL150		AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.	
Power Supply: SELV = 15...28 Vdc; max. 500 mA		ADVERTENCIA: amenaza de explosão Leia modos de aplicação antes de instalar.	
Um = 125 V 4100317		 	

Example of marking plate FLSE100-XT-S (ATEX/IECEX)

 FLSE100-XT-S	Made in Germany	 II 1 G Ex ia IIC T6 Ga TÜV 09 ATEX 554975 X Ex ia IIC T6 Ga IECEx TUN 09.0015X	  0044
T _{amb} -50 °C...+55 °C @ T6 T _{amb} -50 °C...+70 °C @ T4		WARNING: Explosion Hazard Read Operation Instructions before installation.	
Process conditions: See operating instructions! P _{max} 20,0 bar @ +38 °C T _{gas} -196 °C...+280 °C P _{max} 10,9 bar @ +280 °C Flange size: 2" / CL150		AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.	
Power Supply: SELV = 15...28 Vdc; max. 500 mA		ADVERTENCIA: amenaza de explosão Leia modos de aplicação antes de instalar.	
Um = 125 V 4100317		 	

Example of marking plate passive (SLAVE) FLSE100-XT-S (ATEX/IECEX)

Fig. 7 Type plate example FLSE100-XT-M







 FLSE100-XT-M	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany	 II 1/2 G Ex db [ia Ga] IIB T4 Ga/Gb TÜV 09 ATEX 554975 X Ex db [ia Ga] IIB T4 Ga/Gb IECEx TUN 09.0015X	  0044
	F1F-MSADBYA1AN4IA6RASBFANNNNNN Part No. 1098180 Serial No. 12345678 Made in Germany		
T _{amb} -40 °C...+70 °C		WARNING: Explosion Hazard Read Operation Instructions before installation.	
Process conditions: See operating instructions! P _{max} 20,0 bar @ +38 °C T _{gas} -196 °C...+280 °C P _{max} 10,9 bar @ +280 °C Flange size: 2" / CL150		AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.	
Power Supply: SELV = 15...28 Vdc; max. 500 mA		ADVERTENCIA: amenaza de explosão Leia modos de aplicação antes de instalar.	
Um = 125 V 4100315		 	

Example of marking plate FLSE100-XT-M (ATEX/IECEX)

 FLSE100-XT-M	Made in Germany	 II 1 G Ex ia IIC T6 Ga TÜV 09 ATEX 554975 X Ex ia IIC T6 Ga IECEx TUN 09.0015X	  0044
T _{amb} -50 °C...+55 °C @ T6 T _{amb} -50 °C...+70 °C @ T4		WARNING: Explosion Hazard Read Operation Instructions before installation.	
Process conditions: See operating instructions! P _{max} 20,0 bar @ +38 °C T _{gas} -196 °C...+280 °C P _{max} 10,9 bar @ +280 °C Flange size: 2" / CL150		AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.	
Power Supply: SELV = 15...28 Vdc; max. 500 mA		ADVERTENCIA: amenaza de explosão Leia modos de aplicação antes de instalar.	
Um = 125 V 4100315		 	

Example of marking plate passive (SLAVE) FLSE100-XT-M (ATEX/IECEX)

Fig. 8 Type plate example FLSE100-XT-H







SICK FLSE100-XT-H	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany	 II 2 G Ex db IIC T6 Gb TÜV 09 ATEX 555321 X Ex db IIC T6 Gb IECEx TUN 09.0016X	 
	F1F-HSADDDYA1AN4DA6RASBECNNNNNN Part No. 1092248 Serial No. 12345678 Made in Germany		
T _{amb} -40 °C...+55 °C @ T6 T _{amb} -40 °C...+70 °C @ T4	IP 66/67	WARNING: Explosion Hazard Read Operation Instructions before installation.	AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.
Process conditions: See operating instructions! P _{max} 20.0 bar @ +38 °C P _{max} 10.9 bar @ +280 °C T _{gas} -70 °C...+280 °C Flange size: 2" / CL150	Power Supply: SELV --- 15...28 Vdc; max. 500 mA	  	ADVERTENCIA: ameaça de explosão Leia modos de aplicação antes de instalar.
4100312			

Example of marking plate FLSE100-XT-H (ATEX/IECEx)

SICK FLSE100-XT-H	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany	 II 2 G Ex db IIC T6 Gb TÜV 09 ATEX 555321 X Ex db IIC T6 Gb IECEx TUN 09.0016X	 
	F1F-HSADDDYA1AN4DA6RASBEDNNNNNN Part No. 1092250 Serial No. 12345678 Made in Germany		
T _{amb} -50 °C...+55 °C @ T6 T _{amb} -50 °C...+70 °C @ T4	IP 66/67	WARNING: Explosion Hazard Read Operation Instructions before installation.	AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.
Process conditions: See operating instructions! P _{max} 20.0 bar @ +38 °C P _{max} 10.9 bar @ +280 °C T _{gas} -70 °C...+280 °C Flange size: 2" / CL150	Power Supply: SELV --- 15...28 Vdc; max. 500 mA	  	ADVERTENCIA: ameaça de explosão Leia modos de aplicação antes de instalar.
4100312			

Example of marking plate passive (SLAVE) FLSE100-XT-H (ATEX/IECEx)

Fig. 9 Type plate example FLSE100-XT-P

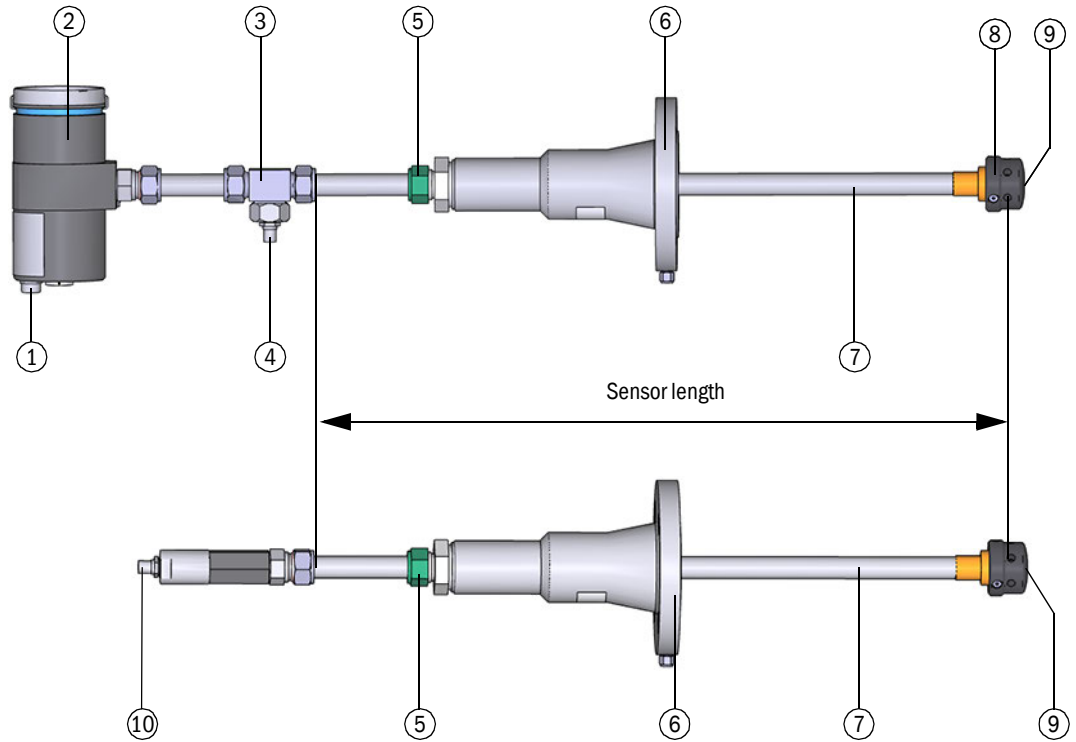
SICK FLSE100-XT-P	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany	 II 1/2 G Ex db [ia Ga] IIC T6 Ga/Gb TÜV 09 ATEX 554975 X Ex db [ia Ga] IIC T6 Ga/Gb IECEx TUN 09.0015X	 
	F1F-PSADCYA1AN1IA6RASBFCNNNNNN Part No. 1068603 Serial No. 12345678 Made in Germany		
T _{amb} -40 °C...+55 °C @ T6 T _{amb} -40 °C...+70 °C @ T4	IP 66/67	WARNING: Explosion Hazard Read Operation Instructions before installation.	AVERTISSEMENT: Risque d'explosion Lisez les modes d'emploi avant l'installation.
Process conditions: See operating instructions! P _{max} 20.0 bar @ +38 °C P _{max} 10.9 bar @ +280 °C T _{gas} -196 °C...+280 °C Flange size: 2" / CL150	Power Supply: SELV --- 15...28 Vdc; max. 500 mA	  	ADVERTENCIA: ameaça de explosão Leia modos de aplicação antes de instalar.
Um = 125 V 4100317			

Example of marking plate FLSE100-XT-P (ATEX/IECEx)

5.3.2 **Sender/receiver units**

Cross-duct

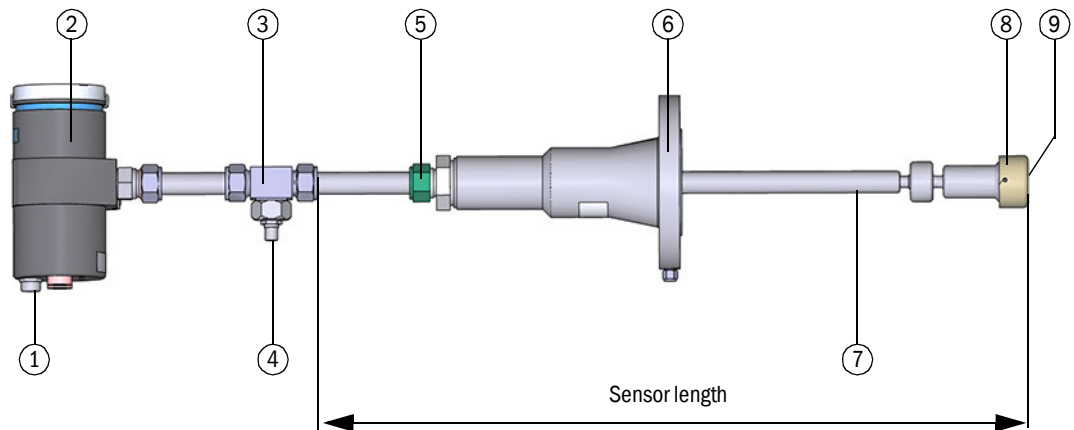
Fig. 10 F1F-S (Master and slave shown as examples)



- | | |
|--|--|
| 1 Pressure compensation element | 6 Retraction nozzle |
| 2 Electronics unit | 7 Duct probe |
| 3 T-connector | 8 Sensor contour |
| 4 TNC connector (connection for Slave) | 9 Transducer |
| 5 Self-cutting ring | 10 TNC connector (connection for Master) |

Fig. 11

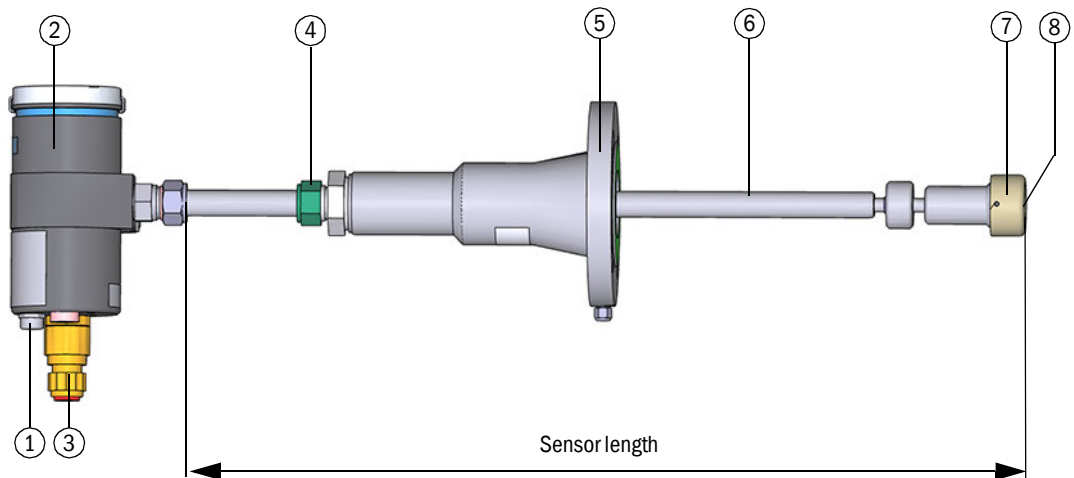
F1F-M (only master shown)



- | | |
|--|---------------------|
| 1 Pressure compensation element | 6 Retraction nozzle |
| 2 Electronics unit | 7 Duct probe |
| 3 T-connector | 8 Sensor contour |
| 4 TNC connector (connection for Slave) | 9 Transducer |
| 5 Self-cutting ring | |

Fig. 12

F1F-H (only master shown)

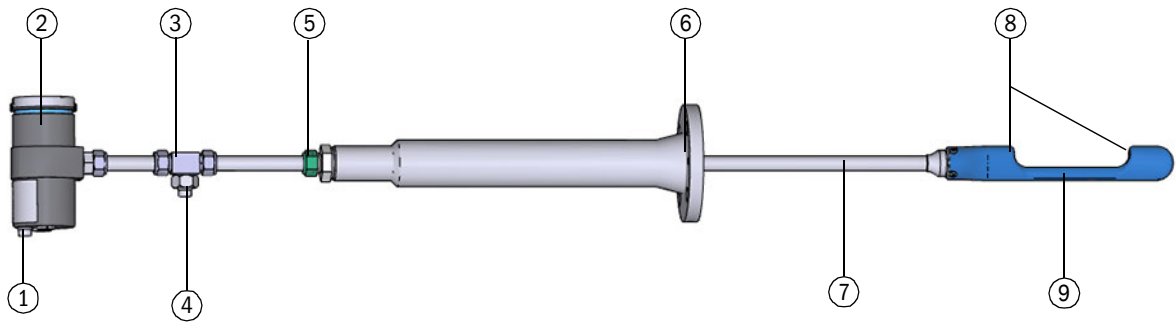


- | | |
|--------------------------------------|---------------------|
| 1 Pressure compensation element | 5 Retraction nozzle |
| 2 Electronics unit | 6 Duct probe |
| 3 Cable gland (connection for Slave) | 7 Sensor contour |
| 4 Self-cutting ring | 8 Transducer |

Probe version

Fig. 13

F1F-P

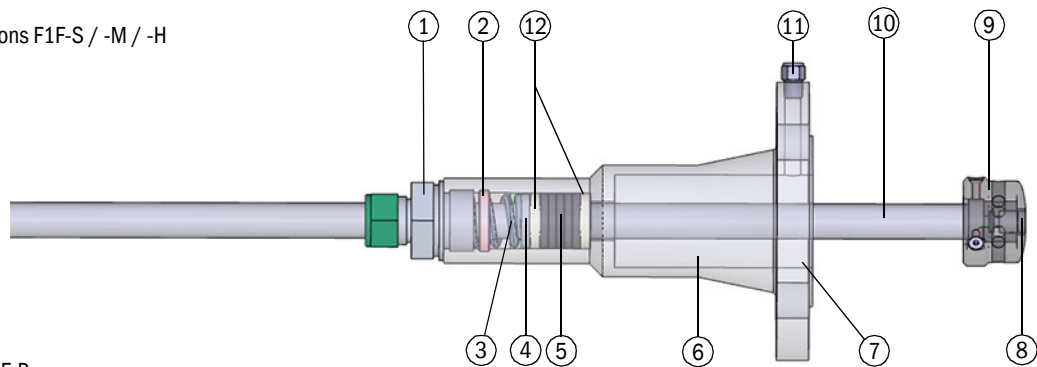


- | | |
|---------------------------------|---------------------|
| 1 Pressure compensation element | 6 Retraction nozzle |
| 2 Electronics unit | 7 Duct probe |
| 3 T-connector | 8 Transducer |
| 4 Pressure compensation element | 9 Sensor contour |
| 5 Self-cutting ring | |

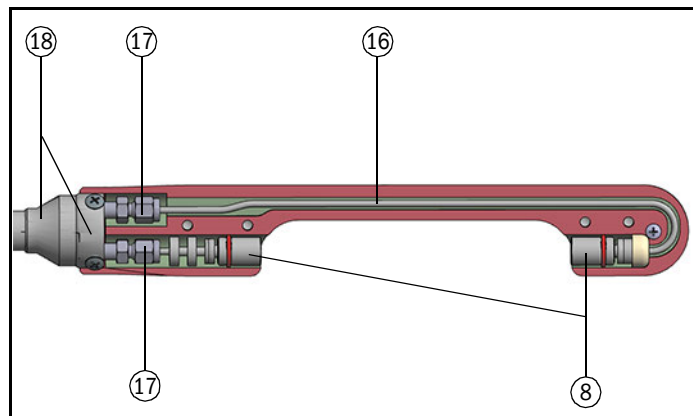
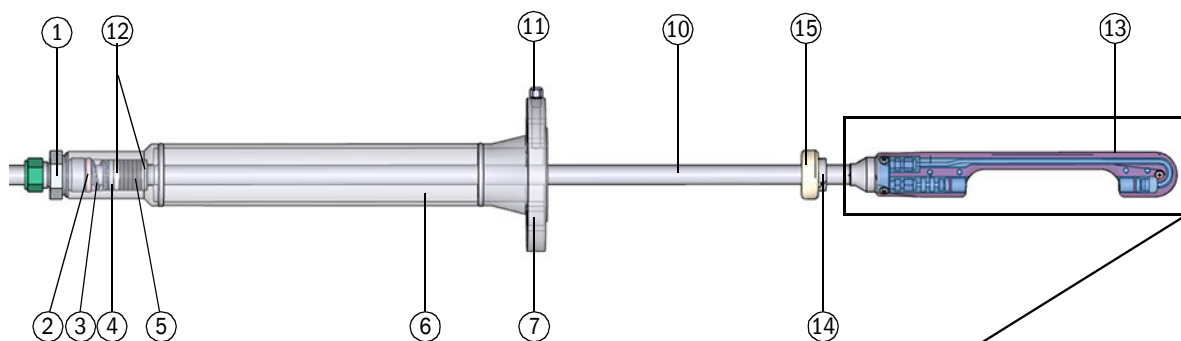
5.3.3 Material for parts with process gas contact

Fig. 14 Parts with process gas contact

Cross-duct versions F1F-S / -M / -H



Probe version F1F-P



- | | |
|----------------------|---------------------------------------|
| 1 Pipe screw fitting | 10 Duct probe |
| 2 Threaded ring | 11 Connection for optional venting |
| 3 Spring | 12 Centering |
| 4 Sealing disc | 13 Sensor contour probe version F1F-P |
| 5 Sealing profile | 14 Adjusting ring |
| 6 Retraction nozzle | 15 Thrust ring |
| 7 Retraction flange | 16 Probe tube |
| 8 Transducer | 17 Transducer pipe screw fitting |
| 9 Sensor contour | 18 Transducer and contour holder |

Table 3 Overview of parts with process gas contact

Material	Component	Type FLSE100-XT			
		F1F-S	F1F-M	F1F-H	F1F-P
Stainless steel 1.4404	Retraction flange (7), threaded ring (2)	x	x	x	x
	Connection for optional venting (11), retraction nozzle (6)	x	x	x	x
	Duct probe (10), sensor contour (13), transducer and contour holder (18), transducer pipe screw fitting (17)				x
	Adjusting ring (14), pipe screw fitting (1), sealing disc (4)	x	x	x	x
Titanium	Duct probe (10), transducer assembly (8)	x	x	x	
	Transducer assembly (8), probe tube (16)				x
PTFE	Centering (12)	x	x	x	x
	Sensor contour (9)	x	x	x	
	Thrust ring (15)				x
PTFE/graphite	Sealing profile (5)	x	x	x	x
Stainless steel 1.4568	Spring (3)	x	x	x	x

5.4 **Spool piece option**

The FLOWSIC100 Flare-XT can also be fitted with an optional spool piece to reduce geometric uncertainty of device installation and to simplify assembly. The exact design (nominal diameter, connection, material) always depends on the customer specifications.

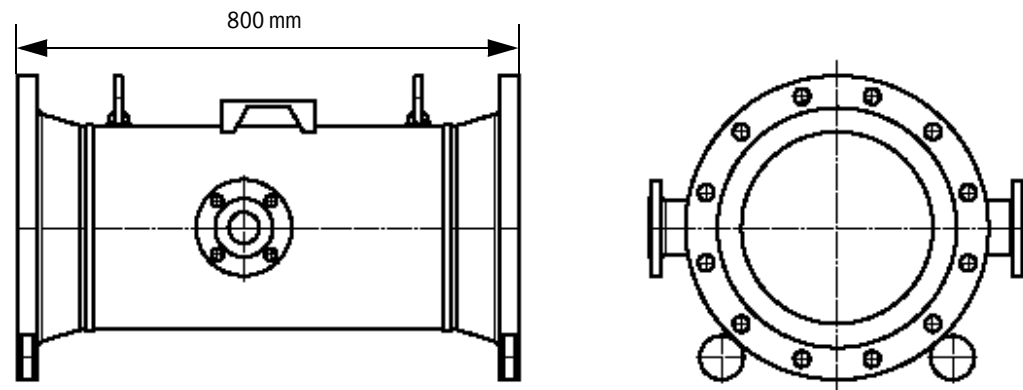
The installation length of the spool piece depends on the nominal diameter of the pipe:

- Installation length 800 mm for pipe diameter up to 28"
- Installation length 1100 mm for pipe diameter 30" ... 60"
- Installation length for pipe diameter >60"...72" on request

All system solutions (FLOWSIC100 Flare-XT + spool piece) are optionally available with pressure and temperature sensors. For the positioning of pressure and temperature transmitters the following configurations are available:

- Spool piece with standard installation length with integrated pressure tapping, temperature sensor 5 D_T (= 5 * diameter of the thermowell) in the outflow area
- Spool piece, extended length with integrated pressure and temperature tapping.

Fig. 15 Spool piece option (example)



5.5 Transport and storage

Comply with permissible storage conditions (→ p. 153, §12).

5.5.1 Transport protection

To prevent transport damage, the FLSE100-XT sender/receiver units must be secured according to Fig. 16 before each transport.

- ▶ Retract the transducer fully into the retraction nozzle.
- ▶ Ensure in a suitable manner that the transducer cannot slip out of the retraction nozzle during transport.

Fig. 16

Transport protection



1 Retraction nozzle

5.5.2 Special notes for handling the spool piece option

Transport and storage

- ▶ During all transport and storage work, ensure:
 - The spool piece is well secured at all times
 - Measures are taken to avoid mechanical damage
- ▶ Protect sealing surfaces of the flanges and the interior of the spool piece if it must be stored outside for more than one day, e.g. with Anticorit spray (not required for spool pieces made of stainless steel). Do the same if the meter must be stored in dry conditions, but for more than a week.

Lifting requirements



WARNING: Danger due to size and mass of the spool piece

- ▶ Only use lifting gear and load handling equipment (e.g. lifting straps) which are suitable for the weight to be lifted. Max. load information can be found on the type plate of the lifting gear.
- ▶ Only use the eye bolts when lifting the spool piece.
- ▶ Do not lift the spool piece using these eye bolts when additional loads (e.g. blind flanges, filling for pressure tests or tubes) are attached.
- ▶ During transport, the spool piece must not be turned over or start to swing.

Fig. 17

Lifting requirements (installed sender/receiver units are not shown)



5.6 Installation

5.6.1 Safety information



WARNING: Risks during installation

- ▶ Observe the relevant safety regulations as well as the safety notices on → p. 13, §2 during all installation work.
- ▶ Carry out assembly work on equipment with hazard potential (hot or aggressive gases, higher internal pipeline pressure) only when the equipment is at a standstill.
Fitting when the equipment is running is only possible using the “hot tapping method”. Such work may only be carried out by a specialized contractor authorized by the plant operator.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.



WARNING: Mechanical burden

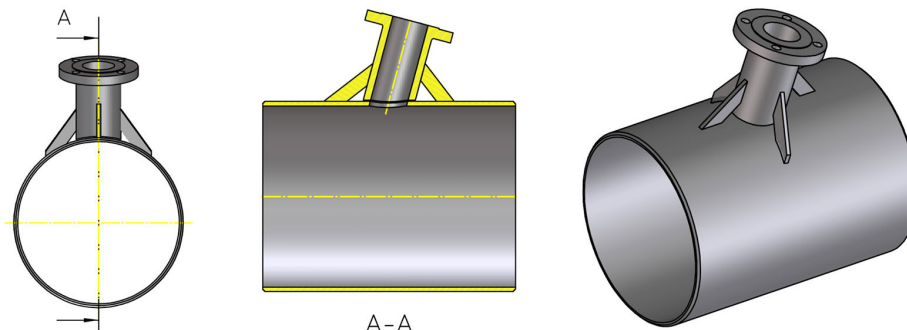
- The static load moment of all parts to be installed on the pipeline can be up to approx. 600 Nm. Strong pipe vibrations can cause damage and can lead to dangerous situations.
- ▶ Use a mechanical support for the nozzles welded to the pipeline, e.g. “gusset plates”.



NOTICE:

The plant operator is responsible for the safety of the system under mechanical load.

Fig. 18 Option mechanical support for nozzle “gusset plates”



5.6.2 Scope of delivery

- ▶ Check that delivery includes all ordered parts.
- ▶ Check parts for possible transport damage. Pay particular attention to transducer surfaces, sealing surfaces on the flanges and, if delivered, the interior of the spool piece.
- ▶ Immediately document and report damage to the manufacturer.



NOTICE:

To ensure safe and reliable operation of the measuring devices, ensure that the current operating conditions on the system correspond to the specifications on the type plates of the sender/receiver units.

5.6.3 Fitting the spool piece (option)

The spool piece must be mounted in the pipeline so that the arrow marking on it corresponds to the flow direction.

The flow is output by the measuring system as a positive value when master and slave of the sender/receiver units for the cross-duct versions are installed according to → p. 18, §3.3.



WARNING: Danger due to size and mass of the spool piece

▶ Observe the transport information in → p. 44, §5.5.2 !

Required fitting work

- ▶ Position the spool piece at the desired section of the pipeline using the hoist.
- ▶ After attaching the flange bolts, but before tightening, check the correct seating and alignment of the flange seal.
- ▶ Align the spool piece so that the offset between inlet pipe, spool piece and outlet pipe is minimized.
- ▶ Insert the remaining fixing screws and tighten the nuts crosswise. The applied torque must not be lower than specified in the project planning.
- ▶ Install the pressure measurement line between the pressure tapping point (option) and the pressure sensor (option).

Perform a leak tightness check with suitable means after completion of the installation work, → p. 74, §5.6.8.4.

5.6.4 Installation sequence

Carry out all assembly work on-site.

This includes:

- ▶ Determining the nozzle position
- ▶ Welding the nozzle on

The nozzles are manufactured precisely at the factory according to customer specifications for fitting on the pipeline.

- ▶ For retractable installation:
Fitting the ball valves (measuring system without optional spool piece)
- ▶ Fitting the sender/receiver units



NOTICE:

To ensure measurement accuracy, the geometric parameters must be determined as exactly as possible. Maximum tolerances:

- Nozzle positions and fitting angle of the nozzles: $\pm 1 \text{ mm} / \pm 1^\circ$
- Measurement of nozzle length: $\pm 1 \text{ mm}$
- Measurement of ball valves: $\pm 1 \text{ mm}$



NOTICE:

The exact wall thickness must be determined for precise calculation of the pipeline inner diameter. "Schedule" information from the applicable standards is less accurate than an exact measurement.

The wall thickness must be determined accurately to 0.1 mm. SICK recommends using a suitable ultrasonic measuring instrument to determine the wall thickness.

5.6.5 Geometry calculator in FLOWgate™

Certain geometry parameters must be determined and calculated for installation of FLSE100-XT sender/receiver units.

The following dimensions can be calculated using the geometry calculator integrated in FLOWgate™:

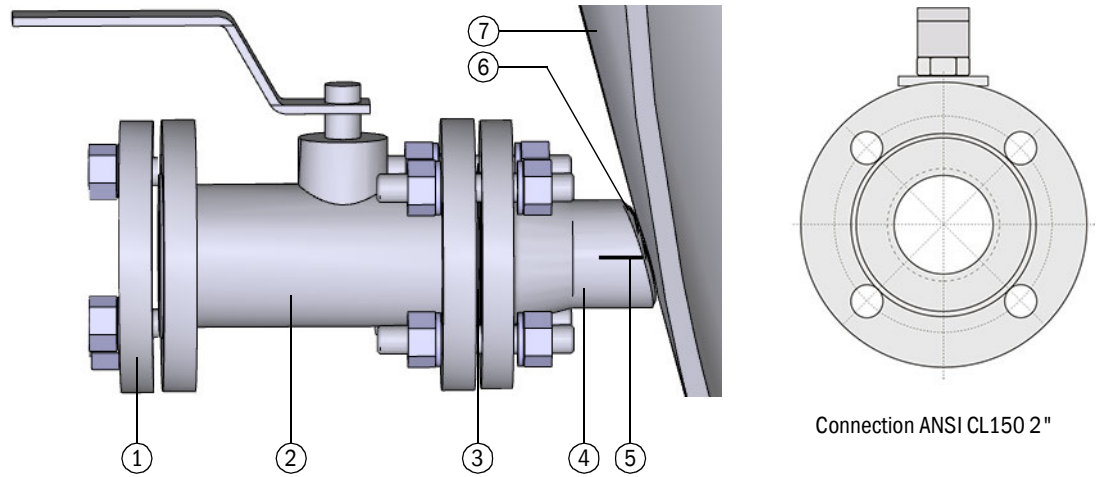
- Probe offset a (nozzle offset), → p. 54, §5.6.7.2.
The following parameters must be determined during installation for calculation of the probe offset:
 - Circumference, wall thickness and nominal nozzle angle
- Wetted part length wL, → p. 65, §5.6.8.1.
For installation of the sender/receiver units, the wetted part length is calculated from:
 - Circumference
 - Wall thickness
 - Gasket thickness
 - Nozzle length
 - For retractable installation: Ball valve length
 - Nozzle angle
 - Additionally for cross-duct versions: Probe offset a

Geometry installation parameters for commissioning the measuring system,
→ p. 65, §5.6.8.1.

5.6.6 Installation accessories

Sender/receiver units are fitted to the pipeline using the following material:

Fig. 19 Installation accessories (using ANSI CL150 as example)



- | | |
|---|-----------------|
| 1 Blind flange | 5 Marking |
| 2 Ball valve (only when sender/receiver units are to be retracted in operation) | 6 Welding bevel |
| 3 Seal | 7 Pipeline |
| 4 Nozzle | |



NOTICE:

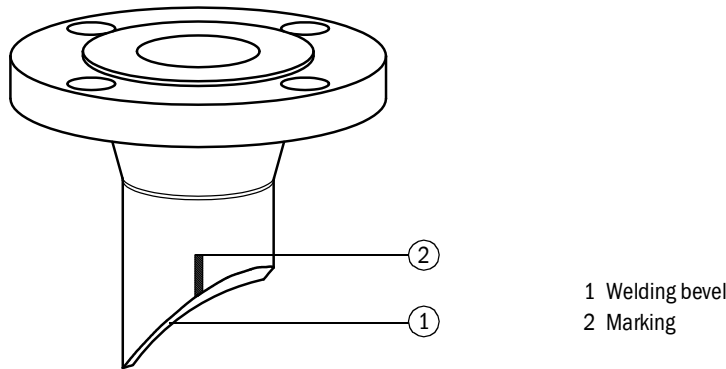
Use of installation accessories for temperature range according to type plate:

- The ball valve must not be insulated for media temperatures below $-40\text{ }^{\circ}\text{C}$ or higher than $+160\text{ }^{\circ}\text{C}$.
- For gas temperatures higher than $+180\text{ }^{\circ}\text{C}$ or below $-40\text{ }^{\circ}\text{C}$, the temperature at the nozzle flange must be checked after through-heating during initial start-up. If required, the nozzle insulation must be removed as required to stay in the specified temperature limit.
- Do not exceed temperature and pressure ranges listed in → p. 167, §12.7. It must be ensured that the temperature of the nozzle and ball valve is not so high that the material strength can no longer be guaranteed when derating the pressure over the temperature, → p. 167, §12.7.

5.6.6.1 **Nozzles, blind flanges and seals**

Nozzles are delivered with factory adaption to the nominal pipe diameter, welding bevel and marking for nozzle alignment according to the gas flow.

Fig. 20 Nozzle



Nozzles and blind flanges





 **NOTICE:** Observe the diagrams on → p. 167, §12.7.

Table 4 Available nozzles and blind flanges


Flange connection	Material	Temperature ranges
CL150	LTCS P355 QH1 / A350 LF2	-46 ... +280 °C
	SS 1.4401, 1.4404, ASTM A182 Gr. 316, 316L	-196 ... +280 °C
CL300	LTCS P355 QH1 / A350 LF2	-46 ... +280 °C
	SS 1.4401, 1.4404, ASTM A182 Gr. 316, 316L	-196 ... +280 °C
PN25 DN50	LTCS P355 QH1 / A350 LF2	-46 ... +280 °C
	SS 1.4401, 1.4404, ASTM A182 Gr. 316, 316L	-196 ... +280 °C

 **NOTICE:** Observe the diagrams on → p. 167, §12.7.

 Dimension drawings of the nozzles are available on the product CD and/or available from SICK.

 To prevent galvanic corrosion between LTCS nozzles and stainless steel ball valves, a nozzle insulation set (sealing material set with polymer seals and sleeves) is available as an accessory, → p. 62, §5.6.8.

Seals

 **NOTICE:** Observe the diagrams on → p. 167, §12.7.

Flat seals are required for the flange connection between nozzle and ball valve and between the ball valve and the sender/receiver unit. These seals are included in the standard scope of delivery of the ball valve and/or sender/receiver unit.

Table 5 Available seals

Material	Temperature range
Serrated gasket B9A 1.4571	-196 ... +280 °C

5.6.6.2 **Ball valve**

The ball valve serves for safe separation of the sender/receiver units from the process and is required when the sender/receiver units are to be dismantled during the process. SICK recommends using a ball valve.

Ball valves for various flange connections (CL150, CL300, PN25 DN50) and temperature ranges) are available.

**NOTICE:**

Observe the diagrams on → p. 167, §12.7.

Table 6 Ball valve according to ANSI

Component	Connection	Material (ASTM)	Gas temperature range
Standard temperature			
Ball valve CL150 2" SS	CL150 2"	Stainless steel 1.4408 (CF08M)	-46...+200°C (-50...+392°F)
Ball valve CL300 2" SS	CL300 2"	Stainless steel 1.4408 (CF08M)	-46...+200°C (-50...+392°F)
Low temperature			
Ball valve CL150 2" SS	CL150 2"	Stainless steel 1.4408 (CF08M)	-196...+200°C (-320...+392°F)
Ball valve CL300 2" SS	CL300 2"	Stainless steel 1.4408 (CF08M)	-196...+200°C (-320...+392°F)
High temperature			
Ball valve CL150 2" SS	CL150 2"	Stainless steel 1.4408 (CF08M)	-50...+400°C (-58...+752°F)
Ball valve CL300 2" SS	CL300 2"	Stainless steel 1.4408 (CF08M)	-50...+400°C (-58...+752°F)

Table 7 Ball valve according to DIN

Component	Connection	Material (ASTM)	Gas temperature range
Standard temperature			
Ball valve PN16 DN50 SS	PN16 DN50	Stainless steel 1.4408 (CF08M)	-46...+200°C (-50...+392°F)
Low temperature			
Ball valve		Stainless steel 1.4408 (CF08M)	-196...+200°C (-320...+392°F)
High temperature			
Ball valve PN40 DN50	PN40 DN50	Stainless steel 1.4408 (CF08M)	-50...+400°C (-58...+752°F)

5.6.6.3 Nozzle installation tool

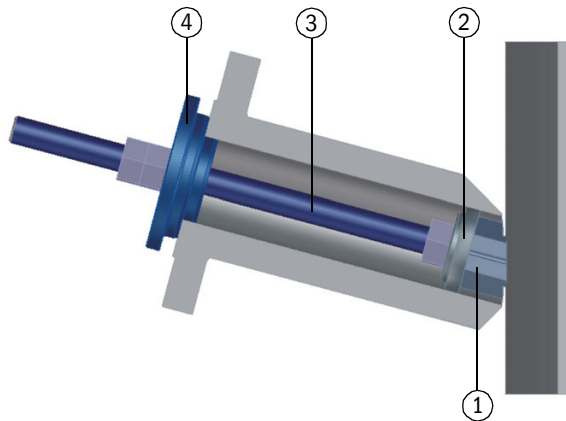
The installation tool serves to align and weld the nozzle on the pipeline. SICK offers various nozzle installation tools depending on the nominal pipe diameter and path configuration.

The nozzle installation tool contains, per nozzle

- Welding aid M16 75 ° (1),
- Centering plate 2" (2),
- Threaded rod M16 length 290 mm (3),
- Centering 2" (4),
- Assembly material
- Installation paper strip as tool to determine the exact nozzle position on the pipeline.

