

## Volume flow measuring system

Measuring system to measure flow rate in dry emissions with a probe using the differential pressure principle

### Features

- Reliable measurement of the gas velocity even at high temperatures
- Calculation of volume flow at standard conditions
- Automatic zero check option
- Certified, cost effective measuring system
- Versions with or without counter-support and for point measurement
- Extremely low maintenance, maintenance interval 6 months
- Convenient operation via remote access with web interface

### Applications

- Volume flow measurement at high temperatures
- Plants with large or small flue cross-sections
- Volume flow measurement at high pressure

### Approvals

- Suitability-tested by the TÜV Cologne, test report 936/21218492/A
- Approved and certified acc. to EN 15267-3
- MCERTS

### Measuring principle

The D-FL 100 measuring system operates according to the differential pressure principle. The probe has two separate chambers between which the flow builds up a differential pressure. The evaluation unit determines the gas velocity and the volume flow (norm conditions or standard conditions) from the differential pressure, taking into account gas temperature and gas pressure.

### Models

- **D-FL 100 probe assembly**  
with assembly of measuring transducer on the probe
- **D-FL 100 hose assembly**  
with the measuring transducer connection via hose line

### Probes

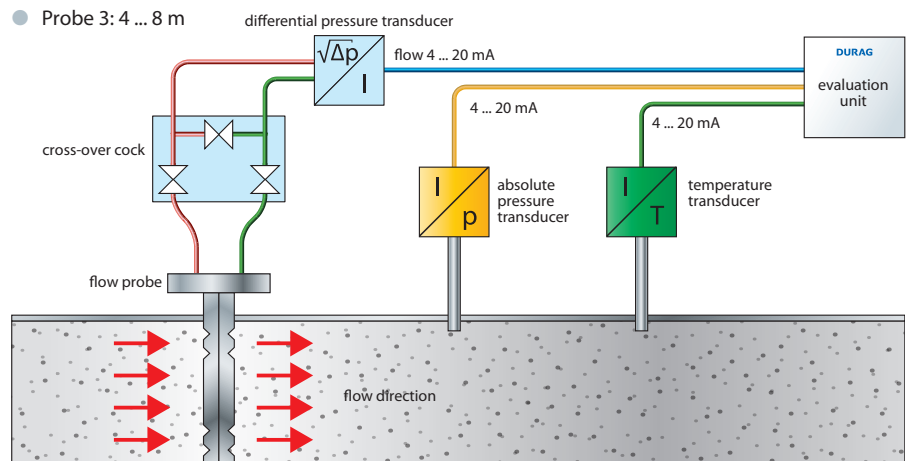
- Probe 1: 0.4 ... 2 m
- Probe 2: 2 ... 4 m
- Probe 3: 4 ... 8 m

### System components

- Flow probe
- Mounting flange
- Differential pressure transducer
- Cross-over cock
- Probe adapter
- Evaluation unit D-FL100-20
- Absolute pressure transducer
- Temperature transducer
- Counter-support (option)

### Options

- Universal operating unit D-ISC 100
- Service software D-ESI 100
- Weather protection covers
- Automatic back purging device
- Special designs in other materials for applications with particularly aggressive exhaust gases or high gas temperatures
- Differential pressure transducer in Ex-version



measurements	flue gas velocity, volume flow	digital outputs	2 relay outputs, permissible load 48 V / 0.5 A
measuring ranges	0 ... 3000000 m³/h / 2 ... 50 m/s	measuring outputs	0/4 ... 20 mA / 500 Ohm, Modbus RTU, RS485
measuring principle	differential pressure	zero point drift	<0.5% of measuring range
flue gas temperature	above dew point, -20 ... 450 °C	power supply	Sensor power supply 24 VDC ±10%, 0.5 A, 90 ... 264 VAC, 48 ... 62 Hz (option)
flue gas pressure	±200 hPa	dimensions (h x w x d)	probe: 380 x 160 x (300 + probe length) mm
duct diameter	0.4...8 m	weight	32 kg + 6,8 kg/m probe length
ambient temperature	-20 ... +50 °C		
protection	IP65, Ex optional		



## Volume flow measuring system

Measuring system for ultra-sonic measuring of flow and volume flow, especially for wet and aggressive smoke emissions

### Features

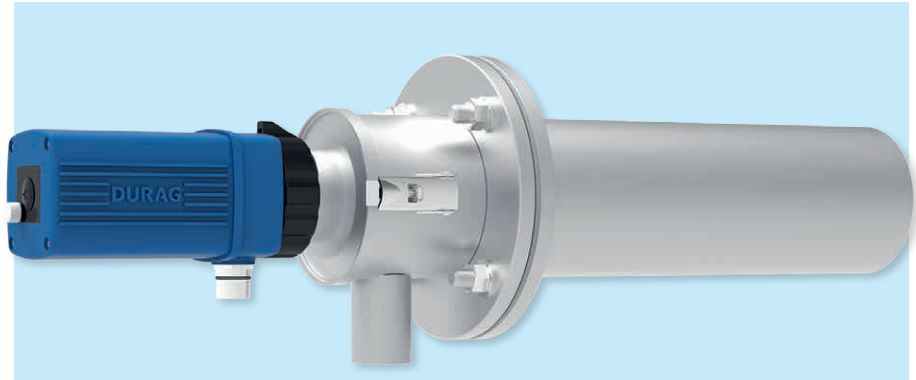
- Non-contact measuring method
- Measurement possible below dew point and for high dust concentrations
- Continuous measurement of normal volume flow and gas velocity
- Automatic zero point and reference point control
- Convenient operation via remote access with web interface
- Operation with or without control unit
- Very low maintenance

