ADDENDUM TO OPERATING INSTRUCTIONS

# FLOWSIC100 Flare

**FLSE100-XT sender and receiver units:**

**Description**

**Installation**

**Technical data**

SICK
Sensor Intelligence.

## Document information

**Described product**
Product name: FLOWSIC100 Flare

**Document identification**
Title: Addendum to Operating Instructions

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**Legal 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

# FLOWSIC100 Flare

# 1 About this document

Function of this document
Scope of application
Target groups
Data integrity
Further information

## 1.1 Function of this document

This document supplements the FLOWSIC100 Flare Operating Instructions and is to be used only in combination with the Operating Instructions. The Addendum describes the FLSE-XT sender/receiver units for connection to the MCUP.

The content of the FLOWSIC100 Flare Operating Instructions applies as long as not described differently in this Addendum.

## 1.2 Scope of application

- This document supplements the following Operating Instructions:
  - FLOWSIC100 Flare (Part No. 8013344)
- The document is not applicable to other SICK measuring devices.

## 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, see → p. 16, §2.7.

## 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

# 2 For your safety

Basic safety information
Intended use
Main hazards
Retraction mechanism of the sender/receiver units
Operation in potentially explosive atmospheres
Warning information on device
Requirements on the personnel's qualification
Restrictions on use

## 2.1 Basic safety information

Observe the safety information here and the warning information in the following Sections of this document and the FLOWSIC100 Flare Operating Instructions to reduce health risks and avoid dangerous situations.

- ► Read the FLOWSIC100 Flare Operating Instructions and this document before putting the FLSE100-XT sender/receiver units into operation.
- ► Observe all safety information.
- ► If there is something you do not understand: Contact SICK Customer Service.
- ► Only use the FLSE100-XT sender/receiver units as described in this document. The manufacturer bears no responsibility for any other use.
- ► Do not carry out any work or repairs on the FLSE100-XT sender/receiver units not described in this manual.
- ► Do not remove, add or modify any components to or on the FLSE100-XT sender/ receiver units unless described and specified in the official manufacturer information.
- ► If you do not observe this:
  - Any warranty by the manufacturer becomes void,
  - the device could become dangerous
  - the approval for use in potentially explosive atmospheres is no longer valid.
- ► Do not use damaged components or parts.

**Special local requirements**

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

## 2.2 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.

## 2.3 Main hazards

### 2.3.1 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. 16, §2.7). 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.

### 2.3.2 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.

### 2.3.3 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. 13, §2.5).
- ► Observe the information on → p. 11, §2.3.1 during installation work on running equipment (“hot tapping” method).

### 2.3.4 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.

## 2.4 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 $dm^3$ with F1F-P and max. 0.27 $dm^3$ 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 dummy plug at the factory.
- ► The dummy plug may only be removed when a venting valve is installed, → p. 62, §4.10.

## 2.5 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<br>Ex db [ia Ga] IIB T4 Ga/Gb<br>Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>Ex ia IIC T6/T4 Ga | II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>II 1G Ex ia IIC T6/T4 Ga | Class I, Division 1, Group D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIA, T4;<br>Class I, Division 2, Group D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIA, T4<br><br>Class I, Division 1, Groups C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB, T4;<br>Class I, Division 2, Groups C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIB, T4<br><br>Class I, Division 1, Groups B, C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIC, T4 |
| F1F-M | Ex db [ia Ga] IIA T4 Ga/Gb<br>Ex db [ia Ga] IIB T4 Ga/Gb<br>Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>Ex ia IIC T6/T4 Ga | II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>II 1G Ex ia IIC T6/T4 Ga | Class I, Division 1, Group D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIA, T4;<br>Class I, Division 2, Group D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIA, T4<br><br>Class I, Division 1, Groups C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB, T4;<br>Class I, Division 2, Groups C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIB, T4<br><br>Class I, Division 1, Groups B, C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>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;<br>Class I, Zone 1, Ex/AEx d IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA IIC, T4 |
| F1F-P | Ex db [ia Ga] IIA T4 Ga/Gb<br>Ex db [ia Ga] IIB T4 Ga/Gb<br>Ex db [ia Ga] IIC T6/T4 Ga/Gb | II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIB T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb | Class I, Division 1, Group D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIA, T4;<br>Class I, Division 2, Group D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIA, T4<br><br>Class I, Division 1, Groups C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB, T4;<br>Class I, Division 2, Groups C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIB, T4<br><br>Class I, Division 1, Groups B, C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIC, T4 |

### 2.5.1 Specific conditions

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

#### 2.5.1.1 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 equipment is marked with a warning label according to IEC 60079-1, Table 16 g).

  Under certain extreme circumstances, the equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment 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 equipment 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.

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

- The equipment 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 equipment are to be connected to the potential equalization system of the installation area.
- The maximum permitted voltage in the safe area (Um) must not exceed the rated 125 V AC. Connect the device only to equipment which does not carry voltage higher than 125 V AC. Use SELV power supplies and equipment 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.

### 2.5.2 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.

### 2.5.3 Permissible gas temperature, depending on the temperature code of the sender/ receiver units

Case 1 (see →Table 2):

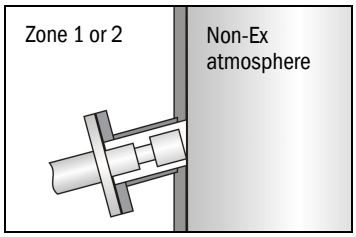
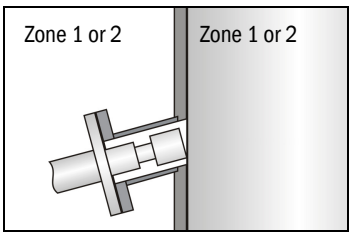
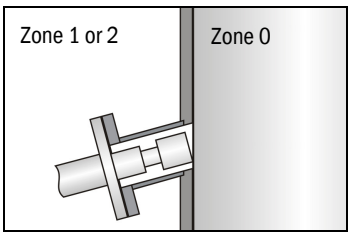
Under normal atmospheric conditions, an explosive atmosphere categorized as Zone 1 or Zone 2 exists outside the pipeline. Process conditions in the pipeline can differ from the atmospheric conditions. Process conditions can be in the range specified on the type plate of the sender/receiver units. In 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 | ● Ultrasonic sensor outside explosive atmosphere Zone 1 or 2<br>● Electronics in explosive atmosphere Zone 1 or 2<br>● Gas pressure and gas temperature according to specification on device label | ● Ultrasonic sensor in explosive atmosphere Zone 1 or 2<br>● Electronics in explosive atmosphere Zone 1 or 2<br>● Gas pressure and gas temperature according to ambient specification of device | ● Ultrasonic sensor in explosive atmosphere Zone 0<br>● Electronics in explosive atmosphere Zone 1 or 2<br>● Gas pressure atmospheric, gas temperature max +60 °C<br>● 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.

## 2.6 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.

## 2.7 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**

EX

► Cabling/installation, equipment 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.

## 2.8 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 °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.

# FLOWSIC100 Flare

# 3 Product description

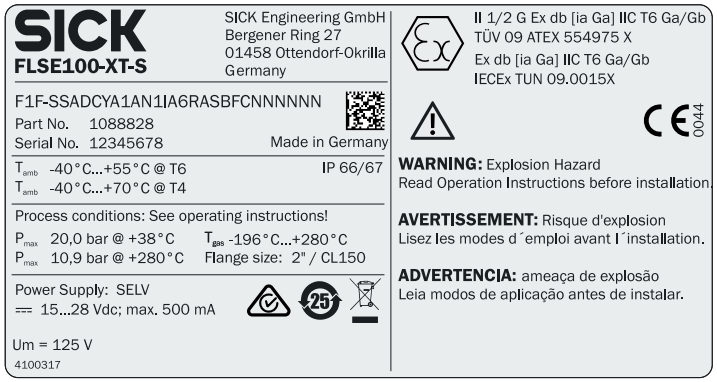
Product identification
Sender/receiver units
Material for parts with process gas contact
Spool piece option
Transport and storage

## 3.1 Product identification

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

### Type plate

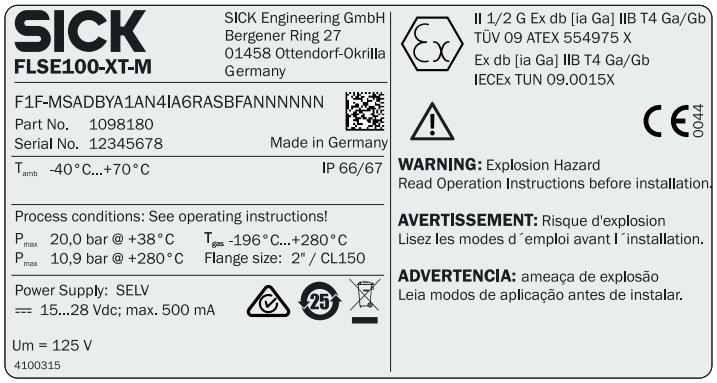
Fig. 1 Type plate example FLSE100-XT-S




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


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

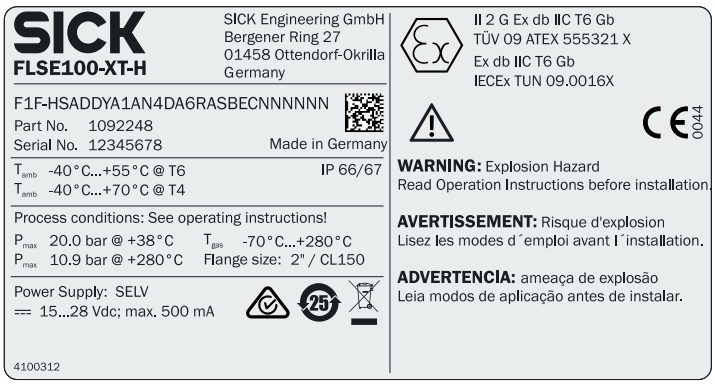
Fig. 2 Type plate example FLSE100-XT-M




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


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

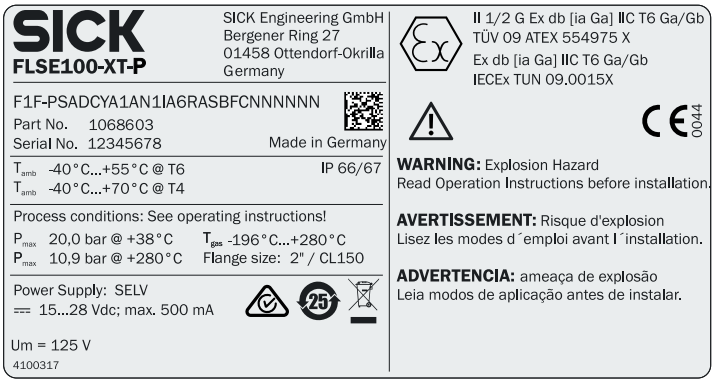
Fig. 3 Type plate example FLSE100-XT-H




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


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

Fig. 4 Type plate example FLSE100-XT-P

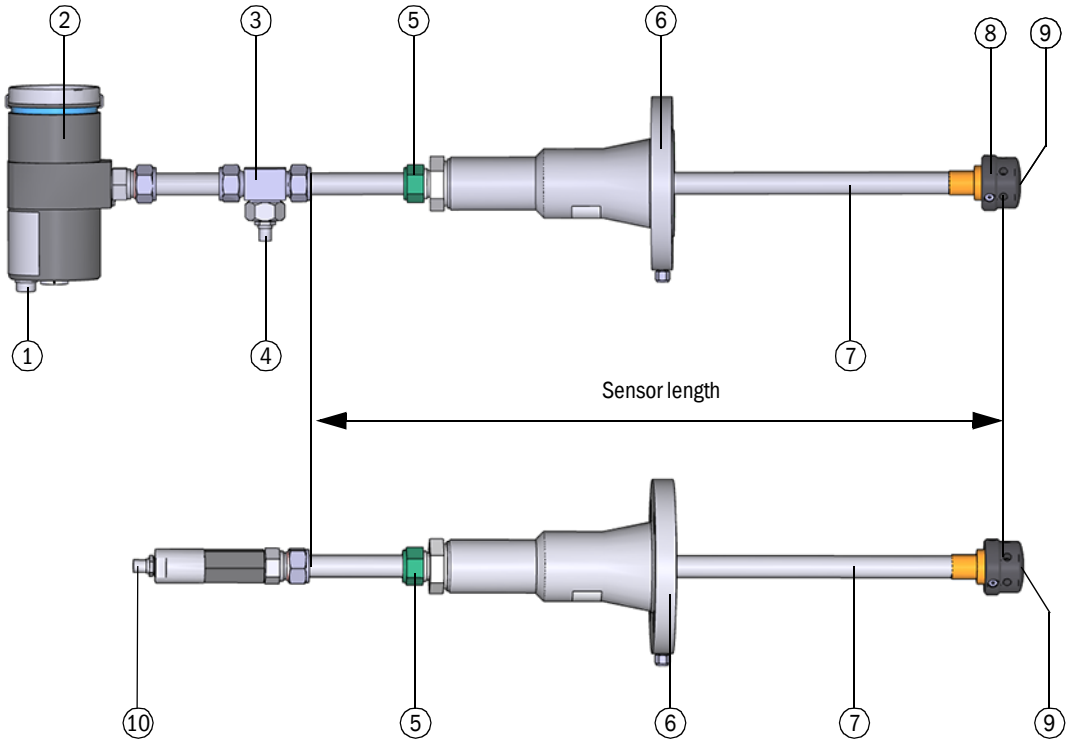



Example of marking plate FLSE100-XT-P (ATEX/IECEx)

## 3.2 Sender/receiver units

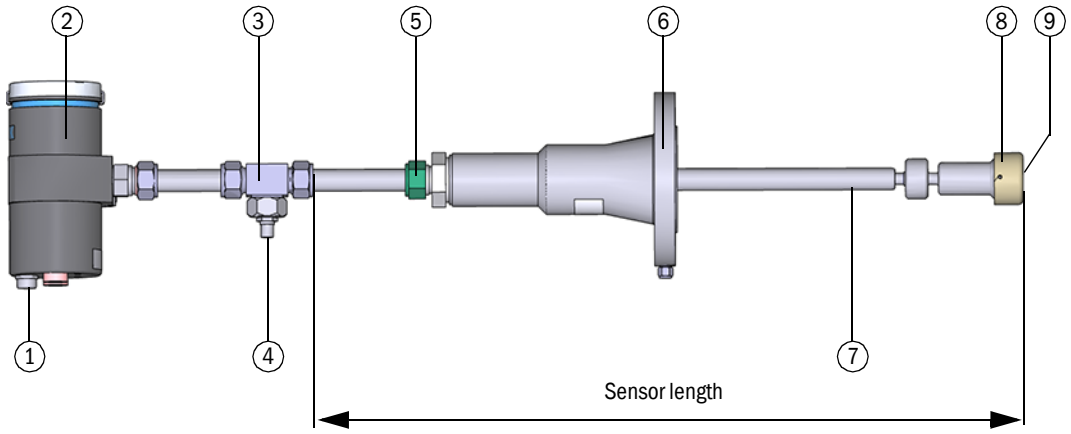
### Cross-duct

Fig. 5 F1F-S (Master and slave shown as examples)