Fig. 21

Nozzle installation tool

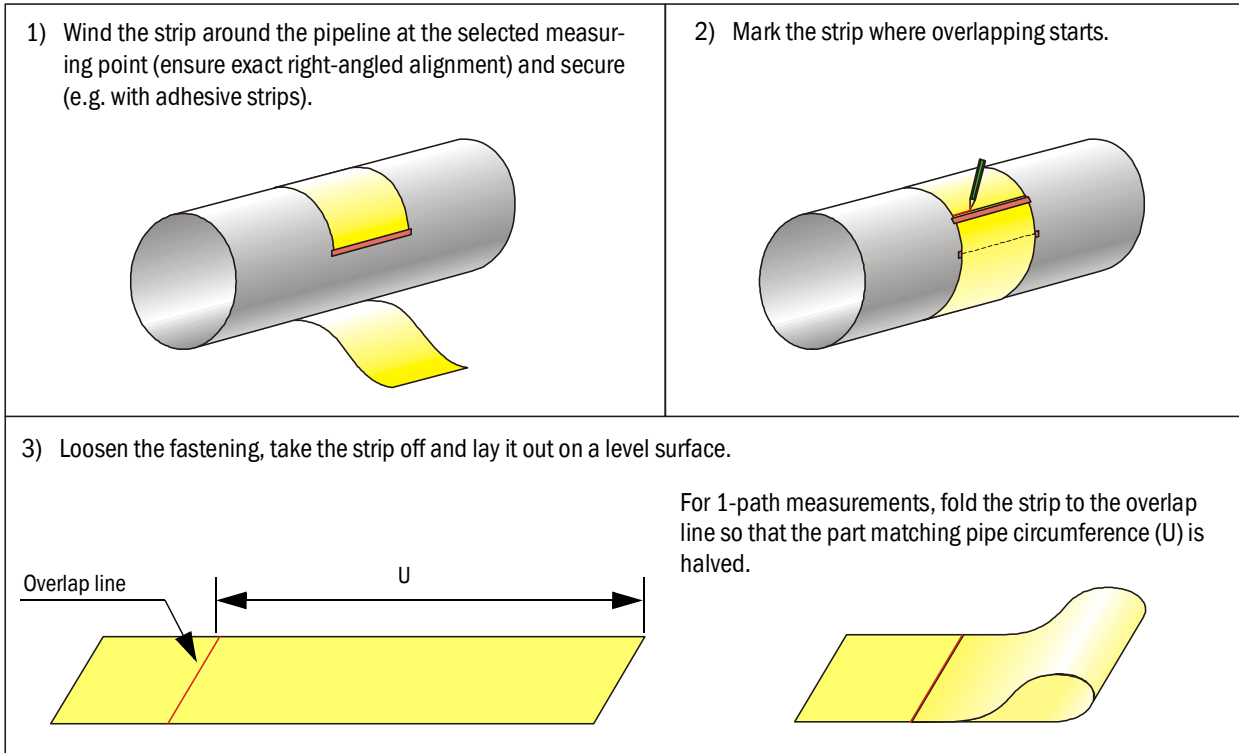


5.6.7 **Fitting the nozzles on the pipeline (measuring system without spool piece option)**

5.6.7.1 **General preparation work**

The installation tool (→ p. 52, §5.6.6.3) contains a foil strip (length approx. 4 times the pipe diameter, width approx. 0.75 of the pipe diameter) as a resource to determine the exact position of the nozzle on the pipeline. The foil strip is prepared with nozzle markings for different pipe diameters.

Fig. 22 General preparation work



5.6.7.2 Determining the nozzle position for cross-duct versions

NOTICE: Note probe offset a , the wall thickness and circumference U ; these values are required for calculating the path angle and path length with FLOWgate™ during commissioning.

Calculate probe offset a with the geometry calculator in FLOWgate™

- 1 Start FLOWgate™ operating software.
- 2 Create a FLOWSIC100 Flare-XT off-line device.
- 3 Open the “Geometry calculator” tile in the “Change parameters” menu.
- 4 Select the “Cross-duct” device type.
- 5 Select whether the installation is a 1- or 2-path installation.
To do this, move the “Number of paths” slider to “One path” or “Two paths” accordingly.
- 6 Enter circumference U and the wall thickness w in the “Dimensions of components” section.
- 7 Click “Calculate probe offset”.
Probe offset a is calculated.

Fig. 23 Geometry calculator in FLOWgate™

GEOMETRIC DIMENSIONS OF ASSEMBLING PARTS

Yes No

Path is retractable

mm Circumference U

mm Gasket thickness S

mm Transducer distance a

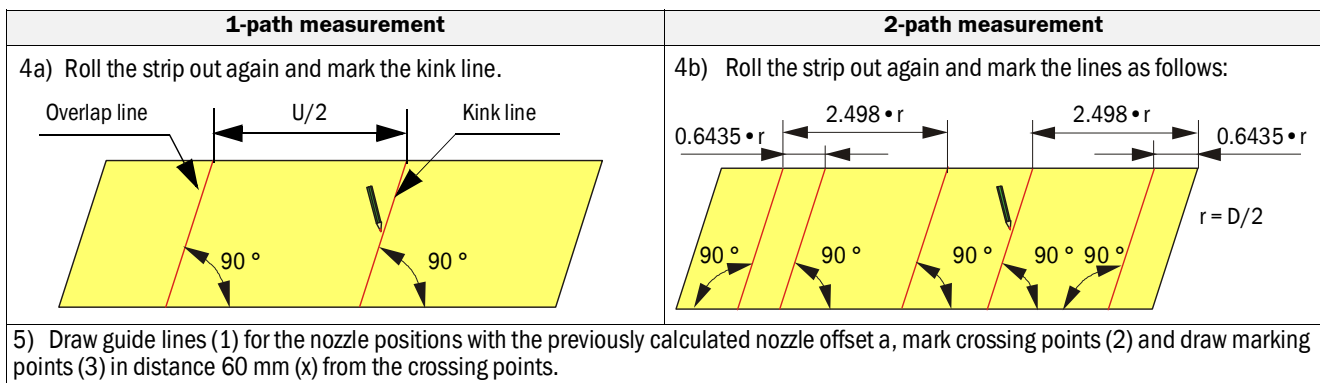
mm Length of ball valve V_L

mm Wall thickness w

DEG Nominal Nozzle Angle β

Marking the nozzle positions on the pipeline

Fig. 24 Determining the nozzle positions on the strip



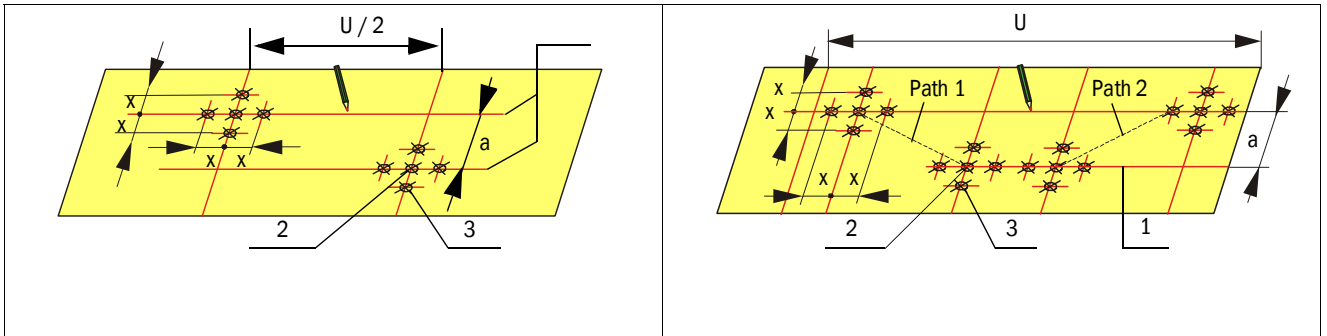


Fig. 25 Marking the nozzle positions on the pipeline for cross-duct versions

1-path measurement	2-path measurement
6) Roll the strip back around the pipeline and mark the nozzle positions with crossing and marking points by using a metal center punch.	
7) Take the strip off again and join the additional markings with a line.	

5.6.7.3 **Determining the nozzle position for the probe version**

Fig. 26 Determining the nozzle positions on the strip

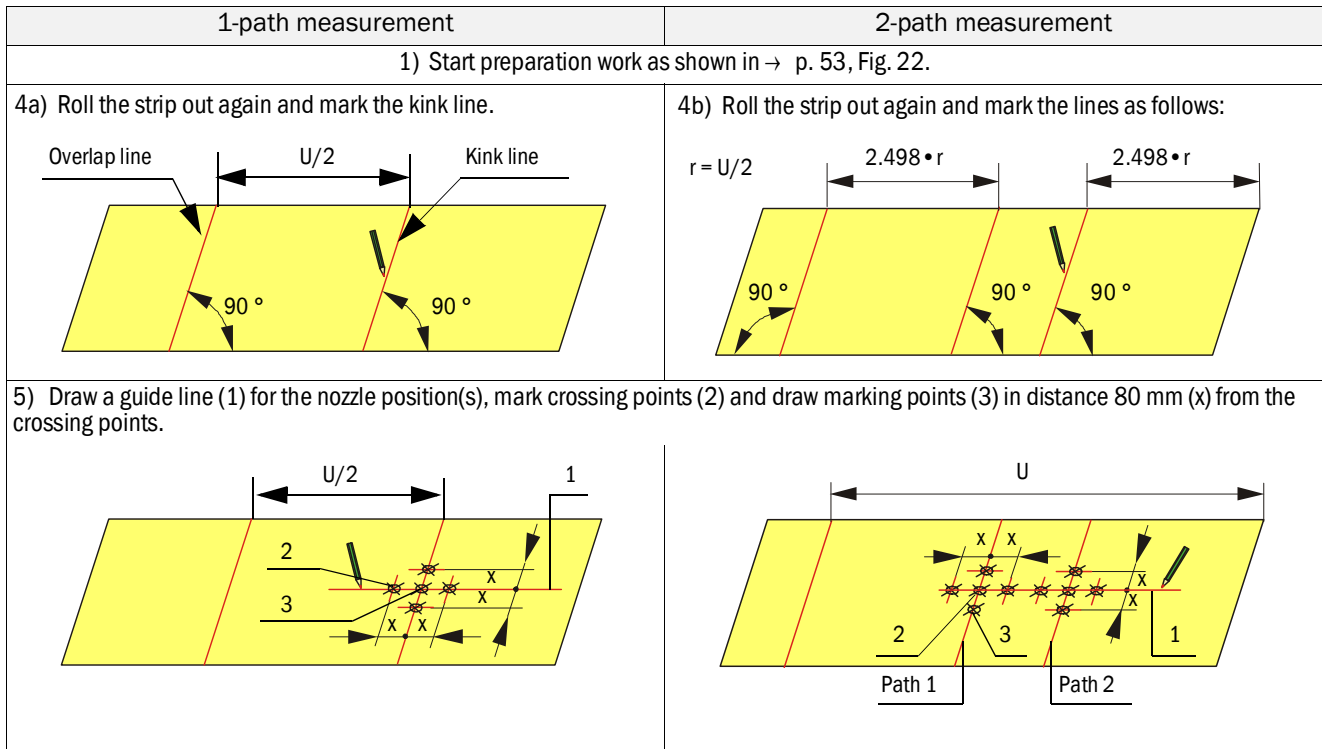
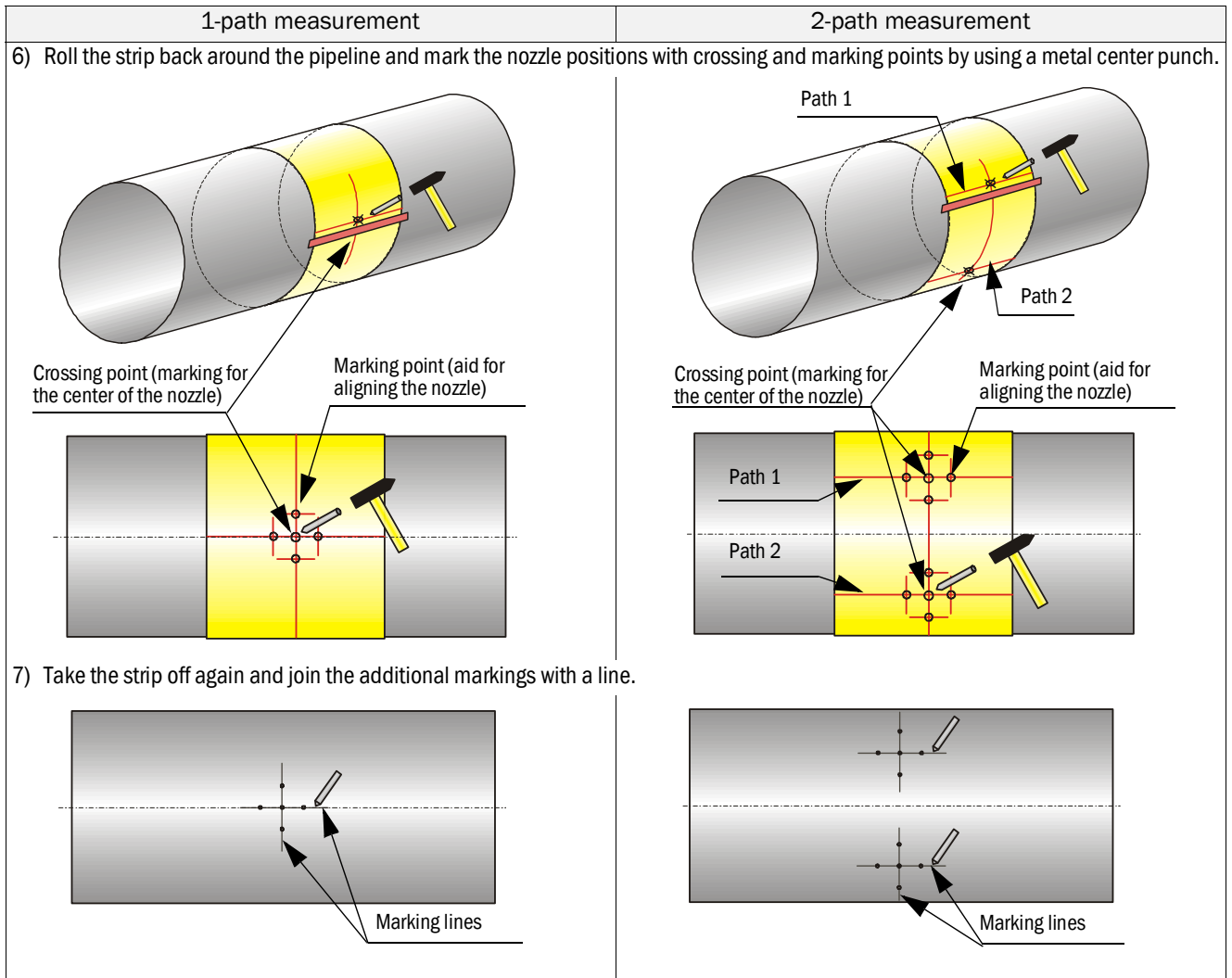


Fig. 27 Marking the nozzle position(s) on the pipeline for the probe version



5.6.7.4 **Welding the nozzle on**

Use the installation tool that corresponds to the nozzle to be welded on the pipeline to carry out the following work.



WARNING: Hazards through combustible gases or high pressure

If “hot tapping” is not used, depressurize the pipeline and flush free of flammable gases before starting the work.



WARNING: Risk of explosion/health hazard

A faulty welding seam can allow gas to escape from the pipeline. This can immediately lead to a dangerous situation.

- ▶ Ensure welding seams are gas-tight.
- ▶ Check strength and durable tightness of the welding seams.

WARNING: Qualified personnel required

- Any welding and installation work on pipelines may only be carried out by authorized personnel with a specific qualification.
- Special qualified and approved procedures have to be followed. This procedure requires the written agreement by the plant operator.
- The general safety requirements and all other plant operator instructions have to be followed.

► Position the welding aid (1) on the pipeline (2) as shown in → Fig. 28.

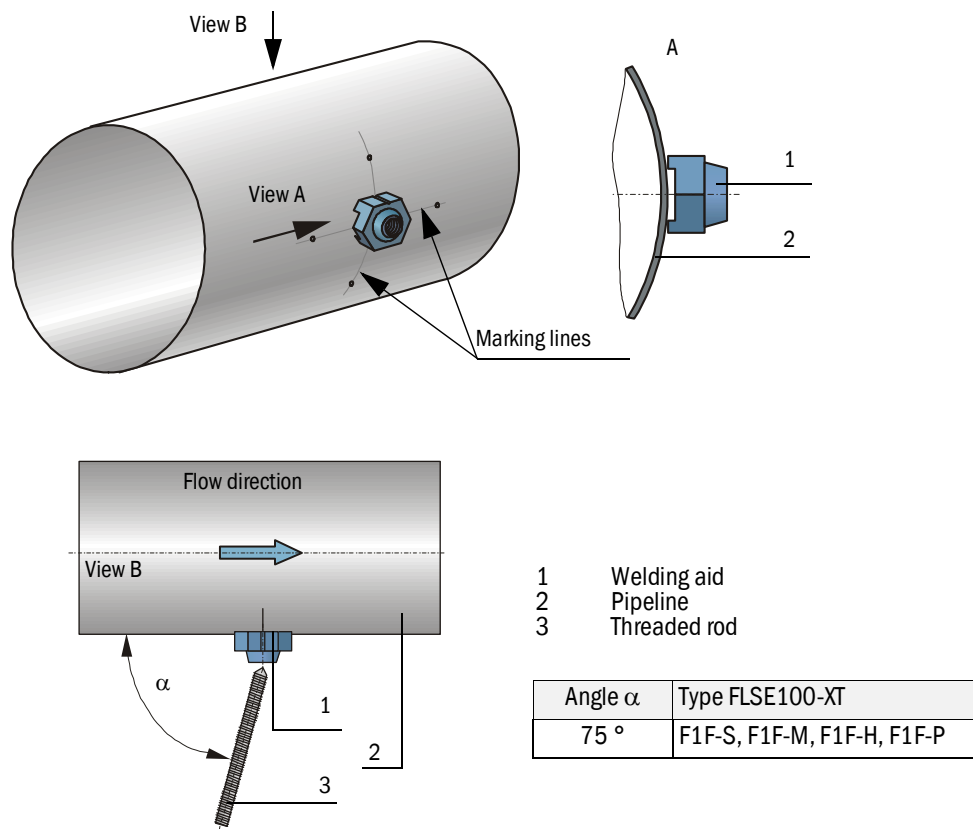
NOTICE: Check the welding aid position after welding. The deviation from the drawn lines must not be more than 0.5 mm. Otherwise reposition the welding aid.

► Screw in threaded rod (3) with the sharp tip in the welding aid.

NOTICE: The threaded rod is fitted by the manufacturer with a clamp ring. This is to aid removal of the centering plate following installation of the nozzles. The clamp ring should therefore not be removed.

Fig. 28

Positioning of the welding aid

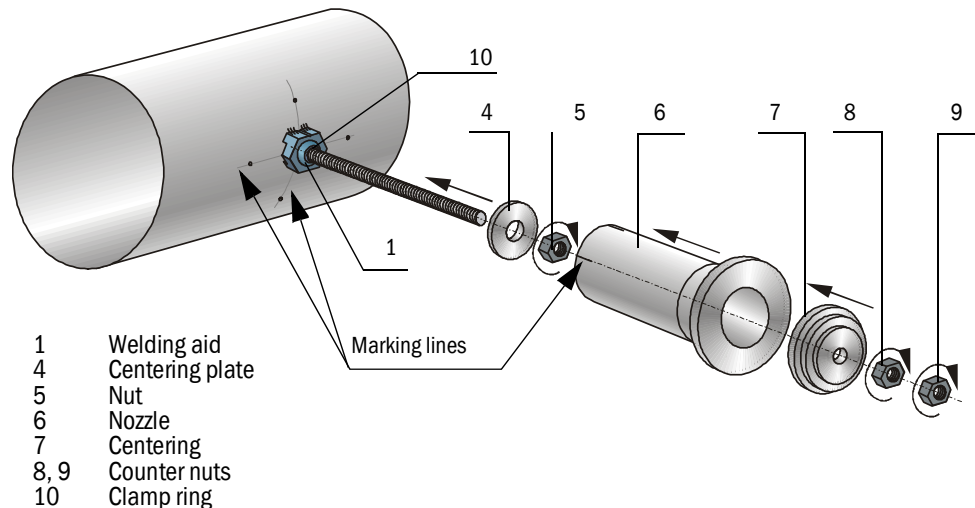


- Slide centering plate (4) on the cone of the welding aid (1) and fasten with the nut (5).
- Slide nozzle (6) over threaded rod and centering plate.

- ▶ Position centering (7) into the nozzle opening so that the marking on the centering corresponds to the nozzle type (ANSI or DIN, size).
- ▶ Screw counternuts (8), (9) onto the threaded rod, position and secure the nozzle with suitable auxiliary materials so that the required weld gap is achieved (e.g. use an uncoated wire).
Align the nozzle so that the marking lines on nozzle and pipe wall are flush.
- ▶ Then fasten the nozzle.

Fig. 29

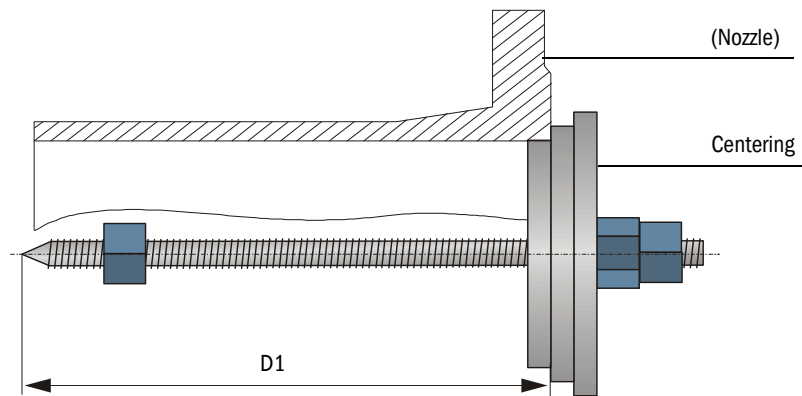
Fitting the nozzle



- ▶ Unscrew the threaded rod as a whole from the welding aid. To do this, place a wrench on the counternuts. The centering plate will be removed by the clamp ring.
- ▶ Finish off the weld seam piece by piece and allow sufficient time for cooling down to avoid unnecessary strain or distortion on the nozzle and pipe wall.
To achieve the measurement uncertainty according to → p. 153, §12 "Technical data", avoid lowering the nozzles into the pipe wall or distortion of the nozzles.
- ▶ For cross-duct versions of FLOWSIC100 Flare-XT (F1F-S, F1F-M, F1F-H):
 - Determine the distance D1 between outer pipe wall and centering after a sufficient time for cooling down.
 - On cross-duct versions, weld the nozzle on the opposite pipeline side in the same manner and then determine distance D2.
 - Note measures D1 and D2; these measures are required for the geometric calculation during commissioning.

Fig. 30

Determining the effective nozzle length



- ▶ Ball valves have to be installed when using retractable sender/receiver units. The ball valves are installed after finishing nozzle welding.
- ▶ Check and ensure gas tightness of ball valve installation before you continue.

**WARNING: Hazard through leakage**

- ▶ Operation in leaky condition is not allowed and potentially dangerous.
- ▶ Hazard through explosive, toxic and hot gas!

Drilling holes into the pipeline if plant is out of operation

The pipe wall must be drilled out at the nozzle position so that the sender/receiver unit can be inserted into the pipeline (→ p. 53, §5.6.7).

- ▶ Only once on each nozzle.
- ▶ Have this work done by skilled persons specially qualified for this work.

Drilling holes into the pipeline if plant is in operation (hot tap)



WARNING: Hazards during hot tapping

When sender/receiver units are installed on the pipeline when the pipeline is in operation (hot tapping):

- ▶ Only have this work done by skilled persons qualified for hot tapping.
- ▶ Comply with all legal, general and company-internal regulations.
- ▶ Only start installation work when all planned measures have been checked and approved by the plant operator.

- ▶ Only once on each nozzle.
- ▶ The hole cutter diameter must be 46 ... 48 mm for 2" nozzles.

- ▶ Mount the drilling tool on the ball valve.
- ▶ Open the ball valve and drill out the holes in the pipeline in the center of the nozzle position.
- ▶ Retract the drilling tool.
- ▶ Close the ball valve again. Then, remove the drilling tool.
- ▶ Mount a blind flange on the ball valve as long as no sender/receiver unit is installed.



WARNING: Accident risk

When the hole has been drilled and no sender/receiver unit has been installed: Gas flows through the pipeline when the ball valve is opened.

- ▶ Keep the ball valve closed and fitted until a sender/receiver unit has been fitted.
- ▶ Secure the ball valve against unintentional activation.
- ▶ Instruct other persons accordingly.

5.6.8

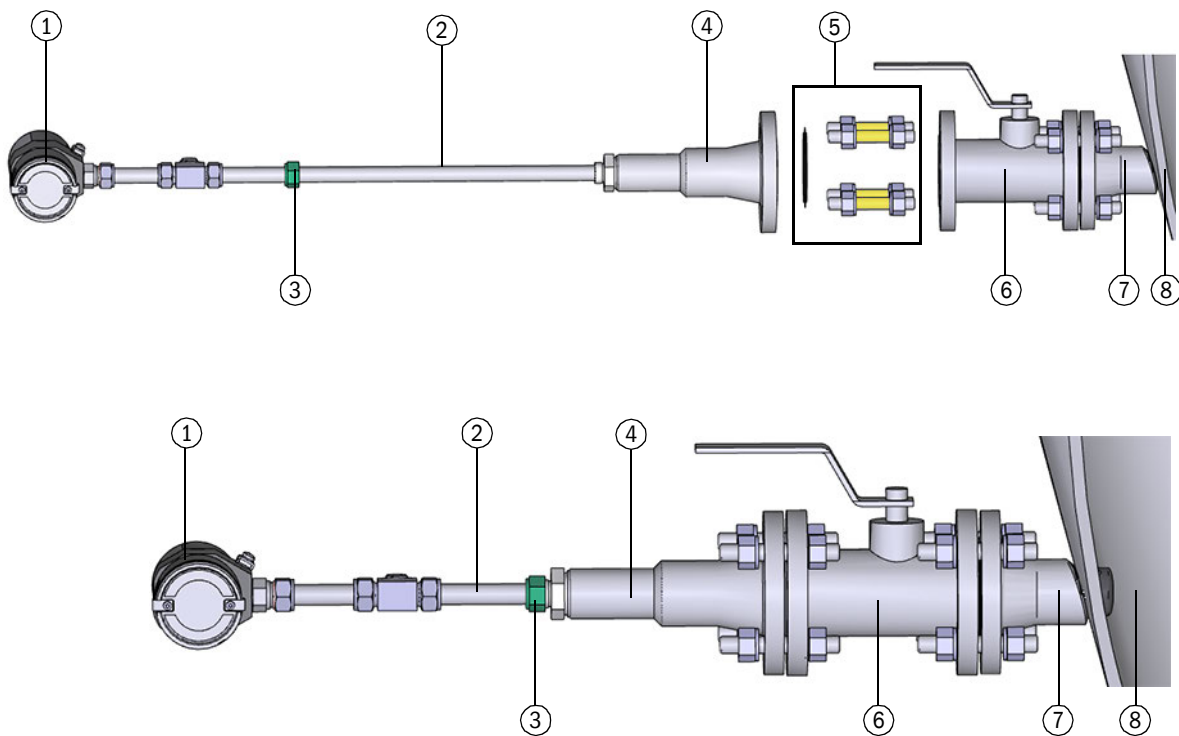
Fitting the sender/receiver units

**WARNING: General risks during installation**

- ▶ Observe and follow the valid regulations and safety regulations as well as the safety notices in → p. 28, §5.2.
- ▶ Take special precautions for plants with increased hazard potential (toxic/aggressive/explosive gases, higher pressure, higher temperature). Otherwise serious injuries are possible.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.
- ▶ Observe the allowable operating parameters during all work.
- ▶ Ball valve and sender/receiver unit do not function correctly following incorrect installation. Both parts can be damaged. Serious injuries are possible.

Fig. 31

Overview



- 1 Electronics unit
- 2 Duct probe
- 3 Cutting ring screw connection
- 4 Retraction nozzle

- 5 Mounting kit (gasket, fastening screws, nuts, washers, centering sleeves)
- 6 Ball valve
- 7 Nozzle
- 8 Pipeline

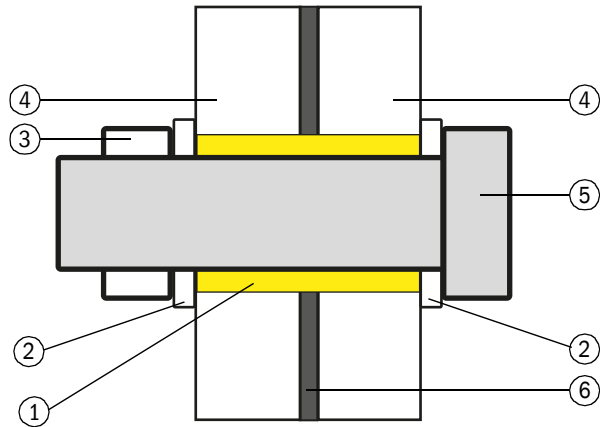
Using the centering sleeves

The mounting kit for the sender/receiver units includes centering sleeves.

The centering sleeves serve to ensure the centering of the process flanges of the sender/receiver units.

Fig. 32

Using the centering sleeves



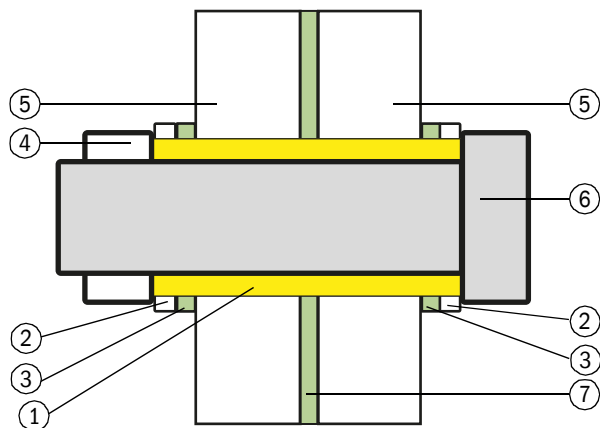
- | | |
|--------------------|-------------------|
| 1 Centering sleeve | 4 Flange |
| 2 Washer | 5 Fastening screw |
| 3 Nut | 6 Gasket |

Using the nozzle insulation set (accessory)

To prevent galvanic corrosion of the LTCS nozzles and stainless steel ball valves, a nozzle insulation set is available as an option (Part No. 2057569). The insulation sleeves included in the nozzle insulation set replace the standard centering sleeves. In this case, dispose of the centering sleeves and use the longer insulation sleeves instead.

Fig. 33

Using the nozzle insulation set



- | | |
|---------------------|-------------------|
| 1 Insulation sleeve | 5 Flange |
| 2 Washer | 6 Fastening screw |
| 3 Insulating disc | 7 Gasket |
| 4 Nut | |

Check the following points before installation

- Sender/receiver units to be fitted for a particular measuring point must belong to the same system to ensure the maximum measurement accuracy possible. Exchanging structurally identical sender/receiver units from different measuring systems is not allowed.
- Sender/receiver unit pairs are matched and can only be exchanged in pairs for identical units.
- Sender/receiver units from one system are marked with sequential serial numbers (printed on the device label).
The FLSE100-XT Master always has the lower number and the FLSE100-XT Slave the higher number.
- The flange connections of the sender/receiver units and nozzles must be compatible.
- The flange connections of the nozzles must be free of welding beads on the inside.

**NOTICE:**

The deformation characteristic of the flange gasket has an influence on the geometry of the installation and therefore on the uncertainty of the measurement. SICK recommends:

- Only use the same gasket type as the original delivery.
- Apply a tightening torque according to the installed gasket, → p. 187, §15.4.

5.6.8.1 Calculating the wetted part length w_L and geometric installation parameters

Before installation, calculate how deep the sender/receiver units will be pushed into the pipeline.

The wetted part length depends on:

- Nozzle length
- Gasket thickness
- Ball valve length
- Wall thickness



NOTICE:

The wall thickness must be determined accurately to 0.1 mm. SICK recommends using a suitable ultrasonic measuring instrument to determine the wall thickness.

- 1 Start operating software FLOWgate™.
- 2 Create a FLOWSIC100 Flare-XT off-line device.
 - 1 Open the “Geometry calculator” tile in the “Change parameters” menu.
 - 2 Select the “Cross-duct” or “probe” device type.
 - 3 Select whether the installation is a 1- or 2-path installation.
To do this, move the “Number of paths” slider to “One path” or “Two paths” accordingly.
 - 4 For installations with ball valve, move the “Path is changeable” slider to “Yes”, for installations without ball valve, move it to “No”.
 - 5 For cross-duct versions, enter the “Probe offset” as determined during nozzle installation, → p. 54, §5.6.7.2.
 - 6 Enter the required dimensions:
 - Circumference U
 - Wall thickness w
 - Gasket thickness S
 - Gasket thicknesses D1 and D2
 - For installation with ball valve: Length of ball valve VL
 - Angle β : For cross-duct versions, enter the nominal nozzle angle (e.g. 75°, 60°, 45°). For the probe version, measure the installation angle and enter the exact value (maximum tolerance for measuring the installation angle: $\pm 0.3^\circ$).
 - 7 Click “Calculate parameter values” in “Parameter values”.
The wetted part length w_L is calculated .
 - 8 Click “Create Report” to generate a protocol of the geometry data.



NOTICE:

The Geometry Data report is required when commissioning the measuring system with FLOWgate™, → p. 126, §7.5.4.

Fig. 34

Creating a protocol



Fig. 35 Installation of F1F-S, F1F-M, F1F-H (cross-duct versions)

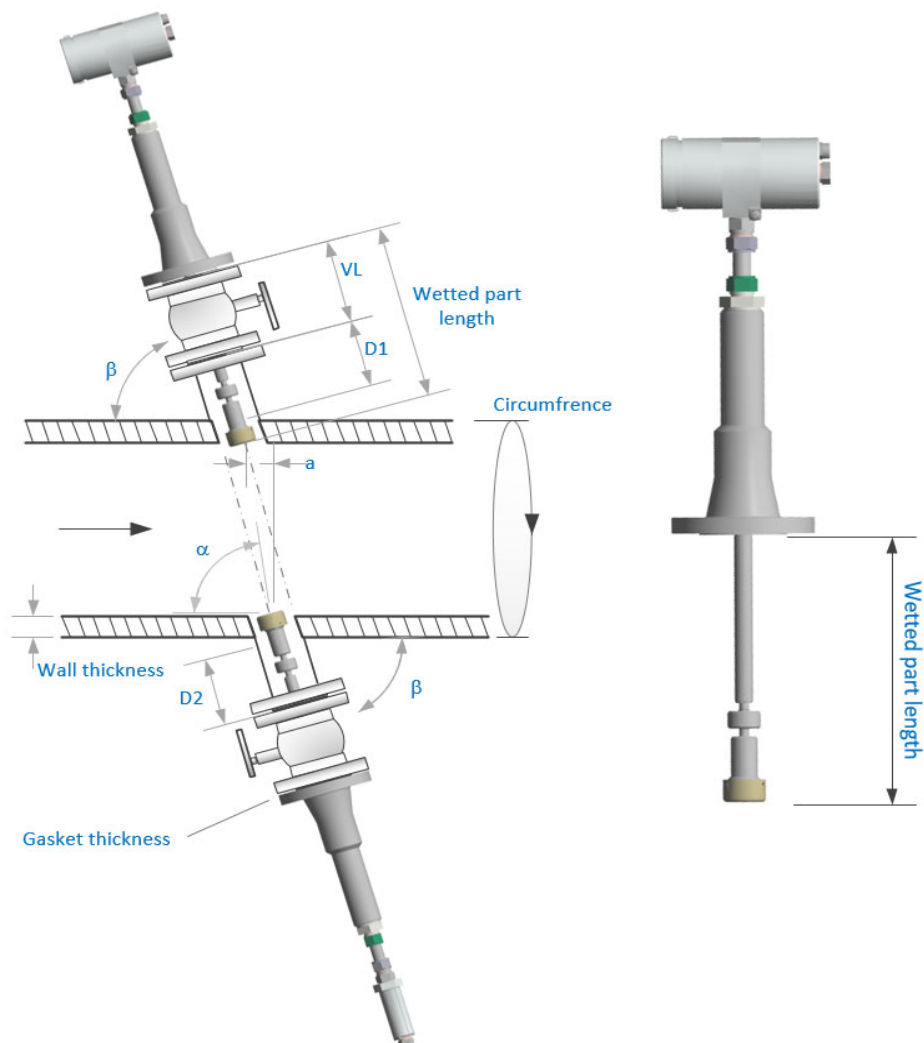
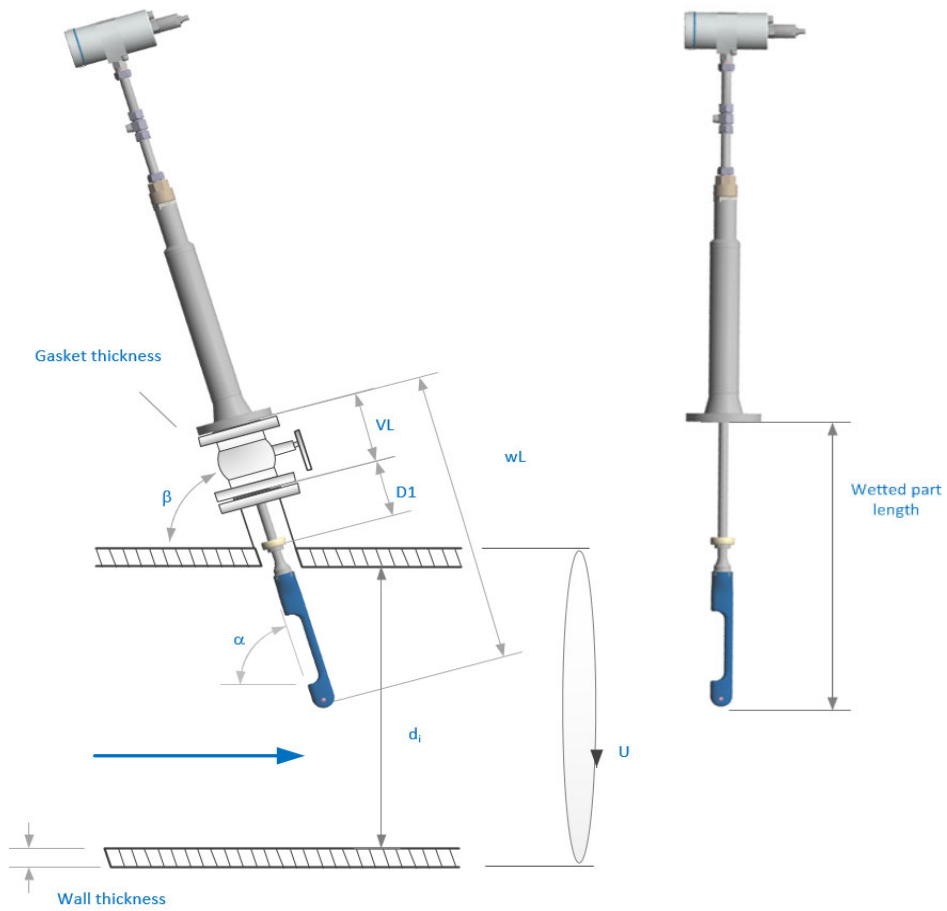


Fig. 36 Installation of F1F-P (probe version)



5.6.8.2

Tightening the self-cutting ring

SICK recommends that the correct setting of the wetted part length and tightening the cutting ring be carried out in a workshop before installation in the pipeline.