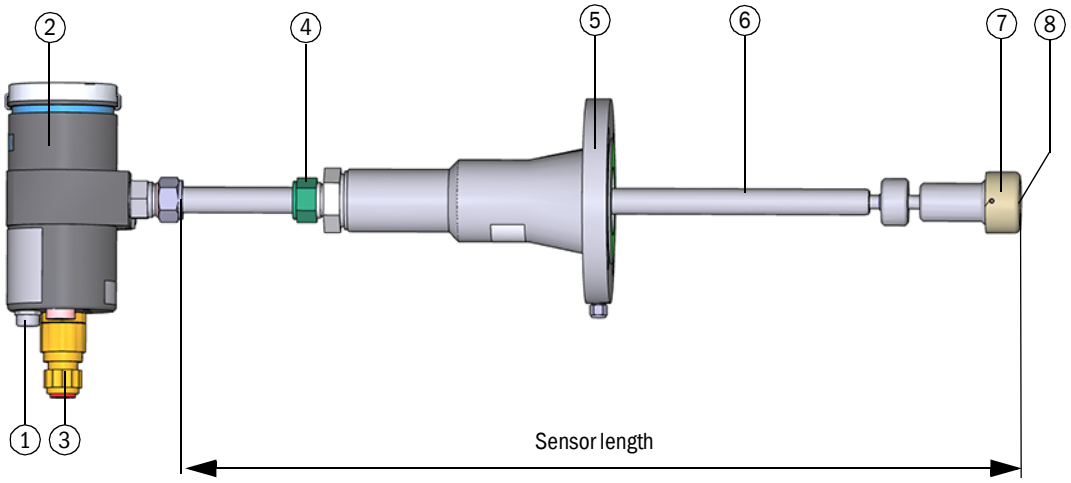

1 Pressure compensation element
2 Electronics unit
3 T-connector
4 TNC connector (connection for Slave)
5 Self-cutting ring
6 Retraction nozzle
7 Duct probe
8 Sensor contour
9 Transducer
10 TNC connector (connection for Master)

Fig. 6 F1F-M (only master shown)




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

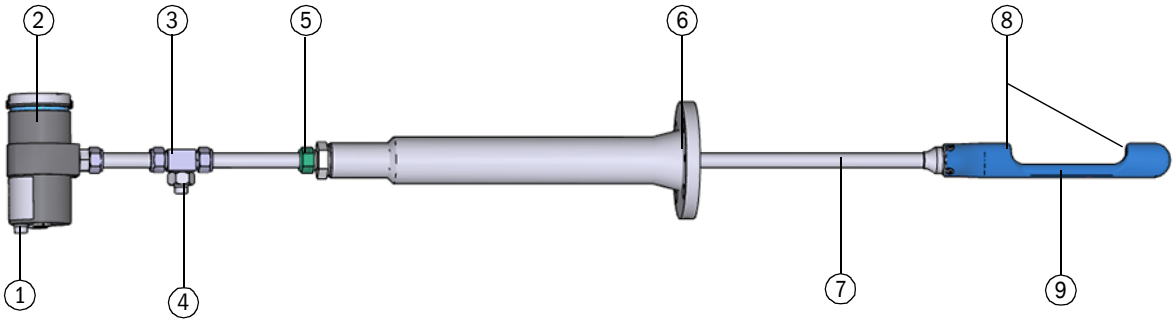
Fig. 7 F1F-H (only master shown)




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

## Probe version

Fig. 8 F1F-P




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

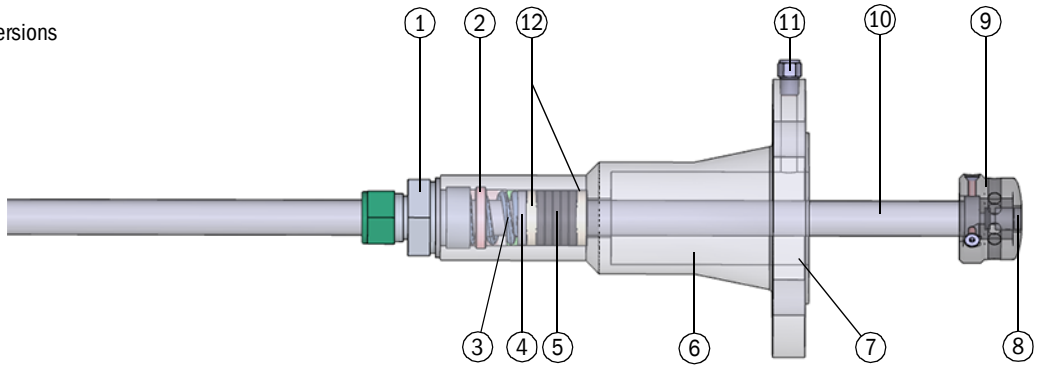
## 3.3 Material for parts with process gas contact

Table 3 Overview of parts with process gas contact

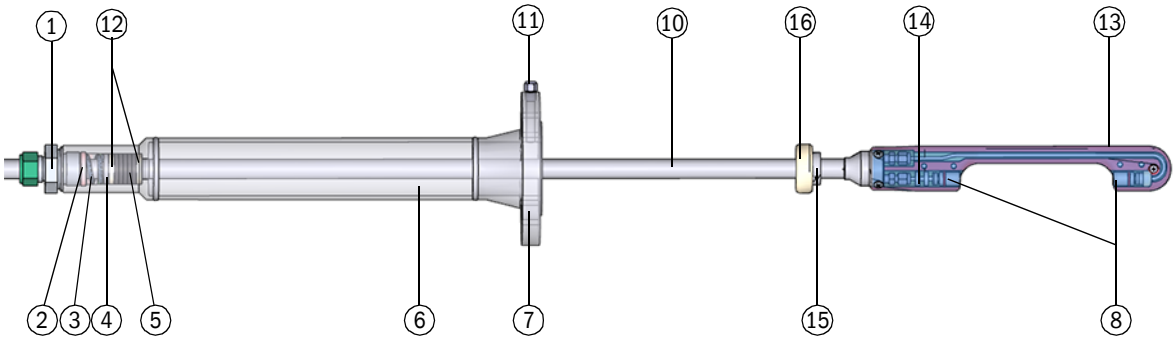
| Material | Component | Type FLSE100-XT | | | |
|---|---|---|---|---|---|
| | | F1F-S | F1F-M | F1F-H | F1F-P |
| Stainless steel 1.4404 | Duct probe (10), transducer (8), connecting flange (7), threaded ring (2) | | x | | |
| | Connection for optional venting (11), retraction nozzle (6) | | x | | |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

Fig. 9 Parts with gas contact

Cross-duct versions




Probe version




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

## 3.4 Spool piece option

The FLOWSIC100 Flare 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.

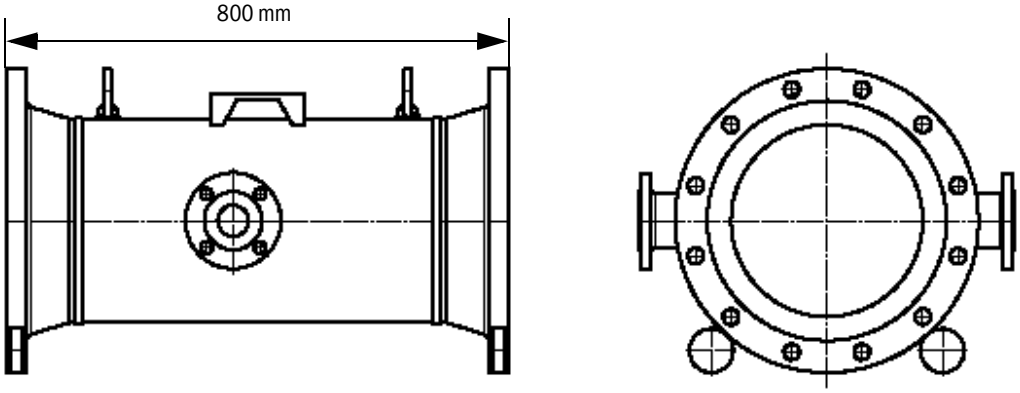
The installation length of the spool piece depends on the nominal diameter of the pipe:

- 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 + spool piece) are optionally available with pressure and temperature sensors. For the positioning of pressure and temperature transmitters the following configurations are available:

- Measuring tube with standard installation length with integrated pressure tapping, temperature sensor 5 $D_T$ ( = 5 * diameter of the thermowell) in the outflow area (customer's pipeline)
- Spool Piece, extended length with integrated pressure and temperature tapping.

Fig. 10 Spool piece option (example)




## 3.5 Transport and storage

Comply with permissible storage conditions (→ p. 75, §7).

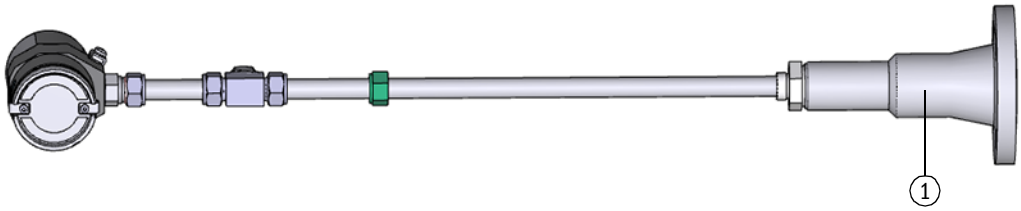
### 3.5.1 Transport protection

To prevent transport damage, the FLSE100-XT sender/receiver units must be secured according to Fig. 11 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. 11 Transport protection




1 Retraction nozzle

### 3.5.2 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: Hazard 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. 12 Lifting requirements

# FLOWSIC100 Flare

# 4 Installation

Safety information
Scope of delivery
Installation sequence
Installation accessories
Fitting the nozzles on the pipeline (measuring system without spool piece)
Pulling the sender/receiver units back
Fitting the sender/receiver units
Pulling the sender/receiver units back
Fitting the venting valve
Fitting the weatherproof cover for the sender/receiver units

## 4.1 Safety information

**WARNING: Risks during installation**

- ► Observe the relevant safety regulations as well as the safety notices on → p. 9, §2 during all installation work.
- ► Carry out installation 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**

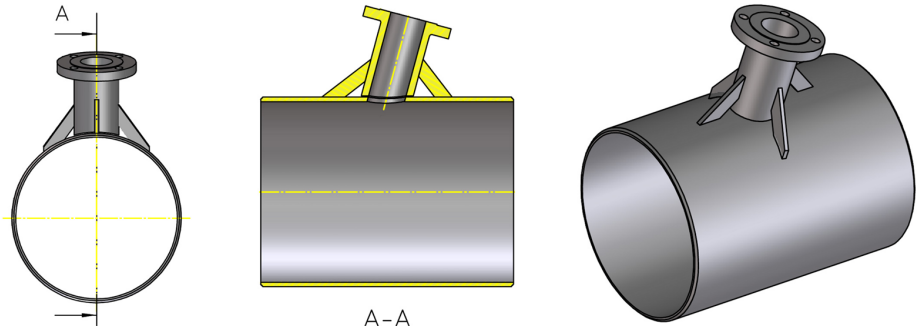
The static load moment of all parts to be installed on the pipeline can be up to approx. 600 Nm. Strong pipe vibrations can cause damages and can lead to dangerous situations.

- ► 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. 13 Option mechanical support for nozzle “gusset plates”




## 4.2 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 reported damages 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.

## 4.3 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 Operating Instructions FLOWSIC100 Flare, Figure 2.

**WARNING: Hazard due to size and mass of the spool piece**

► Observe the transport information on → p. 27, §3.5.2 !

**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. 60, §4.8.4.

## 4.4 Installation sequence

Carry out all assembly work on-site.

This includes:

- ► Determining the nozzle position
- ► Welding the nozzle on

  The nozzles are manufactured at the factory precisely 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 low measuring uncertainty, the geometric parameters must be determined as accurately as possible. Maximum tolerances:
> – Nozzle positions and fitting angle of the nozzles: ±1 mm / ±1 °
> – Measurement of the nozzle length: ±1 mm
> – Measurement of the ball valves: ±1 mm

> ***NOTICE:***
> The exact pipe 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 wall thickness measuring device.

## 4.5 Geometry Calculator

The Geometry Calculator for installation of FLSE100-XT sender/receiver units is available on the provided product CD (Geometry Calculator for "Flare-XT").

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

The following dimensions can be calculated using the Geometry Calculator:

- Transducer distance a (offset between nozzles),→ p. 38, §4.7.2.

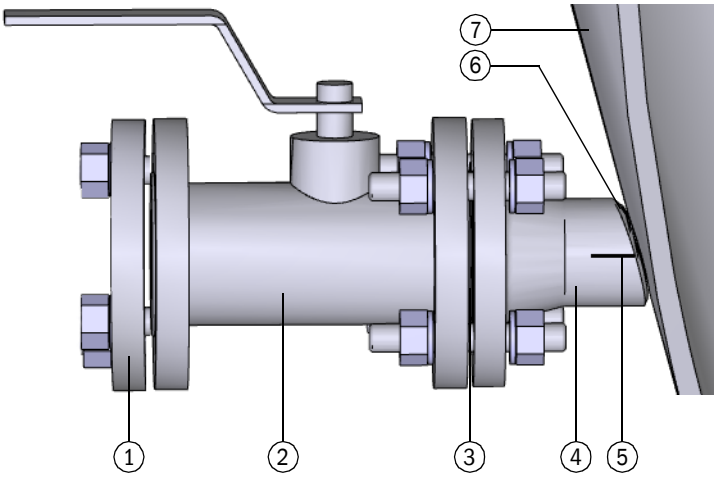
  The following parameters must be determined during installation for calculation of the transducer distance: Circumference and nozzle angle
- Wetted part length wL, → p. 49, §4.8.1.

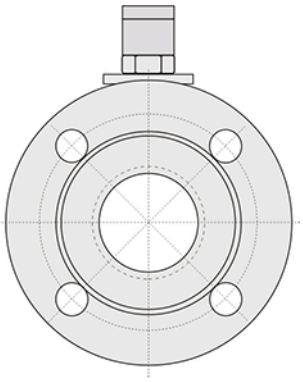
  For installation of the sender/receiver units, the wetted part length is calculated from:
  – Circumference
  – Wall thickness
  – Gasket thickness
  – Nozzle length
  – For retractable installation: Ball valve length
  – Nozzle angle
  – For cross-duct versions additionally: Transducer distance a
- Geometric installation parameters for commissioning of the measuring system, → p. 49, §4.8.1.

## 4.6 Installation accessories

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

Fig. 14 Installation accessories (using ANSI CL150 as example)



Connection ANSI CL150 2"

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

***NOTICE:***

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

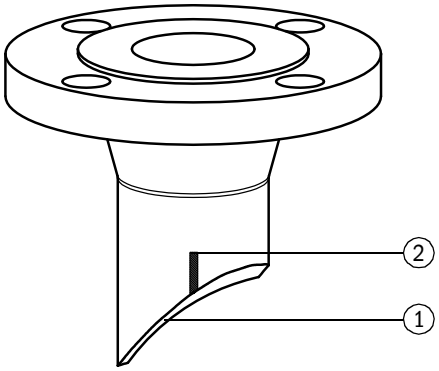
- The ball valve must not be insulated for media temperatures below -40 °C or higher than +160°C.
- For gas temperatures higher than +180°C or below -40 °C , the temperature at the nozzle flange must be checked after through-heating during initial start-up. If required, the nozzle insulation must be removed as required to stay in the specified temperature limit.
- Do not exceed temperature and pressure ranges listed in → p. 82, §7.3.
  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. 82, §7.3.

4.6.1

## 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. 15 Nozzle




1 Welding bevel
2 Marking

### Nozzles and blind flanges

***NOTICE:***
Observe the diagrams on → p. 82, §7.3.

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. 82, §7.3.

Dimensional drawings of the nozzles are available on the product CD or can be obtained 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 screwed sleeves) is available as an accessory.

### Seals

***NOTICE:***
Observe the diagrams on → p. 82, §7.3.

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 |
|---|---|
| Grooved metal gasket B9A 1.4571 | -196 ... +280 °C |

### 4.6.2 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 dismounted 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. 82, §7.3.

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) |

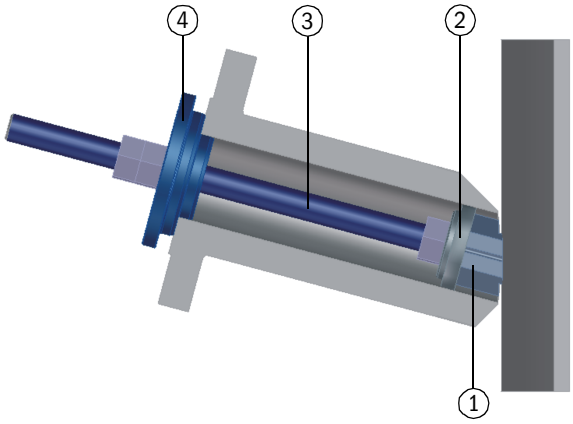
### 4.6.3 Nozzle installation tool

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. 16 Nozzle installation tool



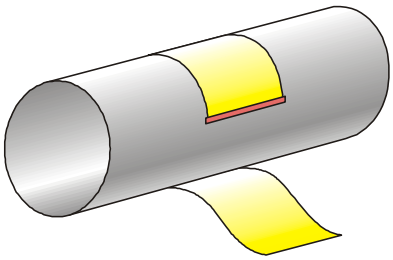
## 4.7 Fitting the nozzles on the pipeline (measuring system without spool piece)

### 4.7.1 General preparation work

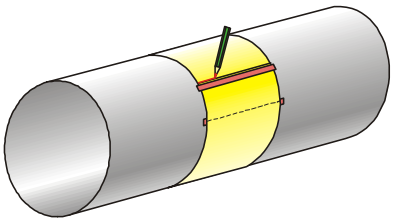
The installation tool (→ p. 36, §4.6.3) contains a foil strip (length approx. 4 times the pipe diameter, width approx. 0.75 of the pipe diameter) to determine the exact position of the nozzle on the pipeline. The foil strip is prepared with nozzle markings for different pipe diameters.

Fig. 17 General preparation work

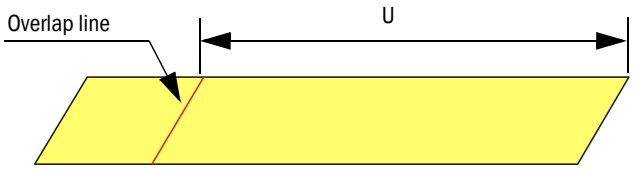
1) Wind the strip around the pipeline at the selected measuring point (ensure exact right-angled alignment) and secure (e.g. with adhesive strips).



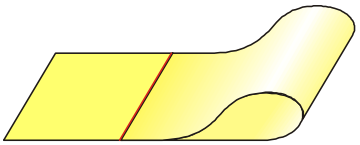
2) Mark the strip where overlapping starts.



3) Loosen the fastening, take the strip off and lay it out on a level surface.




For 1-path measurements, fold the strip to the overlap line so that the part matching pipe circumference (U) is halved.



### 4.7.2 Determine the nozzle position for cross-duct versions

> ***NOTICE:***
> Note transducer distance a and circumference U; these values are required to calculate path angle and path length during start-up.

**Calculate transducer distance a**

- ► Determine circumference U.
- ► Calculate transducer distance a.
- ► The transducer distance can be determined manually using the formula in → Fig. 18 or the Geometry Calculator available on the provided product CD, → p. 32, §4.5 .

Fig. 18 Formulas to calculate transducer distance a

**1-path devices:**

α [°] = Path angle including nozzle offset
U [mm] = circumference
a [mm] = transducer distance

$$a = \frac{U/\pi}{\tan(\alpha)}$$

Example for 75° nominal installation angle / 77.5° path angle:

$$a = \frac{U/\pi}{\tan(77,5°)}$$

$$a = \frac{U/\pi}{4,5107}$$

**2-path devices:**

$$a = \frac{0,8 \cdot (U/\pi)}{\tan(\alpha)}$$

Example for 75° nominal installation angle / 77.5° path angle:

$$a = \frac{0,8 \cdot (U/\pi)}{\tan(77,5°)}$$

$$a = \frac{0,8 \cdot (U/\pi)}{4,5107}$$

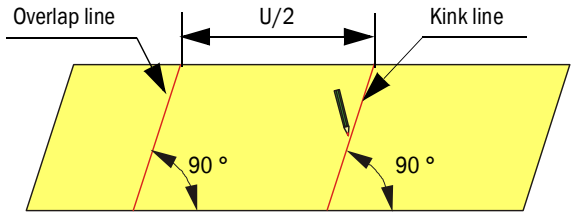
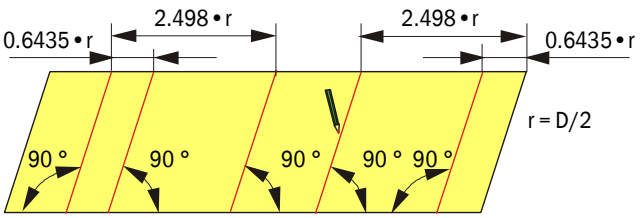
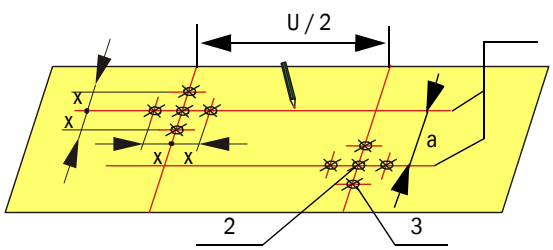
### Calculate transducer distance a with the Geometry Calculator

Alternatively to the manual calculation of the nozzle offset, the Geometry Calculator available on the provided product CD can be used, → p. 32, §4.5:

1 Open the Geometry Calculator.
2 On the tab "Calc transducer distance" first select in the field "Meter type" if it is a 1-path or a 2-path installation.
3 Enter circumference U.
4 Enter the "Nominal nozzle angle" (e.g. 75°, 60°, 45°).
5 "Transducer Distance a" is calculated.

### Marking the nozzle positions on the pipeline

Fig. 19 Determining the nozzle positions on the strip

<table>
<tr><th>1-path measurement</th><th>2-path measurement</th></tr>
<tr><td>4a) Roll the strip out again and mark the kink line.<br> 
</td><td>4b) Roll the strip out again and mark the lines as follows:<br> 
</td></tr>
<tr><td colspan="2">5) Draw guide lines (1) for the nozzle positions with the previously calculated nozzle offset a, mark crossing points (2) and draw marking points (3) in distance 60 mm (x) from the crossing points.<br> 

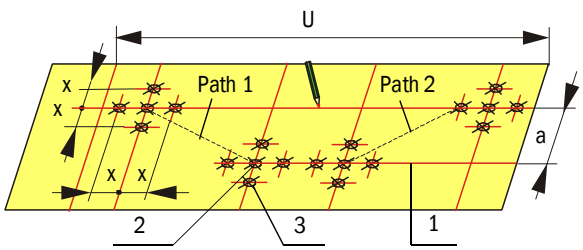
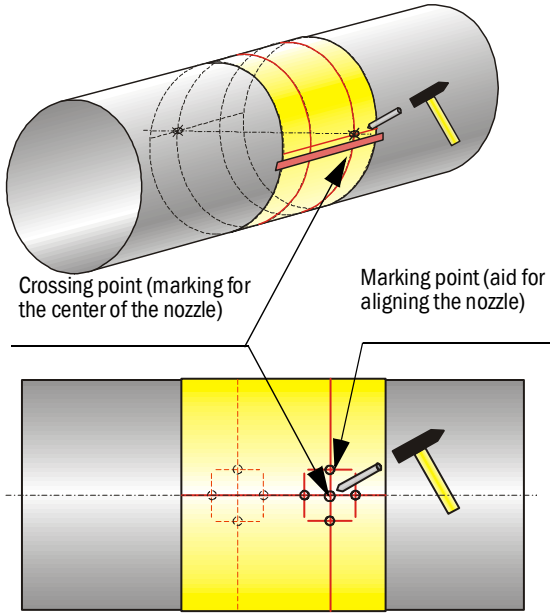
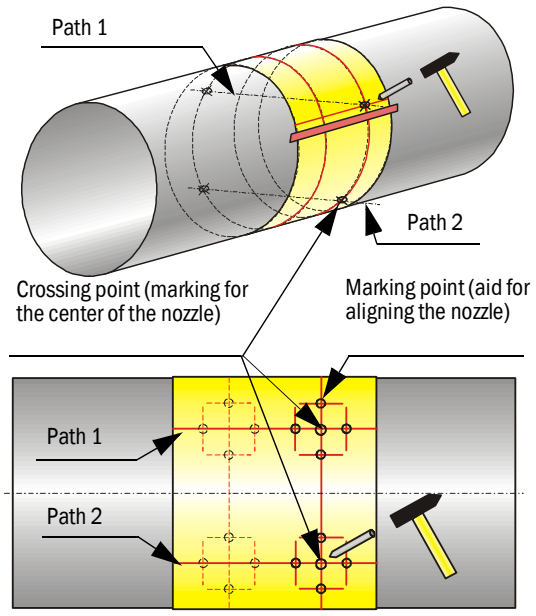
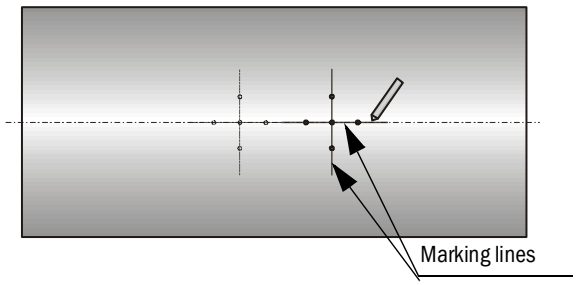
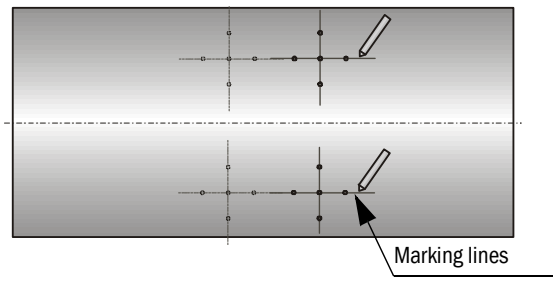