Tightening the self-cutting ring in the correct position ensures the correct wetted part length for installation in the pipeline.

**WARNING: Risk of leakage due to damage to the duct probe**

If the duct probe is displaced when the pipe screw fitting is tightened, the duct probe may be damaged so that no tightness can be achieved after tightening the cutting ring.

- ▶ Only move the duct probe when the pipe screw fitting is loosened.
- ▶ Tighten the pipe screw fitting with a torque of 150 Nm after positioning the duct probe.

Otherwise there is a risk of leakage.

**NOTICE: Damage due to incorrect position of the self-cutting ring**

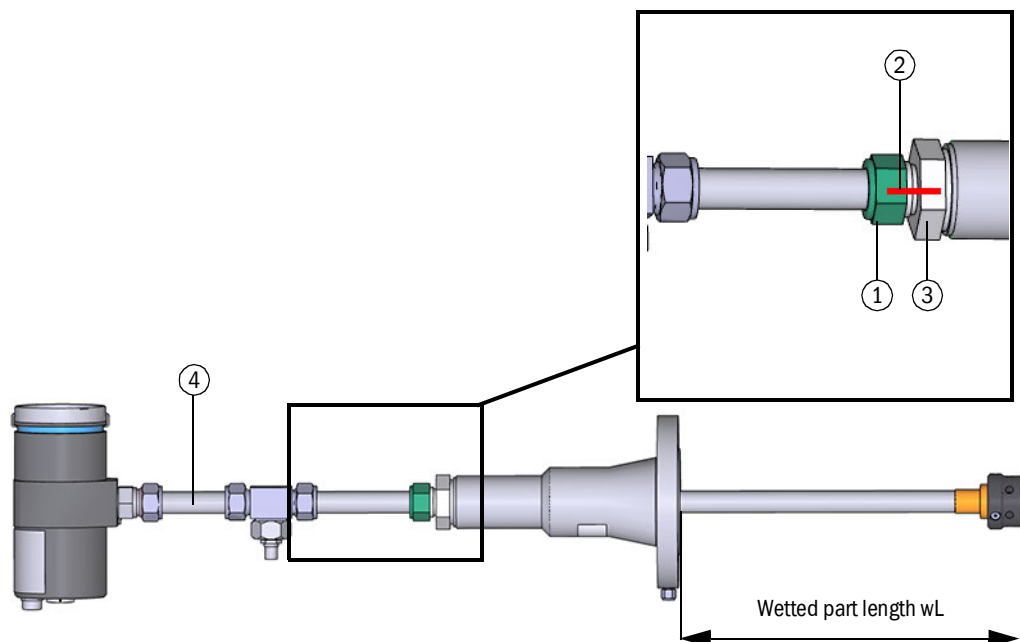
The position of the self-cutting ring cannot be changed after tightening! If the self-cutting ring is tightened in the wrong position, the sender/receiver unit must be replaced; for cross-duct versions both sender/receiver units must be replaced.

Before tightening the self-cutting ring, make sure that the wetted part length has been calculated correctly:

- ▶ Check the measured values.
- ▶ Check that the wetted part length is plausible compared with nozzle length and ball valve length.

Fig. 37

Positioning of self-cutting ring (overview)



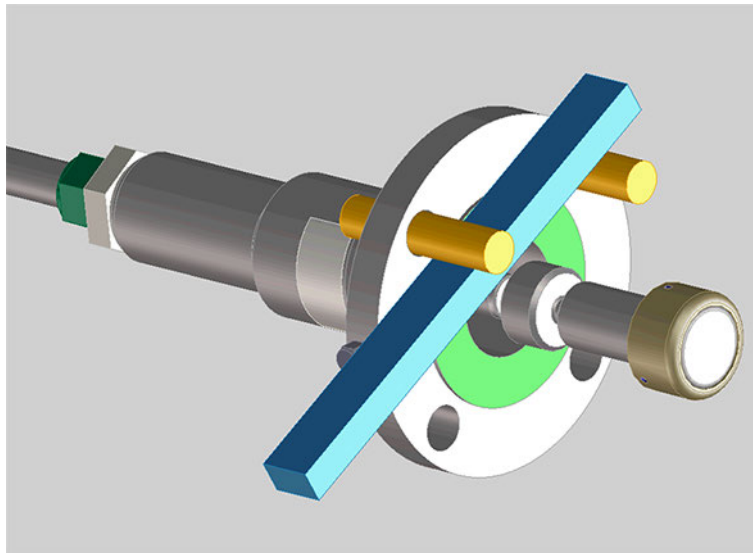
- 1 Cap nut (self-cutting ring fitting)
- 2 Self-cutting ring marking
- 3 Pipe screw fitting
- 4 Duct probe

Proceed as follows to set the wetted part length and to tighten the self-cutting ring:

- 1 Loosen the pipe screw fitting.
The pipe screw fitting is screwed hand-tight at the factory. Loosen the pipe screw fitting completely to set the wetted part length.
- 2 Set the calculated wetted part length wL and check with a length gauge (maximum tolerance: ± 1 mm), → Fig. 37.
- 3 Screw in the pipe screw fitting and tighten with a torque of 150 Nm. Secure the sender/receiver unit in a suitable manner, e.g.
 - Screw the retraction nozzle to a suitable flange connection that provides the space required inside for the duct probe (diameter and length of the set wetted part length wL).
 - Alternatively, install threaded bolts/screws in the through-holes of the retraction nozzle to prevent slipping. Position a suitable rigid rod between the threaded bolts/screws for countering. Ensure that the duct probe and the flange sealing surface are not damaged.

Fig. 38

Securing the sender/receiver unit (example)



- 4 First tighten the self-cutting ring fitting hand-tight.



NOTICE: Damage due to incorrect position of the self-cutting ring

The position of the self-cutting ring cannot be changed after tightening! If the self-cutting ring is tightened in the wrong position, the sender/receiver unit must be replaced; for cross-duct versions both sender/receiver units must be replaced.

Before tightening the self-cutting ring, make sure that the wetted part length has been calculated correctly:

- ▶ Check the measured values.
- ▶ Check that the wetted part length is plausible compared with nozzle length and ball valve length.

- 5 Now tighten the self-cutting ring fitting tight 1.25 turns.
Counter with a jaw wrench at the pipe screw fitting.
- 6 Mark the self-cutting ring fitting position, → Fig. 37.
- 7 Completely loosen the pipe screw fitting again.
- 8 Loosen the cap nut again and fully retract the sender/receiver unit for transport and installation in the pipeline.

- 9 The self-cutting ring remains in the fixed position on the duct probe.
- 10 Then tighten the pipe screw fitting again hand-tight.

**WARNING: Leakage hazard**

Repeated use may damage the gasket of the pipe screw fitting.

- ▶ Before reuse, i.e. whenever the pipe screw fitting is to be tightened again, check the gasket of the pipe screw fitting:
- ▶ Replace the gasket if it has visible deformations, indentations or damage. In this case contact SICK Service.

Otherwise there is a risk of leakage.

5.6.8.3 **Installing the sender/receiver units**

- 1 Make sure the ball valves are closed.
 - If applicable, close ball valves.
 - If applicable, remove blind flanges.
- 2 Position the flange gasket.
- 3 Position the sender/receiver unit on the ball valve.
 Make sure the gasket does not move during positioning.
 For cross-duct versions, make sure to install the Slave sender/receiver unit (→ Fig. 10) on the nozzle on the downstream side so that the sender/receiver unit points against the flow direction.
- 4 Insert the 4 bolts with the centering sleeves (→ Fig. 32) and screw the sender/receiver unit onto the ball valve.
 Apply a tightening torque according to the installed gasket, → p. 187, §15.4.
- 5 Completely loosen the pipe screw fitting.
- 6 Open the ball valve.

**WARNING: Danger due to gas leaks**

When gas escapes, close the ball valve again and contact SICK Service.

- 7 Push the sender/receiver unit into the pipeline.
- 8 Check the gasket of the pipe screw fitting for damage.

**WARNING: Leakage hazard**

Repeated use may damage the gasket of the pipe screw fitting.

- ▶ Before reuse, i.e. whenever the pipe screw fitting is to be tightened again, check the gasket of the pipe screw fitting:
- ▶ Replace the gasket if it has visible deformations, indentations or damage. In this case contact SICK Service.

Otherwise there is a risk of leakage.

- 9 Screw in the pipe screw fitting and tighten with a torque of 150 Nm.
- 10 Push the sender/receiver unit to the stop.
- 11 On probe version F1F-P, now align the measuring path correctly before securing the self-cutting ring fitting. For cross-duct versions, proceed with the next step.
- 12 Tighten the self-cutting ring fitting tight 1.25 turns.
 Make sure the markings for the self-cutting ring fitting are next to each other again, → Fig. 37.
- 13 For cross-duct versions, install the Master sender/receiver unit on the nozzle on the upstream side so that the sender/receiver unit points in the flow direction.

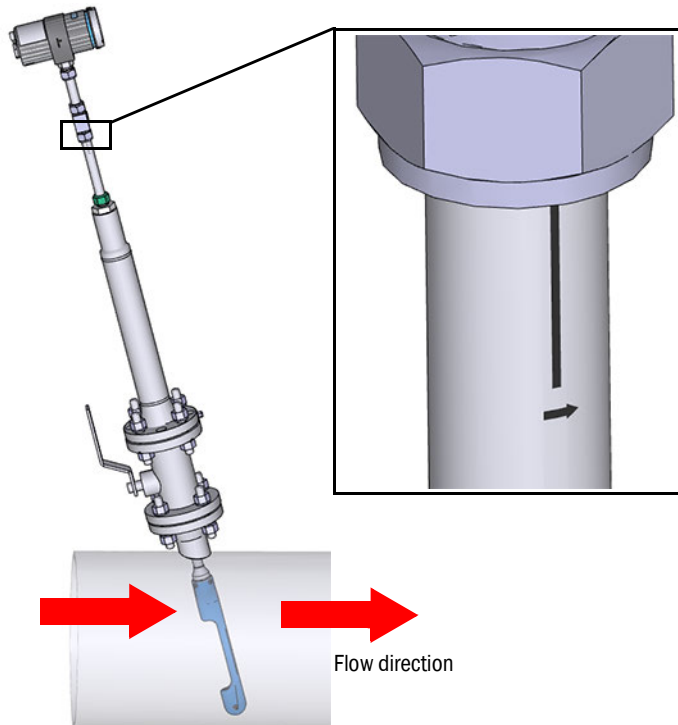
Observe when aligning the probe version

Before securing the self-cutting ring fitting again, align probe version F1F-P correctly:

The measuring path must be aligned in flow direction, i.e. the arrow shown must point in flow direction.

Fig. 39

Marking on probe version F1F-P



- ▶ Align the measuring path of probe version F1F-P as shown, see → Fig. 39. The maximum deviation of the rotation angle of the probe to the flow direction may be $\pm 3^\circ$. To ensure this, use a laser to align probe version F1F-P:

Alignment of the device to the flow direction using a laser



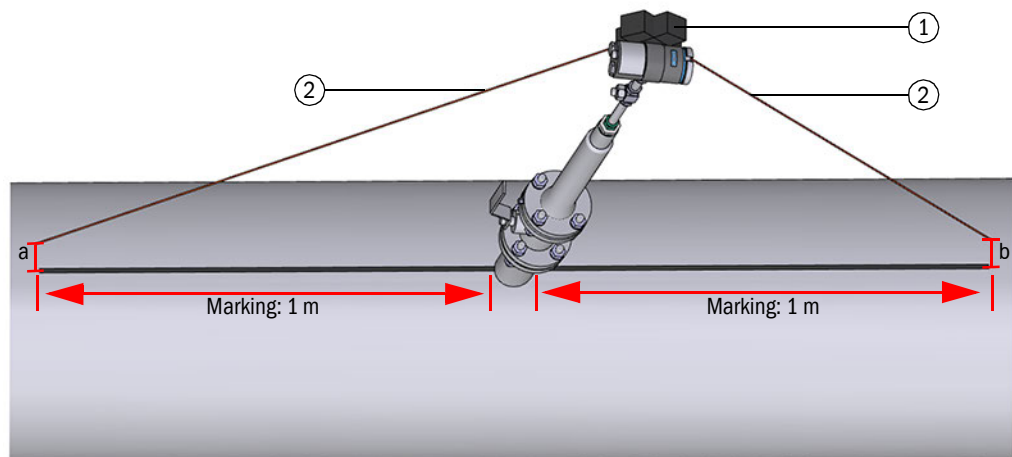
WARNING: Risk of explosion

The laser may only be used if no Ex atmosphere is present. Use of the laser is not permitted under Ex conditions.

- 1 Mark the pipe center one meter before and after probe version F1F-P, e.g. with chalk or a felt pen, see → Fig. 40.
- 2 Place a laser on the side of the electronics housing and let the laser beam hit the pipe at the level of the end of the first marking.
- 3 Measure the distance between the point of impact of the laser and the marking on the pipeline.
- 4 Repeat the procedure for the second marking.
- 5 Align the electronics housing so that distance a corresponds approximately to distance b.
The maximum permissible difference between value a and value b is 10 mm.
- 6 After alignment, tighten the self-cutting ring fitting 1.25 turns.
Make sure the markings for the self-cutting ring fitting are next to each other again, → Fig. 37.

Fig. 40

Alignment of probe version F1F-P



- 1 Laser
- 2 Laser beam

5.6.8.4

Leak tightness check**NOTICE:**

- ▶ Perform a leak tightness check with suitable means after completion of the installation work.
- ▶ Also perform a leak tightness check with suitable means after completion of the installation work with spool piece. No leakage check has been made at the factory.

- ▶ After a successful leak tightness check, connect the sender/receiver units electrically, → p. 80, §5.7 .

**NOTICE:**

Proceed as follows when leak tightness is not established:

- ▶ Pull the sender/receiver units back and disconnect them from the process by closing the ball valve, → p. 75, §5.6.9.
- ▶ Contact SICK Service.

5.6.9

Pulling the sender/receiver units back**WARNING: Hazard through incorrect use of the retraction mechanism**

- ▶ Observe the information on activating the retraction mechanism, → p. 30, §5.2.5.

- 1 Completely loosen the cap nut of the self-cutting ring fitting, → Fig. 41.
- 2 Completely loosen the pipe screw fitting, → Fig. 41.
- 3 Pull the sender/receiver unit back completely to the stop.
- 4 Close the ball valve.

**NOTICE:**

The ball valve must close without resistance.

If this is not possible:

- ▶ Make sure the sender/receiver unit has been pulled back completely.

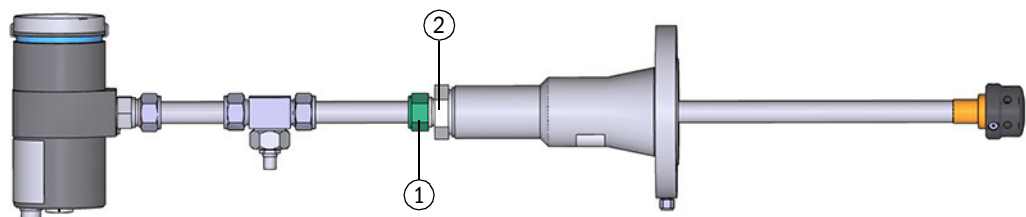
**NOTICE:**

Do not use force when the sender/receiver unit cannot be pulled back.

- ▶ Tighten the pipe screw fitting again with a torque of 150 Nm.
- ▶ Contact SICK Service.

Fig. 41

Cap nut



- 1 Cap nut (self-cutting ring fitting)
- 2 Pipe screw fitting

**WARNING: Hazardous gas (possibly explosive or toxic)**

Consider the gas trapped in the retraction nozzle, → p. 30, §5.2.5.

5.6.10

Fitting the venting valve

A venting valve is available as an option from SICK (Order No. 2108210).

Use a suitable valve with 1/8" NPT thread when the valve available from SICK is not used.

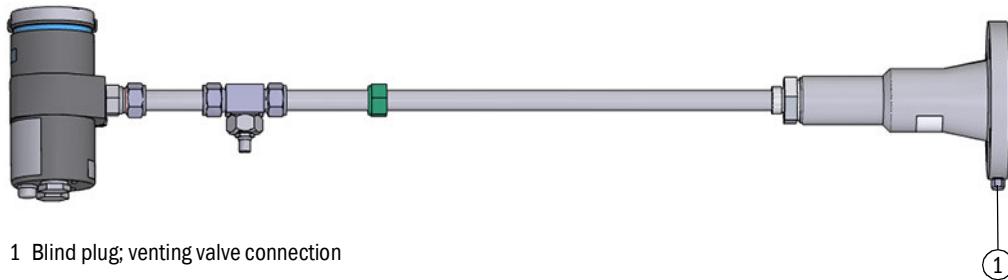
**WARNING: Hazard through gas in the pipeline**

- ▶ Install the venting valve only when the sender/receiver unit is not yet installed in the pipeline or when the pipeline is free from pressure and dangerous gas.
- ▶ During installation and operation, adjust the position of the vent so that personnel do not come into direct contact with the medium.
- ▶ Open the vent slowly.
- ▶ Small quantities of medium can escape via the spindle in the open position. Take appropriate protective measures for the operating personnel.

- 1 Remove the blind plug on the sender/receiver unit, → Fig. 42.
- 2 Wrap the sealing tape (PTFE) 2.5 layers around the external thread of the venting valve in thread direction.
- 3 Screw the venting valve in.
Pay attention to the alignment of the key surfaces: The valve must not hit the ball valve; align the wrench surfaces as parallel as possible to the flange sealing surface.
- 4 Tighten the screw plug of the valve so that no gas escapes there.
- 5 Then carry out a leak tightness check with suitable means.

Fig. 42

Venting valve connection



1 Blind plug; venting valve connection

5.6.11 **Fitting the weatherproof cover for the sender/receiver unit**

The weatherproof cover (Order No. 2105581) serves to shield the electronics of the sender/receiver unit from sunlight and weather influences.

5.6.11.1 **Overview**

Fig. 43 Weatherproof cover overview

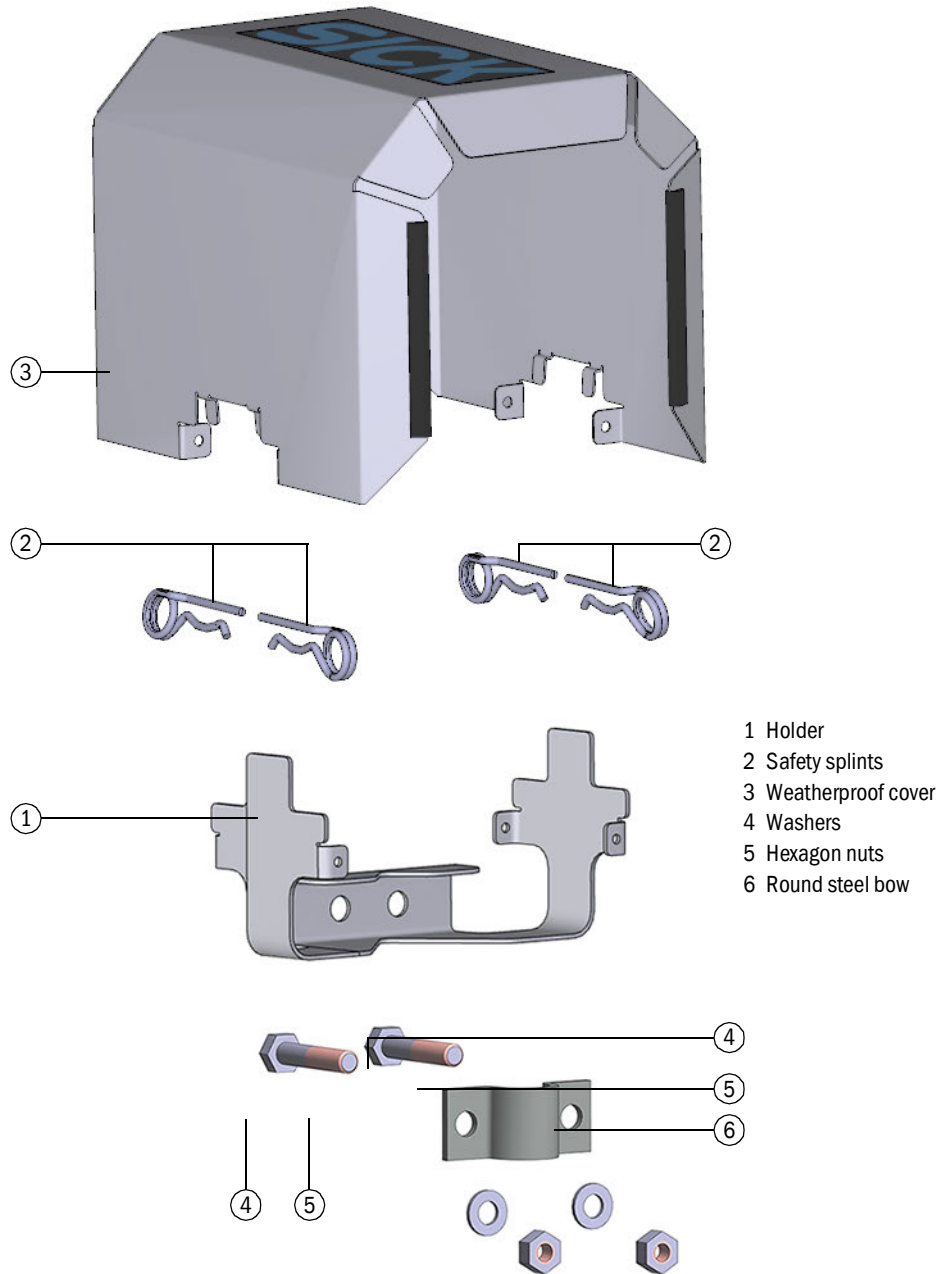
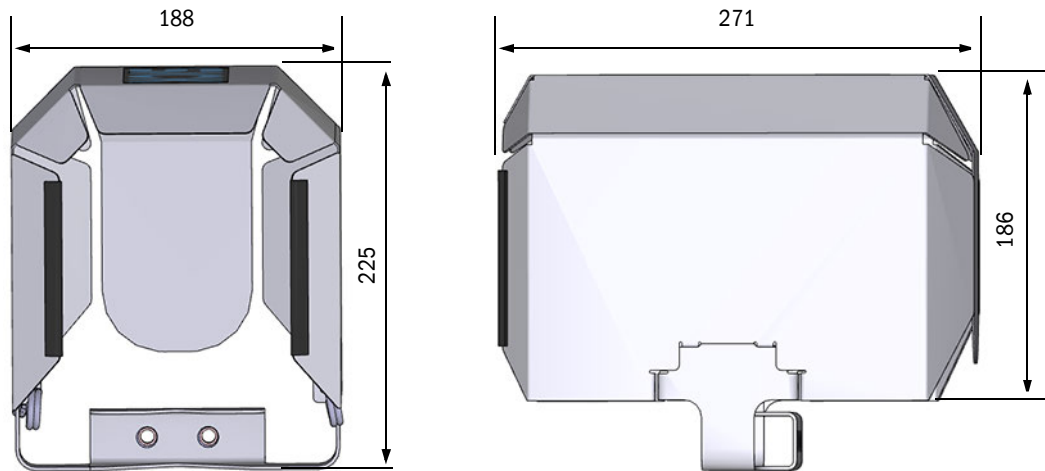


Fig. 44

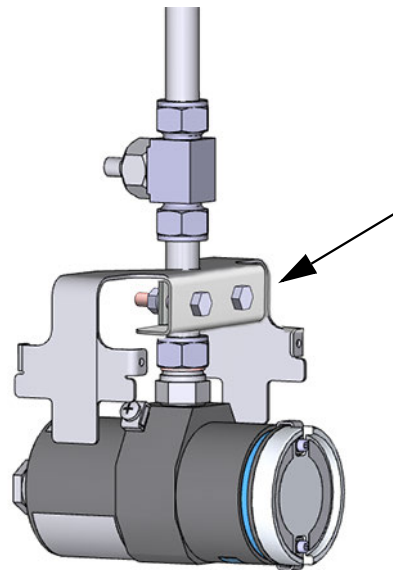
Dimensions [mm]



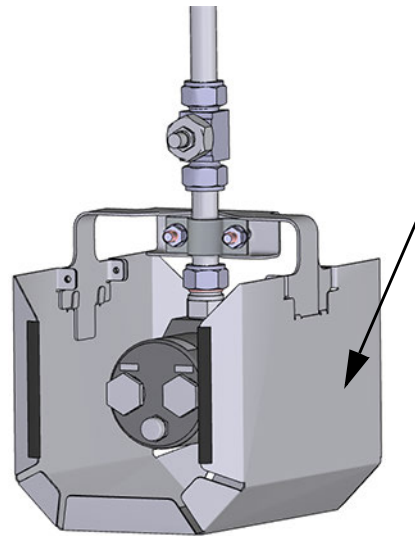
5.6.11.2

Fitting the weatherproof cover

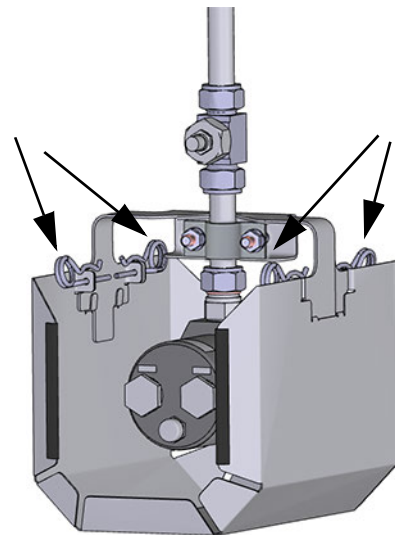
- 1 Fasten the holder on the sender/receiver unit:
 - ▶ Fasten the holder with round steel bow to the probe neck of the sender/receiver unit using hexagon nuts with washers.
 - ▶ Make sure the holder is correctly aligned and the probe is not damaged. See the adjacent Figure.



- 2 Push the weatherproof cover into the holder.



- 3 Fix the weatherproof cover with the four safety splints.



5.7 Electrical installation

5.7.1 General instructions, prerequisites

All assembly work previously described must be completed (as far as applicable) before starting installation work. Unless otherwise agreed with SICK or an authorized representative, all of the installation work must be carried out by the plant operator. This includes laying and connecting the power supply and signal cables and installing switches and power fuses.



WARNING: Electrical hazard

Incorrect cabling can cause serious injuries, device malfunctions or failure of the measurement system.

- ▶ Observe the relevant safety regulations as well as the safety notices in → p. 28, §5.2 during all installation work.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.

5.7.2 Cable specification

The following cable specifications correspond to the standard SICK cables. Special requirements on cabling in the Ex zone are not considered here. The plant operator is responsible that all cables used comply with valid regulations and guidelines for cabling in hazardous areas at the plant.

Standard connection cables between sender/receiver units

The standard connection cables between sender/receiver units are included in the scope of delivery.

- Connection cable between sender/receiver units of device types F1F-M, F1F-S

Cable	Exi, coaxial, RG62, connection TNC with safeguard against pulling off, length
type:	3 m
- Connection cable between sender/receiver units of device type F1F-H

Cable	Armored cable with certified flameproof cable glands including separating seal,
type:	completely mounted, length 5 m

Connection cable between sender/receiver units and higher level control system

The connection cable between sender/receiver units and the higher level control system must comply with the following standard and can optionally be ordered from SICK:

Cable type: Li2YCYv(TP) 2x2x0.5 mm², with reinforced outer sheath, from Lappkabel

The cable must fulfill the following requirements for function of the device:

- Operating capacity < 150 pF/m
- Wire cross-sectional area at least 0.5 mm² (AWG20 to AWG16 max.)
- Screen with Cu wire mesh

The maximum cable length for the RS485 interface is defined as 1000 m total length, i.e. 500 m each for 2-path installations with two sender/receiver units connected in parallel.

When designing the cable cross-section for the power supply of the sender/receiver units, the voltage drop across the cable due to the line resistance must be taken into account.

The supply voltage on the sender/receiver unit must be at least 20 V.

With a supply voltage of 24 V (as e.g. also from a mains-supplied Interface Unit) and a current consumption of 40 mA for a sender/receiver unit, the following maximum line resistance results:

$$\frac{(24V - 20V)}{40mA} = 100\Omega \quad \text{in total for the plus and minus lines}$$

For 1000 m and a cable cross-section of 0.5 mm², the following calculation results:

$$\frac{35\Omega}{km} \cdot 1000m \cdot 2 = 70\Omega$$

This value is thus below the limit value of 100 Ω.

With smaller cable cross-sections or a lesser lower supply voltage limit, there may therefore be restrictions on the maximum cable length.

5.7.3 Cable glands

The enclosure inputs are closed with certified sealing plugs. Cable glands are not included in the scope of delivery, except for the completely installed connection cables between the sender/receiver units type F1F-H.

Only use installation material approved for the applied hazard zone.

The user is responsible for correct selection.

5.7.4 Requirements for installation in the Ex zone



WARNING: Risk of explosion

- ▶ Do not open the enclosures while energized.
- ▶ Do not connect or disconnect the circuits unless the voltage has been turned off or the area is safe.
- ▶ When using alternative connection of devices not belonging to the system, especially external power supply devices, power supply units, etc., ensure that the maximum voltage at the connections does not exceed 125 V even if a fault occurs.
- ▶ Do not use the device when cables or terminals are damaged.

General information

- The documentation for zone classification according to EN 60079-10 must be available.
- The devices to be used must be checked for suitability for the application area.
- After installation, an initial test of the device and the plant according to EN/IEC 60079-17 must be performed.

Cables

- Cables must fulfill the requirements according to EN 60079-14.
- Protect cables especially endangered by thermal, mechanical or chemical stress, e.g. by laying in protective tubes.
- Cables must be flame-retardant according to DIN VDE 0472 Part 804. The fire behavior according to B / IEC 60332-1 must be approved.
- Observe the clamping range of the cable glands for cable selection.
- Ex-d cable gland must be suitable for the intended cable type (e.g. cables with or without armoring).
- Cables and lines for Ex-d cable glands must comply with the requirements in EN 60079-14.

- Protect the wire ends with connector sleeves against fraying.
- Replace unused cable glands with certified Ex-d sealing plugs.
- Connect or safeguard unused wires to ground so that a short circuit with other conductive parts is excluded.
- Carry out potential equalization in accordance with EN 60079-14 (see also the following Section).
- “Conduit” systems must comply with the requirements in EN 60079-14 9.4 and 9.6. In addition, compliance with national and other relevant standards is required.
- “Conduits” according to IEC 60614-2-1 or IEC 60614-2-5 are not suitable.
- “Conduit” systems must be protected against vibration.
- Use thread sealant according to EN/IEC 60079-14, Section for threads with ½" NPT.

The following applies additionally for intrinsically safe cable connection with intrinsically safe ultrasonic transducers/probes for the F1F-M, F1F-P, F1F-S sender/receiver units:

- The device marking must at least include the information Ex ia.
- Use only cables delivered by SICK.

The connections of the intrinsically safe ultrasonic probes are designed so that the individual circuits are safely separated from other intrinsically safe and non-intrinsically safe circuits.

If the transducer circuits are disconnected while energizing, it still must be observed that the safe separation from other intrinsically safe and non-intrinsically safe circuits is not overridden and thus intrinsic safety endangered. For this reason, the associated connection cable should be disconnected at both ends, i.e. unplugged individually and successively, first from the electronics and then, if required, from the ultrasonic probes, or suitably attached to prevent uncontrolled movement of the cable with the unprotected, open cable connector.

The cables for the intrinsically safe components are marked either with “Exi” or a blue cable covering or with blue shrink sleeves on the cable ends or with the SICK item number, at least on the associated packaging. The technical safety data are shown in the Type Examination Certificate.

- Operation of the sender/receiver units type F1F-M, F1F-P, F1F-S with sensors and components not belonging to the system and sensors from other manufacturers is not permitted. See the Type Examination Certificate for the technical safety data.

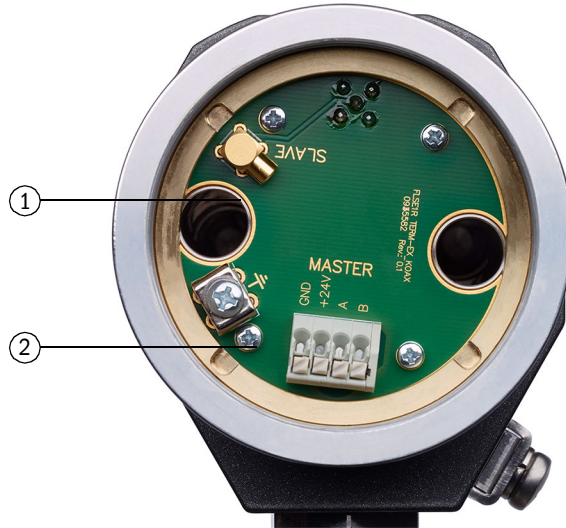
Specific requirements for installation in the USA and Canada

- Installations in USA must be carried out according to NEC (ANSI/NFPA70).
- Installations in Canada must be carried out according to CEC part 1.

5.7.5 Connection overview

Pin assignment in the terminal compartment of the sender/receiver units

Fig. 45 Terminal compartment FLSE100-XT sender/receiver with electronics (Master)




- 1 Terminal compartment open
- 2 Grounding terminals

Table 8 Connection of the sender/receiver units

Terminals	Description			
	Master			Slave
Designation in Terminal box	B	A	+24 V DC	GND
External connection **	yellow	green	white	brown
Assignment	IF1	IF1	+24 V DC	GND

** : Applicable only for cables with wire color code according to DIN 47100
 IF1: Communication between FLSE Master and a higher level control system (Interface 1)
 MCX: Signal for FLSE Slave



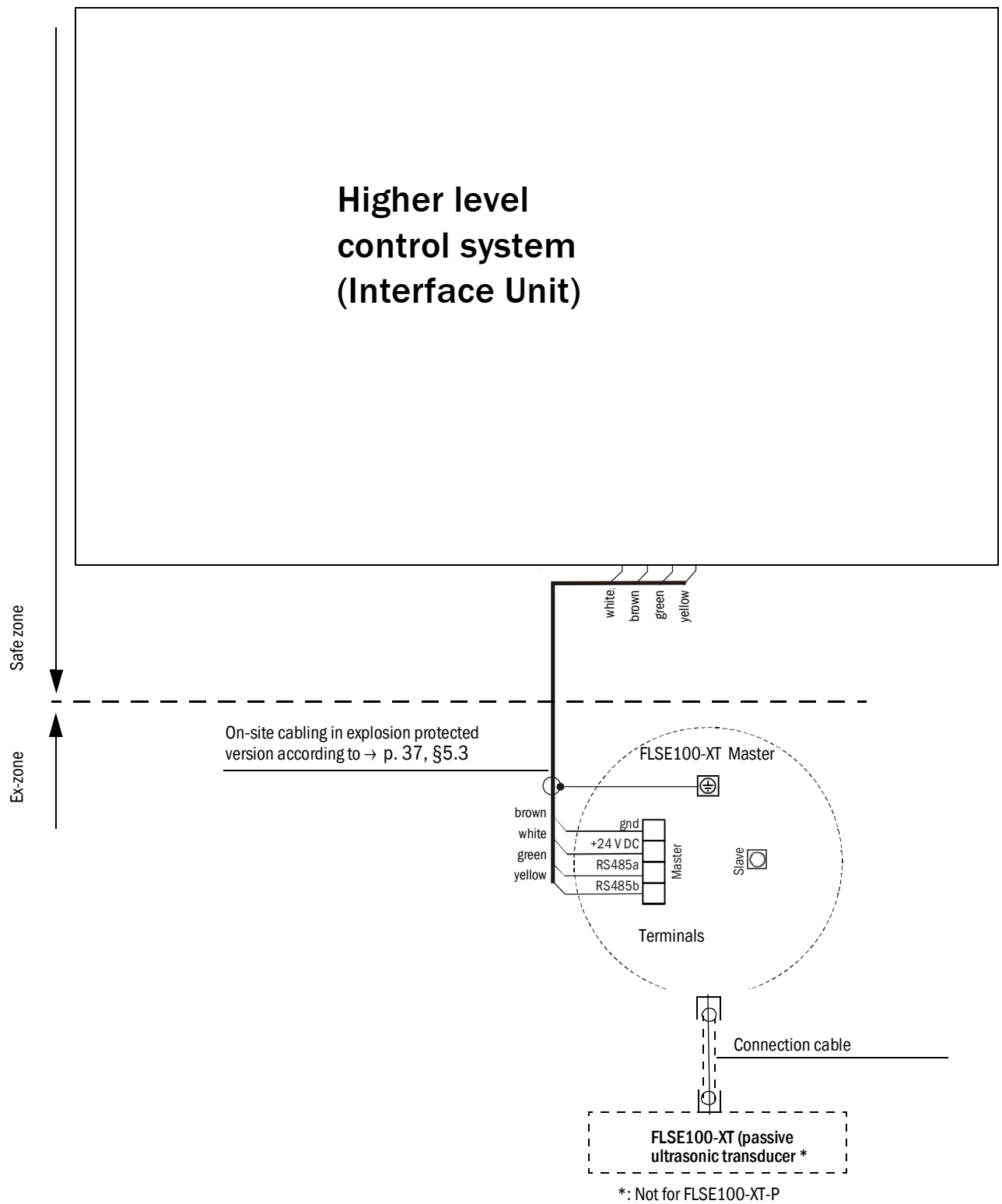
NOTICE: Self-locking terminals for wire sizes 0.5 .. 1.5 mm² (AWG20 ... AWG16).

Interconnection of sender/receiver units

- For the F1F-H device, use a coax plug-on aid to connect the Slave sender/receiver unit to the Master.