</td></tr>
</table>

Fig. 20 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. | |
|  |  |

### 4.7.3 Determining the nozzle position for the probe version

Fig. 21 Determining the nozzle positions on the strip

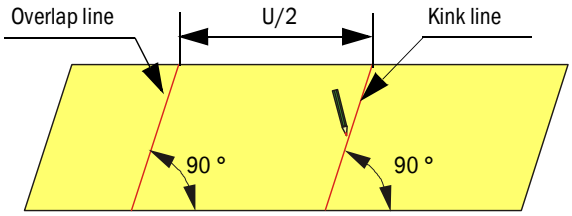
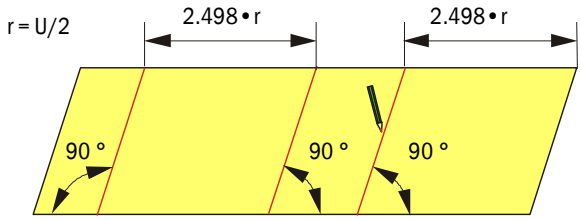
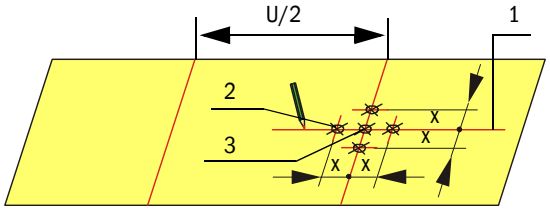
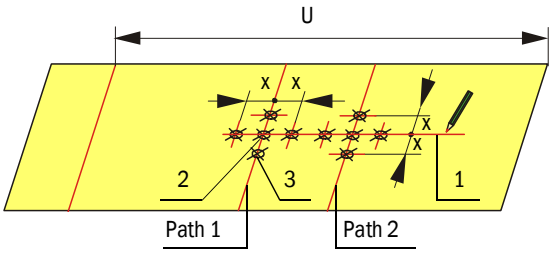
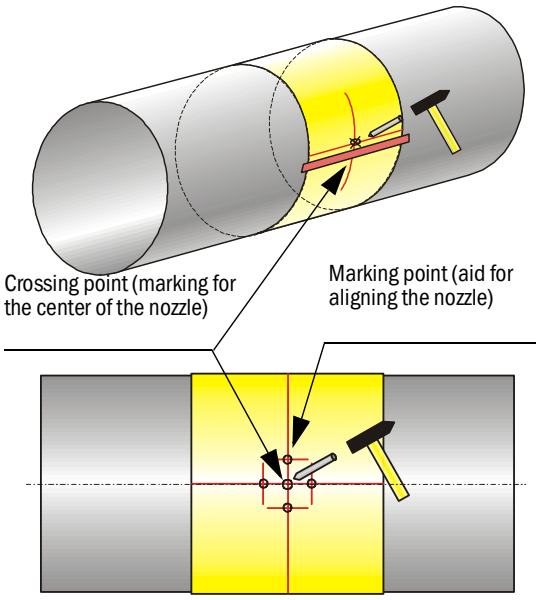
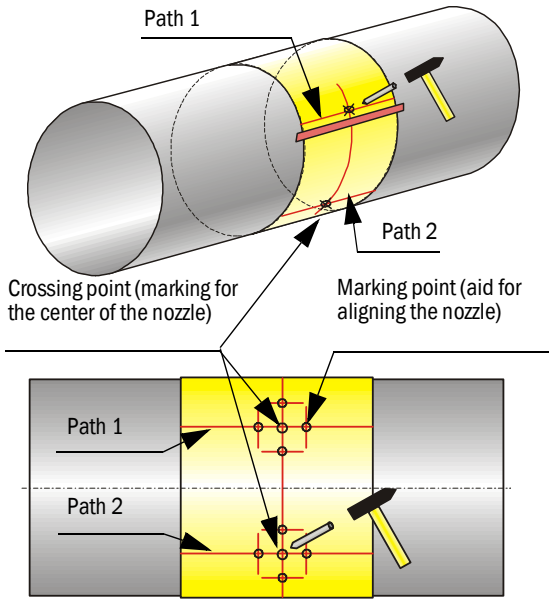
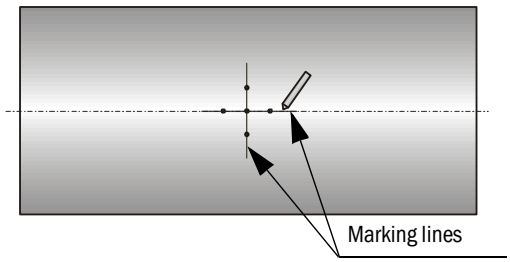
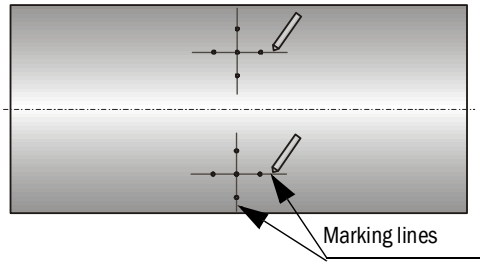
| 1-path measurement | 2-path measurement |
|---|---|
| 1) Start preparation work as shown in → p. 37, Fig. 17. | |
| 4a) Roll the strip out again and mark the kink line. | 4b) Roll the strip out again and mark the lines as follows: |
|  |  |
| 5) Draw a guide line (1) for the nozzle position(s), mark crossing points (2) and draw marking points (3) in distance 60 mm (x) from the crossing points. | |
|  |  |

Fig. 22 Marking the nozzle position(s) on the pipeline for the probe version

| 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. | |
|  |  |

### 4.7.4 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
- ► Ensure welding seams are gas-tight.
- ► Check strength and durable tightness of the welding seams.

***NOTICE:* 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.

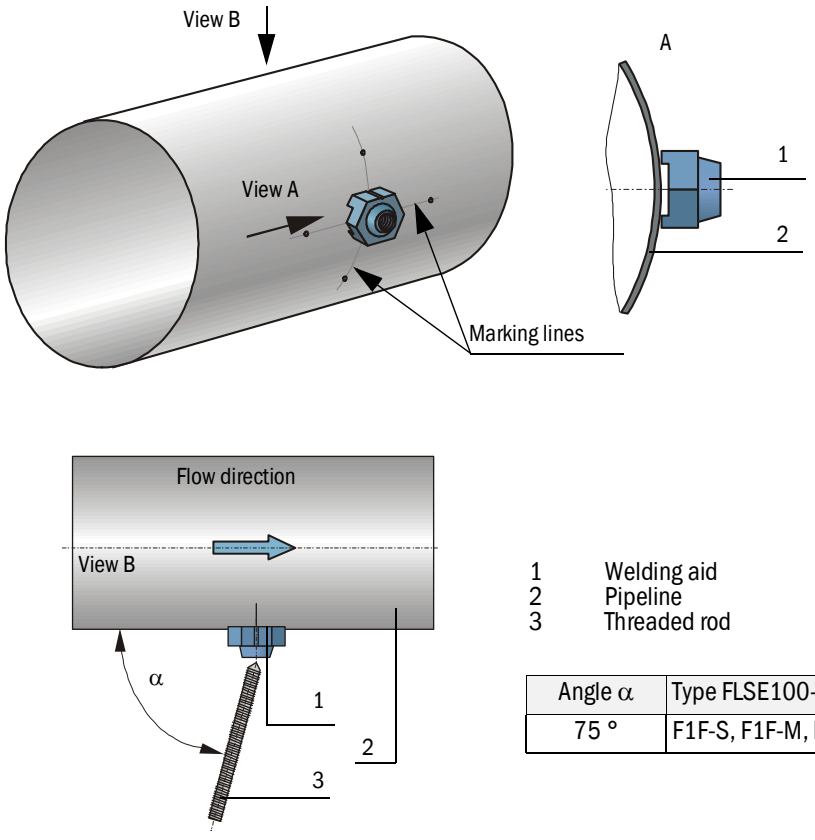
► Position the welding aid (1) on the pipeline (2) as shown in → Fig. 23.

***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. 23 Positioning of the welding aid




1 Welding aid
2 Pipeline
3 Threaded rod

| Angle α | Type FLSE100-XT |
|---|---|
| 75 ° | F1F-S, F1F-M, F1F-H, F1F-P |

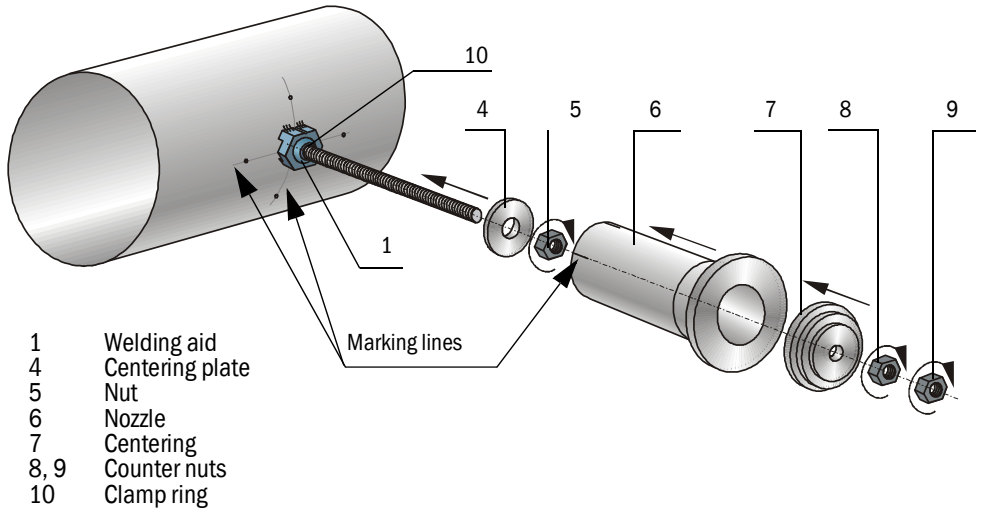
► Slide centering plate (4) on the cone of the welding aid (1) and fasten with the nut (5).
► Slide nozzle (6) over threaded rod and centering plate.
► Place the centering (7) into the nozzle opening so that the marking on the centering corresponds to the nozzle type (ANSI or DIN, size).

► Screw counternuts (8), (9) onto the threaded rod and position the nozzle with suitable means (e.g. use an uncoated wire) and clamp it so that the required welding gap is achieved.

When positioning, align the nozzle so that the marking lines on nozzle and pipe wall are flush.

► Then tack-weld.

Fig. 24 Fitting the nozzle




1 Welding aid
4 Centering plate
5 Nut
6 Nozzle
7 Centering
8, 9 Counter nuts
10 Clamp ring

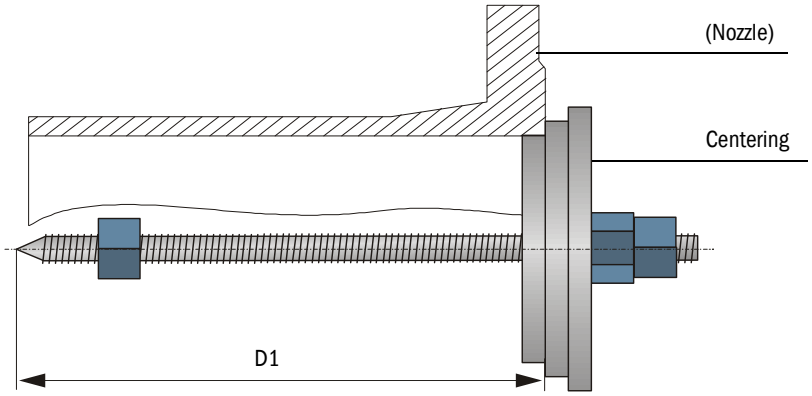
► Unscrew the threaded rod as a whole from the welding aid. To do this, place a wrench on the counternuts. The centering plate will be removed by the clamp ring.

► 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.

► For cross-duct versions of FLOWSIC100 Flare (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. 25 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. 37, §4.7).

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

### 4.7.5 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.

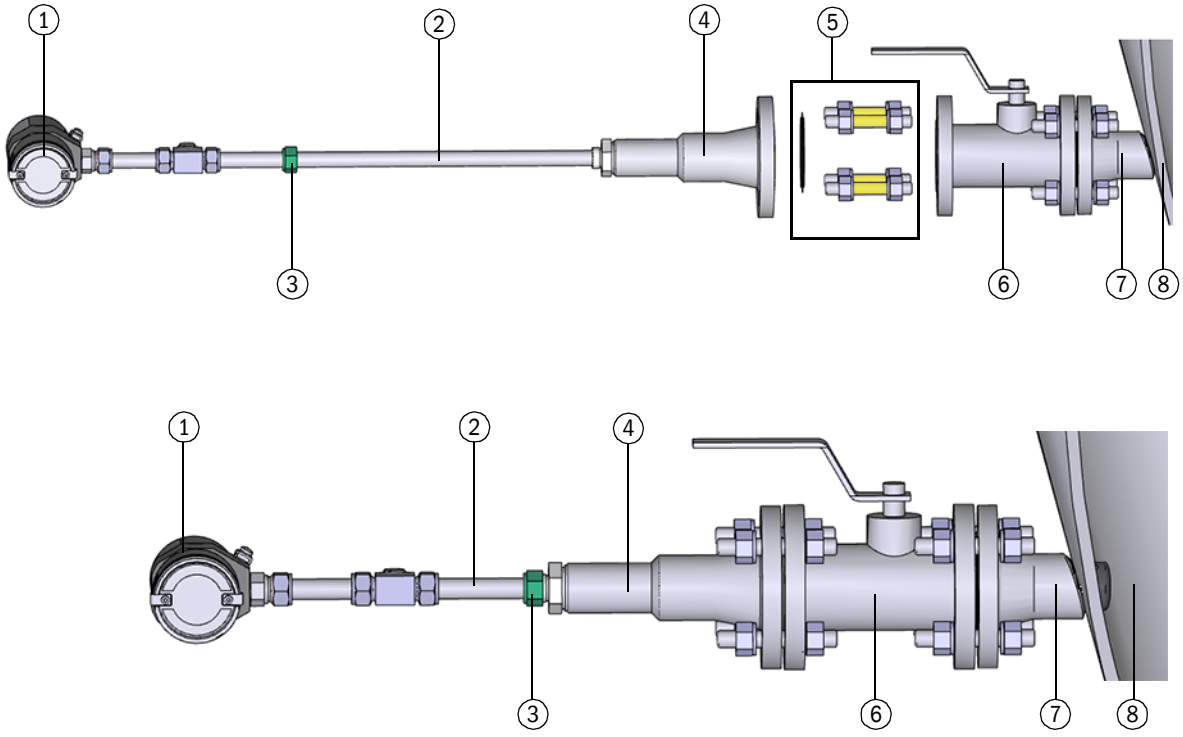
- ► Keep the ball valve closed and fitted until a sender/receiver unit has been fitted.
- ► Secure the ball valve against unintentional activation.
- ► Instruct other persons accordingly.

## 4.8 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. 11, §2.3.
- 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. 26 Overview

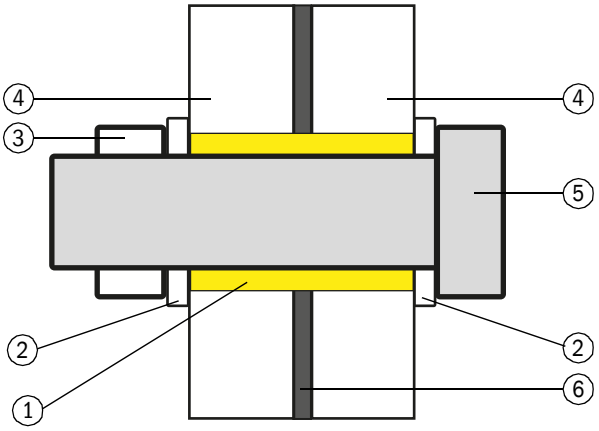



1 Electronics unit
2 Duct probe
3 Cutting ring screw connection
4 Retraction nozzle
5 Mounting kit (including gasket, fastening screws, nuts, washers and alignment sleeves)
6 Ball valve
7 Nozzle
8 Pipeline

### Use of the alignment sleeves

The alignment sleeves are included in the mounting kit and serve to ensure the centering of the process flanges of the sender/receiver units.

Fig. 27 Alignment sleeves




1 Alignment sleeve
2 Washer
3 Nut
4 Flange
5 Fastening screw
6 Gasket

### 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 measuring precision possible. Exchanging structurally identical sender/receiver units from different measuring systems is not recommended.
- Sender/receiver units can only be exchanged against 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 Operating Instructions FLOWSIC100 Flare §6.7 "Sealing installation instruction".

### 4.8.1 Calculating the wetted part length wL 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 an ultrasonic wall thickness measuring device.

- ► Calculate the wetted depth length for cross-duct versions according to → Fig. 30.
- ► Calculate the wetted part length for the probe version according to → Fig. 31.