5.7.6 Connection diagrams

Fig. 46 Cabling of the sender/receiver units



FLWSIC100 Flare-XT

6 Installation Interface Unit

Intended use
Safety information
Product description
Installation
Electrical installation

6.1 Intended use

The Interface Unit is a device for recording, processing and transferring of measured values. For example, the Interface Unit can be used for controlling the sender/receiver units FLSE100-XT as well as for the calculation, evaluation, output and display of measured value data.

Using the device for purposes other than those intended can lead to safety-critical conditions. The manufacturer bears no responsibility for any other use.

6.2 Safety information

6.2.1 Hazard through electrical equipment



WARNING: Danger through power voltage

- ▶ Disconnect power supply lines before working on power connections or parts carrying power voltage.
- ▶ Refit any contact protection removed before switching the power voltage back on again.
- ▶ The device may only be operated with the cover closed.
- ▶ Before opening the cover, the device must be disconnected from the power supply.
- ▶ The device must not be used if the electrical wiring (cables, terminals, ...) is damaged.

6.2.2 Hazard through electromagnetic interference



NOTICE:

According to EN55011:2009, the Interface Unit is a device of group 1, class A. It is intended for operation in an industrial environment. In other environments, especially in residential environments, it could possibly be difficult to ensure electromagnetic compatibility due to the occurring conducted as well as radiated interferences. In this case, the operator may be required to take appropriate measures.

Should conditions which exceed the usual level for such areas prevail at the place of use, additional measures may be necessary to reduce electromagnetic interference.

6.2.3 Hazards through explosive or ignitable gases

The Interface Unit may be used in potentially explosive atmospheres only according to the respective specifications.




WARNING: Hazards through explosive or ignitable gases

- ▶ In potentially explosive atmospheres, only use the version of the Interface Unit specified for such use (→ p. 87, §6.2.5).

6.2.4 **Hazards through electrostatic discharges**

The electronic housing is painted in the factory with a layer thickness of max. 0.2 mm. Special paintwork can have a higher layer thickness.

	<p>WARNING: Ignition hazard through electrostatic discharge</p> <p>The plastic display surface dimensions of the display door and of the display exceed the allowable value for ignition group IIC. The user must take appropriate precautions to avoid ignition hazards through electrostatic discharge.</p> <p>Ignition hazards through electrostatic discharges exist when gas flow meters with special paintwork and a layer thickness >0.2 mm are used in applications with ignition group IIC in accordance with ATEX and IECEx.</p> <ul style="list-style-type: none"> ▶ For installation, the risk of electrostatic charging of the surface must be reduced to a minimum. Therefore, the device should not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. change previous text ▶ Use appropriate caution when performing maintenance and cleaning work. For example, the surfaces should only be cleaned with a damp cloth. The respective devices will be identified by the manufacturer with a warning sign.
---	--

6.2.5 **Operation in potentially explosive atmospheres**

The Interface Unit is designed for use in potentially explosive atmospheres according to the respective device version:

Table 9 Device versions



Version	FCF-A	FCF-C
Zone 2 / Div. 2	ATEX: II 3G Ex ec ia IIC T4 Gc IECEX: Ex ec ia IIC T4 Gc	Ex ec ia IIC T4 Gc Class I Zone 2, AEx ec ia IIC T4 Gc Class I Division 2, Groups A, B, C and D, T4

Operation in potentially explosive atmospheres

This is a hazardous area in which an explosive atmosphere exists under the following normal atmospheric conditions:

- Specified ambient temperature -40 ... +60 °C, optional maximum ambient temperature of +65 °C
- Ambient pressure 80 kPa (0.8 bar) to 110 kPa (1.1 bar)
- Air with normal oxygen content, typically 21 percent by volume.

6.2.6 **Warning information on device**

	<p>WARNING: Danger identification on device</p> <p>The following symbol draws attention to important dangers directly on the device:</p> <div style="text-align: center;">  </div> <ul style="list-style-type: none"> ▶ Consult the Operating Instructions in all cases where the symbol is attached to the device or shown on the display.
---	--

6.2.7 **Requirements on the personnel's qualification**

- ▶ Read the Operating Instructions before putting the Interface Unit into operation.


- ▶ Observe all safety information.
- ▶ If anything is not clear: Please contact SICK Customer Service.

Designated users

All operators of the Interface Unit should be specifically trained on this device, knowledgeable of relevant regulations, and able to assess potential hazards related to its operation. Skilled persons are persons according to DIN VDE 0105, DIN VDE 1000-10 or IEC 60050-826 or directly comparable standards.

The named persons must have exact knowledge of operational hazards caused, e.g., by low voltage, hot, toxic, explosive gases or gases under pressure, gas-liquid mixtures or other media as well as adequate knowledge of the measuring system gained through training.

Specific requirements for the use of devices in hazardous areas

	<ul style="list-style-type: none">▶ Cabling/installation, device setup, maintenance and testing may only be carried out by experienced persons familiar with the rules and regulations for hazardous areas, in particular:<ul style="list-style-type: none">- Degree of protection- Fitting instructions- Area definition▶ Regulations to be applied:<ul style="list-style-type: none">- IEC 60079-14- IEC 60079-17or comparable national regulations.
---	--

6.2.8

Restrictions on use**WARNING: Hazard through pressure/temperature**

- ▶ Only use the Interface Unit within the pressure and temperature limits as specified in these Operating Instructions as well as on the type plate.

**WARNING: Dangerous voltage**

- ▶ Do not open the enclosure while energized.
- ▶ Only operate internal switches if the device is not live or the area is safe.
- ▶ Do not connect or disconnect the circuits unless the power has been turned off or the area is safe.
- ▶ It must be ensured that the rated voltage U_M 60 V is not exceeded when connected to devices not belonging to the system, in particular external power supply devices, power supply units, etc.; except for the main power supply with $U_M < 253$ V.
- ▶ A suitable main power switch must be provided.
- ▶ Do not use the device when cables or terminals are damaged.

**WARNING: Risk of explosion**

In a closed enclosure, degree of contamination 2 according to IEC 60664-1 is assumed. Opening the enclosure is only permitted when the environment does not endanger degree of contamination 2 inside the enclosure (e.g. through penetration of conductive dust or moisture).

**WARNING: Device restrictions/high risk use**

The device firmware is not designed for any use requiring fail-safe performance in which the failure of the computer system could lead to death, serious personal injury, or severe environmental damage, and therefore must not be used in such areas.

6.3 Product description

6.3.1 Product identification

Product name:	Interface Unit
Manufacturer	SICK Engineering GmbH Bergener Ring 27 01458 Ottendorf-Okrilla Germany
Type plate	The type plate is located on the right side of the device.

Fig. 47 Type plate ATEX (example)



Fig. 48 Type plate CSA (example)



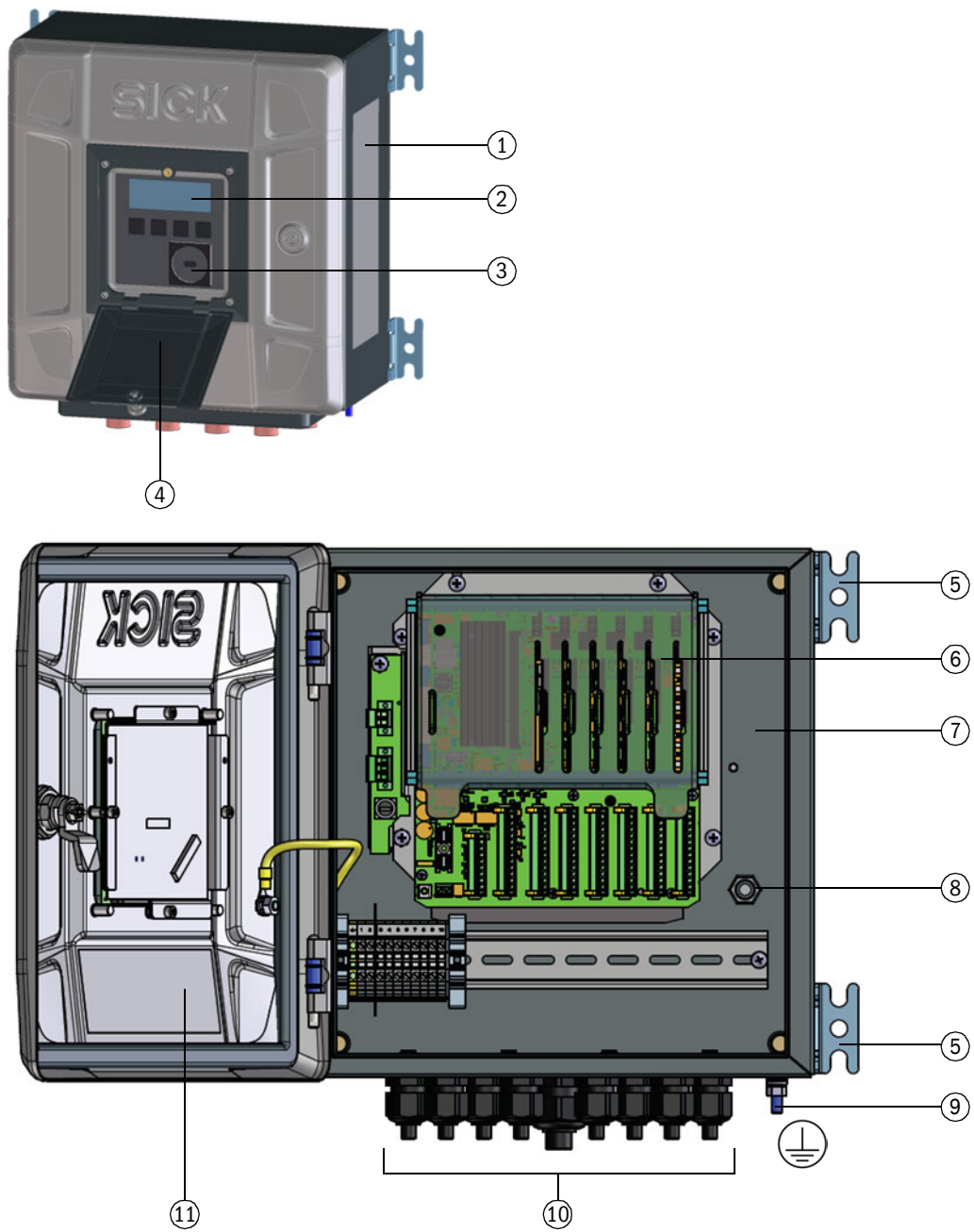
6.3.2 Type code

Fig. 49 Interface Unit type code (example)

	FC	F	-	AEC	A1A1S	TS	1S111F	N
Product name								
Application								
Ex classification								
Mechanical properties								
Ambient conditions								
Electronics								
Customized								

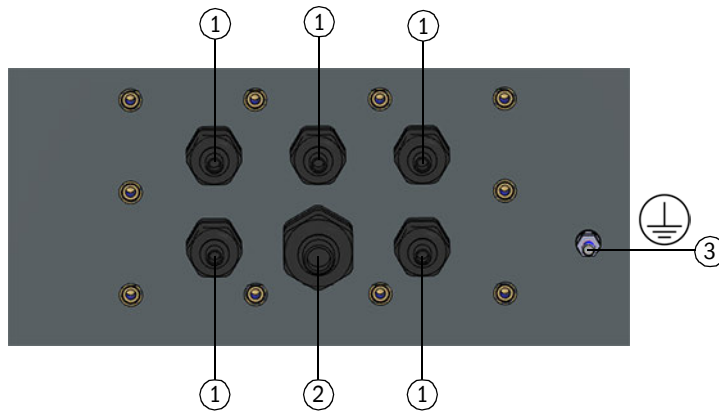
6.3.3 Device components

Fig. 50 Overview



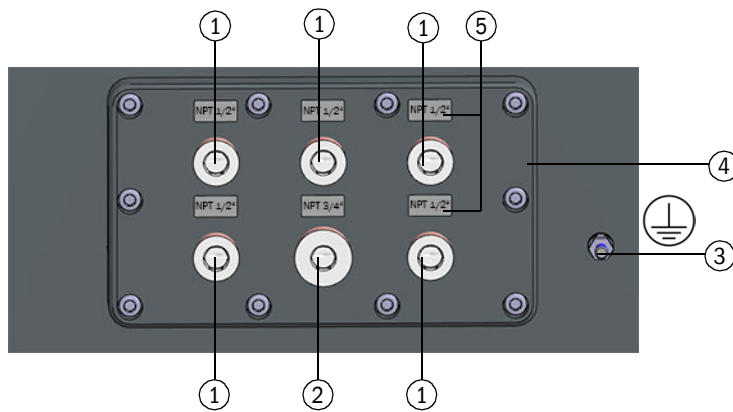
- | | |
|----------------------|---------------------------------|
| 1 Type plate | 7 Enclosure base |
| 2 Display | 8 Pressure compensation element |
| 3 Infrared interface | 9 Exterior ground terminal |
| 4 Display cover | 10 Cable inlets |
| 5 Screw-on tabs | 11 Enclosure door |
| 6 Electronics cover | |

Fig. 51 Metric cable glands (optionally available with 9 cable glands)



- 1 Metric cable gland M20
- 2 Metric cable gland M25
- 3 Exterior ground terminal

Fig. 52 Sealing plugs NPT (optionally available with 9 cable entries)



- 1 Sealing plugs NPT 1/2"
- 2 Sealing plugs NPT 3/4"
- 3 Exterior ground terminal
- 4 Flange plate
- 5 Identification plates for thread size

6.3.4 Device description

The Interface Unit is used for the acquisition, processing and output of measured values and serial data. A multitude of different digital, analog and serial sensors can be connected to the Interface Unit.

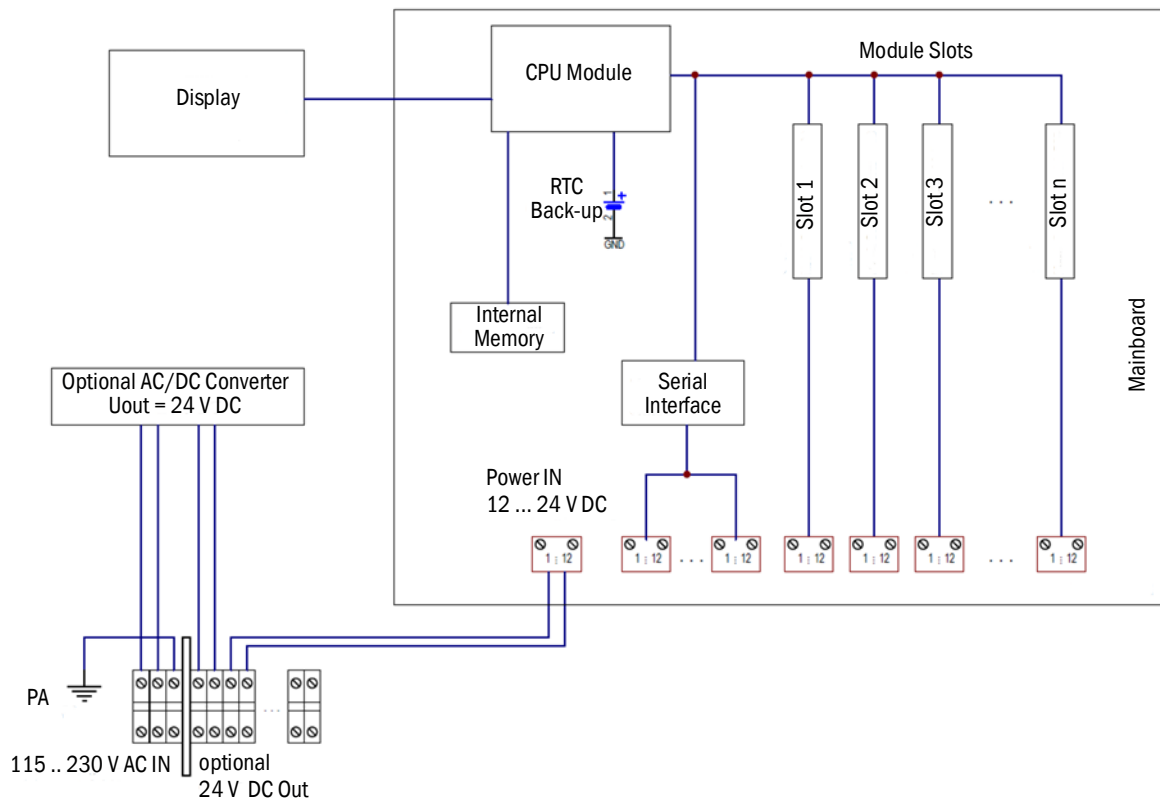
As a modular expandable system, the Interface Unit contains a processor board on its motherboard as well as a basic set of serial interfaces. In addition, module slots are available for connecting up to six I/O modules (depending on device version). For the connection of the field-side interfaces of the I/O modules, up to six slots with pluggable terminal strips are available on the mainboard.

Up to nine cable inlet openings, either NPT or with metric cable glands, are available for routing all connection cables (depending on device version). The internally installed real-time clock also has a replaceable backup battery.

The Interface Unit is optionally supplied via DC voltage 12 ... 24 V DC or by an internally installed SELV wide range power supply with 24 V DC output voltage for the connection range from 115 ... 230 V AC.

It is possible to connect additional sensors to the Interface Unit. These can be connected to the internal terminal blocks. The sensors are supplied either via the internally generated 24 V DC or by routing the external supply voltage. The data connection between sensors and Interface Unit runs via the internal RS485. Additional terminal blocks provided can be used to connect several sensors.

Fig. 53 Layout



6.3.5 Interfaces

6.3.5.1 Basic equipment of mainboard

The mainboard is available in two versions: Standard and Extended

The following interfaces are provided:

- 1 Ethernet interface (Modbus TCP) for the Standard variant
- 2 Ethernet interfaces (Modbus TCP) for the Extended variant
- 3 RS485 interfaces (Modbus RTU / ASCII)
- 1 RS232 interface, for firmware updates

6.3.5.2 I/O module definition

Analog module type 1 (2AI/2AO)

- Two analog inputs, switchable as voltage input or 4 ... 20 mA current input
- The first analog input also has a serial HART master interface
- Two analog outputs (4 ... 20 mA)
- The first analog input also has a serial HART slave interface which can be optionally configured as HART master.
- Two electrically isolated auxiliary voltages for supplying up to two current loops; the module can be operated both passively and actively with two auxiliary voltages per module

Analog module type 2 (2AO)

- Two analog outputs 4 ... 20 mA
- The first analog output also has a serial HART slave interface which can be optionally configured as HART master.
- Two electrically isolated auxiliary voltages for supplying up to two current loops; the module can be operated both passively and actively with two auxiliary voltages per module

Digital module type 1

- Two switching outputs, individually switchable as digital input
- 4 digital outputs, one of which can be used as frequency output

Interface module FOUNDATION Fieldbus (FF)

- One serial FOUNDATION Fieldbus Slave interface



Detailed descriptions of the MODBUS, HART and FOUNDATION Fieldbus protocols are available as separate documents on the product CD, at www.sick.de or from SICK Service.

6.4 Installation

6.4.1 Safety information

**WARNING: Risks during installation**

- ▶ Observe the safety information in → p. 86, §6.2.
 - ▶ Observe and comply with regulations of the plant operator.
- Otherwise hazards are possible and safe operation is not ensured.

**CAUTION: Accident risk through inadequate fastening of the device**

- ▶ Consider the device weight specifications when planning the mounting supports.
- ▶ Ensure sufficient stability:
 - When fitting the device on a wall, ensure that the wall construction is sufficiently stable.
 - When fitting the device on a pipe, ensure sufficient stability of the pipe.
- ▶ Use suitable fasteners to secure the device and optional accessories.
- ▶ Take the vibration load into account.

**NOTICE:**

The plant operator is responsible for the safety of the system under mechanical load.

**NOTICE:**

The Interface Unit is only suitable for vertical installation.

6.4.2 Scope of delivery

- ▶ Check that delivery includes all ordered parts.
- ▶ Check parts for possible transport damage.

**NOTICE:**

Do not put the interface Unit into operation if you notice any damage!

6.4.3 Tools required

- Allen keys SW 6 and 8
- Jaw wrenches size 13, 17 and 19
- Drill and tools for wall fitting

6.4.4 Fitting the Interface Unit

Fit the Interface Unit in an easily accessible and protected position. The following must be taken into account:

- ▶ Maintain the ambient temperature range in accordance with the Technical Data under consideration of possible radiant heat (shield when necessary).
- ▶ Protect the Interface Unit against direct sunlight and atmospheric conditions (weather-proof cover available as option).
- ▶ Select an installation location free from vibrations when possible and stabilize vibrations when necessary.
- ▶ Provide sufficient clearance for cables and opening the front panel.
- ▶ Select an installation location free of chemical influence.

6.4.4.1 Wall fitting

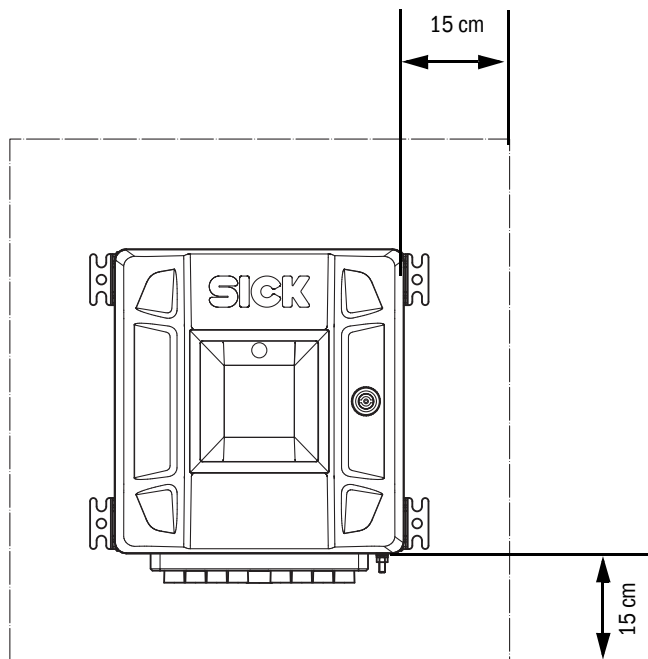
**NOTICE:**

- ▶ Use suitable fixing material for mounting.
- ▶ Observe the total weight of the Interface Unit as well as local and legal regulations for the design of the wall construction and fastening material.

- ▶ Ensure sufficient assembly clearance.
Dimension drawing, see → p. 171, §12.8.2.
- ▶ Maintain a general clearance of 15 cm around the enclosure to ensure better heat circulation.
- ▶ The distance between enclosure base and wall must be 10 mm; the wall must be flat. The air circulation behind the Interface Unit must not be obstructed.

Fig. 54

General clearance to Interface Unit



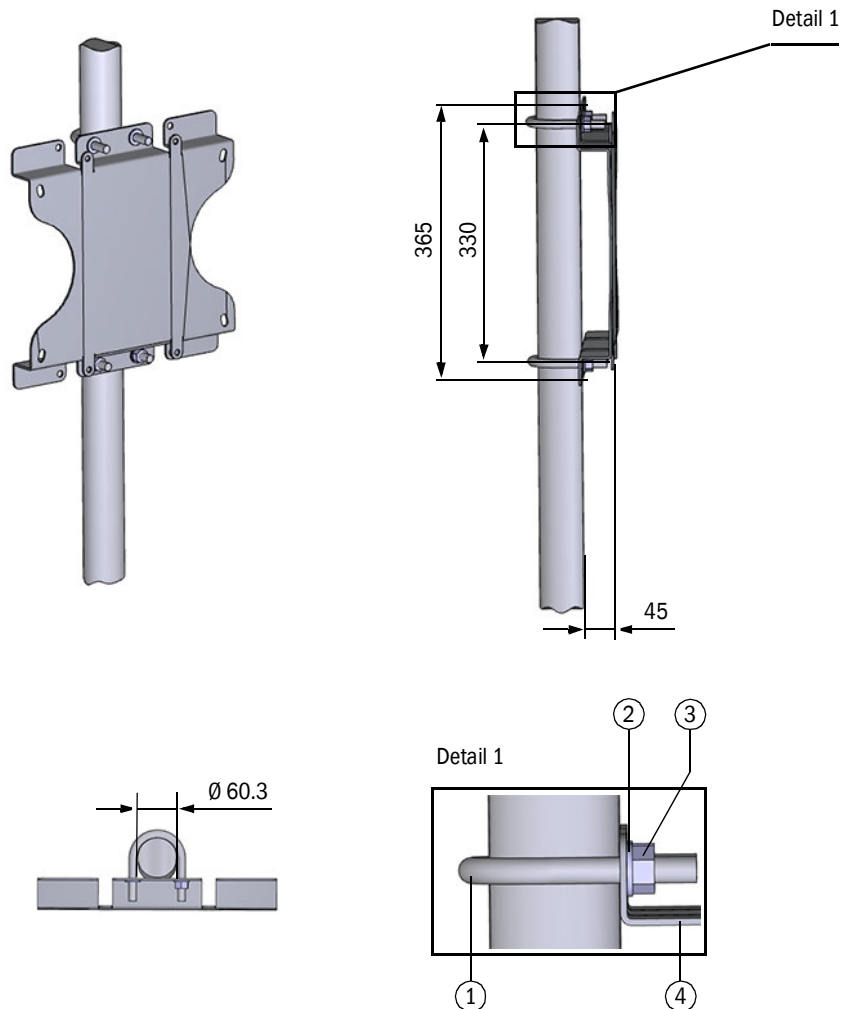
6.4.4.2

Option "Mounting kit 2-inch pipe mounting"

- ▶ Use two round steel bows (1), nuts (2) and washers (3) to fasten installation plate (4) 2-inch pipe (Order No. 2109763), → Fig. 55.
- ▶ Use nuts (5), washers (6) and screws (7) to fasten the Interface Unit on the installation plate through the 4 marked openings, → Fig. 56.

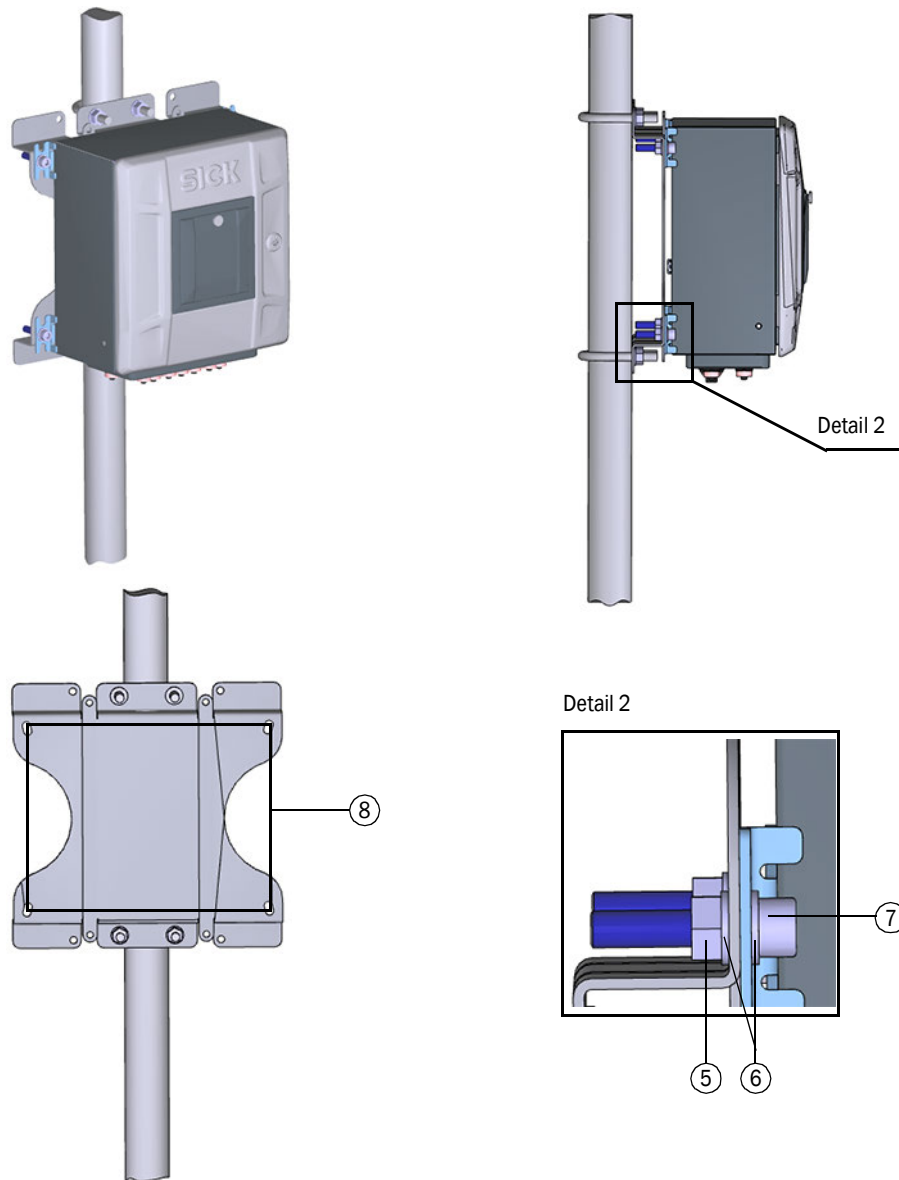
Fig. 55

Fitting the installation plate on the 2-inch pipe (dimensions in mm)



- 1 Round steel bow DIN3570
- 2 Washer A13 -A4
- 3 Nut M12 -A4
- 4 Installation plate

Fig. 56 Fitting the Interface Unit on the installation plate



- 5 Nut M10 DIN934
- 6 Washer B10.5 DIN125
- 7 Screw M10 DIN912
- 8 Holes for fitting the Interface Unit Zone 2

6.4.5 Fitting the weatherproof cover

6.4.5.1 Weatherproof cover for Interface Unit for wall fitting

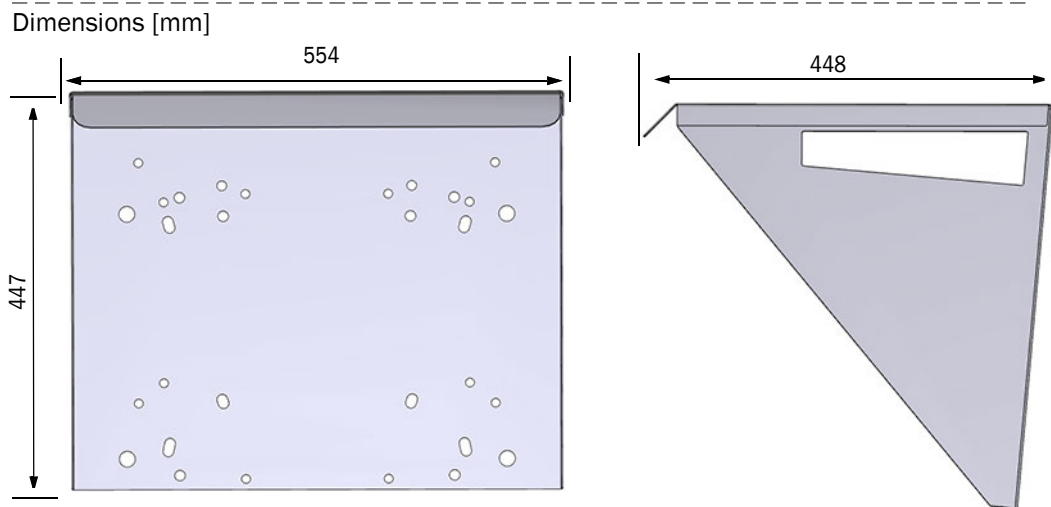


NOTICE:

The weatherproof cover for wall fitting (Part No. 2108970) is delivered without fastening material.

- ▶ Use suitable fastening material to fit the weatherproof cover on the wall.
- ▶ Observe the total weight of the Interface Unit together with the weatherproof cover as well as local and legal regulations for the design of the wall construction and fastening material. Weight of Interface Unit and weatherproof cover, see Technical Data → p. 159, §12.3.

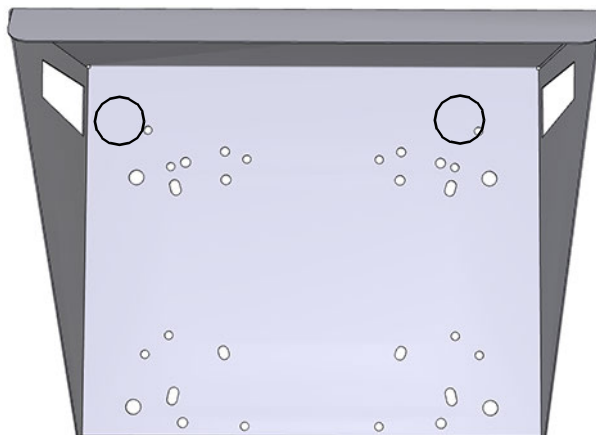
Fig. 57



- 1 First screw the weatherproof cover to the wall through the two holes marked in → Fig. 58.

Fig. 58

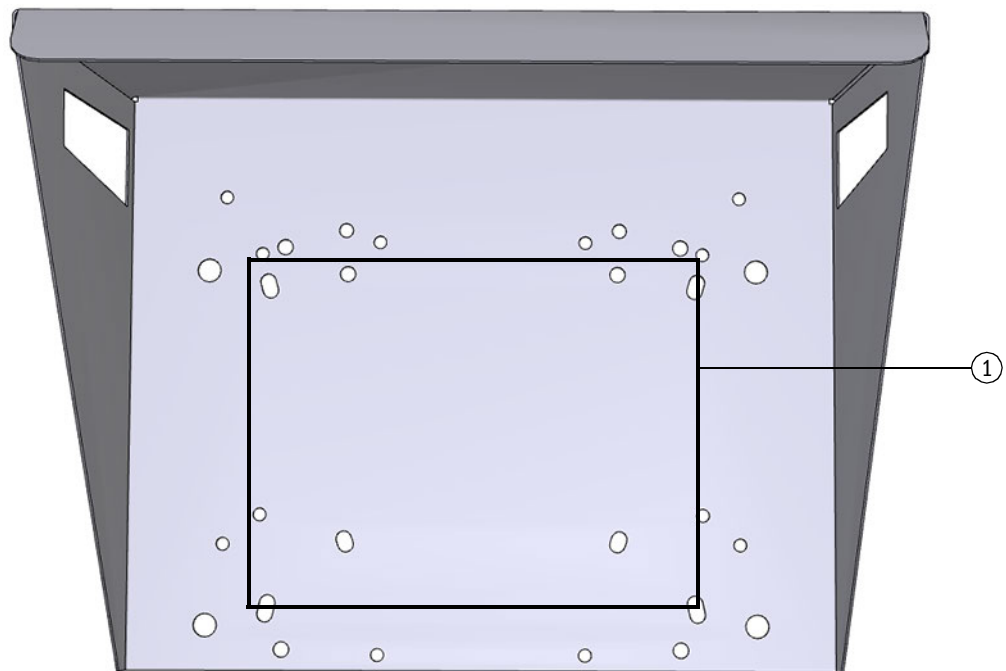
Fitting the weatherproof cover on the wall



- 2 Then screw the Interface Unit also to the wall through the four holes in the weatherproof cover as marked in → Fig. 59.

Fig. 59

Fitting the Interface Unit on the weatherproof cover



- 1 Holes for fitting the Interface Unit Zone 2

6.4.5.2 Weatherproof cover for Interface Unit for fitting on a 2-inch pipe

The weatherproof cover for fitting on a 2-inch pipe (Part No. 2109217) is delivered as a set comprising the following components:

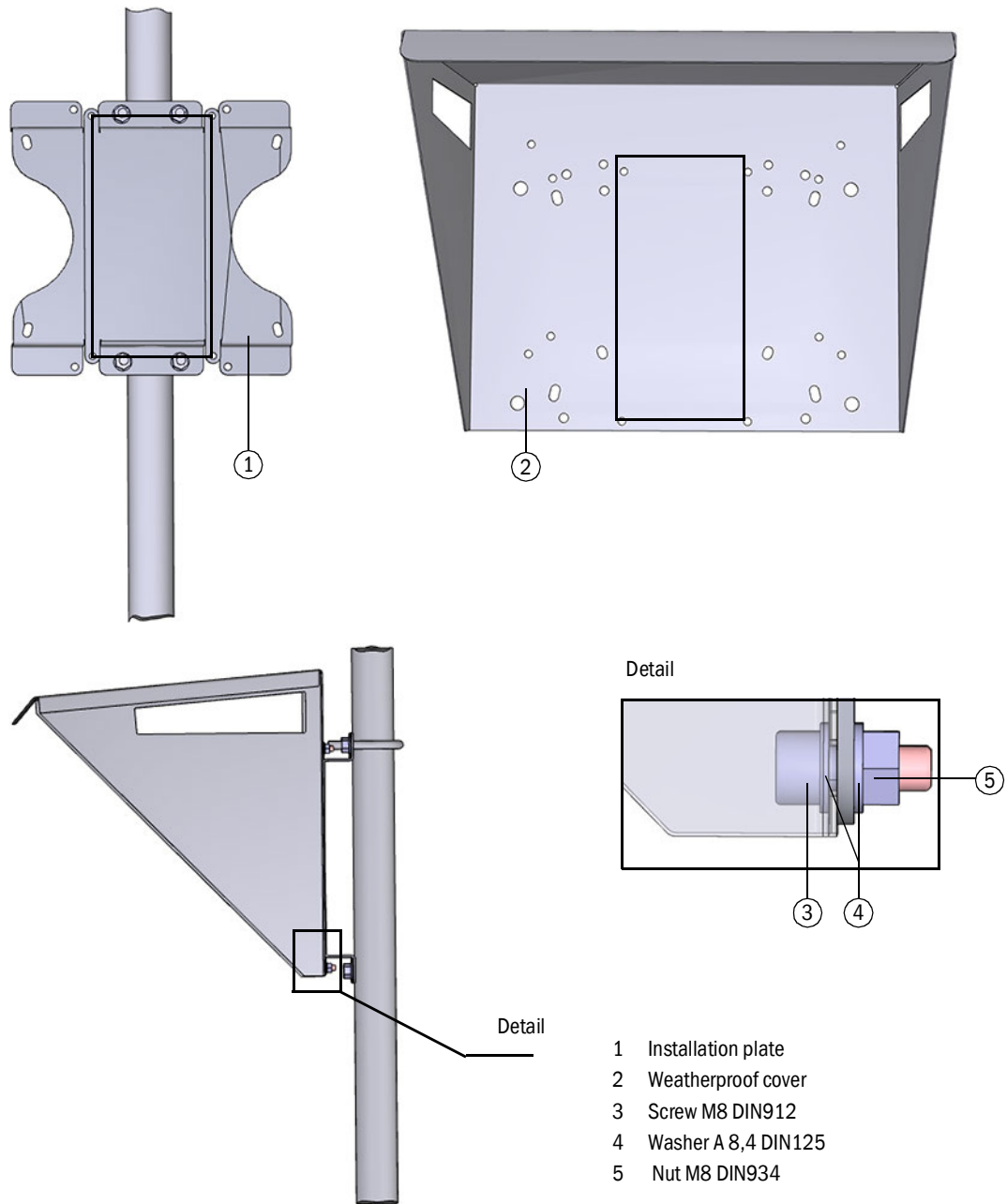
- Mounting plate
- Weatherproof cover
- Fastening material (round steel bow, screws, washers, nuts)

Fitting the weatherproof cover

- 1 The installation plate for the Interface Unit is screwed with the weatherproof cover for transport. For fitting on the 2-inch pipe, first dismount the mounting plate from the weatherproof cover.
- 2 Fasten the installation plate to the 2-inch pipe according to → p. 98, §6.4.4.2 and → Fig. 55.
- 3 Screw the weatherproof cover with the supplied fastening material through the four holes marked on the mounting plate, → Fig. 60.