**Calculating the wetted part length wL with the Geometry Calculator**

Alternatively to manual calculation of the wetted part length wL, the provided calculator can be used:

1 Open the Geometry Calculator.
2 On the "Calc length, angle, diameter" tab, first select in the "Path number" field if the installation is a 1-path or a 2-path installation.
3 In the field "Transducer type" select if it is a "cross-duct" or the "Probe" device version.
4 Select "retractable" for installations with ball valve and "non retractable" for installations without ball valve.
5 For cross-duct versions, enter the "Transducer distance" a determined during nozzle installation,→ p. 38, §4.7.2 .
6 Enter the required dimensions:
  - Circumference U
  - Wall thickness w
  - Gasket thickness S
  - Nozzle length D1 or 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 the measurement of the installation angle: ±0.3°).

  Wetted part length wL and the geometric installation parameters are calculated.

***NOTICE:***
The geometric installation parameters in the area "Result: Parameter for program configuration" and the wall thickness are required for the parameterization of the measuring system during commissioning.

Fig. 28 Installation of F1F-S, F1F-M, F1F-H (cross-duct versions)

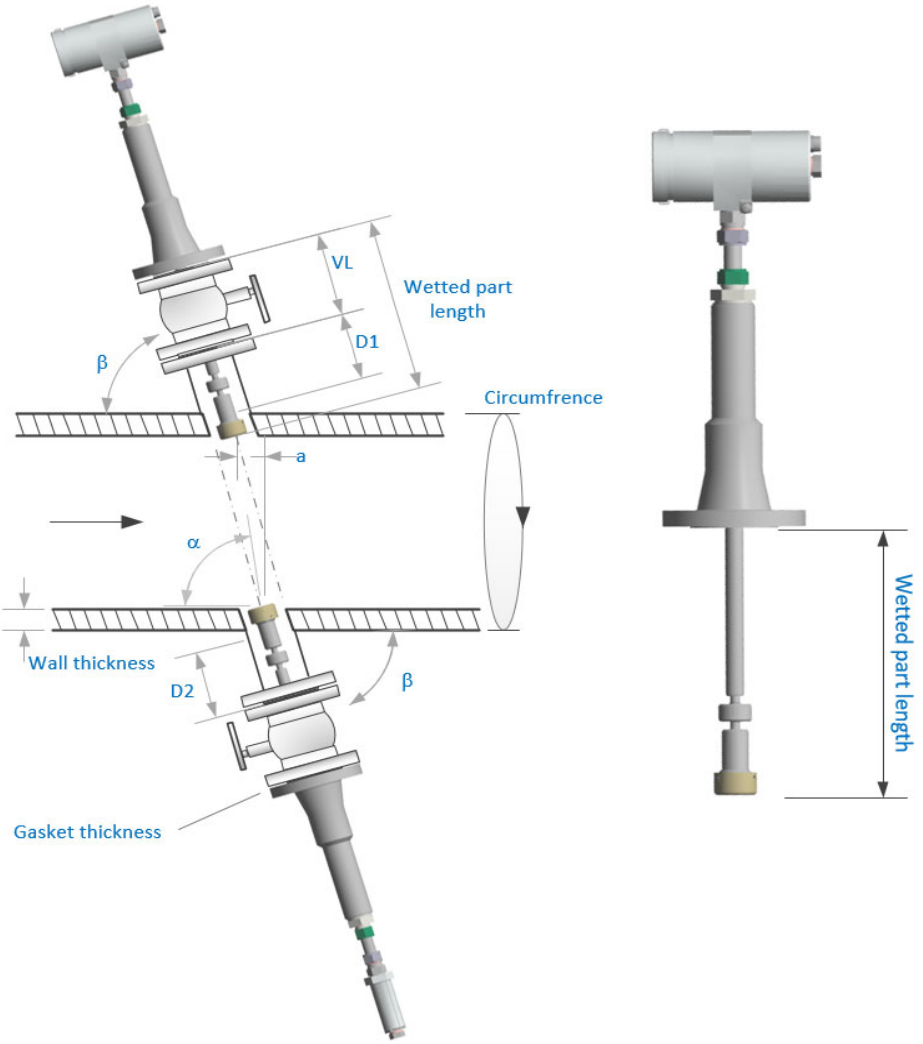
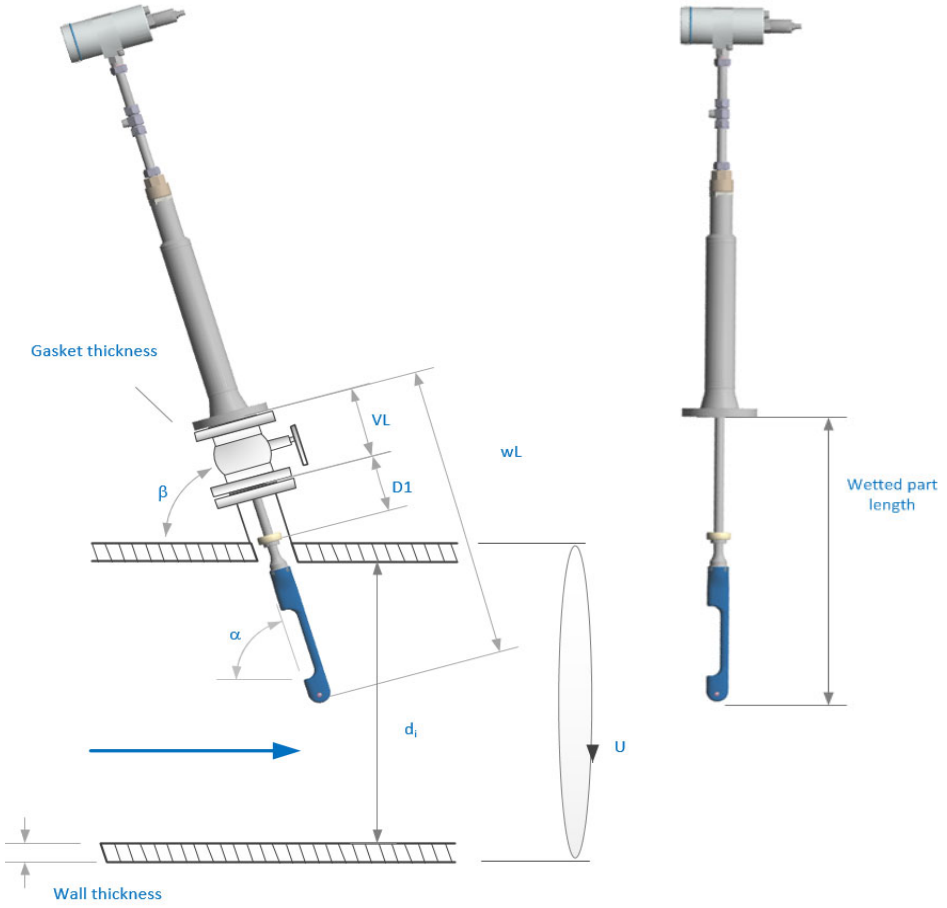


Fig. 29 Installation of F1F-P (probe version)



### 4.8.1.1 Calculating the wetted part length for cross-duct versions

Fig. 30 Formulas for calculation of the wetted part length wL for cross-duct versions

**Installation with ball valve (retractable)**

$$wL_{CrossDuct} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(\beta)} - FittingAdjust$$

Example for 75°

$$wL_{CrossDuct} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(75°)} - FittingAdjust$$

**Installation without ball valve (non-retractable)**

$$wL_{CrossDuct} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(\beta)} - FittingAdjust$$

Example for 75°

$$wL_{CrossDuct} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(75°)} - FittingAdjust$$

β [°] = Nominal nozzle installation angle
NozzleLength [mm] = Nozzle length D1 or D2; dimension on nozzle installation tool
GasketThickness [mm] = Dimension of gasket thickness
LengthBallValve [mm] = Length of ball valve, measure from gasket surface to gasket surface
WallThickness [mm] = Wall thickness of pipe
FittingAdjust [mm] = 1 mm Compensation when tightening the self-cutting ring fitting (self-cutting ring fitting displaces the duct probe by 1 mm when tightened)

#### 4.8.1.2 Calculating the wetted part length for the probe version

**Probe version: 1-path measurement**

Fig. 31 Formulas for calculation of the wetted part length wL for the probe version

**Installation with ball valve (retractable)**

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(\beta)} + \frac{120,79mm}{\sin(\beta)} + 206,4mm - FittingAdjust$$

Example for 75°

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(75°)} + \frac{120,79mm}{\sin(75°)} + 206,4mm - FittingAdjust$$

Simplified:

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{0,966} + 330,45mm$$

**Installation without ball valve (non-retractable)**

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(\beta)} + \frac{120,79mm}{\sin(\beta)} + 206,4mm - FittingAdjust$$

Example for 75°

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(75°)} + \frac{120,79mm}{\sin(75°)} + 206,4mm - FittingAdjust$$

Simplified:

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{0,966} + 330,45mm$$

β [°] = Nominal nozzle installation angle
NozzleLength [mm] = Nozzle length D1 or D2; dimension on nozzle installation tool
GasketThickness [mm] = Dimension of gasket thickness
LengthBallValve [mm] = Length of ball valve, measure from gasket surface to gasket surface
WallThickness [mm] = Wall thickness of pipe

120,79 mm = Probe 1-path distance inner pipe wall to first probe A
82,189 mm = Probe 2-path distance inner pipe wall to first probe A
206,4 mm = Distance probe A to end of probe
330,45 mm = Probe 1-path wetted part length in pipe
290,48 mm = Probe 2-path wetted part length in pipe
0,966 = sin(75°) – Nominal nozzle installation angle
FittingAdjust [mm] = 1 mm Compensation when tightening the self-cutting ring fitting (self-cutting ring fitting displaces the duct probe by 1 mm when tightened)

### Probe version: 2-path measurement

Fig. 32 Formulas for calculation of the wetted part length wL for the probe version

**Installation with ball valve (retractable)**

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(\beta)} + \frac{82,189mm}{\sin(\beta)} + 206,4mm - FittingAdjust$$

Example for 75°

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{\sin(75°)} + \frac{82,189mm}{\sin(75°)} + 206,4mm - FittingAdjust$$

Simplified:

$$wL_{Probe} = NozzleLength + 2 \cdot GasketThickness + LengthBallValve + \frac{WallThickness}{0,966} + 290,48mm$$

**Installation without ball valve (non-retractable)**

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(\beta)} + \frac{82,189mm}{\sin(\beta)} + 206,4mm - FittingAdjust$$

Example for 75°

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{\sin(75°)} + \frac{82,189mm}{\sin(75°)} + 206,4mm - FittingAdjust$$

Simplified:

$$wL_{Probe} = NozzleLength + GasketThickness + \frac{WallThickness}{0,966} + 290,48mm$$

β [°] = Nominal nozzle installation angle
NozzleLength [mm] = Nozzle length D1 or D2; dimension on nozzle installation tool
GasketThickness [mm] = Dimension of gasket thickness
LengthBallValve [mm] = Length of ball valve, measure from gasket surface to gasket surface
WallThickness [mm] = Wall thickness of pipe

120,79 mm = Probe 1-path distance inner pipe wall to first probe A
82,189 mm = Probe 2-path distance inner pipe wall to first probe A
206,4 mm = Distance probe A to end of probe
330,45 mm = Probe 1-path wetted part length in pipe
290,48 mm = Probe 2-path wetted part length in pipe
0,966 = sin(75°) – Nominal nozzle installation angle
FittingAdjust [mm] = 1 mm Compensation when tightening the self-cutting ring screw fitting (self-cutting ring fitting displaces the duct probe by 1 mm when tightened)

### 4.8.2 Tightening the self-cutting ring

SICK recommends carrying out the correct setting of the wetted part length and the tightening of the cutting ring 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: Leakage hazard due to duct probe damage**

Shifting the duct probe after the pipe screw fitting was tightened can damage the duct probe, so that tightness cannot be achieved after tightening the self-cutting ring.

- ► Shift the duct probe only when the pipe screw fitting is loosened.
- ► Retighten the pipe screw fitting with a torque of 150 Nm after positioning the duct probe.

Otherwise there is a risk of leakage.

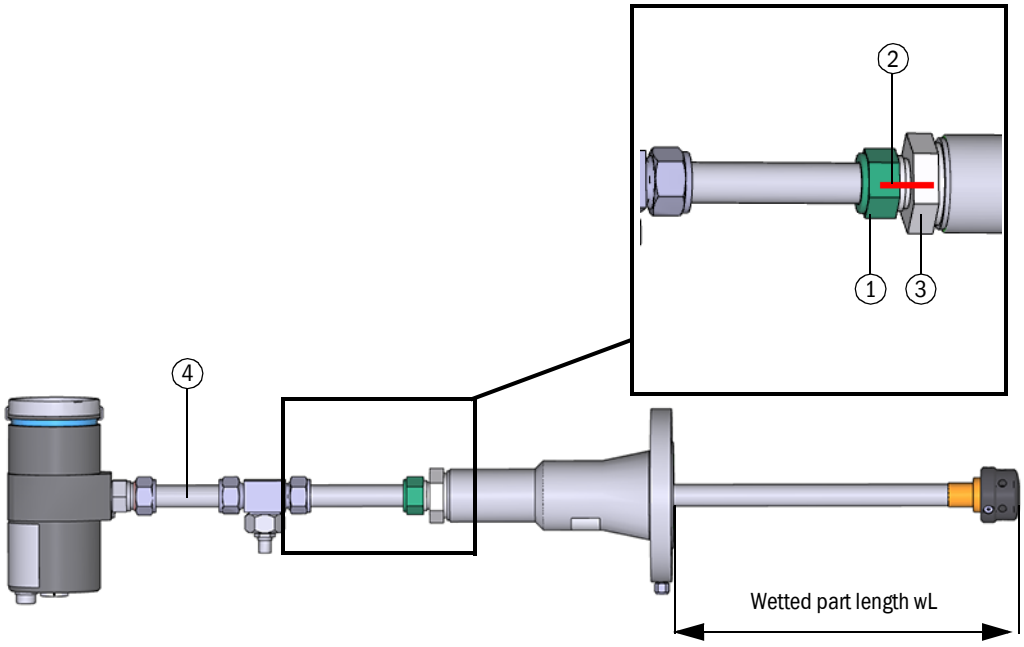
***NOTICE:* Damage due to incorrect position of the self-cutting ring**

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. On cross-duct versions, both sender/receiver units must be replaced.

Make sure the wetted part length has been calculated correctly before tightening the self-cutting ring:

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

Fig. 33 Positioning of self-cutting ring (overview)




1 Cap nut (self-cutting ring fitting)
2 Marking of self-cutting ring fitting
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.

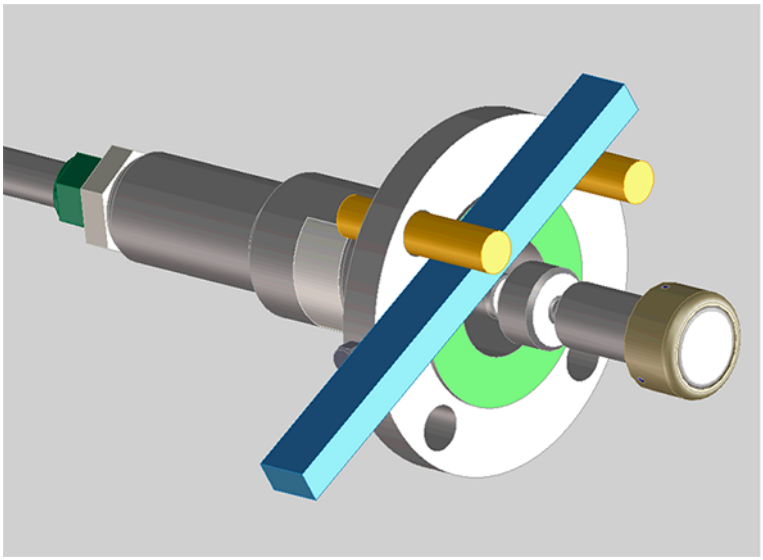
The pipe screw fitting is screwed hand-tight at the factory. Loosen the pipe screw fitting completely to set the wetted part length.

2 Set the calculated wetted part length wL and check with a length measuring device (maximum tolerance ±1 mm), → Fig. 33.

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 where the required space for the duct probe is provided inside (diameter and length of the set wetted part length wL).
- As an alternative, screw the threaded bolts/screws slip-proof in the through-holes of the retraction nozzle. Position a suitable bend-proof rod between the threaded bolts/screws for counterholding. Make sure the duct probe and the flange sealing surface are not damaged.

Fig. 34 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; on cross-duct versions both sender/receiver units must be replaced.
>
> Before tightening the self-cutting ring make sure 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 Tighten the self-cutting ring fitting 1.25 turns.

Counter with a jaw wrench on the pipe screw fitting.

6 Mark the position of the self-cutting ring fitting, → Fig. 33.

7 Completely loosen the pipe screw fitting.

8 Loosen the cap nut again and fully retract the sender/receiver unit for transport to and installation into the pipeline.

9 The self-cutting ring remains in the fixed position on the duct probe.

10 Then tighten the pipe screw fitting hand-tight.

**WARNING: Leakage hazard**

Multiple use can 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.

### 4.8.3 Installing 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 seal does not move during positioning.

   Ensure for cross-duct versions that the Slave sender/receiver unit (→ Fig. 35) is installed on the nozzle on the downstream side so that the sender/receiver unit points against the flow direction:

4 Insert the four bolts with the alignment sleeves (→ Fig. 27) and screw the sender/receiver unit on the ball valve (torque: see Operating Instructions FLOWSIC100 Flare §6.7 "Sealing installation instruction").

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**

Multiple use can 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 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 further to the stop.

11 For probe version F1F-P, align the measuring path correctly before the self-cutting ring fitting is fixed. For cross-duct versions, proceed with the next step.

12 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. 33.

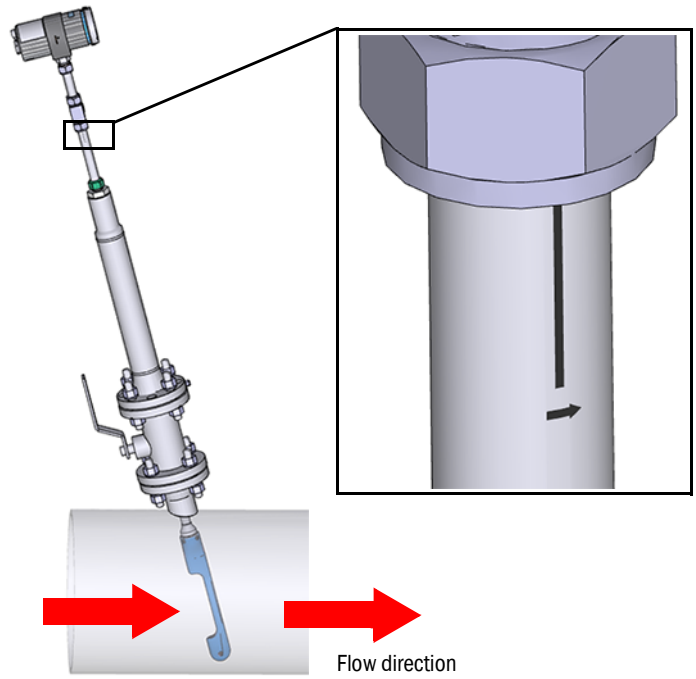
13 For cross-duct versions, install the Master sender/receiver unit on the nozzle on the upstream side so that the sender/receiver unit points in the flow direction.

**Observe when aligning the probe version**

Align probe version F1F-P correctly before securing the self-cutting ring fitting again:

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

Fig. 35 Marking on probe version F1F-P




► Align the measuring path of probe version F1F-P as shown, see → Fig. 35. The maximum deviation of the angle of rotation of the probe to the flow direction may be ±3°.

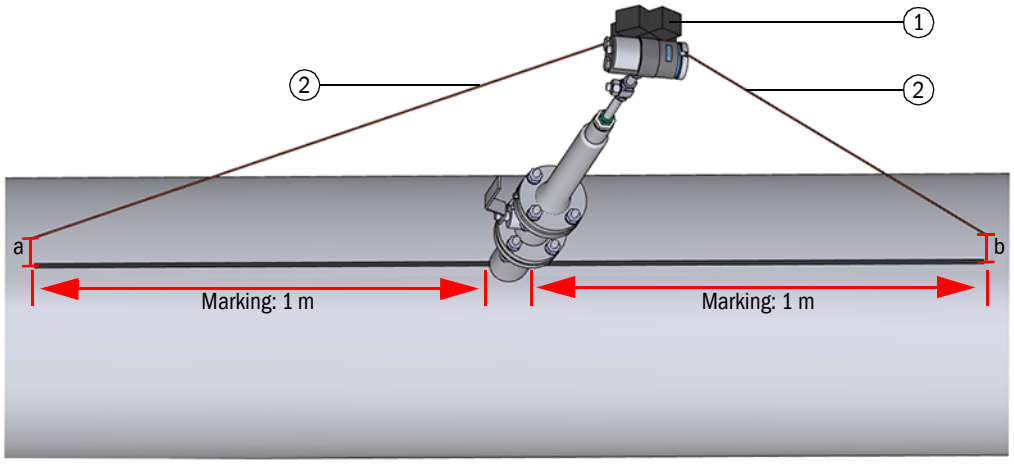
To ensure this, align the probe version F1F-P using a laser:

### Alignment of the device to the flow direction by means of 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 Apply a one metre long mark to the centre of the pipeline before and after the F1F-P probe version, e. g. with chalk or a felt pen, see → Fig. 36.
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 is approximately the same as distance b.
The maximum permissible difference between value a and value b is 10 mm.
6 Tighten the self-cutting ring fitting 1.25 turns after alignment.
Make sure the markings for the self-cutting ring fitting are next to each other again, → Fig. 33.

Fig. 36 Alignment of the probe version F1F-P




1 Laser
2 Laser beam

### 4.8.4 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. 67, §5 .

***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. 60, §4.9.
- ► Contact SICK Service.

## 4.9 Pulling the sender/receiver units back

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

- ► Observe the information on activating the retraction mechanism, → p. 12, §2.4.

1 Completely loosen the cap nut of the self-cutting ring fitting, → Fig. 37.
2 Completely loosen the pipe screw fitting, → Fig. 37.
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:

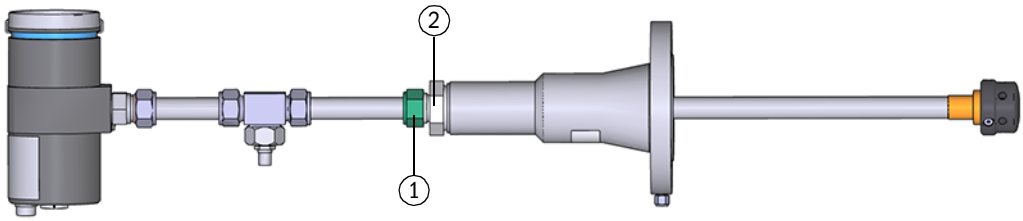
- ► Make sure the sender/receiver unit has been pulled back completely.

***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. 37 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. 12, §2.4.

## 4.10 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. 38.

2 Wrap the sealing tape (PTFE) 2.5 layers around the external thread of the venting valve in thread direction.

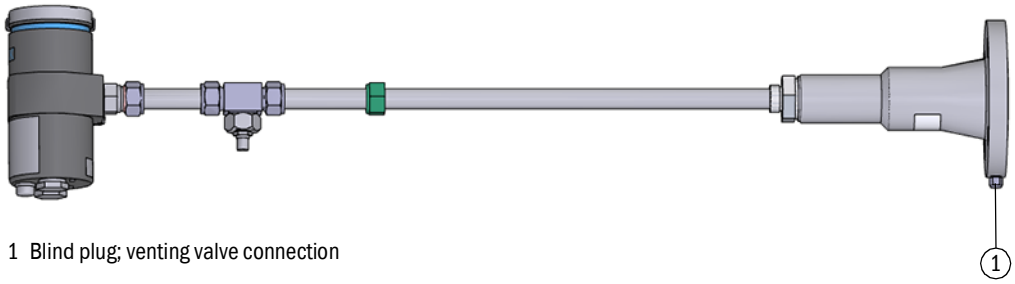
3 Screw the venting valve in.

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. 38 Venting valve connection



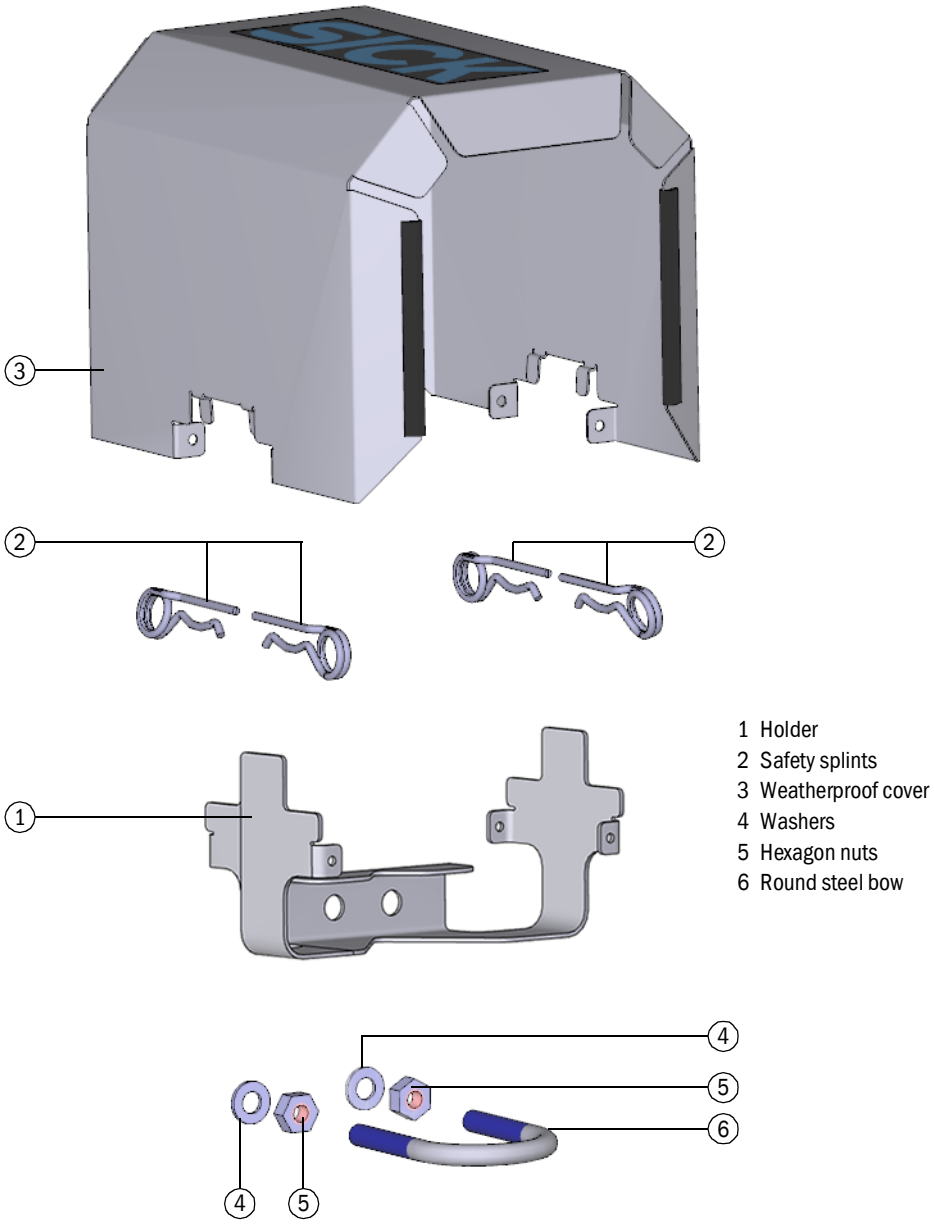

1 Blind plug; venting valve connection

## 4.11 Fitting the weatherproof cover for the sender/receiver units

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

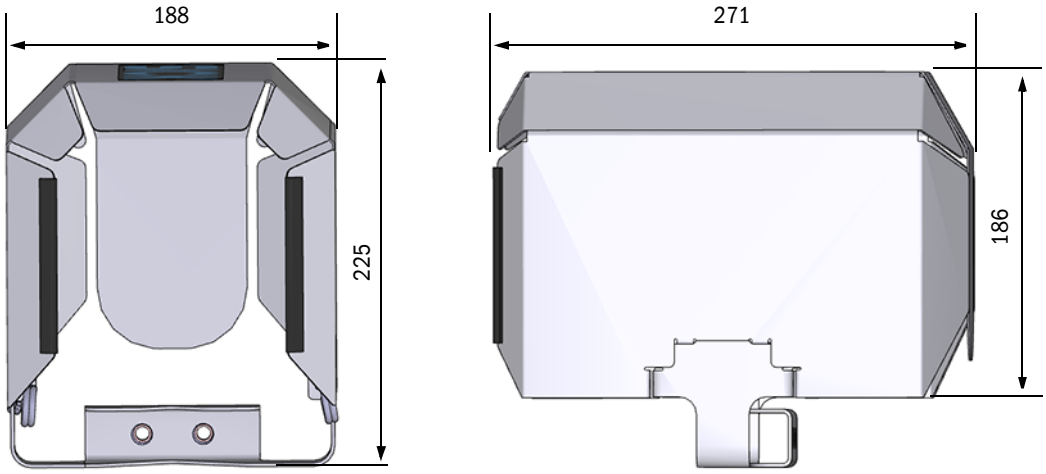
### 4.11.1 Overview

Fig. 39 Weather protection overview




1 Holder
2 Safety splints
3 Weatherproof cover
4 Washers
5 Hexagon nuts
6 Round steel bow

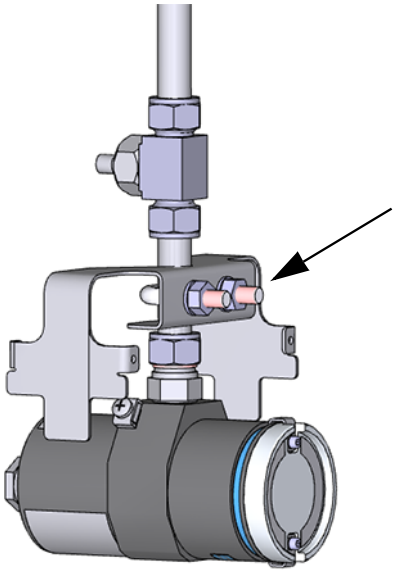
Fig. 40 Dimensions [mm]