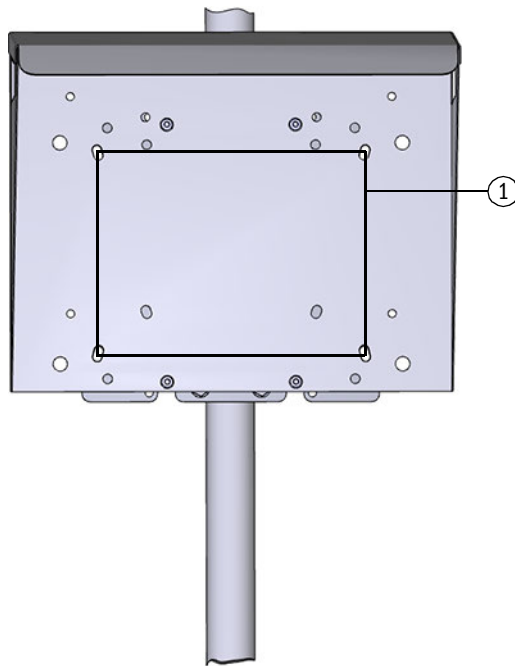
Fig. 60

Fitting the weatherproof cover on the installation plate



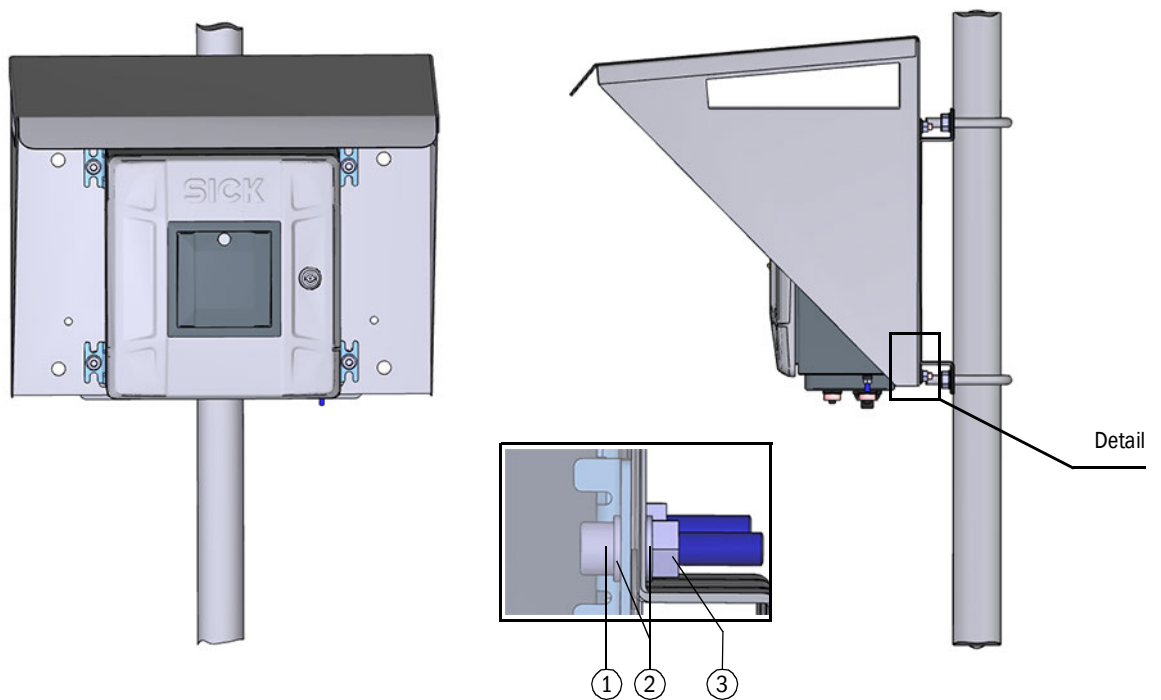
- 4 Also screw the Interface Unit to the installation plate through the four holes of the weatherproof cover using the supplied assembly material, → Fig. 61.

Fig. 61 Fitting the Interface Unit on the weatherproof cover



- 1 Holes for fitting the Interface Unit Zone 2

Fig. 62 Interface Unit with fitted weatherproof cover



- 1 Screw M10 DIN912
- 2 Washer B10.5 DIN125
- 3 Nut M10 DIN934

6.4.6 Fitting the tag plate (available as option)

Two versions of the tag plate are available:

- As label
The label with the tag number is already glued on at the factory when this variant is selected.
- As label with an additional stainless steel tag plate
The label with the tag number is already glued on at the factory when this variant is selected and the additional stainless steel tag plate then attached after electrical installation. This Section describes fitting the stainless steel tag plate.

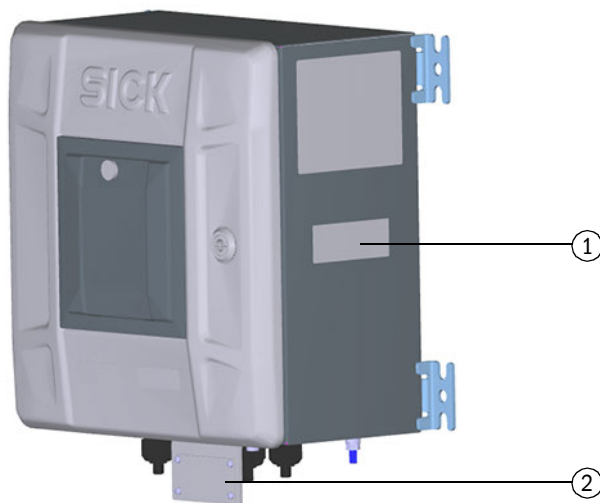


NOTICE:

- Fit the tag plate after the electrical installation in → p. 106, §6.5.

Fig. 63

Overview



- 1 Label with tag number
2 Stainless steel tag plate

Fitting the stainless steel tag plate

- Before fitting the tag plate ensure it is the correct tag plate. Compare the tag plate with the tag number on the Interface Unit.
- Fit the tag plate.

The tag plate assembly kit comprises 4 screws with different lengths (2 short, 2 long) and one contact disc:



WARNING: Hazard through electrostatic discharge

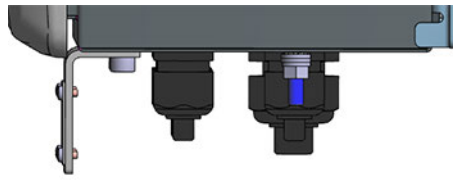
Fit the contact disc provided with one of both screws.

The contact disc ensures the stainless steel tag is securely earthed via the screw-on point.

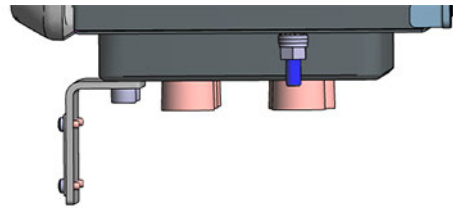
- Use both longer screws for the Interface Unit with NPT cable entries (with flange plate): For fitting the tag plate, first unscrew two screws from the flange plate and replace these with the longer screws. Fit the contact disc with one of the two screws between the screw head and tag plate.
- Use both shorter screws for the Interface Unit with metric cable entries (without flange plate): Fit the contact disc with one of the two screws between the screw head and tag plate.

Fig. 64

Tag plate fitted



Interface Unit with metric thread



Interface Unit with NPT thread

6.5 Electrical installation

6.5.1 Safety information

All assembly work previously described must be completed (as far as applicable) before starting installation work. Carry out all installation work on-site unless otherwise explicitly agreed with SICK or authorized representatives. This includes laying and connecting the power supply and signal cables and installing switches and power fuses.



WARNING: Electrical hazard

Incorrect cabling can cause device malfunctions, failure of the measurement system or serious injuries.

- ▶ Observe the relevant safety regulations as well as the safety notices in → p. 86, §6.2 during all installation work.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.
- ▶ All work may only be carried out when the device is disconnected from the power supply.
- ▶ Before opening the cover, the device must be disconnected from the power supply.



WARNING: Danger due to missing fuse protection of the power supply line

An external line fuse must be provided during installation. Internally, the main power supply lines are designed for an overcurrent protection device up to max. 16 A.

Requirements for the external main power switch:

- ▶ A main power switch must be provided in the installation.
- ▶ The main power switch must be located at a suitable position and must be easily accessible.
- ▶ The main power switch must be marked as disconnecting device for the device.

6.5.2 Cable specification



WARNING: Electrical hazard

- ▶ The cables and wires must be permanently installed. The plant operator must provide adequate strain relief.
- ▶ Cables must have a permitted operating temperature of min. 70 °C.



NOTICE: Requirements on cables and installation

- ▶ Pay attention to the requirements in EN 60079-14 when selecting the cables and during installation!
- ▶ Further legal requirements must be observed for use in explosive atmospheres.
- ▶ For devices with Ex approval, the cable inlets must have an Ex approval minimum Ex ec IIC.
- ▶ All cable inlets or cable sealing plugs must be approved for a temperature range of -40 °C ... + 60 °C or -40 °C ... +65 °C, depending on the version.
- ▶ Only copper wires may be used.

Power supply

- DC version
Max. 30 VDC, max. 1 A, recommended cable cross-section: 1 ... 2.5 mm²
- AC version
Max. 253 VDC, max. 0.5 A, recommended cable cross-section: 0.75 ... 2.5 mm²

Switching outputs

Max. 30 VDC, max. 70 mA, switching frequency max. 50 Hz, recommended cable cross-section: min. 0.5 mm²

Digital output

Max. 30 VDC, max. 70 mA, switching frequency max. 10 kHz, recommended cable cross-section: min. 0.5 mm², twisted pair, shielded

Analog output

Max. 30 VDC, max. 24 mA, recommended cable cross-section: min. 0.5 mm², twisted pair, shielded

Analog input

Max. 30 VDC, max. 24 mA, recommended cable cross-section: min. 0.5 mm², twisted pair, shielded

RS485

EIA -485, max. 57.6 kbit/s, termination 150 Ohm switchable, recommended cable cross-section: min. 0.5 mm². twisted pair, shielded

Ethernet

10/100 Mbit/s, protocol Modbus TCP, recommended cable cross-section: Cat 5 or higher

6.5.3

Cable glands

Depending on the variant, the inputs of the device are installed with certified cable glands or with certified sealing plugs. Use only installation material approved for the hazard zone involved. The user is responsible for correct selection.

6.5.4

Requirements for installation in the Ex zone**WARNING: Dangerous voltage**

- ▶ Do not open the enclosure while energized.
- ▶ Only operate internal switches if the device is not live or the area is safe.
- ▶ Do not connect or disconnect the circuits unless the power has been turned off or the area is safe.
- ▶ It must be ensured that the rated voltage U_M 60 V is not exceeded when connected to devices not belonging to the system, in particular external power supply devices, power supply units, etc.; except for the main power supply with $U_M < 253$ V.
- ▶ A suitable main power switch must be provided.
- ▶ Do not use the device when cables or terminals are damaged.

**WARNING: Ignition hazard through electrostatic discharge**

The plastic display surface dimensions of the display door and of the display exceed the allowable value for ignition group IIC. The user must take appropriate precautions to avoid ignition hazards through electrostatic discharge.

Ignition hazards through electrostatic discharges exist when gas flow meters with special paintwork and a layer thickness >0.2 mm are used in applications with ignition group IIC in accordance with ATEX and IECEx.

- ▶ For installation, the risk of electrostatic charging of the surface must be reduced to a minimum.
Therefore, the device should not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. change previous text
- ▶ Use appropriate caution when performing maintenance and cleaning work. For example, the surfaces should only be cleaned with a damp cloth. The respective devices will be identified by the manufacturer with a warning sign.

General information

- The documentation for zone classification according to EN 60079-10 must be available.
- The devices to be used must be checked for suitability for the application area.
- After installation, an initial test of the device and the plant according to EN/ IEC 60079-17 must be performed.

Cables

- Cables must fulfill the requirements according to EN 60079-14.
- Cables must have a permitted operating temperature of min. 70 °C.
- Protect cables especially endangered by thermal, mechanical or chemical stress, e.g. by laying in protective tubes.
- Cables must be flame-retardant according to DIN VDE 0472 Part 804. The fire behavior according to B / IEC 60332-1 must be approved.
- The cross-section of each individual wire must not be smaller than 0.5 mm².
- Observe the clamping range of the cable glands for cable selection.
- Cables for Ex-e cable inlets must comply with the requirements in EN 60079-14 Section 11.3.
- The existing air and creepage paths according to EN 60079-7 or EN 60079-15 may not be reduced by cable connections in the terminal box.
- Protect the wire ends with connector sleeves against fraying.
- Replace unused cable inlets with the enclosed Ex-e sealing plugs.
- Connect or safeguard unused wires to ground so that a short circuit with other conductive parts is excluded.
- Carry out potential equalization in accordance with EN 60079-14 (see also the following Section).
- Use thread sealant according to EN 60079-14, Section 9.4 for threads with ½" NPT.

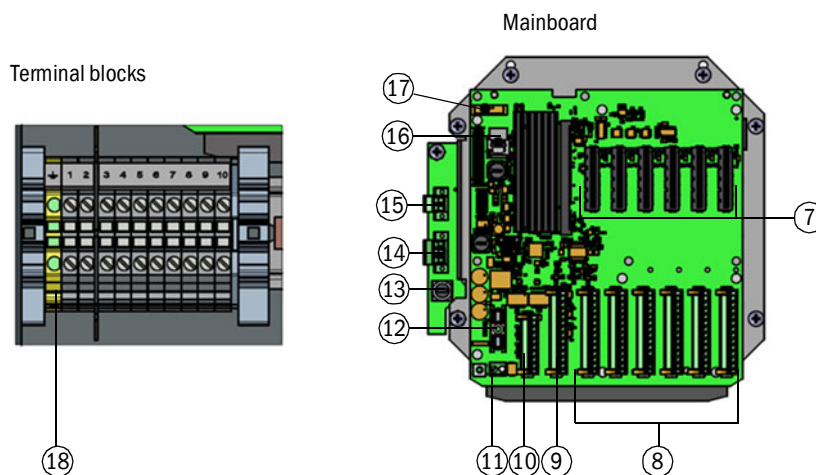
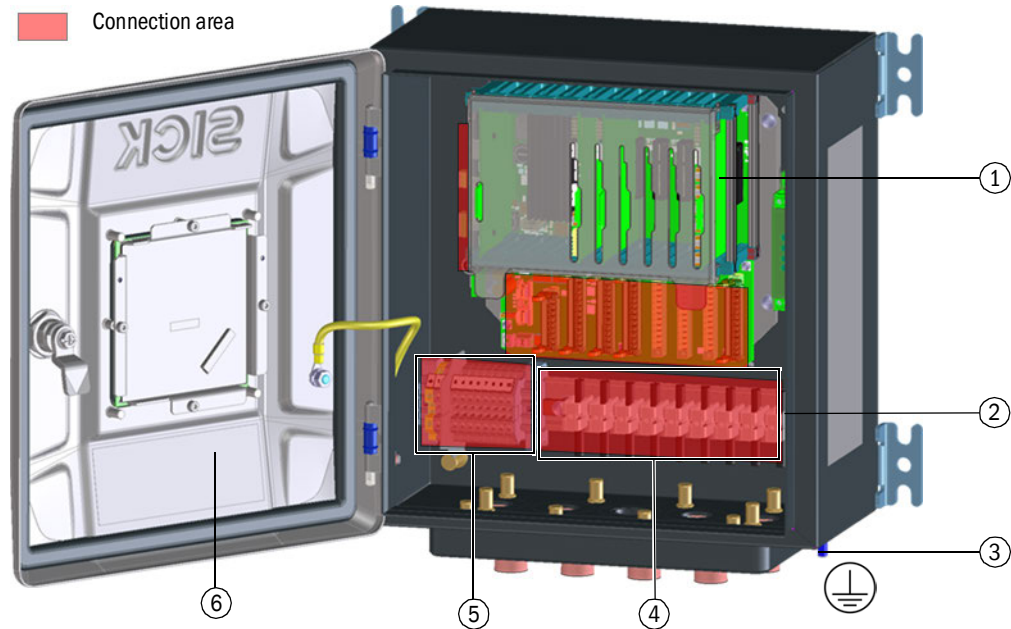
Specific requirements for installation in the USA and Canada

- Installations in USA must be carried out according to NEC (ANSI/NFPA70).
- Installations in Canada must be carried out according to CEC part 1.

6.5.5 Electrical connections of the Interface Unit

6.5.5.1 Overview of electrical connections

Fig. 65 Connection area and inner electronics of the Interface Unit



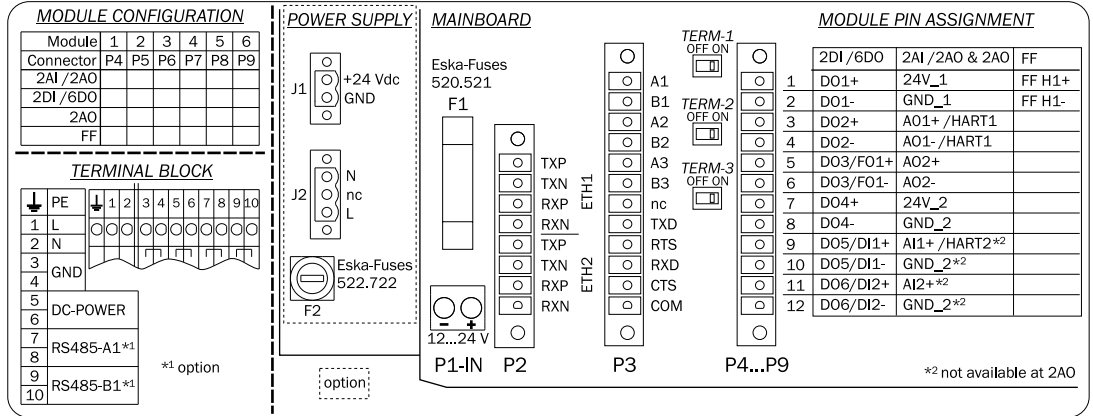
- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Mainboard 2 DIN rail 3 Exterior ground terminal (connected with GND) 4 Shielding terminals 5 Terminal blocks 6 Terminal assignment sticker 7 Slots for I/O modules 1-6 8 Field connections for I/O modules P4 - P9 - direct connection to module slots 1-6 9 Field connection for ultrasonic sensors P3 - external serial bus | <ul style="list-style-type: none"> 10 Field terminal connector P2 - Ethernet 11 Field terminal connector P1 - Power In 24 V DC 12 Fuse F1 13 Fuse F2 14 Field connection J2 - power supply connection of the internal power supply unit 15 Field connection J1 - 24 V output voltage of the internal power supply unit 16 Memory card (Micro SD) 17 Backup battery for real-time clock (RTC) 18 Terminal block grounding |
|---|---|

The pin assignment is shown on the sticker on the inside of the door:

- Device module configuration
- Connection area for field-side wiring
- Termination resistors of serial RS485 lines
- Identification of fuses and fuse characteristics

Fig. 66

Terminal assignment



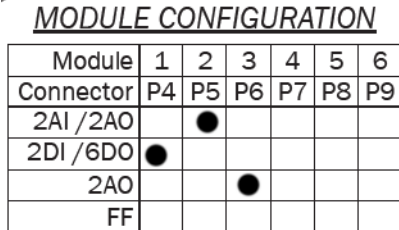
6.5.5.2

Device module configuration

The module configuration of the respective device is marked on the sticker on the inside of the enclosure door:

Fig. 67

Module configuration (example; the first line designates module slots 1-6)



6.5.6 Connection area for field-side wiring

Fig. 68 Terminal blocks

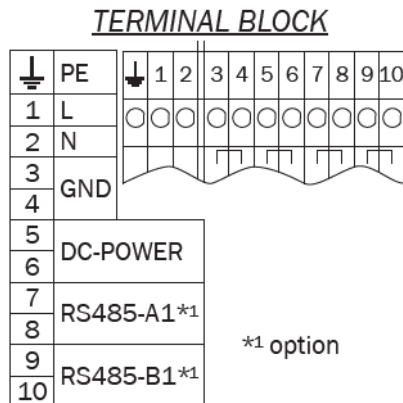

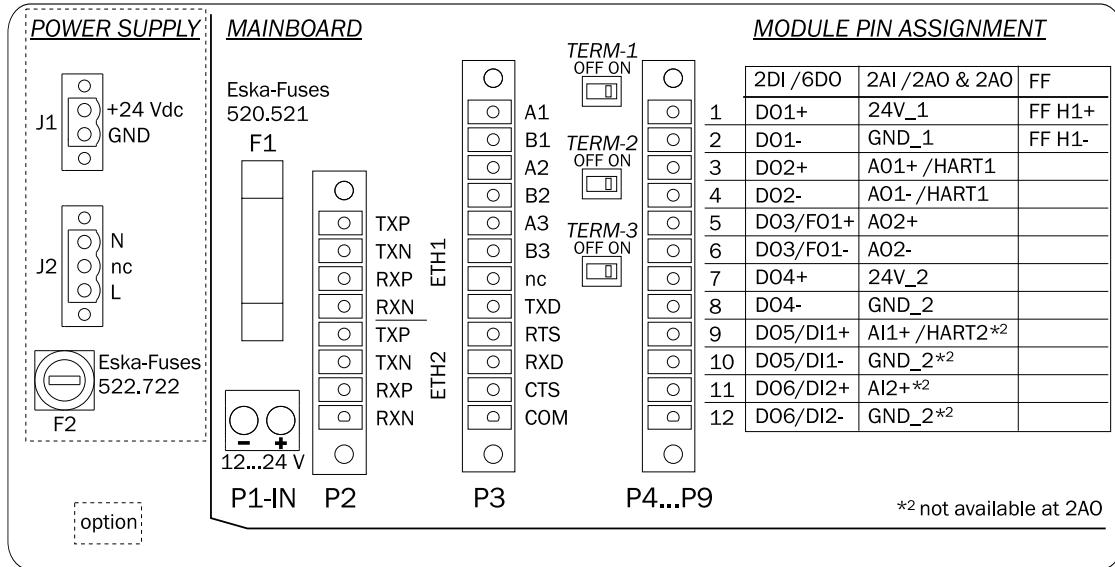


Table 10 Terminal assignment of the terminal blocks

Terminal No.	Short name	Function	Comment	Conductor size
	Ground symbol	Grounding	Connected with GND	0.5 ... 2.5 mm ²
1	L1	Phase conductor	Optional - AC variant	
2	N	Neutral conductor		
Separator / partition plate				
3	GND	Minus pole - DC	Variant-dependent wiring	0.5 ... 2.5 mm ²
4				
5	DC power	Positive pole - DC	<i>DC variant</i>	
6			<ul style="list-style-type: none"> - Connection of ext. power supply unit - Routing of external power supply to FLSE100-XT sender/receiver units 	
			<i>AC variant:</i>	
			<ul style="list-style-type: none"> - Internal 24 VDC power supply unit is connected - Connection of external. FLSE100-XT sender/receiver units for their power supply 	
			GND is connected electrically with the exterior ground terminal	
7	RS485-A1	Serial interface	Installation option for connection of two FLSE100-XT sender/receiver units, connection from P3 to the terminal blocks must be made on-site	
8				
9	RS485-B1			
10				

Overview of field connections mainboard and 115 ... 230 VAC power supply

Fig. 69 Field connections



Plug/terminal name	Pin identification	Function	Comment	Conductor size
P1	1	Minus pole - DC, GND	Power supply of electronic unit, prewired at the factory to terminal block 3 to 6	0.5 ... 1.5 mm ²
	2	Positive pole - DC		
P2	TXP - ETH1	Data line of first Ethernet interface	100Base-TX or 10Base-T full and halfduplex Ethernet	0.14 ... 1.5 mm ²
	TXN - EHT1			
	RXP - ETH1			
	RXP - ETH1			
	TXP - ETH2	Data line between of second Ethernet interface	100Base-TX or 10Base-T full and halfduplex Ethernet	
	TXN - EHT2			
	RXP - ETH2			
	RXP - ETH2			
P3	A1	Serial RS485	internal COM5, Connection FLSE100-XT	0.5 ... 1.5 mm ²
	B1			
	A2	Serial RS485	internal COM2, Connection Scada, Service PC or Gas chromatograph	
	B2			
	A3	Serial RS485	internal COM3, Connection Scada, Service PC or Gas chromatograph	
	B3			
	nc	Not connected		
	TXD	Transmit data	Serial RS232 Internal COM1, Connection Scada, Service PC or Gas chromatograph	
	RTS	Request to send		
	RXD	Receive data		
	CTS	Clear to send		
COM	Common Ground - connected electrically with GND			

Plug/terminal name	Pin identification	Function	Comment	Conductor size
P4 to P9	1	Directly connected to I/O module slots 1 to 6, example: P4 connected to slot 1 etc. Exact pin assignment depending on the module, see → Table 11		0.5 ... 1.5 mm ²
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
J1	+24V DC	Positive pole - DC	24V output voltage of internal power supply unit *optionally available	0.5 ... 2.5 mm ²
	GND	Minus pole - DC, GND		
J2	N	Neutral conductor	Power supply connection of internal power supply unit, prewired to terminal blocks 1 and 2 *optionally available	0.5 ... 2.5 mm ²
	nc	Not connected		
	L	Phase conductor		

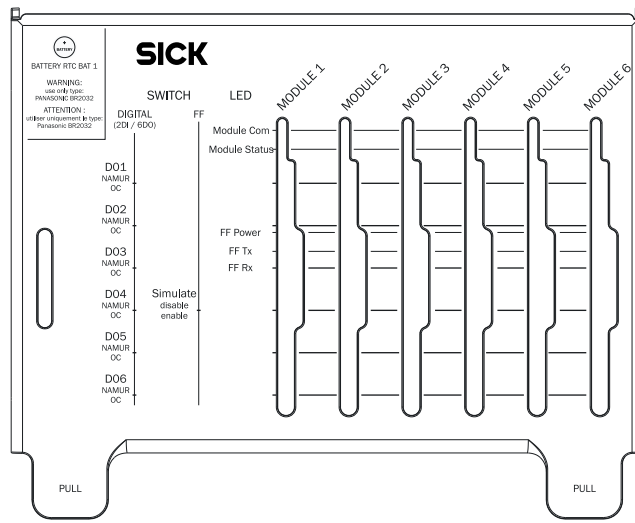
6.5.7 Connection assignment of I/O modules

Table 11 Signal definition of individual modules

Pin ident.	I/O module							
	Analog module type 1 (2AI/2AO)		Analog module type 2 (2AO)		Digital module type 1 (2DI/6DO)		Interface module FOUNDATION Fieldbus (FF)	
1	24V_1	Auxiliary voltage for up to two current loops, max. 60 mA	24V_1	Auxiliary voltage for up to two current loops, max. 60 mA	DO1+	Digital output	FF H1+	FOUNDATION Fieldbus
2	GND_1		GND_1		DO1-		FF H1-	
3	AO1+/HART1	Analog output; HART Slave	AO1+/HART1	Analog output; HART Slave	DO2+	Digital output		
4	AO1-/HART1		AO1-/HART1		DO2-			
5	AO2+	Analog output	AO2+	Analog output	DO3+	Digital output		
6	AO2-		AO2-		DO3-			
7	24V_2	Auxiliary voltage for up to two current loops, max. 60 mA	24V_2	Auxiliary voltage for up to two current loops, max. 60 mA	DO4+	Digital output		
8	GND_2		GND_2		DO4-			
9	AI1+/HART2	Analog input; HART master			DO5+/DI1+	Switching output/digital input		
10	GND_2				DO5-/DI1-			
11	AI2+	Analog input			DO6+/DI2+	Switching output/digital input		
12	GND_2				DO6-/DI2-			

6.5.8 Electronics cover

Fig. 70 Electronics cover



The electronics cover serves to protect the internal electronics from contamination. The labeling on the electronics cover refers to the module slots.

Fig. 71 Electronics cover labeling

Labeling	Description	
Digital	Switch for NAMUR/OC changeover, for digital modules	Switching between Open Collector and Namur, see → p. 116, §6.5.9.
FF	Simulate switch, only for FOUNDATION Fieldbus	<ul style="list-style-type: none"> ● Disable: Measured and process values available via FOUNDATION Fieldbus ● Enable: Simulated values available via FOUNDATION Fieldbus
LED	Mobile communication signaling	
	Module COM	Communication via backplane bus active
	Module Status	<ul style="list-style-type: none"> ● Flashing: I/O module synchronization (once per I/O cycle, e.g. 500 ms) ● Blinking: Short-term I/O or communication error; check I/O module status ● Static on: Permanent I/O or communication error; check I/O module status
	FF Power	Bus line via FOUNDATION Fieldbus H1 available
	FF Tx	<ul style="list-style-type: none"> ● Flashing/blinking: Internal communication response of the I/O module¹⁾ ● Static on: No communication
	FF Rx	<ul style="list-style-type: none"> ● Flashing/blinking: Internal communication response of the I/O module¹⁾ ● Static on: No communication

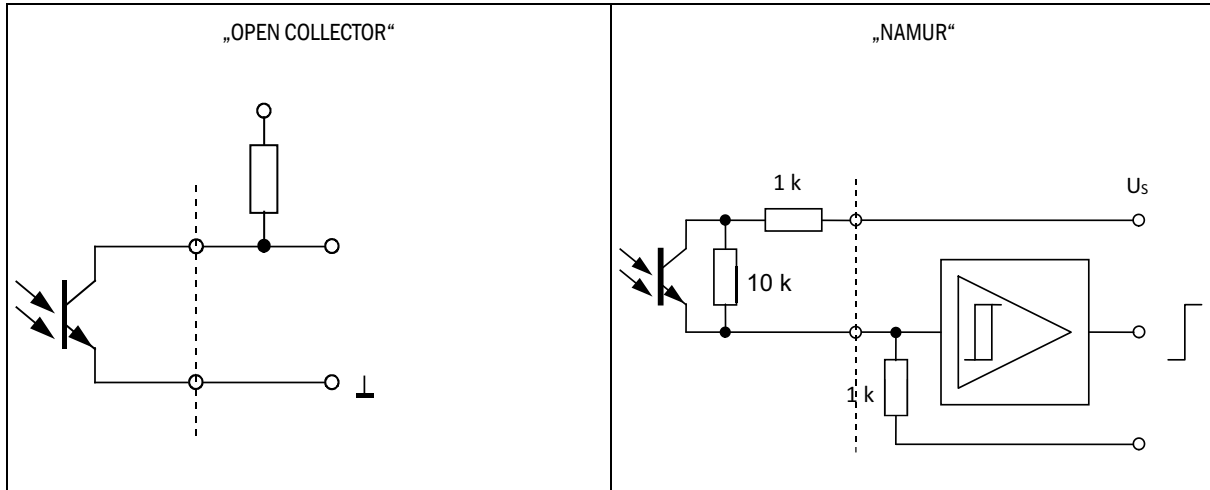
¹⁾ Independent of external communication via FOUNDATION Fieldbus H1

6.5.9 Switching (Open Collector - Namur) on digital modules


NOTICE:

Electrical parameters, see Technical Data, → p. 159, §12.3 “Digital outputs”.

Figure 72 DO circuitry (Open Collector - Namur)



6.5.10 Termination resistors of serial RS485 lines

For all three serial RS485 lines, termination resistors can be optionally connected via switches (Term-1...3).

The termination network is structured as follows:

Fig. 73 Termination

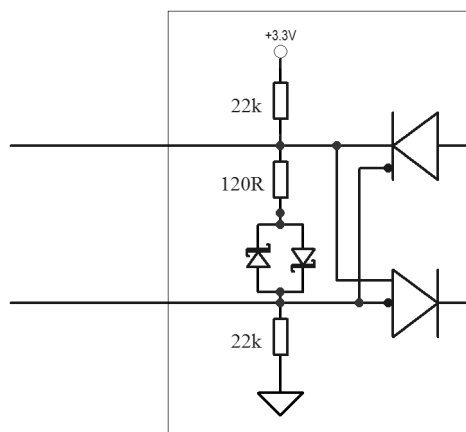
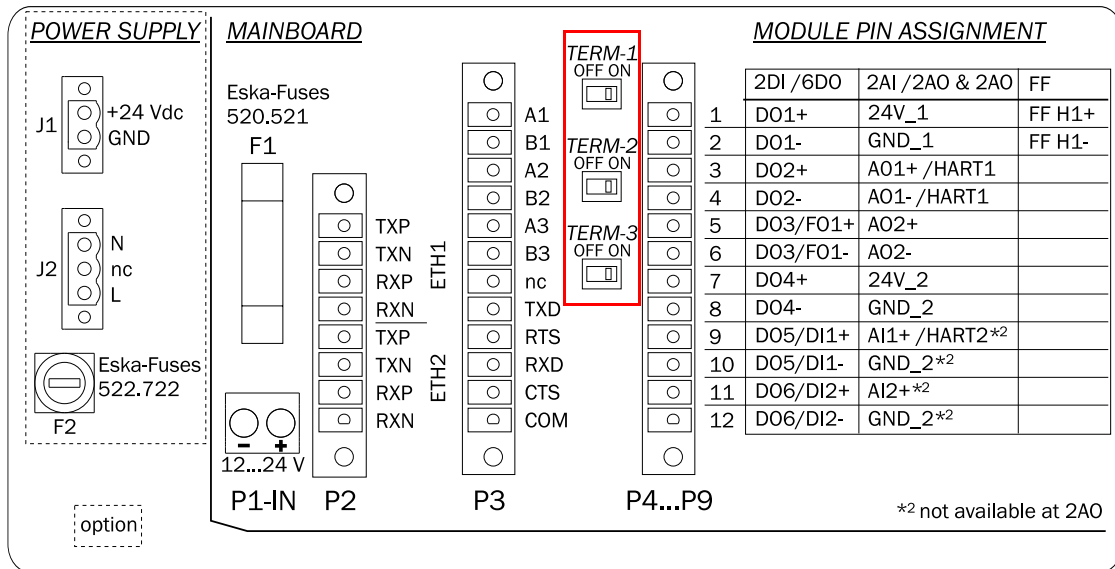


Fig. 74 Position of termination switches



6.5.11 Internal fuses



WARNING: Danger through power voltage

► Disconnect the power supply line before replacing the fuse.

The device has two internal fuses.

- Fuse F1 - protection of the DC supply for the complete electronic unit
Fuse characteristics:
Manufacturer: Eska Fuses
Part No.: 520.521
SICK Order No.: 2104408
D5 * 20; 2.5 A; quick-blow; with extinguishing agent
- Fuse F2 - depending on variant for securing the AC supply line
Fuse characteristics:
Manufacturer: Eska Fuses
Part No.: 522.722
Sick Order No.: 2105350
D5 * 20; 3.15 A; slow-blow; with extinguishing agent



NOTICE:

To prevent the fuse from blowing repeatedly, the user must determine the cause and take appropriate precautions before restarting the device.

6.5.12 Torque values for screw connections

All screw connections have to be tightened with a specific torque value:

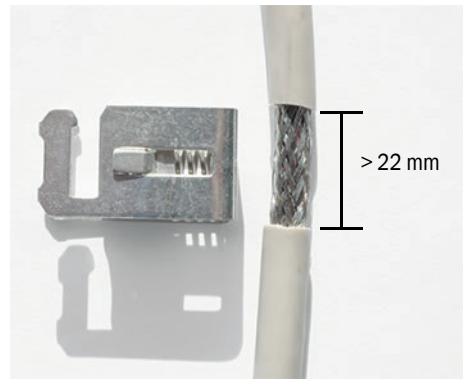
Table 12 Torque values

Electrical connection	Definition of torque value
Terminal block	0.5 - 0.6 Nm
Terminal P1	0.5 - 0.6 Nm
Terminal P2 ... P9	0.22 - 0.25 Nm
Terminal J1, J2	0.5 - 0.6 Nm

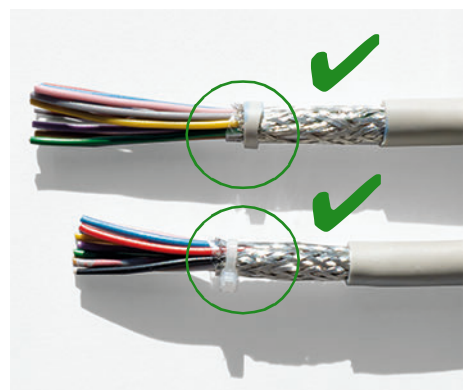
6.6

Connecting shielding terminals

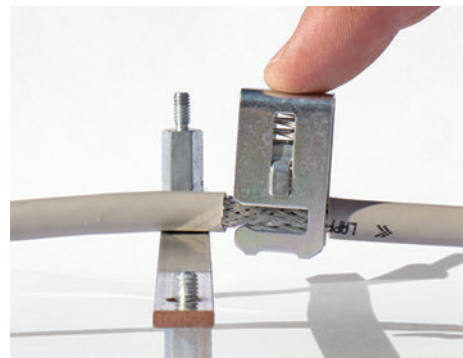
1 Strip the cable > 22 mm.