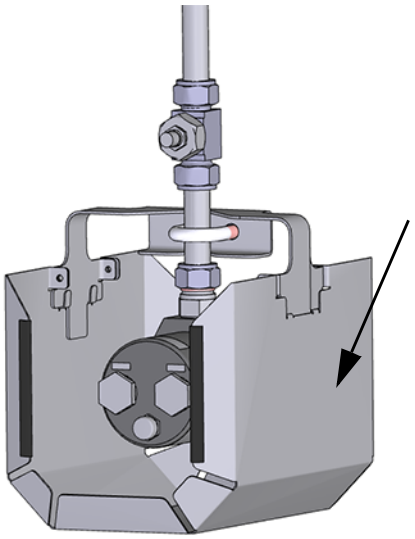
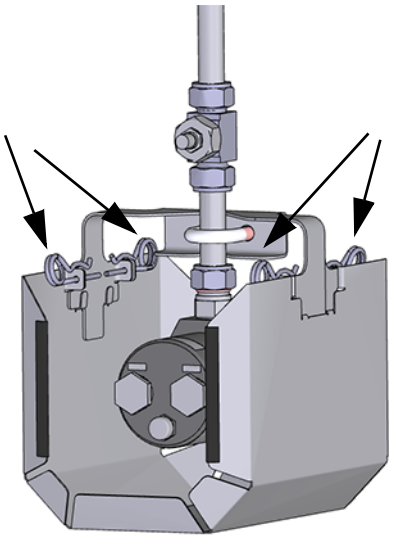



## 4.11.2 Fitting the weatherproof cover

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 that 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. |  |

FLOWSIC100 Flare

# 5 Electrical installation

General instructions, prerequisites
Cable specifications
Cable glands
Requirements for installation in the Ex zone
Connection diagrams

## 5.1 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 this document as well as in the Operating Instructions FLOWSIC100 Flare during all installation work.
- ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.

## 5.2 Cable specifications

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 unit**

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 type: Exi, coaxial, RG62, connection TNC with safeguard against pulling off, length 3 m

- Connection cable between sender/receiver units of device type F1F-H

  Cable type: Armored cable with certified flameproof cable glands including separating seal, 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 $mm^2$, 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 $mm^2$ (AWG20 to AWG16 max.)
- Screen with Cu wire mesh

## 5.3 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.

## 5.4 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.

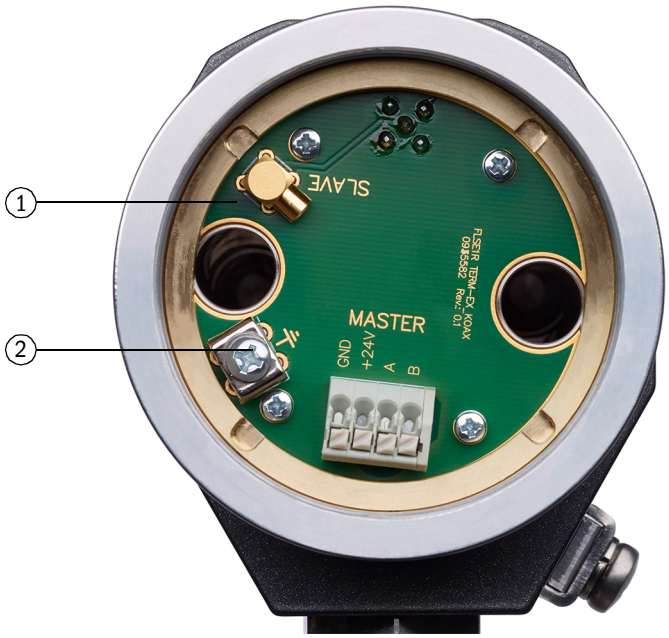
**Specific requirements for installation in the USA and Canada**

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

## 5.5 Connection overview

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

Fig. 41 Terminal compartment FLSE100-XT sender/receiver with electronics (Master)




1 Terminal compartment open
2 Grounding terminals

Table 8 Connection of the sender/receiver units

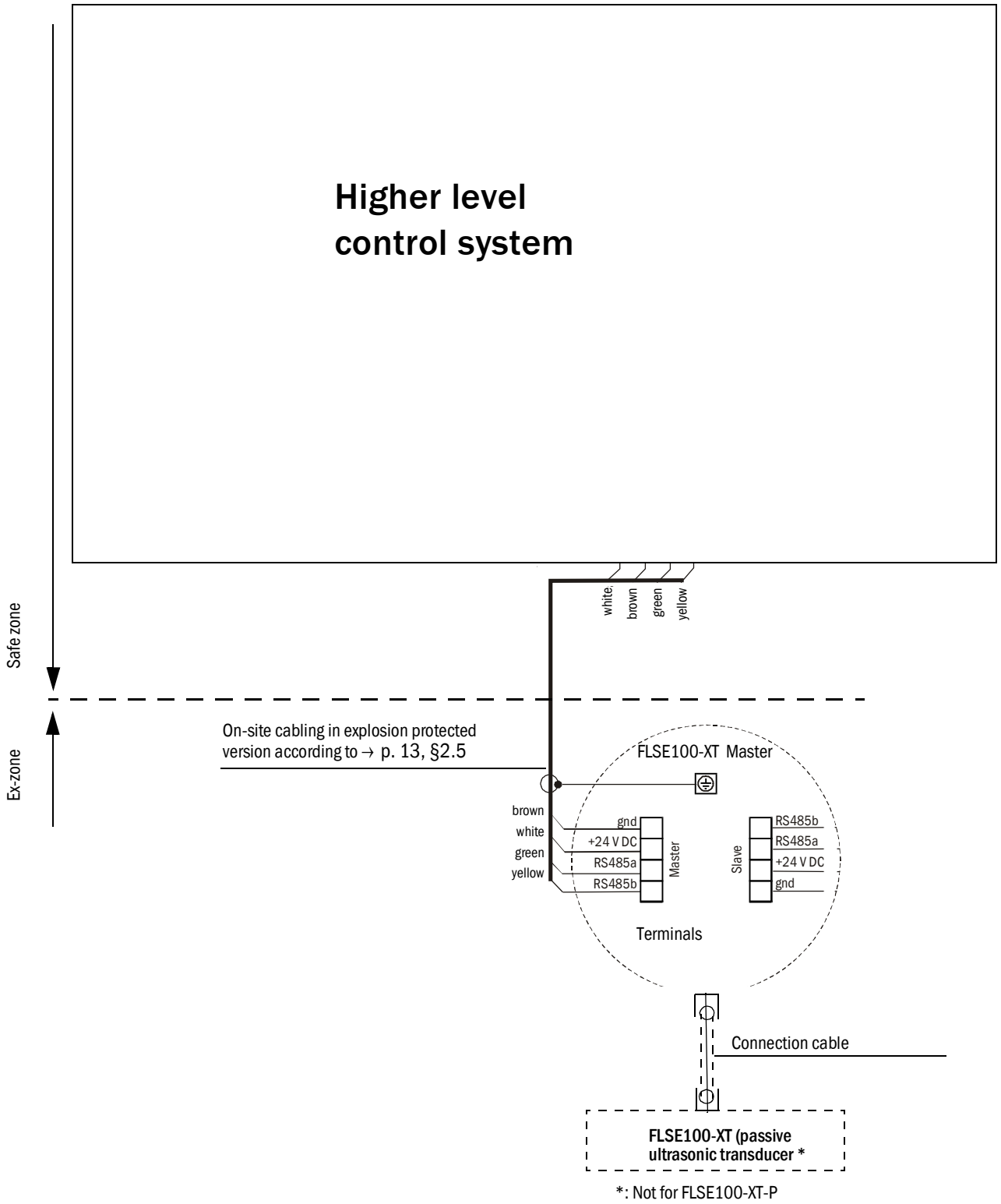
| Terminals | Description | | | | |
|---|---|---|---|---|---|
| Designation in terminal compartment | Master | | | | Slave |
| | B | A | +24 V DC | GND | MCX connector |
| External connection ** | yellow | green | white | brown | |
| Assignment | IF1 | IF1 | +24 V DC | GND | |

**: 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).

## 5.6 Connection diagrams

Fig. 42 Cabling of the sender/receiver units



# FLOWSIC100 Flare

# 6 Commissioning

General information
Commissioning procedure

## 6.1 General information

The parameters determined during installation, → p. 49, §4.8.1, are required for configuration during commissioning of the FLOWSIC100 Flare measuring system.

## 6.2 Commissioning procedure

For commissioning follow the instructions in the Operating Instructions FLOWSIC100 Flare §4 "Start-up and Parameter Settings".

# FLOWSIC100 Flare

# 7 Technical data

FLSE100-XT sender/receiver units
Application limits
Derating of pressure resistance
Dimension drawings

## 7.1 FLSE100-XT sender/receiver units

Table 9 Technical data FLSE100-XT

| | |
|---|---|
| Power supply | |
| Power supply | 12...24 V DC, max. 500 mA |
| Power input | < 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:<br>-40 °C ... +70 °C<br>–50 °C ... +70 °C optional |
| | Ignition group IIC T6:<br>-40 °C ... +55 °C<br>–50 °C ... +55 °C optional |
| Storage temperature | -40 °C ... +70 °C<br>–50 °C ... +70 °C optional |
| Degree of protection | IP 66 / 67 |
| Dimensions | |
| Dimensions (W x H x D) | Details, see dimension drawings |

### 7.1.1 F1F-S

Table 10 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<br>Ex db [Ia Ga] IIB T4 Ga/Gb<br>Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>Ex ia IIC T6/T4 Ga |
| ATEX | II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb<br>II 1/2G Ex db [Ia Ga] IIB T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>II 1G Ex ia IIC T6/T4 Ga |
| NEC/CEC (US/CA) | Class I, Division 1, Group D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIA, T4;<br>Class I, Division 2, Group D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIA, T4<br><br>Class I, Division 1, Groups C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB, T4;<br>Class I, Division 2, Groups C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIB, T4<br><br>Class I, Division 1, Groups B, C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIC, T4 |
| Installation | |
| Weight | ≤ 12 kg (sensor pair) |

[1)] Temperature dependent, details see → p. 82, §7.3 → »Derating of pressure resistance«

### 7.1.2 F1F-M

Table 11 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<br>Ex db [Ia Ga] IIB T4 Ga/Gb<br>Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>Ex ia IIC T6/T4 Ga |
| ATEX | II 1/2G Ex db [ia Ga] IIA T4 Ga/Gb<br>II 1/2G Ex db [Ia Ga] IIB T4 Ga/Gb<br>II 1/2G Ex db [ia Ga] IIC T6/T4 Ga/Gb<br>II 1G Ex ia IIC T6/T4 Ga |
| NEC/CEC (US/CA) | Class I, Division 1, Group D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIA, T4;<br>Class I, Division 2, Group D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIA, T4<br><br>Class I, Division 1, Groups C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB, T4;<br>Class I, Division 2, Groups C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIB, T4<br><br>Class I, Division 1, Groups B, C and D, T4;<br>Class I, Zone 1, Ex/AEx d[ia] IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA[ia] IIC, T4 |
| **Installation** | |
| Weight | ≤ 12 kg (sensor pair) |

[1)] Temperature dependent, details see → p. 82, §7.3 → »Derating of pressure resistance«

### 7.1.3 F1F-H

Table 12 Technical data F1F-H

| | |
|---|---|
| **Measuring conditions** | |
| Operating pressure:[1)] | CL150 device flange:<br>ATEX/IECEx: 20 bar(g)<br>CSA: 16 bar(g) |
| | PN25 device flange (optional):<br>ATEX/IECEx: 20 bar(g)<br>CSA: 16 bar(g) |
| | CL300 device flange (optional):<br>ATEX/IECEx: 20 bar(g)<br>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;<br>Class I, Zone 1, Ex/AEx d IIB + H2, T4;<br>Class I, Division 2, Groups A, B, C and D, T4;<br>Class I, Zone 2, Ex/AEx nA IIC, T4 |
| **Installation** | |
| Weight | ≤ 14 kg (sensor pair) |

[1)] Temperature dependent, details see → p. 82, §7.3 → »Derating of pressure resistance«

### 7.1.4 F1F-P

Table 13 Technical data F1F-P

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

[1)] Temperature dependent, details see → p. 82, §7.3 → »Derating of pressure resistance«

## 7.2 Application limits

Fig. 43 $V_{max}$ of 1-path and 2-path solutions dependent on speed of sound (SOS)

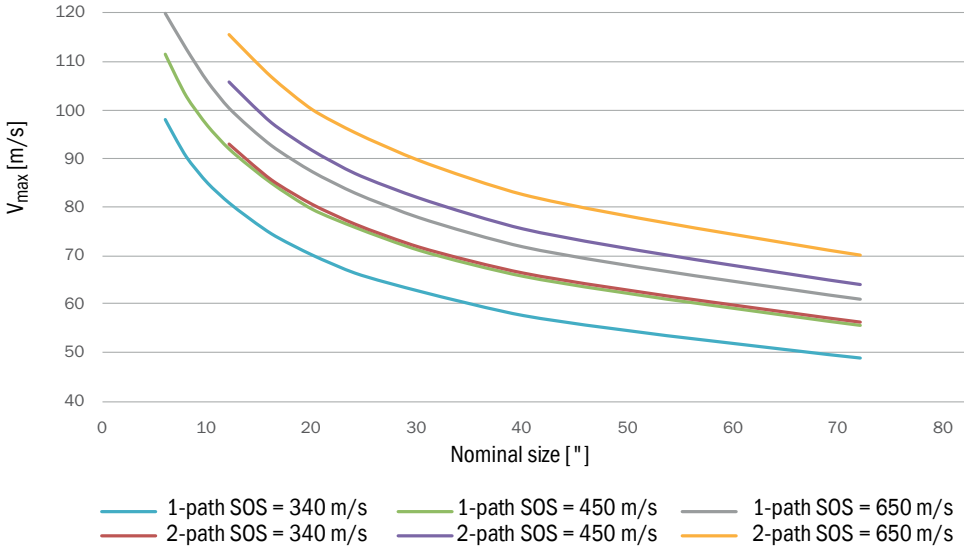



Fig. 44 $V_{min}$ at 20% uncertainty of 1-path and 2-path solutions dependent on speed of sound (SOS)