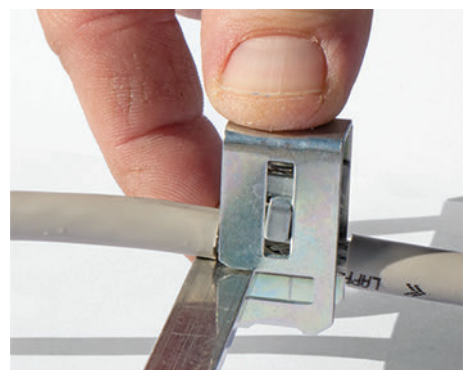
2 Leave a piece of the sheath in place to hold the wires together. As an alternative, use a cable strap.



3 Before securing the cable with the terminal, attach the associated plug-in connector. Then connect the terminal to the shield.

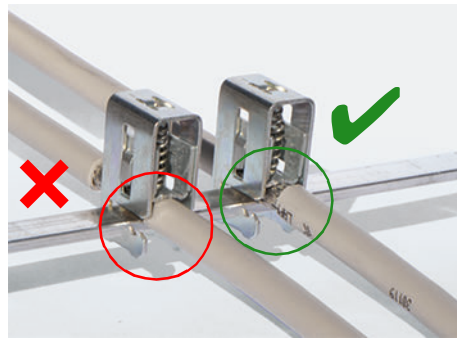


4 Press the terminal down and slide it onto the rail to secure the cable.



WARNING: Danger due to incorrect use of the shielding terminal
 The insulation of the cable must not be clamped under the shielding terminal. Otherwise there is no electrical contact and shielding is not guaranteed.

- 5 Ensure the insulation of the cable is not clamped under the shielding terminal.



- 6 Check that the cable is correctly seated.



FLOWSIC100 Flare-XT

7 Commissioning FLOWSIC100 Flare-XT

General information

Opening the display protective flap

Setting the display language

Commissioning with the FLOWgate™ operating software

Field setup wizard

Function checks after commissioning

7.1 General information

- Before commissioning, the sender/receiver units and the Interface Unit must be installed and electrically connected.
- The display language can be set directly on the device via the display, → p. 122, §7.3.
- The field setup wizard in the FLOWgate™ operating software supports commissioning, → p. 123, §7.4.



NOTICE:

User administration, archives and logbooks are only available via an Ethernet connection to the FLOWSIC100 Flare-XT.

7.2 Opening the display protective flap

- ▶ Loosen the screw on the display protective flap.
- ▶ Swivel the display protective flap down.



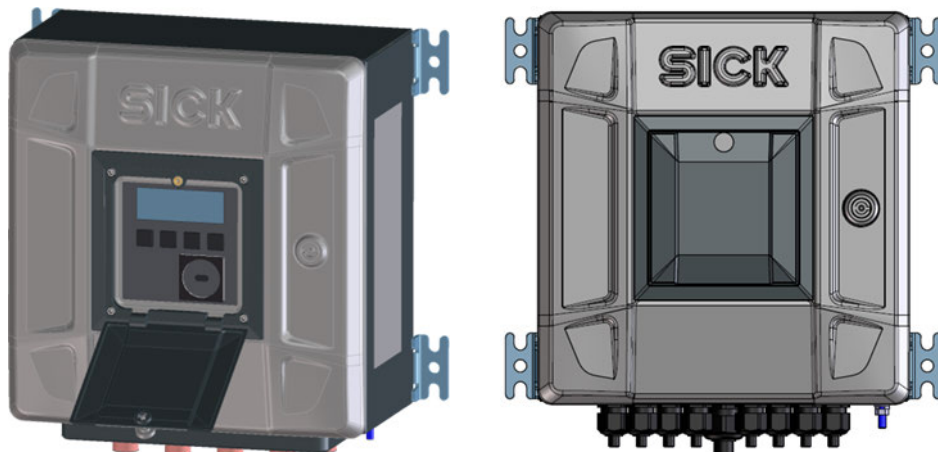
NOTICE: Display protective flap

Do not remove the display protective flap.

- ▶ Always keep the display protective flap closed when the display is not in use!
- ▶ Screw the display protective flap tight after finishing work.

Fig. 75

Display protective flap



7.3 Setting the display language

The display language can be set directly on the display without login.

Available: English, German, Russian

- 1 Press ESC to go to the main menu.
- 2 Using the arrow buttons, navigate to the “Language” menu.
- 3 Press ENTER to open the “Language” menu.
- 4 Using the arrow buttons, navigate to the desired language.
- 5 Press ENTER to confirm the language selection.

The display language is changed.

7.4 Commissioning with the FLOWgate™ operating software

7.4.1 Connect to the device

A data connection can be established with the device using the optical data interface and the infrared/USB adapter HIE-04 (Order No. 6050602).

This interface serves to configure the FLOWSIC100 Flare-XT. The infrared/USB adapter has a USB 2.0 interface. This interface provides the connection to the PC and transfers the FLOWSIC100 Flare-XT data.



A device driver software must first be installed to operate the adapter on a PC. The device driver software is on the delivered Product CD.

- 1 Install the device driver software before connecting the USB plug to the PC.
- 2 Connect the USB plug to the PC.
- 3 Fit the infrared/USB adapter to the infrared interface as shown (Fig. 76), a magnet integrated in the reading head retains the adapter.

Fig. 76

Aligning the infrared/USB adapter

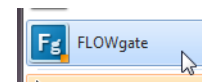
Correct alignment



- 4 Install the FLOWgate™ operating software. The FLOWgate™ operating software and the associated Manual are to be found on the Product CD delivered with the FLOWSIC100 Flare-XT and on the SICK website.



- 5 Click on the FLOWgate™ icon to start FLOWgate™:




- 6 Add the FLOWSIC100 Flare-XT to the Device Manager of the FLOWgate™ operating software and create a connection to the device.



Standard settings for connection with the infrared/USB adapter:

- Protocol: Modbus RTU
- Baud rate: 38400
- Modbus address: 1

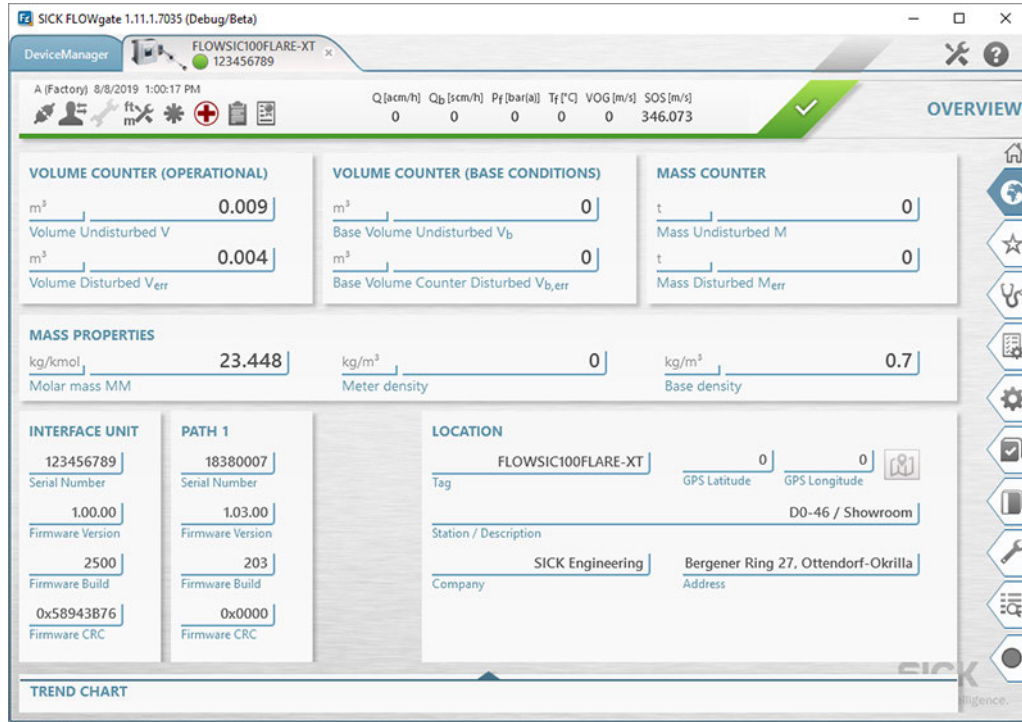
- 7 Login to the device with the default user “Operator”.

 Standard password for the “Operator”: flaregas

- 8 Start the field setup wizard and follow the step-by-step instructions.

Fig. 77

Connection with FLOWgate™ - Overview



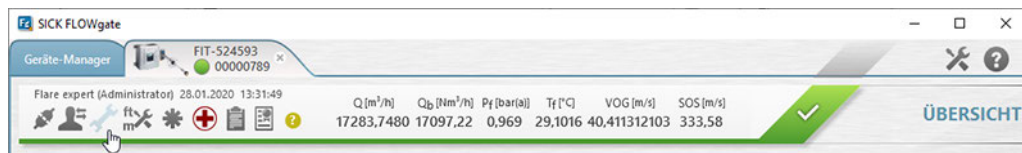
7.5 Field setup wizard

The field setup wizard leads step by step through the necessary parameterization of the FLOWSIC100 Flare-XT and ensures no important settings are forgotten. The respective parameters are written to the Interface Unit and the FLSE-XT sender/receiver unit after every step.

- Switch to Configuration mode to start commissioning.

Fig. 78

Starting Configuration mode



7.5.1 Path setup

The connected device is automatically recognized for a 1-path installation.

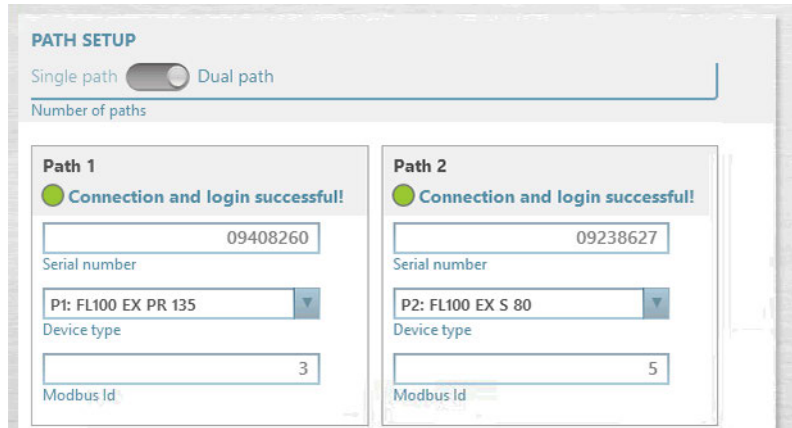
Proceed as follows for a 2-path installation:

- Push the slider control to “2 path”.
- The assignment of the two paths in the pipe is that the upper path is "Path 1" and the path below it has the number 2.

The FLSE100-XT Master always has the lower number and the FLSE100-XT Slave the higher number.

- ▶ Click “Use path setup”.
- ▶ The connection to the sender/receiver units is created.

Fig. 79 Path setup (2-path installation)



7.5.2 **Identification**

- ▶ Compare the serial numbers with the type plates.
- ▶ Enter a device name: The device name is freely selectable.
- ▶ Enter the location.

7.5.3 **System/archives**

Date and time

- ▶ Enter the date and time or synchronize with the PC.

Units

- ▶ Select the unit system for the display in FLOWgate™.
- ▶ Set whether pressure values are to be shown as absolute or relative pressure.

Data archive settings

- ▶ Determine the storage intervals for the data archives.
The archives each have a memory of 65,000 entries and are ring buffers.

+i A typical setting at 1 hour allows saving data for a period of 7 years.

7.5.4 Installation

**NOTICE:**

Systems consisting of Interface Unit, FLSE-XT sender/transmitter/receiver units and spool piece are preconfigured at the factory. Do not change the configurations for these systems and skip the “Installation”.step.



The dimensions of the components can be taken from the report generated during assembly.

- For installations with ball valves, set slider “Path is retractable” to “Yes”.

Fig. 80

Installation parameters

GEOMETRIC DIMENSIONS OF ASSEMBLING PARTS

Yes No

Path is retractable

mm Circumference U

mm Gasket thickness S

DEG Path 1: Path angle α

mm Path 1: Length nozzle D1

mm Length of ball valve VL

mm Wall thickness w

- Enter the dimensions determined during installation:
 - Wall thickness w, circumference U
→ p. 54, §5.6.7.2 for cross-duct versions and → p. 56, §5.6.7.3 for the probe versions
 - Nozzle length D1; and the length of the second nozzle D2 for cross-duct versions,
→ p. 57, §5.6.7.4
 - Gasket thickness S, length of ball valve VL → p. 62, §5.6.8
- Click “Calculate probe offset”.
The probe offset is calculated.
- Click “Calculate parameter values”.
The parameter values are calculated.

7.5.5 **Pressure/temperature sensor**

- Select source of pressure and temperature measured values.

Table 13 Settings for connected pressure or temperature sensors

Selection	Parameter	Description
pT sensor settings		
Single/dual source	Single	One sensor connected
	Dual	Two sensors connected
Fall back type	Last good value	Last valid measured value of connected sensor
	Fixed value	Value set under "Fixed value"
Fixed value	Entry field	Fixed value for pressure or temperature If "Fixed value" was selected under "Source selection" or when a sensor fails.
Dual mode	Auto transmitter A	The value of transmitter A is used by default
	Auto transmitter B	The value of transmitter B is used by default
	Average	An average is created from both measured sensor values
Deviation limit	Entry field	Maximum allowed deviation of the measured values of both transmitters from each other
Deviation failed mode	Transmitter failure	If the configured "Maximum deviation" is exceeded, an error message is displayed
	Use transmitter A value	If the configured "Maximum deviation" is exceeded, the value of transmitter A is used
	Use transmitter B value	If the configured "Maximum deviation" is exceeded, the value of transmitter B is used
pT transmitter A/B		
Source selection	Fixed value	Value set under "Fixed value"
	Analog input	Pressure value read in via an analog input.
	Analog input channel	Assignment via which analog input the measured value is read in
	HART	Measured value read in via HART
	Analog input channel	Assignment via which analog input the measured value is read in
	Slave ID	Address of the pressure or temperature sensor
	Freeze mode	Activates the freeze mode of the transmitter; if the freeze mode is activated, the measured values are frozen at the requested time and can be queried one after the other.
	HART value selection	Selection which of the dynamic variables should be used as process input: Primary, Secondary, Tertiary or Quaternary variable.
	External live value	Measured value read in via the Modbus register
	P Absolute/Gauge	
P Source Abs Gauge	Absolute	The connected sensor is an absolute pressure sensor
	Gauge	The connected sensor is a gauge pressure sensor

7.5.6 I/O configuration

In the I/O configuration step, the parameters can be set for the interfaces available in accordance with the ordered configuration. Depending on the configuration, several modules of one type may be available.

The designation Px behind the interface designation describes the position of the module, for arrangement see → p. 110, §6.5.5.

7.5.6.1 Ethernet

The MAC address can be read out in this view.

- ▶ Enter IP address, network mask and gateway.
- ▶ When no gateway is used, enter "0.0.0.0" as gateway.



Factory settings:

- Ethernet port 1:
 - IP address: 192.168.1.100
 - Network mask: 255.255.255.0
- Ethernet port 2:
 - IP address: 192.168.2.100
 - Network mask: 255.255.255.0

7.5.6.2 RS485/RS232

Define the communication settings for connected devices, e.g., for connected gas chromatographs.

Table 14 Selection options for connected devices

Selection	Description
Flowgate Modbus Ser	Connection Service PC via RS485-USB Adapter Using Flowgate over greater distances than with infrared adapter
Scada MODBUS Ser	Connection Interface Unit to higher level control system
MCU-P compatible	Interface Unit MODBUS Register mapping analog to MCUP
GC	Connecting a standardized gas chromatograph

7.5.6.3 DI/DO (layout depending on the selected configuration)

Digital outputs DO1, DO2 and DO4 can be activated.

DO3 can be configured as status output or pulse output (PO1). The desired measured value can be assigned to the pulse outputs. The desired function can be assigned to the digital output in the "Function" menus.

DO5 and DO6 can be configured as digital inputs DI1 and DI2.

Example for the configuration of a digital output:

Fig. 81

DO1 (example)

Pin	Signal	active	Output assignment	Fixed value	Invert logic	Alarm on error	Test mode	Status
1	DO1+	DO	Checkcycle active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Off	● ?
2	DO1-		Warnings active	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Off	● ?

Table 15 Selection options

Selection	Description
Checkcycle active	Check cycle of the sender/receiver units
Warnings active	Warnings are active on the FLOWSIC100 Flare-XT
Alarms active	Alarms are active on the FLOWSIC100 Flare-XT
Flow direction	Flow direction of the gas; positive flow direction (0), return flow (1)

- Invert logic: Inverts the logic of the output signal
- Alarm on error: In case of an error of the digital output, an error is displayed in the system status of the FLOWSIC100 Flare-XT
- Test mode:
 - Off: Test mode not active
 - Permanently on: Test of digital output, permanently on
 - Permanently off: Test of digital output, permanently off

Example for the configuration as pulse output:

Fig. 82

P01 (example)

	Output assignment	Factor [Imp/acm]	Alarm on error	Test mode	Test value []	Status
4 DO2-						
5 DO3/PO1+ PO	P01 Indicated volume fwd	3.2	<input type="checkbox"/>	<input type="checkbox"/>	1	● ?

- Function: Output values of the pulse output; the following measured values can be output (forward = positive flow direction):
 - Indicated volume fwd
 - Base volume fwd
 - Mass fwd
 - CO2 mass fwd
- Factor: The factor indicates how many pulses are output per selected unit; in the example (→ Fig. 82), 3.2 pulses per measured cubic meter of gas are output in the flow direction.
- Alarm on error: In case of an error of the pulse output, an error is displayed in the system status of the FLOWSIC100 Flare-XT
- Test mode: Test mode active
- Test value: Impulses per calculation cycle of the application; the default duration of a calculation cycle is 500 ms.

Example for the configuration as digital output:

Fig. 83

DI1 (example)

	Input assignment	Invert logic	Raw read	Debounce [ms]	Alarm on error	Test mode	Status
7 DO4+ inactive							
8 DO4-							
9 DO5/DI1+ DI	DI1 Start check cycle	<input type="checkbox"/>	<input type="checkbox"/>	0	<input type="checkbox"/>	Off	● ?

Table 16 Selection options

Selection	Description
Maintenance	Set maintenance condition
Start check cycle	Start check cycle of the sender/receiver units
Start AO check cycle	Start check cycle of the analog outputs
Start AO check and check cycle	Start check cycle of analog outputs and sender/receiver units
Data valid	Overall status for the measuring point; when the control system signals an incorrect overall status, the Interface Unit increments the error counters, even when there is no error on the FLOWSIC100 Flare-XT

- Invert logic: Inverts the logic of the received signal
- Raw read: Instantaneous value, without debounce
- Debounce: Debounce time (the time a digital input must be constant without status change)
- Alarm on error: In case of an error of the digital input, an error is displayed in the system status of the FLOWSIC100 Flare-XT
- Test mode:
 - Off: Test mode not active
 - Permanently on: Test of digital input, permanently on
 - Permanently off: Test of digital input, permanently off

7.5.6.4

AI/AO

- ▶ Determine the output values for the analog outputs.
- ▶ Determine whether an alarm is to be displayed for analog input errors.

Fig. 84

Output via analog output (example)

	Output assignment	Low scale	High scale	Test mode	Test value
AO1 SCALE	Volume flow rate <input type="text" value="acm/h"/>	<input type="text" value="0"/>	<input type="text" value="20000"/>	<input type="checkbox"/>	<input type="text" value="0"/>
AO2 SCALE	Velocity of sound <input type="text" value="m/s"/>	<input type="text" value="0"/>	<input type="text" value="800"/>	<input type="checkbox"/>	<input type="text" value="0"/>

- Lower output value: Minimum output value of the analog output
- Upper output value: Maximum output value of the analog output
- Test mode: Test mode active
- Test value: Test of the output in relation to the selected upper and lower output value

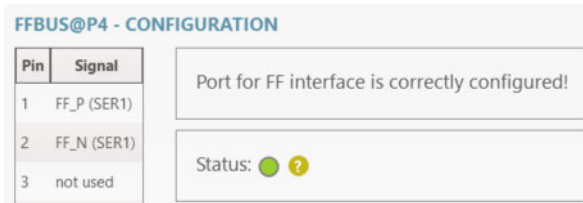
AO check cycle:

A lower and a higher output value can be set for the check cycle. Both values are output at the start of the check cycle for the time specified in the “Duration of steps” field.

7.5.6.5 **FFBUS**

Displays the status of the FOUNDATION Fieldbus (FF) module. To view details of the status, click on the “?” symbol.

Fig. 85 Status of the FOUNDATION Fieldbus module



The FF-related configuration is necessary to read values from the device, e.g., node address and communication relationship of the FF blocks. This FF configuration can only be accessed via the Fieldbus not via the FLOWgate™ operating software.

The FF address is set to 248 and the physical device tag to

“FLOWSIC_IU_____commMod12345678” for example. Here, 12345678 is an I/O module specific serial number and not the serial number of the Interface Unit.

Please use official FOUNDATION Fieldbus configuration equipment or a field communicator to set these values according to the standards for your application.



Detailed descriptions of the MODBUS, HART and FOUNDATION Fieldbus protocols are available as separate documents on the product CD, at www.sick.de or from SICK Service.

7.5.7 Molar mass

7.5.7.1 Algorithm for calculating the molar mass

- ▶ Select the desired algorithm for the use of the molar mass:
 - Basic
 - Hydro Carbon
 - Carbon number
 - MR113

VOG dependency

When the VOG dependency is activated, different algorithms can be selected for higher and lower gas velocities.

The field "VOG Limit" serves to define at which gas velocity the algorithm should switch over.

Basic algorithm

The basic algorithm is suitable for basically flammable gases with a constant composition and low hydrocarbons content. The basic algorithm is based on the following equation, which can be used to determine the molar mass for ideal gases

Fig. 86

Basic algorithm formula

$$Mm = \frac{\kappa \cdot R \cdot T}{VOS^2}$$

Mm= molar mass
 κ = adiabatic coefficient
 R = universal gas constant
 T = temperature
 VOS = velocity of sound

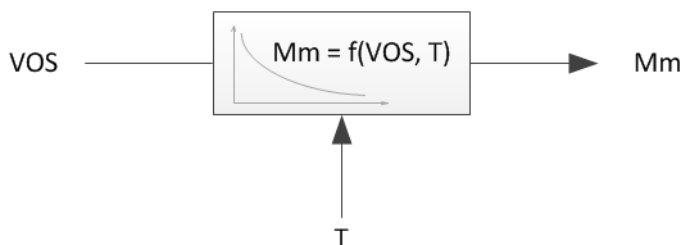
The algorithm requires the adiabatic coefficient κ (mean value) as input value, . Velocity of sound and temperature can be measured by FLOWSIC100 Flare-XT. The algorithm is suitable for all ideal gases with pressures < 5 bar with constant gas composition.

Hydrocarbon algorithm

The hydro-carbon algorithm is suitable for typical hydrocarbon mixtures with inert gases proportion < 10%. On the basis of the velocity of sound, the molar mass is calculated with the assumption of a typical hydrocarbon mixture. Changes in the composition of the hydrocarbon fractions can be taken into account.

Fig. 87

Hydrocarbon algorithm formula

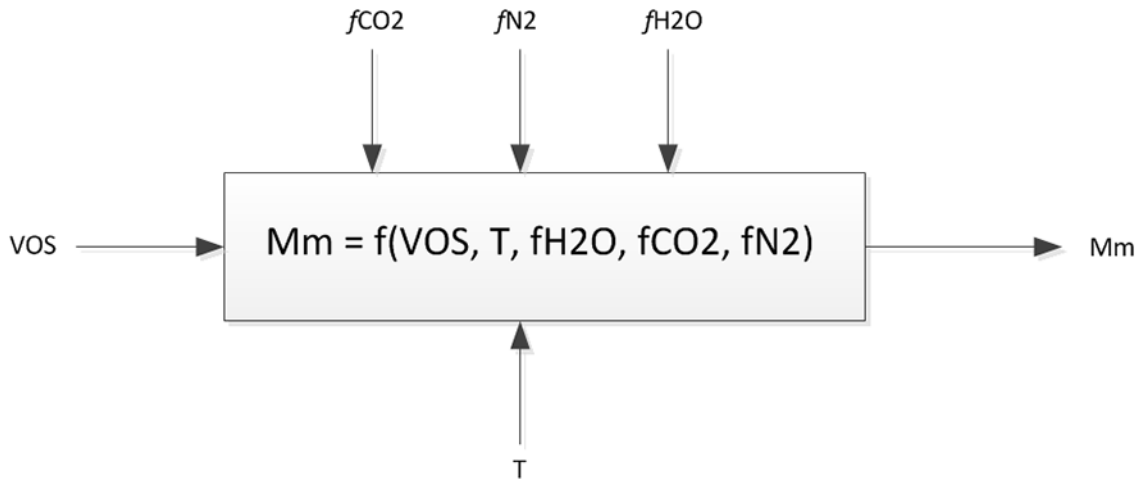


Carbon number algorithm

The carbon number algorithm is suitable for calculating the molar mass for hydrocarbon mixtures. During the calculation, the carbon-number algorithm can compensate the influence of inert gas components CO₂, N₂, H₂O and uncertainty of the molar mass

calculation improves. Fixed values of the inert gas components must be entered when the carbon number algorithm is selected. The portions can be configured in operating software FLOWgate™ as medium constant values.

Fig. 88 Carbon number algorithm formula



Algorithm MR113n

MR113n is an algorithm for calculating the molar mass and other gas characteristics which is widely used for measurement of associated gas in Russia.

The algorithm is adapted better to the typical application conditions of this industry. The calculation of molar mass, compressibility and other characteristics is based on a known gas matrix with 14 components.

Fig. 89 Gas matrix for algorithm MR113n

The gas composition can be configured with constant values or read in by a gas chromatograph. Various types can be selected in the operating software.

The algorithm provides the most exact results when a gas chromatograph is available.

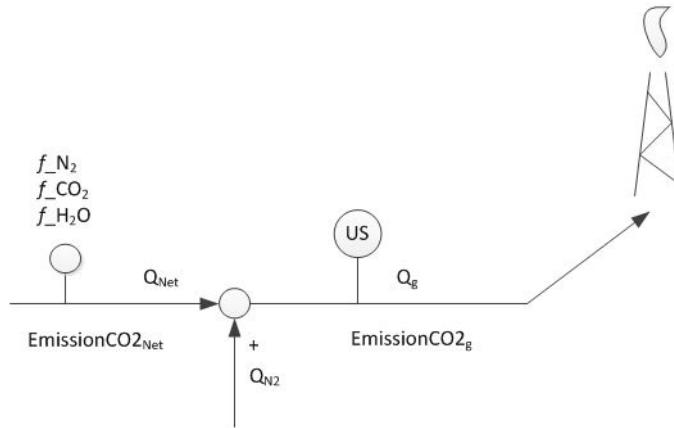
Nitrogen compensation

Nitrogen compensation is available when using the carbon number algorithm.

In applications that inject nitrogen before the measuring device in order to ensure permanent purging, these nitrogen quantities are also recorded.

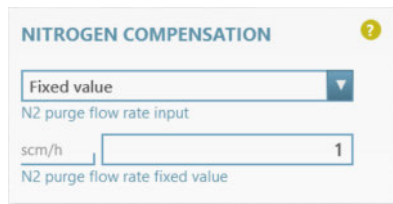
If the quantity of flow rate N_2 is known, FLOWSIC100 Flare-XT can subtract this portion from the total quantity. Without this compensation, the purge air share with the measured molar mass of the combustible gases would be added to the total quantity of CO_2 which leads to higher CO_2 emission values.

Fig. 90 Function of nitrogen compensation



In the Setup wizard, you can select whether the nitrogen quantity should be configured as a constant value or read in via an analog input.

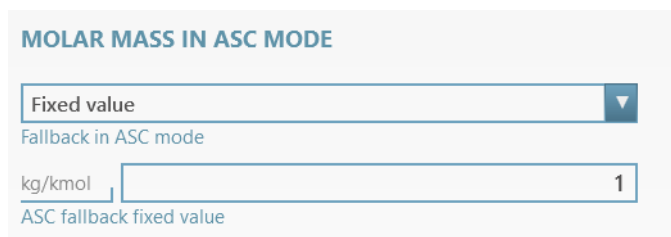
Fig. 91 Nitrogen compensation



Molar mass in ASC mode

A value can be defined for the molar mass with active ASC technology. Either the last good value can be used or a fixed value can be configured.

Fig. 92 Molar mass in ASC mode



7.5.7.2 Compressibility

In addition to the flow rate, the measured pressure and temperature and the compressibility K under standard conditions and operating conditions are also required for the calculation of a volume flow at base conditions.

Fig. 93 Calculation of volume flow at base conditions

$$Q_{sc} = Q_{ac} \cdot \frac{P_{ac}}{P_{sc}} \cdot \frac{T_{sc}}{T_{ac}} \cdot \frac{1}{K}$$

Q_{ac} = Operating volume flow
 Q_{sc} = Volume flow at base conditions
 P_{ac} = Pressure at operating conditions
 P_{sc} = Pressure at base conditions
 T_{ac} = Temperature at operating conditions
 T_{sc} = Temperature at base conditions
 K = Compressibility

For applications < 5 bar, compressibility can always be approximated sufficiently well with value 1. In applications with higher process pressures either constant values for the compressibilities can be configured in the Setup wizard or calculated with a suitable algorithm.

7.5.8 Application

CO₂ calculation

In flare gas applications, unlike CEMS measurements, CO₂ emissions cannot be measured directly because the CO₂ is only created directly at the flare during combustion. Typically, the CO₂ emissions are determined according to a calculation model, which has also been directly implemented in the FLOWSIC100 Flare-XT. Since the measuring device provides an important calculation variable, the mass flow, the calculation of CO₂ emissions can take place directly in the FLOWSIC100 Flare-XT.

The oxidation factor is an installation-dependent fixed value and describes the combustion quality and is provided by the flare manufacturer.

The emission factor describes the flare gas. As there is normally no precise information on the composition of the specific flare gas, an application-dependent fixed value is normally used.

But however, as the FLOWSIC100 Flare-XT can compensate for the components CO₂, N₂ and H₂O which contribute to the generation of CO₂, the measuring system can calculate an emission factor. This allows direct calculation of the real, lower CO₂ emissions.

Fig. 94 Formula for calculating the CO₂ emission

$$emissionCO_2 = eCO_2 \cdot MFlow \cdot OxydationFactor$$

eCO_2 = Emission factor CO₂

$MFlow$ = mass flow rate

$OxydationFactor$ = factor for completeness of combustion (ideal = 1; typically 0.94)

Source: Reporting of greenhouse gas emissions under Directive 2003/87/EC of the European Parliament and of the Council

Fig. 95

CO₂-Emission factor

7.5.9

User Management

The user management is only available when connected to the FLOWSIC100 Flare-XT via Ethernet.

**NOTICE:**

SICK strongly recommends changing the initial password of the device. Please check also your local cyber security requirements, that may apply.

7.5.10

Completion

- ▶ If desired, reset meter levels, logbooks and archives.
- ▶ Create a Parameter report and archive the report with the delivery documentation.
- ▶ Optionally it is possible to create a Validation Certificate, → p. 143, §9.4.

7.6

Function checks after commissioning

- ▶ Check the device status, → p. 143, §9.3.2.

FLWSIC100 Flare-XT

8 Operation

Operating concept
Display and operating elements
Display in the symbol bar

8.1 Operating concept

The Interface Unit display comprises an LCD display for measuring screens and configuring, 4 buttons for menu navigation and an area to attach an infrared/USB adapter (Order No. 6050602) for data communication.

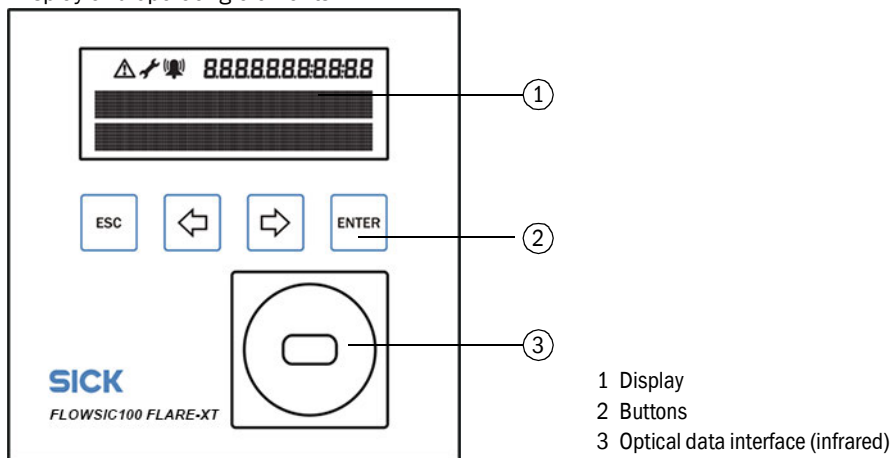


The readability of the display is limited at temperatures below -30 °C. The display is poorly legible to not legible at all. This will not damage the display. The function of the display is guaranteed again at temperatures above -30 °C. To read out data or to make settings on the device, please use the serial interfaces of the device.

8.2 Display and operating elements

Fig. 96

Display and operating elements



- 1 Display
- 2 Buttons
- 3 Optical data interface (infrared)

Table 17

Buttons

	In menu
Esc	Returns to next higher level of the operator menu.
←	Toggles between single menu entries on one level.
→	
ENTER	Calls up a submenu.

8.3 Display in the symbol bar

Table 18

Symbols

Symbol	Significance	Description
	Device status: Malfunction	The device has an error, the measured value is invalid.
	Device status: Warning	The device has a warning, the measured value is still valid.
	Configuration mode	Configuration mode is active, parameters can be changed on the device.

8.4

Menu navigation

Path	Format/unit (metric)	Format/unit (imperial)
Start settings		
Network		
Network status	Connected/not connected	
Network interface IP	x.x.x.x	
Subnet mask		
Gateway	x.x.x.x	
Mac of onboard Eth.	aa:bb:cc:dd:ee:ff	
Device setup		
System time	dd.mm.yyyy time (format: 24 h)	
Start of main measured values		
Velocity of sound	m/s	ft/s
Flow rate ac	m ³ /h	acf/h
Flow rate sc	sm ³ /h	scf/h
Molar mass	g/mol	lb/lbmol
Volume ac total	m ³	acf
Volume sc total	sm ³	scf
Mass total	kg	lbs
CO2 total	kg	lbs
Pressure	bar(a)	psi
Temperature	°C	°F
Velocity of gas	m/s	ft/s
Start language		
English		
German		
Russian		

8.5

Status LEDs on the mainboard

The Status LEDs are located at the bottom left on the mainboard, → Fig. 97.

Fig. 97

Status LEDs position

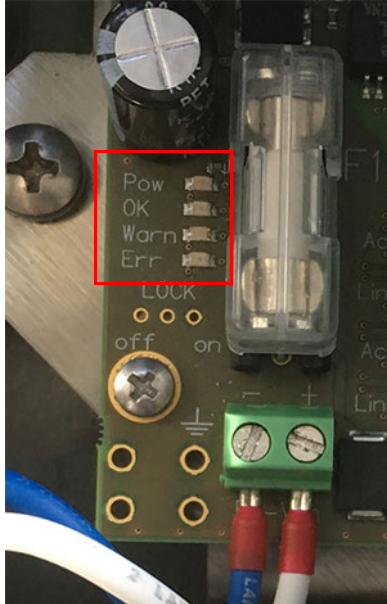


Table 19

Status LEDs description

LED	Description
Pow	Supply voltage present.
OK	Normal operation, neither warnings nor errors exist.
Warn	Device status warning: At least one warning is pending in the device, the measured value is still valid.
Err	Device status error: At least one error is pending in the device, the measured value is invalid.

FLWSIC100 Flare-XT

9 Maintenance

- Safety information
- General information
- Routine checks
- i-diagnostics™ Software-Plug-in (optional)
- Cleaning
- Exchanging the battery

9.1 Safety information

**WARNING: Hazard through improper maintenance work**

After all maintenance work, make sure the entire measuring system and any accessories installed are in a safe condition.

9.2 General information

Maintenance strategy

Just like any other electronic measuring system, the FLOWSIC100 Flare-XT requires regular maintenance. By inspecting the system regularly and observing the scheduled maintenance intervals, the service life of the device can be lengthened significantly and ensures measurements are always reliable.

Even though the FLOWSIC100 Flare-XT is often deployed in harsh environments, its design and measuring principle are such that the device requires only minimal maintenance.

Maintenance tasks

The tasks to be carried out are limited to routine checks and cleaning the surfaces of sender/receiver units and Interface Unit.

The FLOWSIC100 Flare-XT provides the option of carrying out i-diagnostics™ instead of extractive maintenance. This consists of “one-click verification” and time analysis of the most important diagnostic values (license for software plug-in required).

After passing the test, a certificate is provided and it is shown whether a field service will probably be required for extractive maintenance in the next period (1 year).

The prerequisite for this presentation is that the device has been used properly in the past 6 months to record the diagnostic data, as these are necessary for determining the trend.

Maintenance intervals

The maintenance interval depends on specific system parameters such as operation, gas composition, gas temperature, gas moisture as well as ambient conditions. By default, the manufacturer's requirement is that, if a verification interval of one year is observed, the measurement is ensured within the manufacturer's specifications.

An optional software plug-in allows the user to perform verification within the FLOWgate™ operating software based on the diagnostic data. This type of regular annual verification allows the interval between extractive field services to be extended up to 5 years.

The respectively issued Verification Certificates and the Annex must be kept. The activities required locally and their completion must be documented by the operator in a Maintenance Manual.

Maintenance agreement

Regular maintenance work can be carried out by the plant operator according to the Service manual when the plant operator has attended an official FLOWSIC100 Flare-XT service training by SICK. These activities must be carried out by qualified persons as described in → p.34, §5.2.8 and → p.87, §6.2.7. If desired, SICK Service or authorized Service support centers can carry out all maintenance work. Any repairs will be made by specialists on-site whenever possible.



9.3 Routine checks

Proper device function can be determined directly on the LC display of the device. The FLOWgate™ operating software provides a user-friendly option for the performance of routine checks.