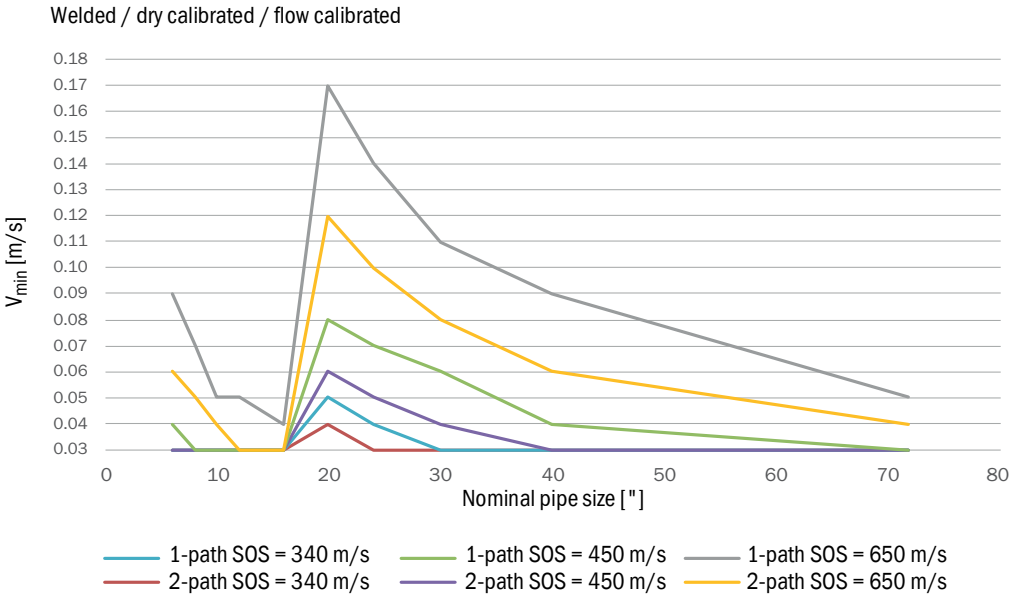
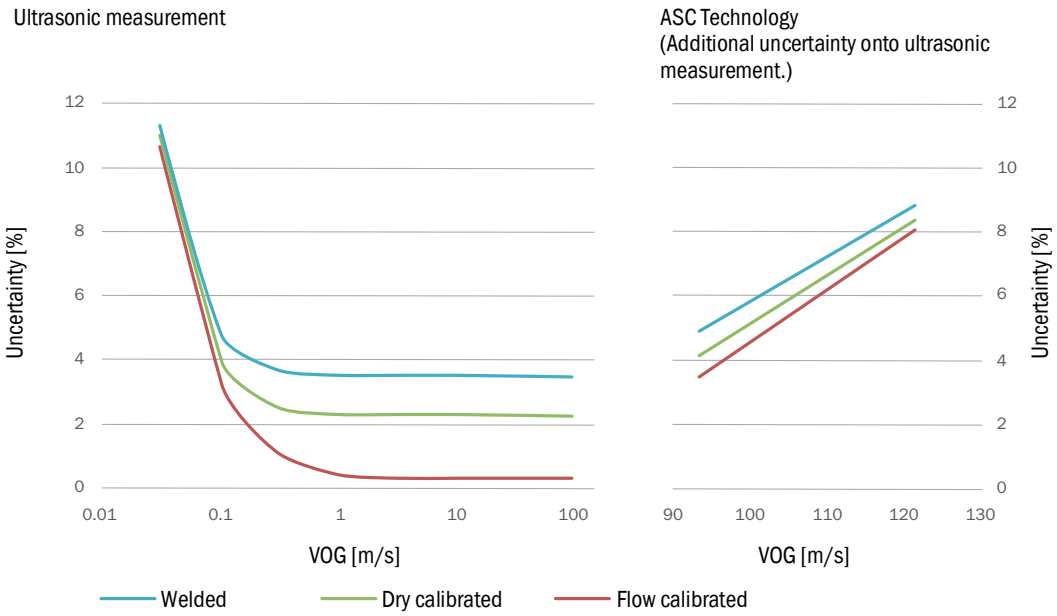


Fig. 45 Uncertainty of flow rate as function of the velocity of gas (VOG)




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

## 7.3 Derating of pressure resistance

Fig. 46 F1F-H ATEX/CSA

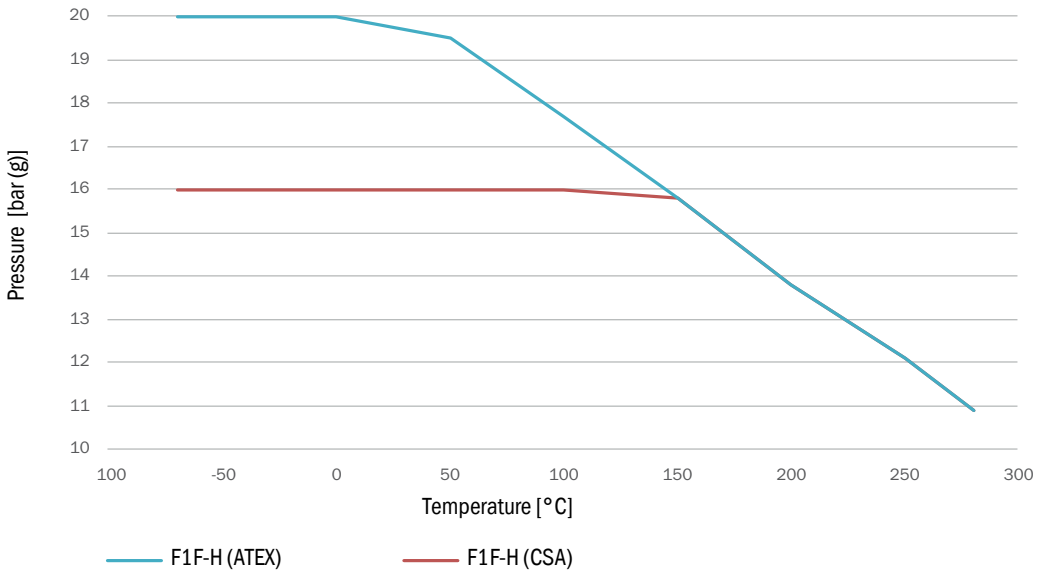
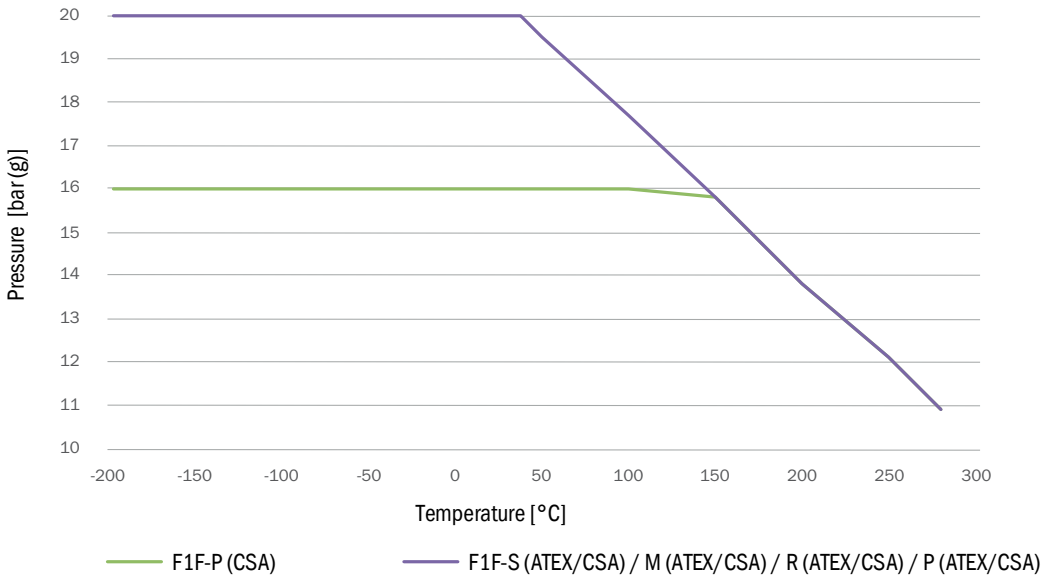



Fig. 47 F1F-S (ATEX/CSA) / M (ATEX/CSA) / R (ATEX/CSA) / P (ATEX/CSA)



## 7.4 Dimension drawings

### Dimensions for F1F-S/-M/-H

Fig. 48 F1F-S/-M/-H

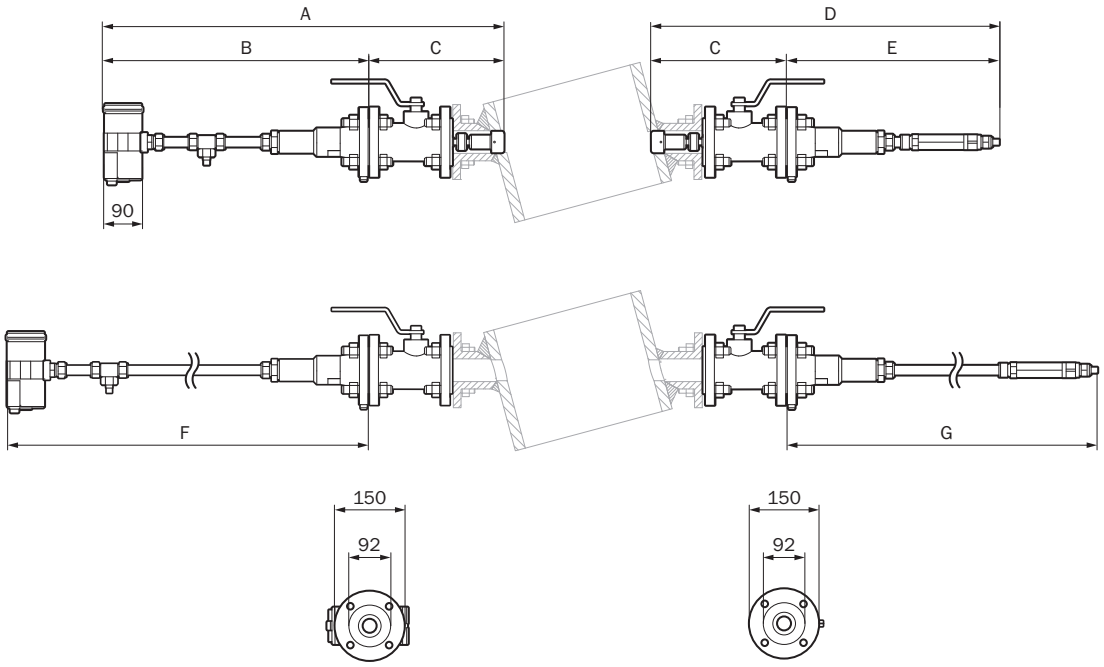



Table 14 Extended version

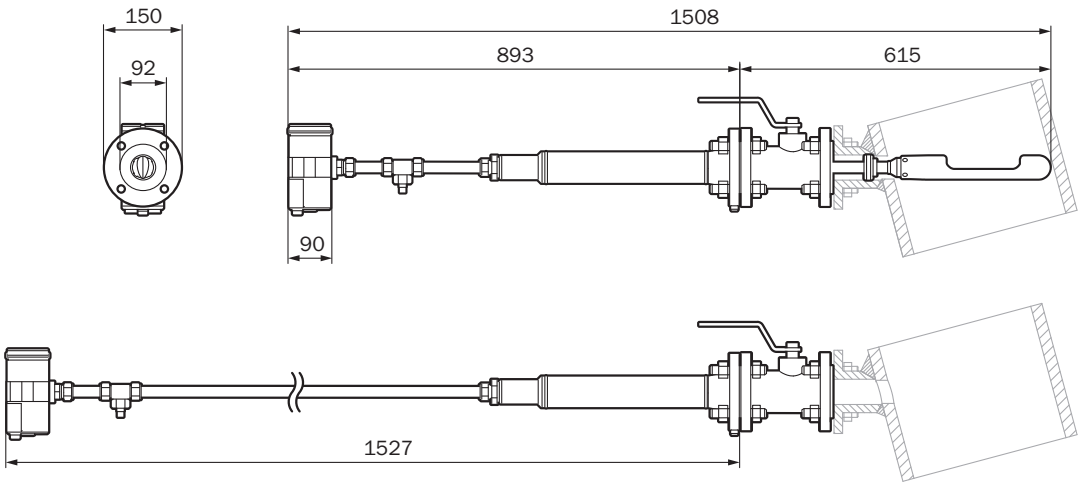
| FLSE100-XT | Dimensions extended version | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| F1F-S | 983 | 583 | 400 | 871 | 471 | 1055.5 | 944 |
| F1F-M | 980 | 582 | 398 | 869 | 471 | 984 | 873 |
| F1F-H | 846 | 448 | 398 | 919 | 518 | 851 | 917 |

Table 15 Compact version

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

### Dimensions for F1F-P

Fig. 49 F1F-P



# FLOWSIC100 Flare

# 8 Spare parts

Recommended spare parts for FLSE100-XT sender/receiver units
Accessories (optional)

## 8.1 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 aluminium EXD M20 housing<br>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<br>Contents: Cover, cover lock, cover insulation, O-ring, spring washer, screws, assembly paste, sealing plugs | | X |
| 2110151 | Replacement cover for aluminium EXD NPT housing<br>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<br>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

FLOWSIC100 Flare

# 9 Accessories (optional)

Accessories for FLSE100-XT sender/receiver units

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

## 9.1 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 |

# FLOWSIC100 Flare

# 10 Annex

Compliances of FLSE100-XT sender/receiver units

## 10.1 Compliances of FLSE100-XT sender/receiver units

> ***NOTICE:***
> Applied European standards and harmonized standards are listed in the valid version of the manufacturer‘s CE conformity declaration.

### 10.1.1 Compliances

### 10.1.2 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.

### 10.1.3 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 60079-26: 2014,
- 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 60079-26:2015, EN 60079-28:2015, EN 61326-1:2013
- EN 61010-1 (Safety requirements for electrical equipment)
- EN 60529: 1991/A1:2000/A2:2013 (IP)

8025365/183X/V1-1/2020-07

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