9.3.1 Function check on the display

If there is a warning or malfunction on the device, the corresponding symbol is shown on the display of the Interface Unit:

Table 20 Symbols




Symbol	Significance	Description
	Device status: Malfunction	The device has an error, the measured value is invalid.
	Device status: Warning	The device has a warning, the measured value is still valid.

- An active error or warning is shown flashing on the LC and details can be retrieved with the FLOWgate™ operating software.

9.3.2 Function check with FLOWgate™

- Check the device status.

Table 21 Signaling the device status in FLOWgate™

Status	Description
	Normal operation, neither warnings nor errors exist
	Device status warning: At least one warning is pending in the device, the measured value is still valid.
	Device status error: At least one error is pending in the device, the measured value is invalid.

- Click on the symbol in the Status bar when warnings or errors exist.
The current Status overview opens and shows details and information on how to proceed.

9.4 i-diagnostics™ Software-Plug-in (optional)

To activate the extended i-diagnostics™ functions, you need an Entitlement ID (Claim ID), which you will receive by e-mail from the manufacturer after ordering the software plug-in.

9.4.1 One-click verification

The system checks itself and protocols its actual status. The one-click verification provides the option of creating a Validation Certificate and generate supporting documentation.

Proceed as follows to create a Validation Certificate:

Click  in the Tool bar:

FLOWgate™ checks critical diagnosis parameters according to manufacturers' specifications.

After the end of the diagnosis, FLOWgate™ creates a Validation Certificate confirming compliance with the standards specified by the manufacturer as relevant for ensuring a valid measurement.

Fig. 98 Validation certificate



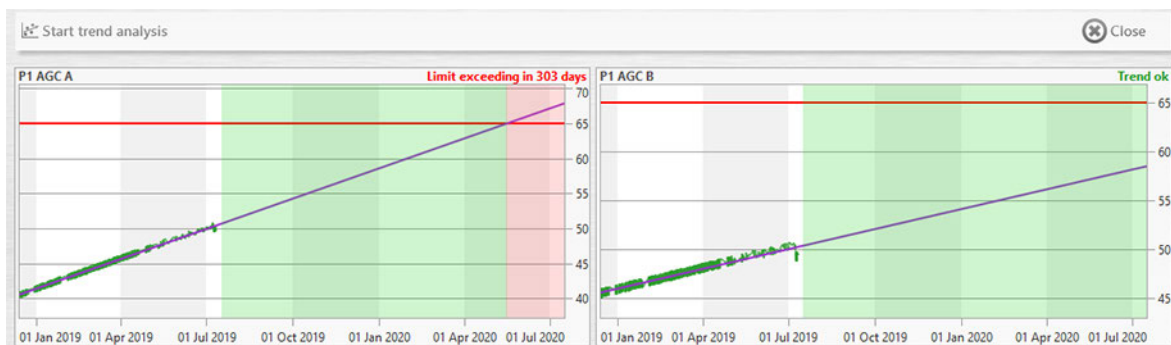
9.4.2 Trend analysis – predictive maintenance

It is also possible to carry out a trend analysis. With the trend analysis, evaluations of various measurement and diagnostic values at past observation points can be made.

If the trend analysis suspects a fault in the future, the manufacturer recommends performing another trend analysis after about 2 months, but at least before reaching the predicted date. This serves to validate the trend in order to then initiate appropriate countermeasures.

The predicted date is based on the assumption of a linear trend and therefore only gives a realistic estimate for linear measurement/diagnostic values.

Fig. 99 Trend analysis



9.5 Cleaning

9.5.1 Cleaning the FLSE100-XT sender/receiver units

- ▶ Only clean the surfaces of the FLSE100-XT sender/receiver units with a damp cloth.
- ▶ Only use materials for cleaning which do not damage the surface of the FLSE100-XT sender/receiver units.
- ▶ Do not use solvents for cleaning.

9.5.2 Cleaning the Interface Unit

Cleaning information

- ▶ Only clean the Interface Unit with a damp cloth.
- ▶ Only use materials for cleaning which do not damage the surface of the Interface Unit.
- ▶ Do not use solvents for cleaning.
- ▶ Only use cleaning agents free from oil, grease and solvents to clean the display.

9.6 Exchanging the battery

9.6.1 Battery types

**WARNING: Hazard for intrinsic safety due to incorrect spare parts**

Only PANASONIC batteries type BR2032 are permitted as RTC battery, otherwise intrinsic safety is endangered.

The battery may only be replaced after a Service training by SICK or by SICK Service!

**NOTICE:**

The replaceable RTC battery has been assessed as intrinsically safe for the following potentially explosive atmospheres: Zone 2, Class I Zone 2 and Class I Div 2.

The exchange may be carried out in these potentially explosive atmospheres.

FLOWSIC100 Flare-XT

10 Troubleshooting

- Detecting malfunctions
- Error signaling on the display
- Contacting Customer Service
- Starting a diagnostic session

10.1 Detecting malfunctions

Any deviations from normal operation must be regarded as a serious indication of a functional impairment. These include:

- Warnings displayed (e.g., high contamination)
- Significant drifts in the measuring results.
- Increased power input.
- A rise in system component temperatures.
- Triggering of monitoring devices.
- Smells or smoke emission
- Failure of a measuring path.



NOTICE:

Proceed as follows when a measuring path fails:

- ▶ Pull the sender/receiver units back and disconnect them from the process by closing the ball valve, → p. 75, §5.6.9.
- ▶ Contact SICK Service.

10.2 Error signaling on the display

Pending errors or warnings are signaled on the display, → p. 142, §9.3.

10.3 Contacting Customer Service



Contact SICK Customer Service for any malfunctions you cannot clear yourself. To help Customer Service to understand malfunctions that have occurred, the FLOWgate™ operating software provides the option to create a diagnostics file that can be sent to Customer Service, → p. 148, §10.4.

10.4 Starting a diagnostic session


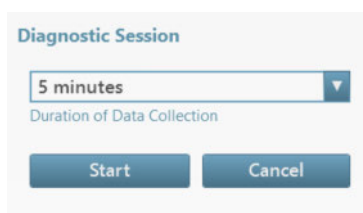
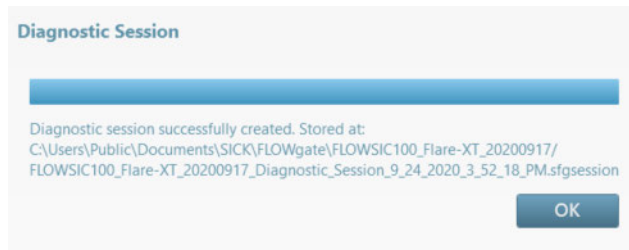
- 1 Click the  icon in the Tool bar to start a diagnostic session.
- 2 Select the desired data collection duration.
It is recommended to select a data collection duration of at least 5 minutes.

Fig. 100 Data collection duration for the diagnostic session



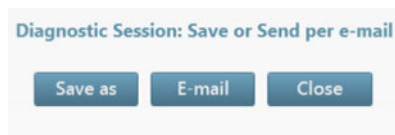
- 3 Click "Start" to start recording.
The following message with the current storage location of the data collection is shown after successful creation of the diagnostic session.

Fig. 101 Diagnostic recording completed



- 4 Click "OK" to confirm the message.
- 5 Select the storage location for the diagnostic session:
 - Click "Close" to leave the file at the standard storage location.
 - Click "Save as" to select a storage location for the diagnostic recording.
 - Click "E-mail" to send the file per e-mail. The file is appended to an e-mail when an e-mail client is available.

Fig. 102 Save the diagnostic session



The diagnostic sessions are saved as files with the ending .sfgsession. The files are saved by default under:
 C:\Users\Public\Documents\SICK\FLOWgate
 The name of the storage folder consists of device type and serial number of the device.

FLOWSIC100 Flare-XT

11 Decommissioning

Returning
Disposal information

11.1 **Returning**

11.1.1 **Contact**

Please contact your SICK representative for assistance.

11.1.2 **Packaging**

Make sure the FLOWSIC100 Flare-XT cannot be damaged during transport.

11.2 **Disposal information**

11.2.1 **Materials**

- The FLOWSIC100 Flare-XT mainly consists of steel, aluminum and plastic materials.
- It does not contain any toxic, radioactive or other environmentally harmful substances.
- Substances from the pipeline can possibly penetrate, or deposit on seals.

11.2.2 **Disposal**

- ▶ Dispose of electronic components as electronic waste.
- ▶ Check which materials having contact with the pipeline must be disposed of as hazardous waste.

FLWSIC100 Flare-XT

12 Technical data

System FLOW SIC100 Flare-XT
FLSE100-XT sender/receiver units
Interface Unit
Dimension drawings

12.1 **System FLOWSIC100 Flare-XT**



NOTICE:

The exact device specifications and performance data of the product may deviate and depend on the respective application and customer specification. Only the metrological parameters described in the Application Evaluation Datasheet apply.

If the delivery documentation of your FLOWSIC100 Flare-XT does not include an Application Evaluation Datasheet, contact your SICK partner!

Example of an Application Evaluation Datasheet: → p. 163, §12.4

Table 22 System FLOWSIC100 Flare-XT

Measuring parameters	
Measured values	Mass flow, volumetric flow s. c. (standard condition), volumetric flow a. c. (actual condition), molecular weight, gas volume and mass, gas velocity, gas temperature, sound velocity
Number of measuring paths	1 path, 2 paths
Nominal pipe size	1-path measurement: 4 " ... 72 " 2-path measurement: 12 " ... 72 " * Other nominal sizes on request
Measuring principle	Ultrasonic transit time difference measurement, ASC technology
Measured medium	Typical flare gas
Measuring ranges ¹⁾	0.03 m/s ... 120 m/s
Repeatability	According to ISO 5725-1; JCGM 200:2012): < 0.5% related to the measured value in the range ≥ 1 m/s
Resolution	(According to JCGM 200:2012): + 0.001 m/s
Uncertainty of measurement ^{1, 2), 3)}	Volumetric flow a. c. 1% ... 5% Related to the measured value with ultrasonic technology (in the range ≥ 0.3 m/s to measuring range end value) 0.5% ... 1.5% with spool piece and flow calibration Related to the measured value with ultrasonic technology (in the range ≥ 1 m/s to measuring range end value) ⁴⁾
	Mass flow rate 2% ... 5.5% Related to the measured value with ultrasonic technology (in the range ≥ 0.3 m/s to measuring range end value) 1.5% ... 2% with spool piece and flow calibration Related to the measured value with ultrasonic technology (in the range ≥ 1 m/s to calibration range end value) ⁴⁾
Uncertainty of measurement ASC technology ^{1),2), 5)}	Volumetric flow a. c.: 1% ... 8%
Resolution	+ 0.001 m/s
Ambient humidity	≤ 95% relative humidity
Compliances	ATEX: 2014/34/EU EMC: 2014/30/EU RoHS: 2011/65/EU PED: 2014/68/EU
Electrical safety	IEC 61010-1 (Non-Ex Interface Unit)

¹⁾ Depending on application conditions such as gas composition, process temperature, device type, pipe diameter, etc.

For mass flow rate, additional selection and configuration of the conversion algorithm as well as uncertainty of the pressure and temperature sensors. To be evaluated by SICK.

²⁾ With fully developed turbulent flow profile. Typically 20D straight inlet and 5D straight downstream piping is required .

³⁾ Below a specific threshold Reynolds number, only run time effects and uncertainties of geometry, excluding contributions from the flow profile are considered.

⁴⁾ Depending on the capabilities of the selected flow lab.

⁵⁾ Additional uncertainty. In the range 100% ... 130% of the last gas velocity measurable with ultrasonic transit time difference measurement.

12.2 FLSE100-XT sender/receiver units

Table 23 Technical data FLSE100-XT

Power supply	
Power supply	20...28 VDC ¹⁾
Power	0.04 A (with 24 VDC) A higher switch-on current must be expected (500 mA).
Power	1 W
Inputs/outputs	
Digital data interfaces	1 x RS485, optically isolated
Approvals	
Ex approvals	ATEX, IECEx, US/C
Ambient conditions	
Temperature range	Ignition group IIC T4: -40 °C ... +70 °C -50 °C ... +70 °C (optional)
	Ignition group IIC T6: -40 °C ... +55 °C -50 °C ... +55 °C (optional)
Storage temperature	-40 °C ... +70 °C -50 °C ... +70 °C (optional)
Degree of protection	IP 66 / 67
Dimensions	
Dimensions (W x H x D)	Details, see dimension drawings

¹⁾ Ensure sufficient supply voltage on the FLSE100-XT input terminals. Performance of the sender/receiver units is restricted when the value falls below the minimum permissible limit. Consider the total cable length between power supply and Interface Unit as well as between Interface Unit and FLSE100-XT when dimensioning the power supply and the cable cross-section, see also → p. 80, §5.7.2.

12.2.1 **F1F-S**

Table 24 Technical data F1F-S

Measuring conditions	
Operating pressure: ¹⁾	CL150 device flange: 20 bar (g)
	PN25 device flange (optional): 20 bar (g)
	CL300 device flange (optional). 20 bar (g)
Gas temperature	- 196 °C ... +280 °C
Ex approvals	
IECEX	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [la Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb Ex ia IIC T6/T4 Ga
ATEX	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [la Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb II 1G Ex ia IIC T6/T4 Ga
NEC/CEC (US/CA)	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4
Installation	
Weight	≤ 12 kg (sensor pair)

¹⁾ Temperature-dependent, for details see → p. 167, §12.7 → »Derating pressure resistance«

12.2.2 **F1F-M**

Table 25 Technical data F1F-M

Measuring conditions	
Operating pressure: ¹⁾	CL150 device flange: 20 bar (g)
	PN25 device flange (optional): 20 bar (g)
	CL300 device flange (optional): 20 bar (g)
Gas temperature	- 196 °C ... +280 °C
Ex approvals	
IECEX	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [Ia Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb Ex ia IIC T6/T4 Ga
ATEX	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [Ia Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb II 1G Ex ia IIC T6/T4 Ga
NEC/CEC (US/CA)	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4
Installation	
Weight	≤ 12 kg (sensor pair)

¹⁾ Temperature-dependent, for details see → p. 167, §12.7 → »Derating pressure resistance«

12.2.3 **F1F-H**

Table 26 Technical data F1F-H

Measuring conditions	
Operating pressure: ¹⁾	CL150 device flange: ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
	PN25 device flange (optional): ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
	CL300 device flange (optional): ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
Gas temperature	- 70 °C ... +280 °C
Ex approvals	
IECEX	Ex db IIC T6/T4 Gb
ATEX	II 2G Ex db IIC T6/T4 Gb
NEC/CEC (US/CA)	Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA IIC, T4
Installation	
Weight	≤ 14 kg (sensor pair)

¹⁾ Temperature-dependent, for details see → p. 167, §12.7 → »Derating pressure resistance«

12.2.4 **F1F-P**

Table 27 Technical data F1F-P

Measuring conditions	
Operating pressure: ¹⁾	CL150 device flange: ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
	PN25 device flange (optional): ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
	CL300 device flange (optional): ATEX/IECEX: 20 bar(g) CSA: 16 bar(g)
Gas temperature	- 196 °C ... +280 °C
Ex approvals	
IECEX	Ex db [ia Ga] IIA T4 Ga/Gb Ex db [ia Ga] IIB T4 Ga/Gb Ex db [ia Ga] IIC T6/T4 Ga/Gb
ATEX	II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb
NEC/CEC (US/CA)	Class I, Division 1, Group D, T4; Class I, Zone 1, Ex/AEx d[ia] IIA, T4; Class I, Division 2, Group D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIA, T4 Class I, Division 1, Groups C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB, T4; Class I, Division 2, Groups C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIB, T4 Class I, Division 1, Groups B, C and D, T4; Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4; Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Ex/AEx nA[ia] IIC, T4
Installation	
Weight	≤ 10 kg

¹⁾ Temperature-dependent, for details see → p. 167, §12.7 → »Derating pressure resistance«

12.3 **Interface Unit**

Table 28 Technical data of Interface Unit

Ambient conditions	
Ambient temperature	-40 °C ... +60 °C -40 °C ... +65 °C optional (number of maximum available I/O interfaces is limited)
Storage temperature	-40 °C ... +70 °C
Ambient pressure	80 kPa (0.8 bar) ... 110 kPa (1.1 bar)
Geographic altitude	Up to 2000 m (above sea level)
Relative humidity	≤ 95% Relative humidity
Installation	Vertical wall or tube installation
Transient overvoltage	Overvoltage category II
Environmental conditions	Degree of contamination 2
Installation location	Indoor, outdoor
Approvals	
Ex approvals	IECEX Ex ec ia IIC T4 Gc ATEX II 3G Ex nA ia IIC T4 Gc NEC/CEC (US/CA) Ex ec ia IIC T4 Gc Class I Zone 2, AEx ec ia IIC T4 Gc Class I Division 2, Groups A, B, C and D, T4
Degree of protection	IP66 and NEMA 4X
Interfaces	
Serial RS485	✓ Quantity: 3 Galv. isolated, termination switchable Data protocol: TCP, RTU RS-485, ASCII RS-485 Baud rate: 2400...57600
Ethernet	✓ Quantity: Up to 2, variant-dependent Speed: 10 or 100 Mbit/s Full duplex Data protocol: Modbus TCP Auto MDI-X
Serial RS232	✓ Quantity: 1 For firmware updates Supported signals: TXD, RTS, RXD, CTS, COM Data protocol: Modbus RTU/ASCII Baud rate: 2400...57600 (default: 9600)
HART®	✓ HART®-compatible master (for connection of external pressure and temperature sensors) HART® slave (for communication with control system)
FOUNDATION Fieldbus	✓ Terminal voltage: 9 ... 32 V DC Power input: 18 mA
Optical interface	✓ Service interface (IR, in accordance with IEC 62056-21)

Inputs and outputs	
Analog auxiliary voltage supply	Up to two auxiliary voltages per analog module Variant-dependent galvanically isolated (→ p. 114, §6.5.7) Output voltage: Approx. 24 VDC, ± 5% Max. output voltage: 60 mA Short-circuit proof, through active current limitation > 60 mA
Analog outputs	Up to 6 outputs when using I/O modules (option) 4 ... 20 mA According to NAMUR NE43, configurable fault current: high 21 mA and low 3.6 mA Terminal voltage: 7 ... 30 V DC Precision: ± 0.07% of fullscale @ 23°C Temperature drift: 7 ppm/K @ 23°C Resolution: 16 bits Reverse polarity protection Galvanically isolated Passive Internal update rate 2 Hz
Analog inputs	Up to 6 outputs when using I/O modules (option) Configurable as voltage or current input 24 bits Reverse polarity protection The analog inputs per module and the second auxiliary voltage (→ Table 11 - 24V_2/GND_2) are referred to a ground, they are galvanically isolated from the rest of the circuit. Internally supplied Internal update rate 2 Hz Current measurement: 4 ... 20 mA, according to NAMUR NE43 With error evaluation for < 3.6 (low error) and > 21 mA (high error) Precision: ± 0.07% of fullscale @ 23°C Temperature drift: 7 ppm/K @ 23°C Input impedance: 290 Ω Single-ended voltage input: 0 ... 5 V DC Precision: ± 0.002% of fullscale @ 23°C Temperature drift: 45 ppm/K @ 23°C Input impedance: > 100 kΩ

Digital outputs	Switching output Optionally configurable as digital input 2 per module, up to 6 available when using I/O modules Galvanically isolated Max. current: 70 mA Max. switching frequency: 50 Hz Max. input voltage: 30 V DC Switchable Namur/Open Collector Reverse polarity protection In Open Collector configuration: Max. switching voltage: 0.5 V DC In Namur configuration at 8.2 V Us supply voltage: Power switch state "On": 4.2 mA Power switch state "Off": 0.5 mA	
	Digital output/frequency output: 4 per module, up to 12 available when using I/O modules thereof 3 as frequency output Galvanically isolated Max. current: 50 mA Max. switching frequency: 10 kHz Switching frequency: 0 ... 10 kHz Max. input voltage: 30 V DC Switchable Namur/Open Collector Reverse polarity protection In Open Collector configuration: Max. switching voltage: 1.8 V DC In Namur configuration at 8.2 V Us supply voltage: Power switch state "On": 3.7 mA Power switch state "Off": 0.7 mA	
Digital inputs	2 per module, up to 6 available when using I/O modules Optionally configurable as digital output (switching output) Galvanically isolated For connection of potential-free contacts or active switching outputs Min. switch-on threshold 2 V DC Max. switch-off threshold 2.85 V DC Max. terminal voltage: 30 V DC Reverse polarity protection	
Display	LCD: Measured variables, system information, warnings, maintenance requests, alarms	
Operation	Software FLOWgate™ or control panel at LCD	
Installation		
Dimensions (W x H x D)	See dimension drawings	
Weight	Non-Ex / zone 2: 8 kg Weatherproof cover: 8.75 kg	
Electrical connection		
Operating voltage		
	AC version	DC version
Power supply (nominal)	115 ... 230 V AC ± 10%	12 ... 24 V DC -10/+20% For installation in ¹⁾ system with FLSE100-XT: 20 ... 28 VDC
Frequency	50 ... 60 Hz	-
Power	0.33 A A higher switch-on current must be expected	1 A A higher switch-on current must be expected
Power input	≤ 18 W	≤ 12 W

Output supply voltage - 24V-OUT (to supply external sensors)		
	AC version	DC version
Output voltage	24 V DC \pm 5%	Equivalent to supply voltage of the Interface Unit, no internal filtering
Max. power output	\leq 2 W	Depending on external supply \leq 4 W
General		
Options	Offshore design, sun and weatherproof cover, tag plate	

¹⁾ Ensure sufficient supply voltage on the FLSE100-XT input terminals. Performance of the sender/receiver units is restricted when the value falls below the minimum permissible limit. Consider the total cable length between power supply and interface unit as well as between Interface Unit and FLSE100-XT when dimensioning the power supply and the cable cross-section, see also → p. 80, §5.7.2

12.4 Application Evaluation Datasheet (example)

Fig. 103 Application Evaluation Datasheet (example)

FLARE Gas Application Evaluation Datasheet FLOWSIC100 Flare / FLOWSIC100 Flare-XT

General Information

Customer Data

Project Name	Revamp Project
Reference (CRM or SAP)	ZT226635
TAG Name or Number	FT2607

Device Selection

Device Type	F1F-S
Nominal Pipe Width [inches]	12
Number of Paths	1
Installation Type	Dry-calibrated
EX Zone	Zone IIc

Order Reference

PO Number	
SICK Part Number	
SICK Serial Number	

Process Data

Calculation basis: User-provided Parameters			
	min	norm	max
Pressure [bar]	1	1.5	1
Temperature [°C]	20	80	0
Speed of Sound [m/s]	300	410	600

Fig. 104 Application Evaluation Datasheet Page 2 (example)

Computed Results

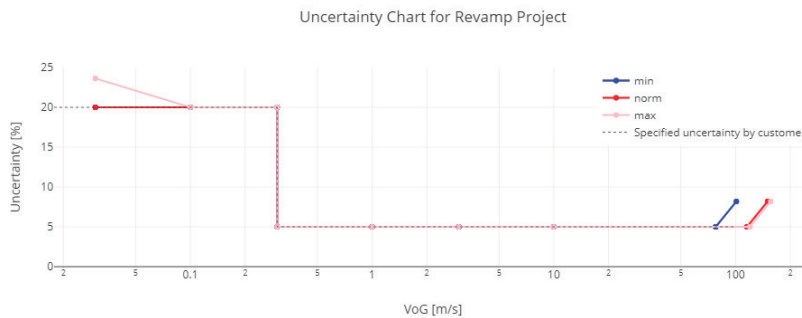
Calculated Flow Ranges

	min	norm	max
Max velocity Vmax [m/s]	77.8	115.6	120
Max flow rate Qmax [m³/h]	20,424.9	30,368.7	31,521.3
Max velocity (ASC) [m/s]	101.1	150.3	156
Max flow rate (ASC) [m³/h]	26,552.4	39,479.3	40,977.6

Measurement Uncertainties

VoG [m/s]	Flowrate [m³/h]	Measurement Uncertainty of Flow (2σ) [%]		
		min	norm	max
0.03	7.9	20	20	23.6
0.1	26.3	20	20	20
0.3	78.8	20	20	20
1	262.7	5	5	5
3	788	5	5	5
10	2,626.8	5	5	5
Vmax	Qmax	5	5	5
Vmax ²	Qmax ²	5	5	5
Vmax, ASC ³	Qmax, ASC ³	8.2	8.2	8.2

- 1) For fully developed flow profiles; based on ultrasonic transit time measurement.
- 2) Increased uncertainty at max. VoG when switching to Active Sound Correlation technology (ASC).
- 3) Extended measuring range based on Active Sound Correlation technology (ASC), 130% of last velocity measured with ultrasonic time difference.



Software-Version

Frontend: 1.5.2, Backend: 0.5.5

Disclaimer

The application evaluation sheet is electronically valid without signature. It is valid for Flare gas applications in compliance with the requirements stated in the latest version of the operating instructions.

Uncertainty of ASC Technology is only valid for densities of 1.2 kg/m³ +/-10 % and if 50 D upstream of the meter no noise generating elements such as temperature wells, flow conditioners, diameter steps >3 % of inner diameter or sharp edges are present.

12.5 **Applications of FLOWSIC100 Flare-XT in a regulated environment**

The gas flow meter can be used for emission measurements, which may be subject to one or more regulations in some jurisdictions. Compliance with all emission regulations applicable at the site of the installation remains the responsibility of the owner / operator. When correctly designed and applied, SICK's ultrasonic flow technology meets or exceeds most regulatory performance requirements. Please contact your SICK representative to find out about the right flare measurement solution that meets the currently applicable regulatory requirements.

12.6 **Application ranges**

Fig. 105 Exemplary V_{max} of 1-path and 2-path solutions dependent on the sound velocity (SOS)

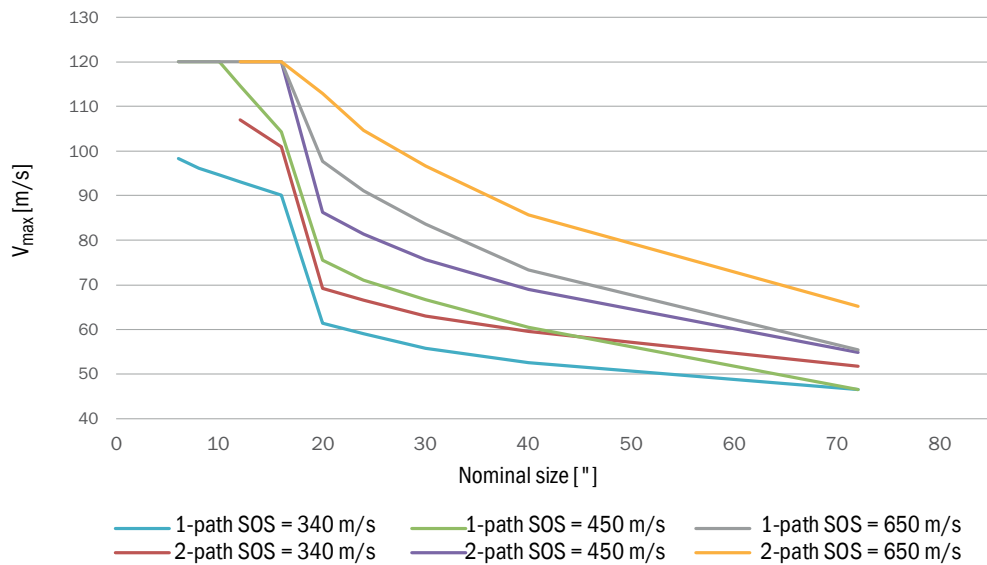


Fig. 106 V_{min} with 20% uncertainty of 1-path and 2-path solutions depending on the speed of sound (SOS)

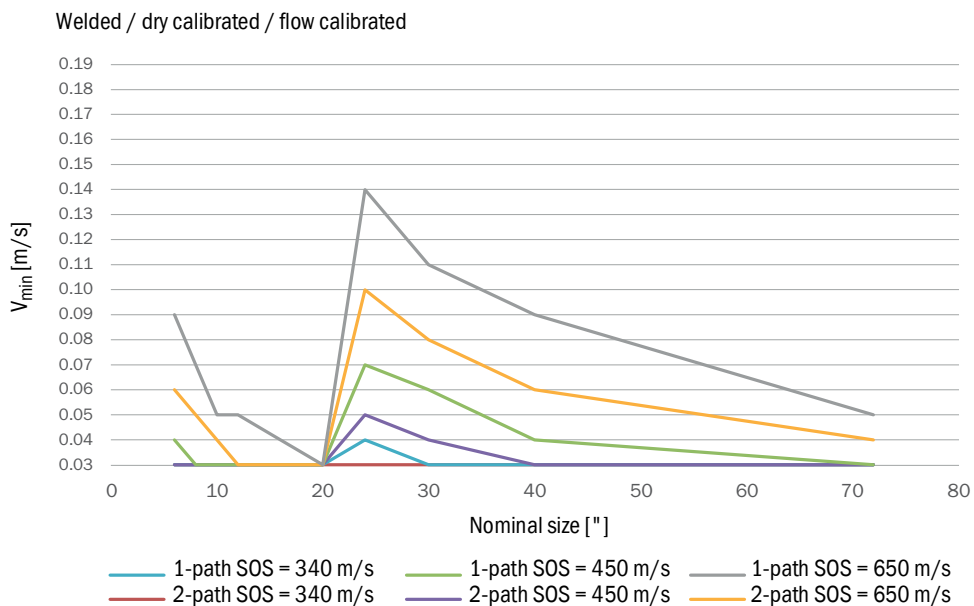
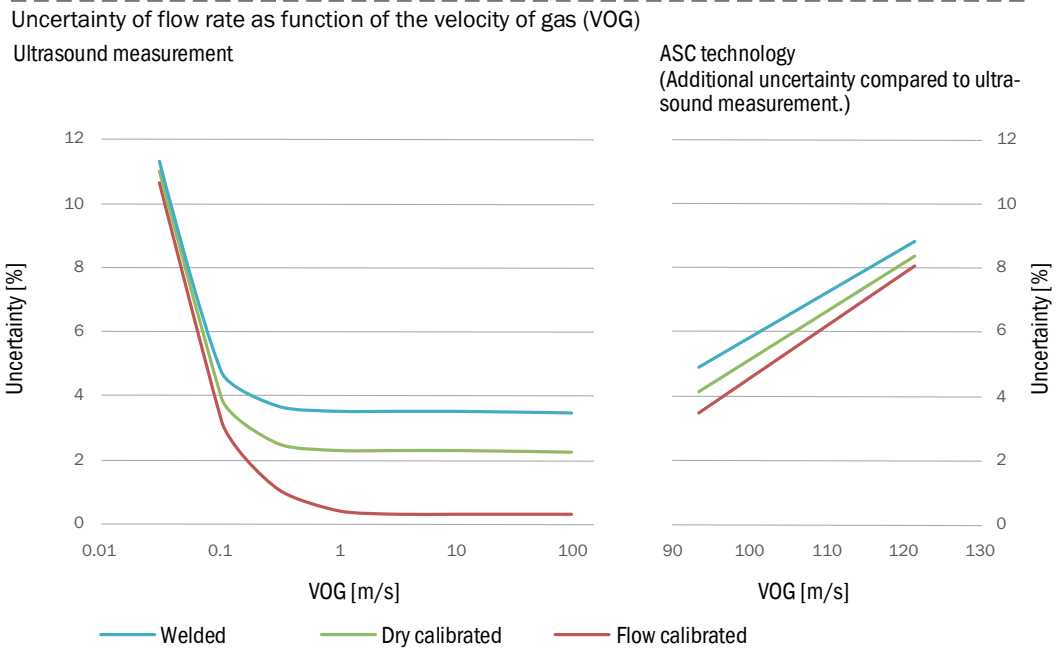


Fig. 107



The exemplary expression of uncertainty according to GUM (Guide to the Expression of Uncertainty in Measurement): ISO/IEC Guide 98-3:2008-09 shows an F1F-S in 1-path, 16" nominal size and assumes a gas temperature of 20 °C, ambient pressure and a typical molecular weight greater than 27 g/mol.

12.7

Derating pressure resistance



NOTICE:

The diagrams are valid for the standard versions of the sender-/receiver units FLSE100-XT only. Deviations for other device versions are possible.

The maximum design values stated on the type plates of the devices shall be respected.

Fig. 108

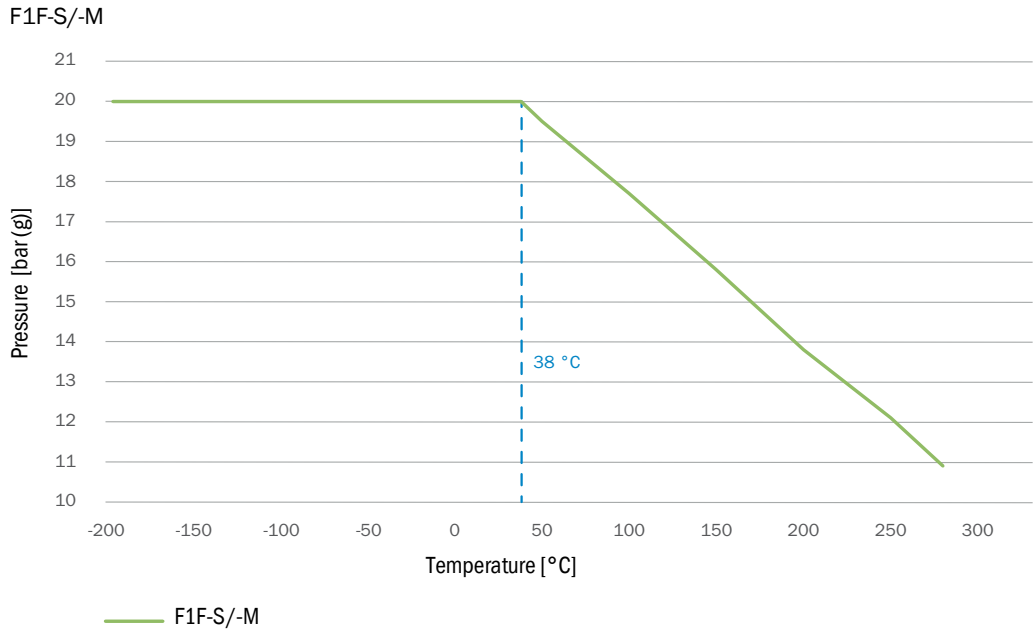


Fig. 109

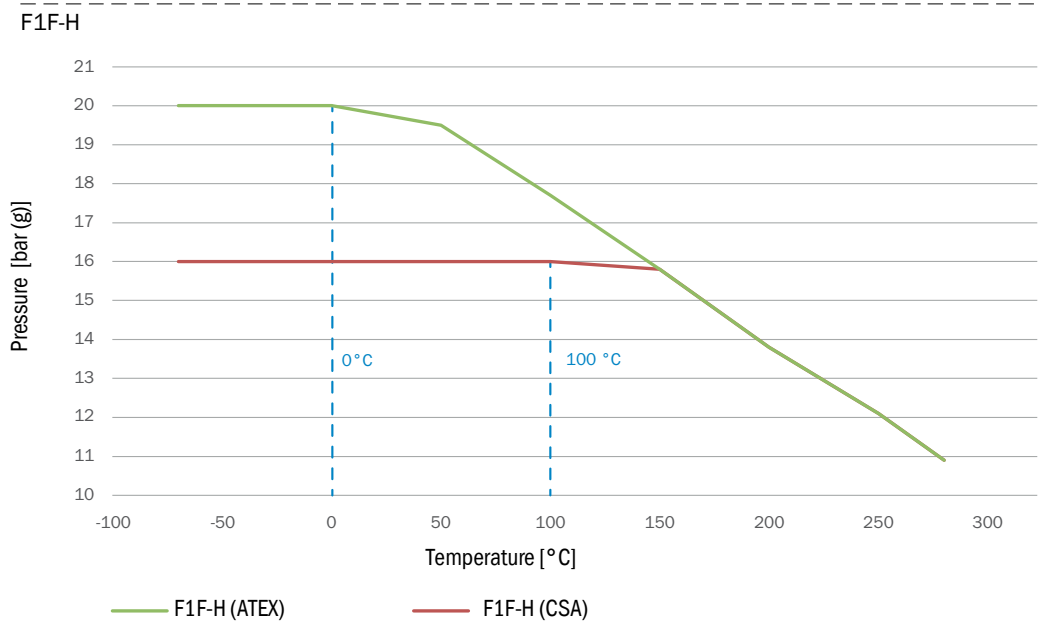
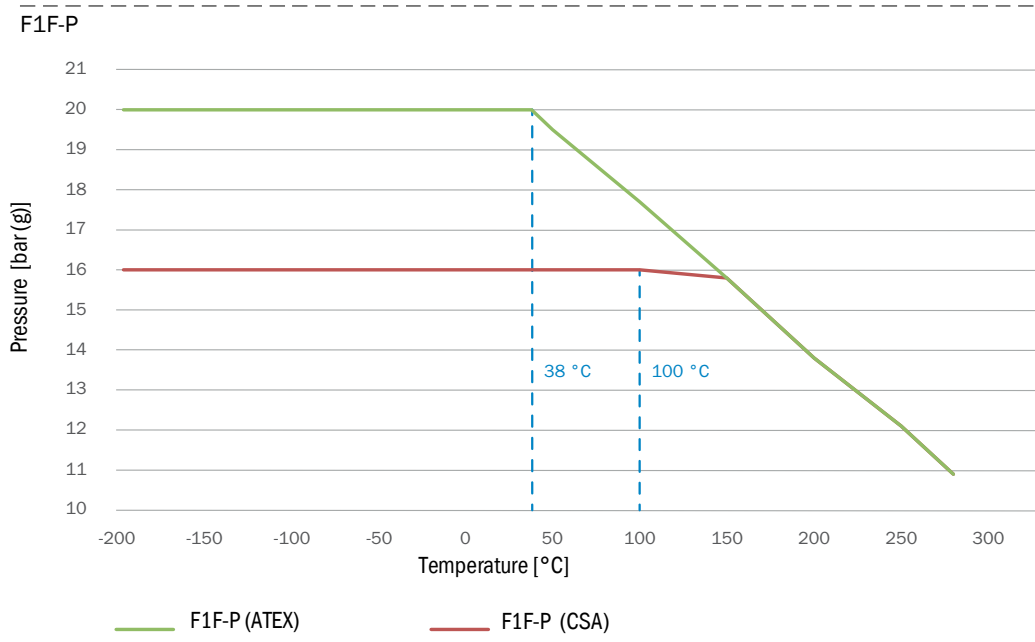


Fig. 110



12.8 **Dimension drawings**

12.8.1 **Dimension drawings of FLSE100-XT sender/receiver units**

Dimensions for F1F-S/-M/-H CL150, 2"

Fig. 111

F1F-S/-M/-H

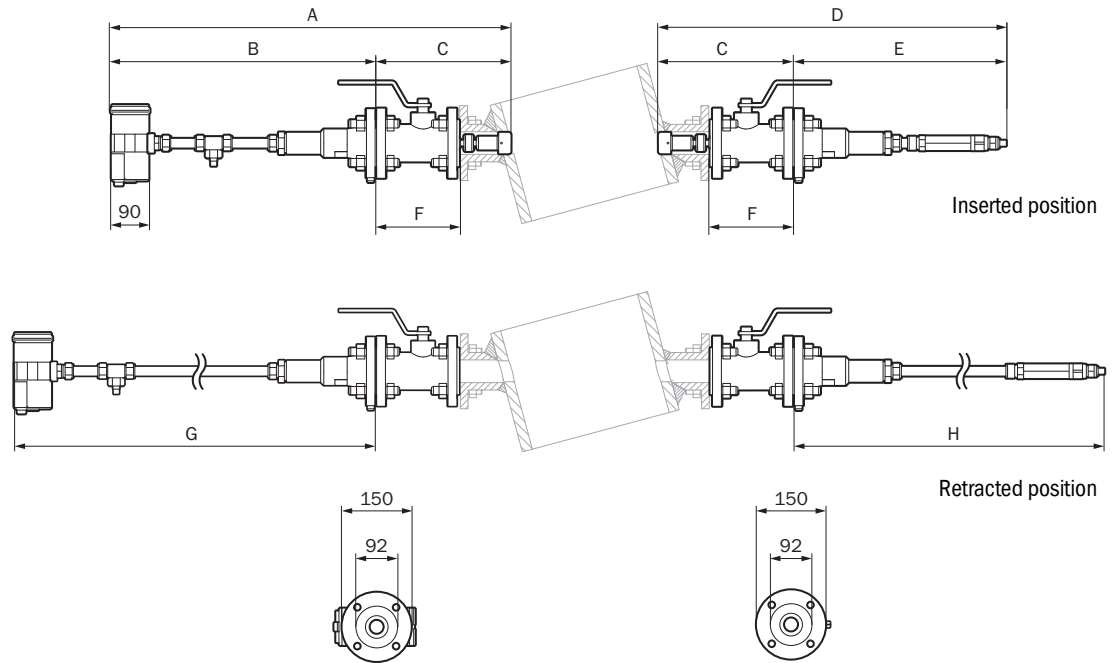


Table 29 Extended version

FLSE100-XT	Dimensions of extended version							
	A	B	C	D	E	F	G	H
F1F-S	983	583	400	871	471	178	1055.5	944
F1F-M	980	582	398	869	471	178	984	873
F1F-H	846	448	398	919	518	178	851	917

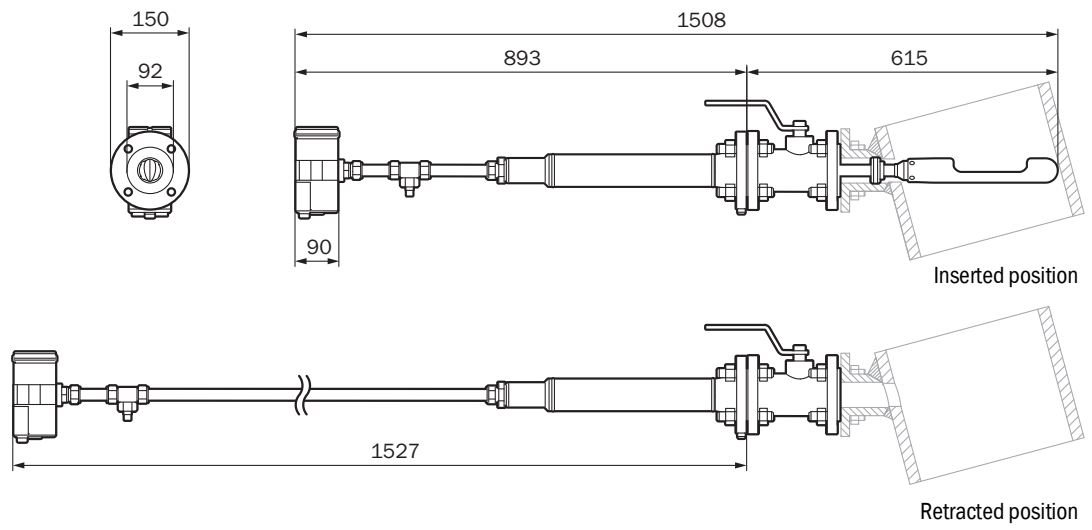
Table 30 Compact version

FLSE100-XT	Dimensions of compact version							
	A	B	C	D	E	F	G	H
F1F-S	883	583	300	771	471	178	955.5	844
F1F-M	880	582	298	769	471	178	884	773
F1F-H	746	448	298	819	518	178	751.5	817

Dimensions for F1F-P, CL150, 2"

Fig. 112

F1F-P



12.8.2 Dimension drawings Interface Unit

Fig. 113 Interface Unit Zone 2 (dimensions in mm (in))

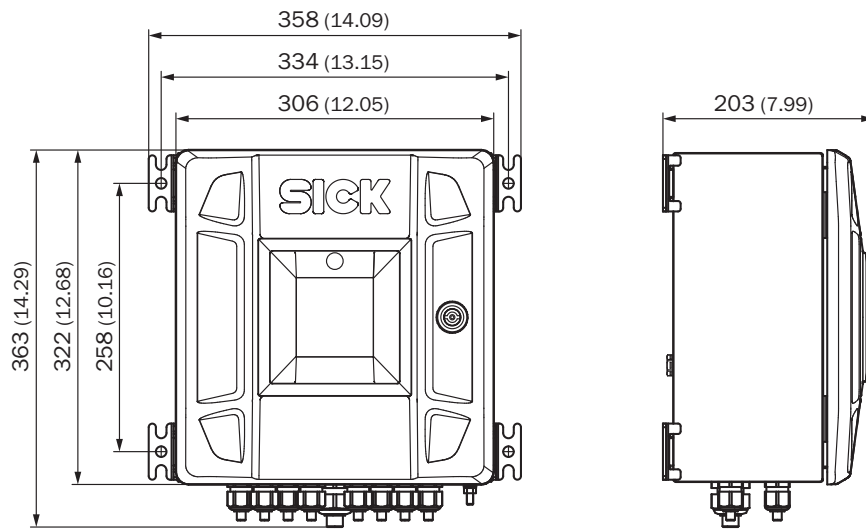
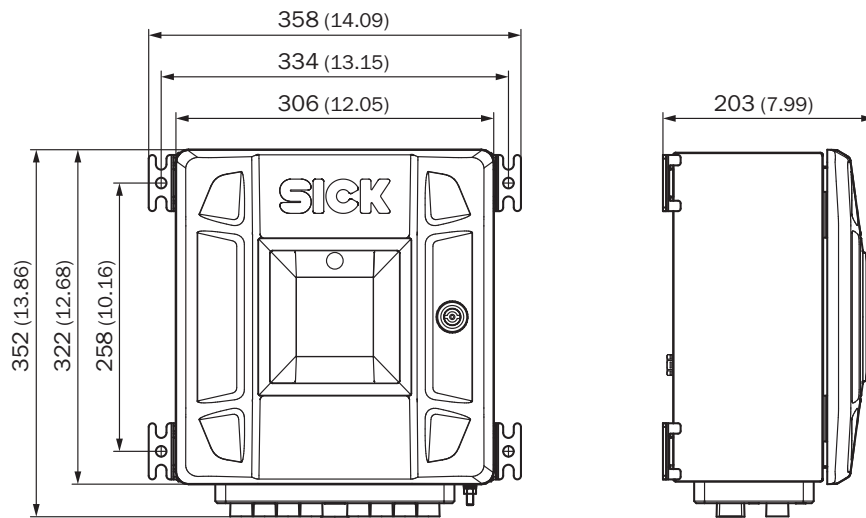


Fig. 114 Interface Unit Cl. 1 Div. 2 (dimensions in mm (in))



FLWSIC100 Flare-XT

13 Spare parts

Recommended spare parts for FLSE100-XT sender/receiver units

Recommended spare parts for Interface Unit

13.1 **Recommended spare parts for FLSE100-XT sender/receiver units**

Order No.	Description	1 ¹⁾	2 ²⁾
2108048	Assembly kit ANSI150 2Z SS ET	X	X
2108049	Assembly kit ANSI300 2Z SS ET	X	X
2108050	Assembly kit DN50 PN16 M16 SS ET	X	X
2107288	Replacement cover for aluminum EXD M20 housing Contents: Cover, cover lock, cover insulation, O-ring, spring washer, screws, assembly paste, sealing plugs		X
2107289	Replacement cover for stainless steel EXD M20 housing Contents: Cover, cover lock, cover insulation, O-ring, spring washer, screws, assembly paste, sealing plugs		X
2110151	Replacement cover for aluminum EXD NPT housing Contents: Cover, cover lock, cover insulation, O-ring, spring washer, screws, assembly paste, sealing plugs		X
2110152	Replacement cover for stainless steel EXD NPT housing Contents: Cover, cover lock, cover insulation, O-ring, spring washer, screws, assembly paste, sealing plugs		X

1) Recommended spare parts for commissioning

2) Recommended spare parts for 2 years operation

13.2 **Recommended spare parts for Interface Unit**

Order No.	Description	1 ¹⁾	2 ²⁾
2104408	Fuse kit 2A5 250V D5*20	X	X
2105349	Small parts kit (screws, washers, etc.)	X	X
2105350	Fuse kit 3A15 250V D5*20	X	X
2105364	Electric installation kit "Ground" marking End holder 1-10 marking Terminals End cover Separator plate		X

1) Recommended spare parts for commissioning

2) Recommended spare parts for 2 years operation

FLWSIC100 Flare-XT

14 Accessories (optional)

Accessories for FLSE100-XT sender/receiver units

Accessories for Interface Unit



Further accessory parts (cable screw fittings, ball valves, nozzles, etc.) are available on request from SICK

14.1 **Accessories for FLSE100-XT sender/receiver units**

Order No.	Description
2105581	Weather/sun protective cover for electronics of the Master ultrasonic sensor
2108210	Venting/drain valve for ultrasonic sensor

14.2 **Accessories for Interface Unit**

Order No.	Description
2109763	Mounting kit 2-inch pipe assembly, for Interface Unit Only for Zone 2 and Div 2, incl. adapter plate for 90° Upgrade Kit
2108970	Weather and sun protective cover Interface Unit, for wall installation
2109217	Weather and sun protective cover Interface Unit Incl. mounting kit 2-inch pipe mounting
6050602	Infrared/USB adapter HIE-04

FLOWSIC100 Flare-XT

15 Annex

Compliances
Wiring examples
Control drawings
Gasket installation

15.1 Compliances



NOTICE:

Applied European standards and harmonized standards are listed in the valid version of the manufacturer's CE conformity declaration.

15.1.1 Compliances of FLSE100-XT sender/receiver units

15.1.1.1 CE declaration

The FLSE100-XT sender/receiver units have been developed, built and tested according to the following EU Directives:

- ATEX Directive 2014/34/EU
- EMC Directive 2014/30/EC

Conformity with the above Directives has been determined and the CE label attached to the device.

15.1.1.2 Standards compatibility and type approval

The FLSE100-XT sender/receiver units comply with the following Norms, Standards or recommendations:

- IEC 60079-0: 2015, IEC 60079-1: 2014, IEC 60079-7: 2015,
- IEC 60079-11: 2011 + Cor. 2012, IEC 60079-15: 2010
- IEC 61010-1: 2010 + Corr. 2011 and comparable European Standards and comparable ANSI/UL or CSA Standards
- EN 60079-0:2012, EN 60079-1:2014, EN 60079-7:2015, EN 60079-11:2012, EN60079-15:2010
- EN 61326-1:2013 (Electrical equipment - EMC requirements)
- EN 61010-1 (Safety requirements for electrical equipment)
- EN 60529: 1991/A1:2000/A2:2013 (IP)

15.1.2 Compliances of Interface Unit

15.1.2.1 CE declaration

The Interface Unit has been developed, manufactured and tested in accordance with the following EU Directives:

- ATEX Directive 2014/34/EU
- EMC Directive 2014/30/EC

Conformity with the above Directives has been determined and the CE label attached to the device.

15.1.2.2 **Standards compatibility and type approval**

The Interface Unit conforms to the following standards or recommendations:

- C22.2 No. 60079-0:2019
- C22.2 No. 60079-11:2014
- C22.2 No. 61010-1-12
- C22.2 No. 60079-7:2016
- CSA C22.2 No 94.2-15
- UL 61010-1: 2012
- UL 60079-0: 2019
- UL 60079-11: 2014
- UL 60079-7: 2017
- UL 50E, 2ND Ed

- IEC 60079-0: 2017 Edition:7.0
- IEC 60079-11: 2011 Edition:6.0
- IEC 60079-7: 2015 Edition:5.0

- EN 61010-1:2010
- EN IEC 60079-0: 2018
- EN 60079-7:2015
- EN 60079-11:2012

15.2 Wiring examples

Fig. 115 Interface Unit Zone 2 AC version (example)

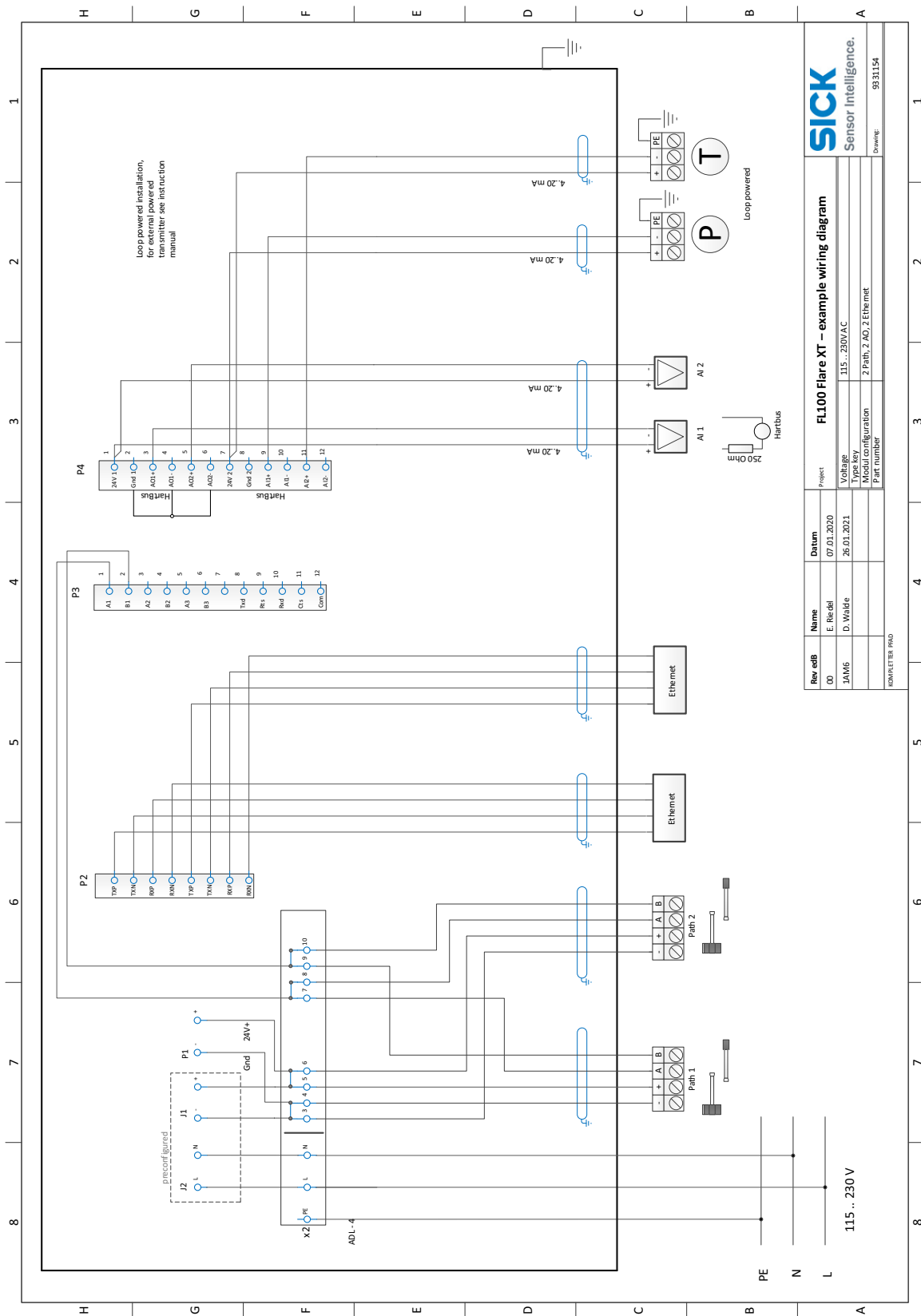
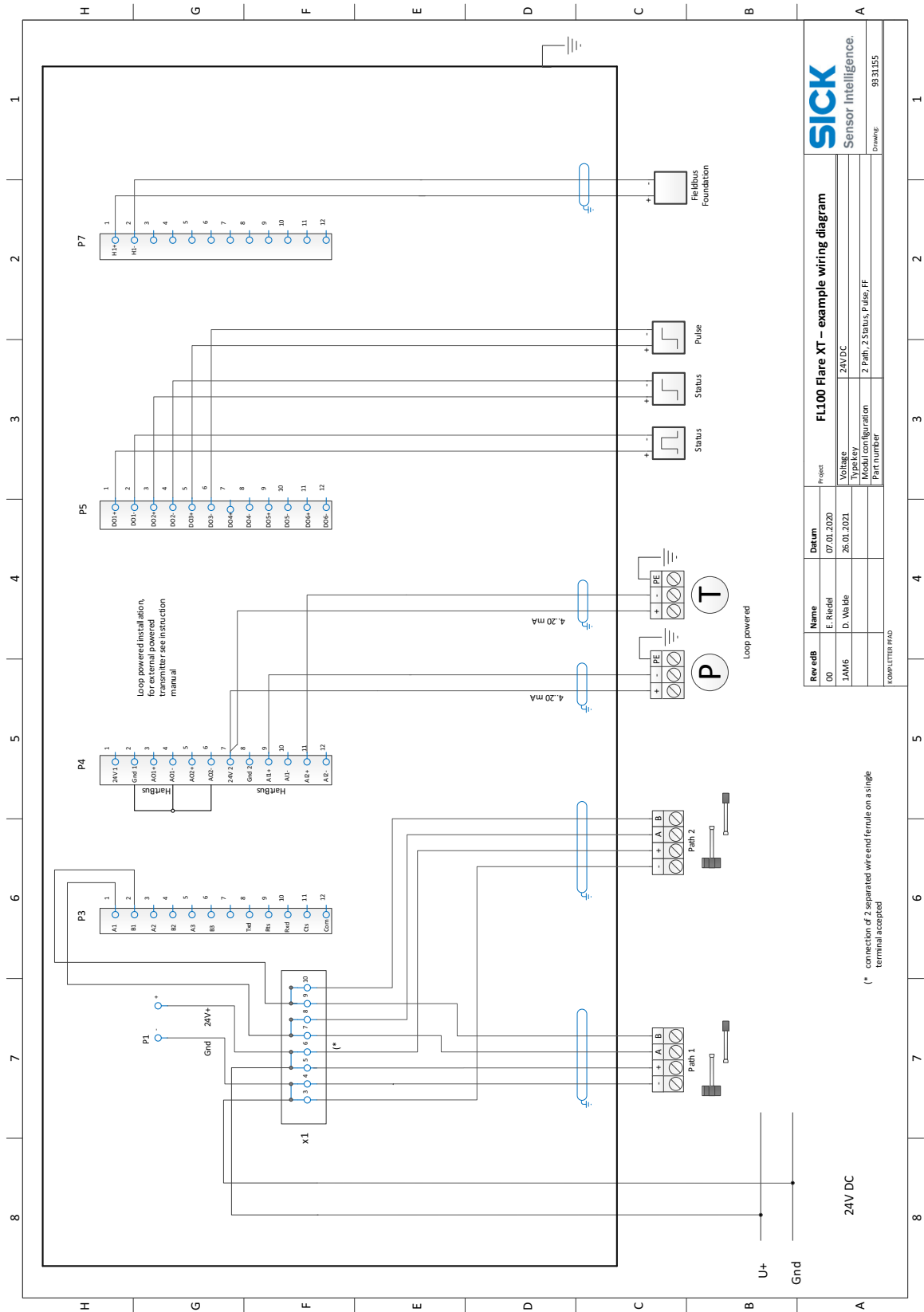


Fig. 116 Interface Unit Zone 2 DC version (example)



Rev	edb	Name	Datum	Project
00		E. Riedel	07.01.2020	
01	JAMG	D. Waide	26.01.2021	

Volts	Value
24V/DC	

Modul	Value
Modul configuration	2 Path, 2 Status, Pulse, FF
Part number	

Project	Value
FL100 Flare XT - example wiring diagram	

Part number	Value
KOMMLETTER P4AD	

(* connection of 2 separated wire end female on a single terminal occupied)

15.3 Control drawings

Fig. 117 Control Drawings FLSE-XT (page 1 of 5)

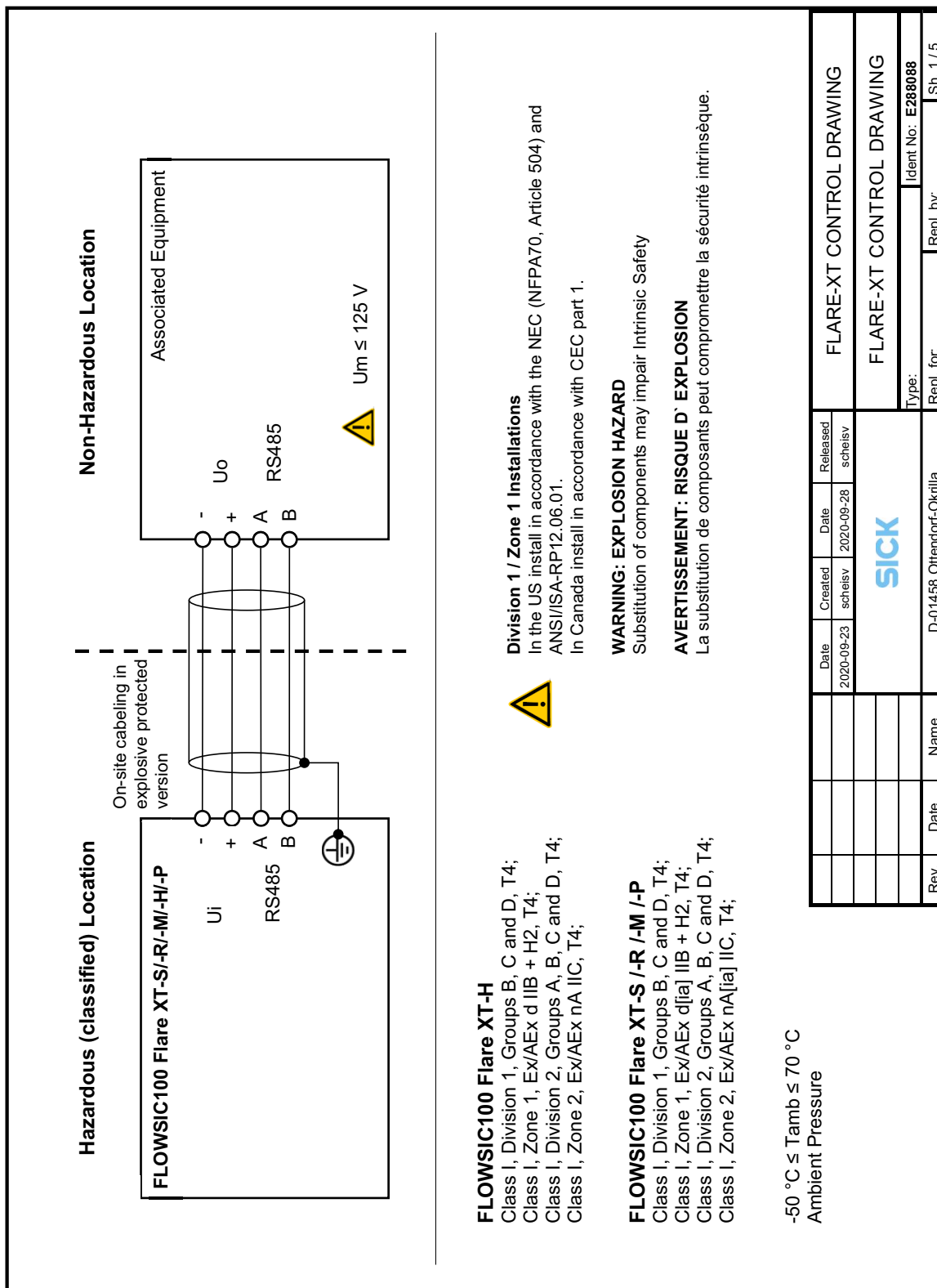
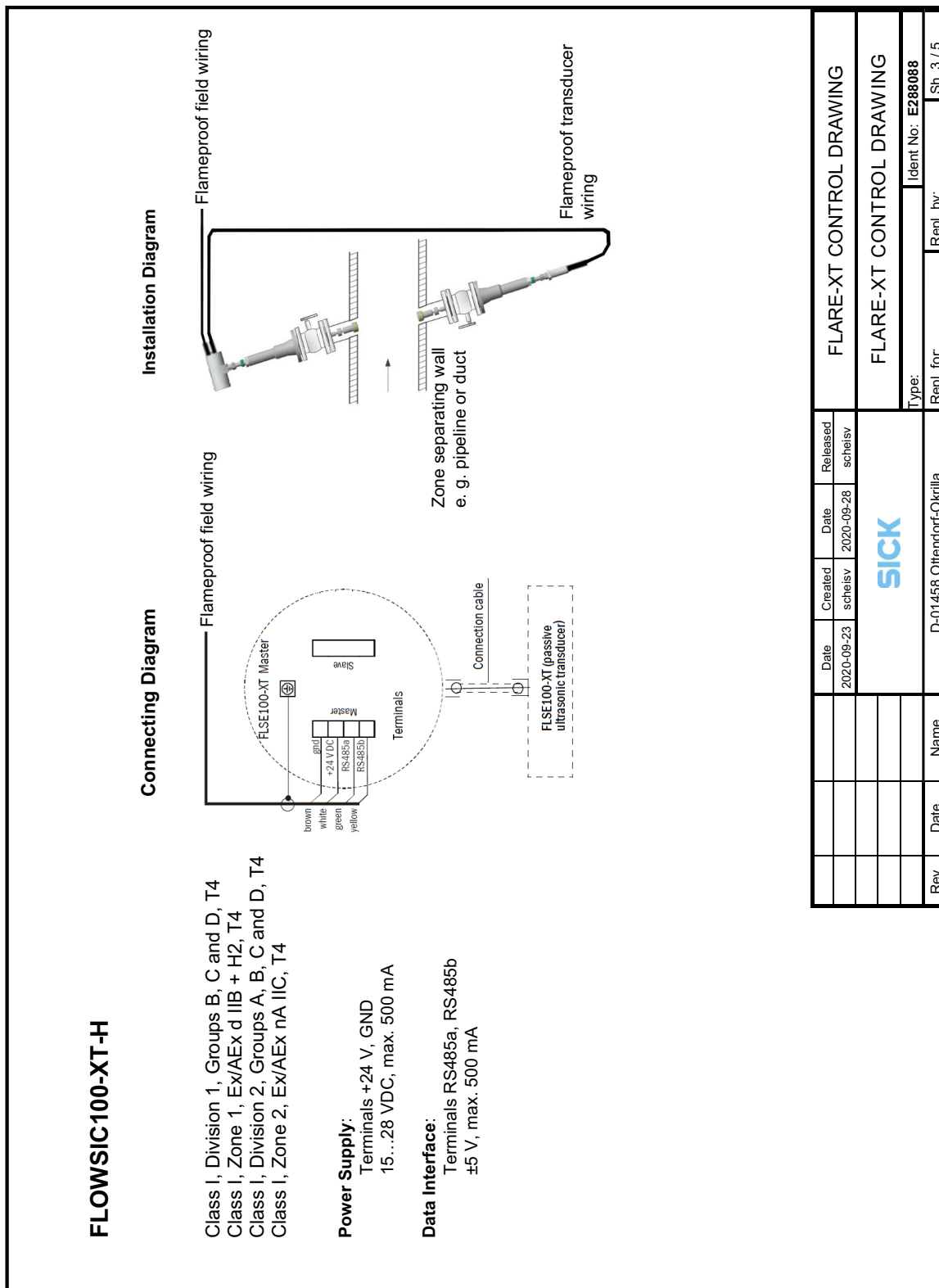


Fig. 119 Control Drawings FLSE-XT (page 3 of 5)



? 04

Fig. 121

Control Drawings FLSE-XT (page 5 of 5)

FLOWSiC100-XT-P

Class I, Division 1, Groups B, C and D, T4
 Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4
 Class I, Division 2, Groups A, B, C and D, T4
 Class I, Zone 2, Ex/AEx nA[ia] IIC, T4

Power Supply:
 Terminals +24 V, GND
 15...28 VDC, max. 500 mA

Data Interface:
 Terminals RS485a, RS485b
 ±5 V, max. 500 mA

Connecting Diagram

Flameproof field wiring

Installation Diagram

Flameproof field wiring

Zone separating wall
e. g. pipeline or duct

WARNING: Substitution of components may impair intrinsic safety.
AVERTISSEMENT: La substitution de composants peut nuire à la sécurité intrinsèque.
 Maximum non-hazardous voltage not to exceed 125 V.
 La tension maximale non dangereuse ne doit pas dépasser 125 V

Install device in accordance with NEC (ANSI/NFPA 70) in USA or CEC Part 1 in Canada.
 "[Ex ia]"

Rev.	Date	Name	Date	Created	Date	Released
				2020-09-23	2020-09-28	scheisv
SICK						
			D-01458 Ottendorf-Okrilla			
			Ident No: E28088			
			Repl. for: Sh. 5 / 5			
FLARE-XT CONTROL DRAWING						
FLARE-XT CONTROL DRAWING						

?
04

15.4

Gasket installation

Fig. 122

Gasket installation (designed by "pikotek")

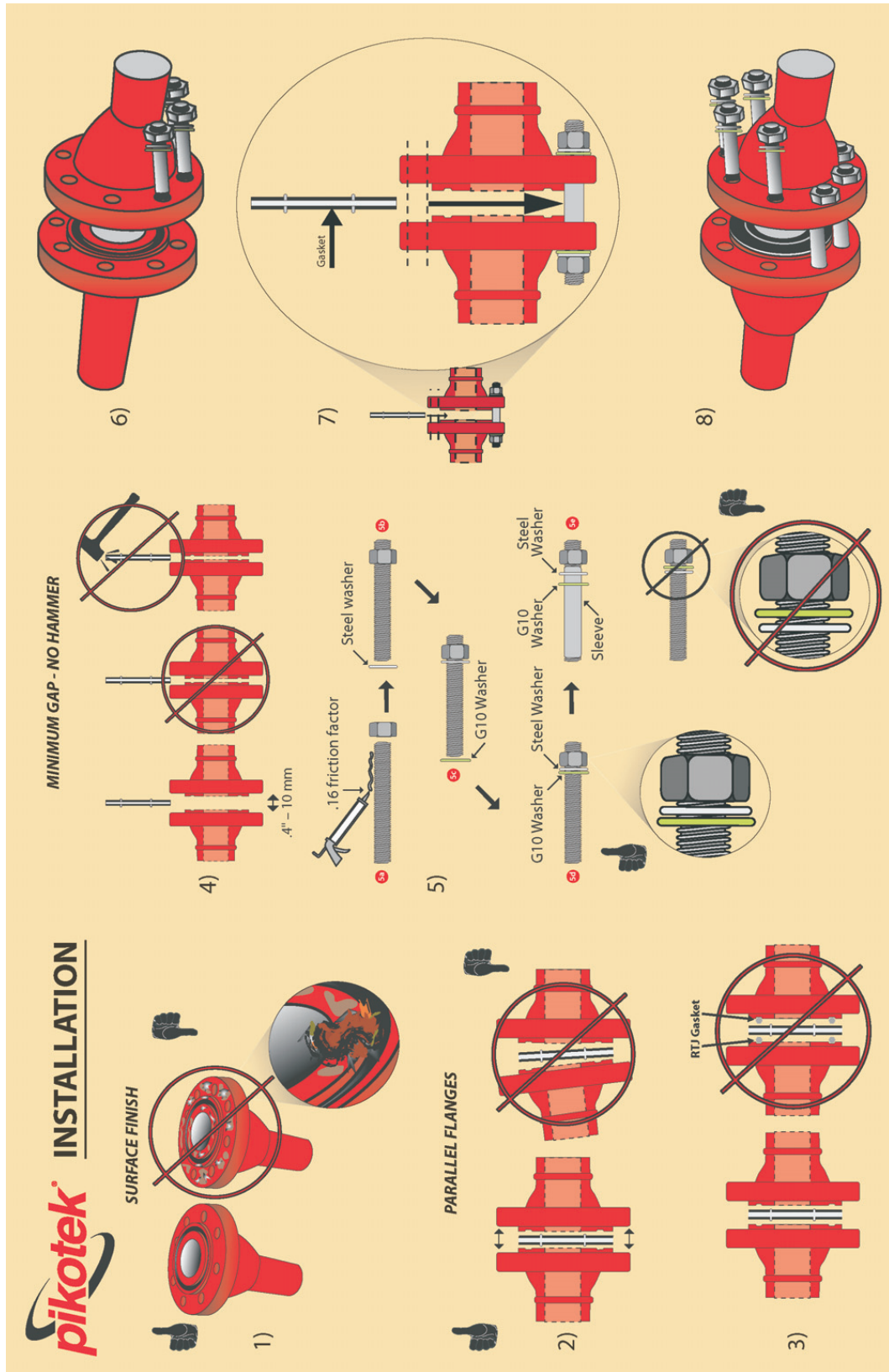


Fig. 123

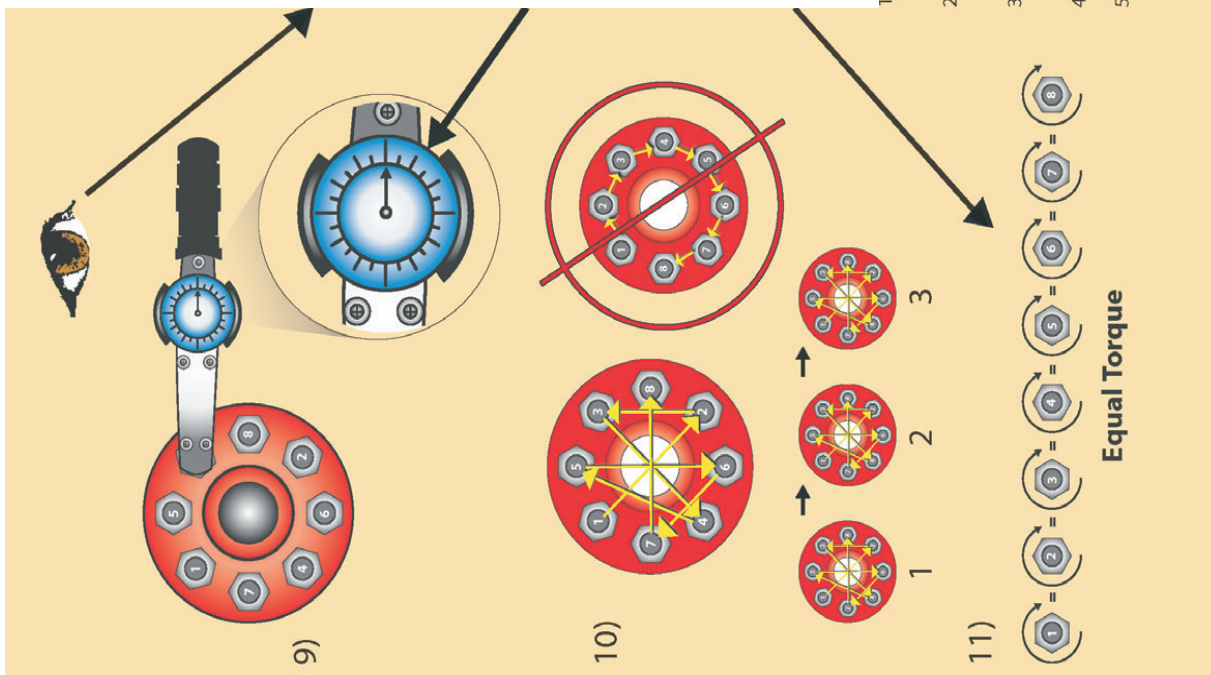
Gasket installation (designed by "pikotek"), bolt torque values for grooved metal gasket B9A and polymer gasket GYLON

Tightening torques

- Default: Grooved metal gasket B9A
- Option: Polymer gasket GYLON

	Grooved metal gasket B9A		Polymer gasket GYLON	
Bolts	2"/DN50	3"/DN80	2"/DN50	3"/DN80
M16 A2/A4-70	126 Nm	126 Nm	126 Nm	126 Nm
5/8 A193 gr. B8m	84 Nm	84 Nm	118 Nm	118 Nm
5/8" A320 gr. L7m (A193 gr. B8m)	77 Nm	77 Nm	118 Nm	118 Nm
Thickness of gasket	4,25 mm		4,6 mm	
No. of bolts	4	4	4/8	4

- 1) Recommended bolt torque is based on deriving a minimum gasket seating stress of 7,500 psi.
- 2) Bolt torque values listed assume a lubricated stud bolt resulting in a .16 friction factor.
- 3) Recommended torque values are based on using weld-neck (integral) flanges.
- 4) Blind or other flange types may require different seating loads.
- 5) 30 ksi bolt stress may exceed the design allowable stress levels for certain stud bolt materials.



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