### Applications

- Volume flow measuring at low speeds
- Plants with damp and/or aggressive exhaust gas, e.g. in waste incineration plants
- Volume flow measurement at high dust content

### Approvals

- Suitability-tested by the TÜV Cologne, test report 936/21218490/A
- Approved and certified acc. to EN 15267-3
- MCERTS



### Measuring principle

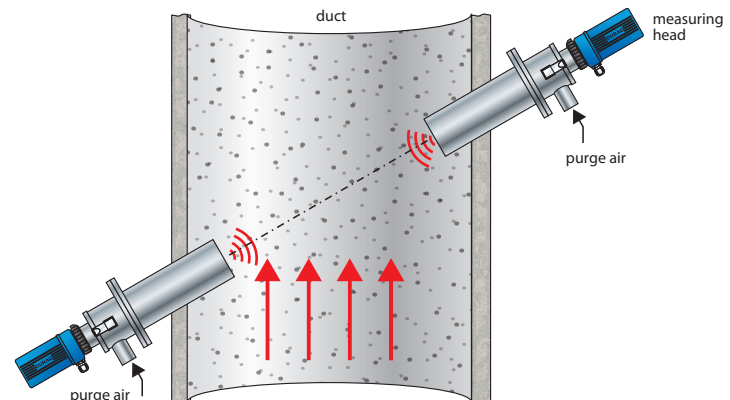
The D-FL 220 measuring system works according to the acoustic transit time differential method. Two identical transducers mutually send and receive short ultrasonic pulses. The system calculates the precise gas velocity from the direction-dependent transit time difference. The flow velocity respective volume flow of the waste gas is precisely calculated from the transit time difference dependent on the direction.

### Options

- Temperature transducer
- Absolute pressure transducer
- Universal operating unit D-ISC 100
- D-ESI 100 Service- and Parameterisation Software

### System components

- 2 Measuring heads
- 2 Purge air flanges
- 2 Mounting flanges
- Purge air unit
- Terminal Box for power supply



measurements	gas velocity and direction, volume flow in norm conditions or operational conditions	detection limit	<0.3% of measuring range
measuring ranges	0 ... 3000000 m³/h / 0 ... 40 m/s	power supply	24 VDC, 0.5 A
measuring principle	acoustic propagation delay	dimensions (h x w x d)	measuring head housing: 113 x 84 x 188 mm
flue gas temperature	0 ... 300 °C	weight	17 kg
flue gas pressure	-50 ... +20 hPa	purge air supply	
duct diameter	0.5 ... 13 m, temperature dependent	purge air quantity	40 m³/h (50 hPa) / 60 m³/h (25 hPa)
ambient temperature	-20 ... +50 °C measuring head -40 ... +70 °C	power supply	115/ 230 V, 50/ 60 Hz, 0.37/ 0.43 kW
protection	IP65	dimensions (h x w x d)	350 x 550 x 500 mm
measuring outputs	0/ 4 ... 20 mA/ 400 Ohm, Modbus RTU bi-directional	weight	12 kg
digital outputs	2 relay outputs, permissible load 48 V/ 0.5 A	protection	IP55





## FLOWSIC100

### Volume Flow Measuring Device

Gas Flow Measurement for  
Continuous Emission Monitoring

# FLWSIC100 –

## The reliable and precise flow measurement with the highest durability

### FIELDS OF APPLICATION

- Power generation (e. g. power plants)
- Processing industries (cement manufacturing, steel and iron production)
- Waste disposal industry (e. g. waste incineration plants)
- Chemical industry
- Petrochemical plants and refineries
- Pulp, paper and textile industry
- Ventilation and heating plants

#### FLWSIC100 H

- High power version for large stacks up to 13 m diameters
- Certified according to 2001/80/EC, 2000/76/EC, 27<sup>th</sup> BImSchV<sup>1)</sup>, TA air, MCERTS and GOST
- Suitable for high dust application

#### FLWSIC100 M

- Medium power version – best suitable for stack diameters up to 3.4 m
- Certified according to 2001/80/EC, 2000/76/EC, 27<sup>th</sup> BImSchV<sup>1)</sup>, TA air, MCERTS and GOST

#### FLWSIC100 PR

- For stack diameters greater than 0.4 m
- Certified according to 2001/80/EC, 2000/76/EC, 27<sup>th</sup> BImSchV<sup>1)</sup>, TA air, MCERTS and GOST
- Probe type with two transducers for the installation from one side only

<sup>1)</sup> Federal Immission Control Ordinance

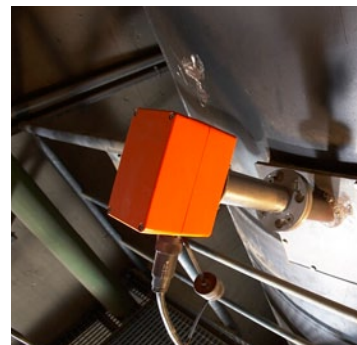
### AT A GLANCE

- Rugged titanium transducers (standard) for higher durability, also in wet gas conditions
- Corrosion resistant probe materials for use with aggressive gases
- No purge air required
- Standard system can be used for gas temperatures up to 260 °C; with the innovative internal cooling up to 450 °C max.<sup>2)</sup>
- Various probe lengths to meet a wide range of application conditions
- Integral measurement over the entire stack diameter<sup>3)</sup> for representative measuring results
- No moving parts means low maintenance
- Fully automatic zero and span check

<sup>2)</sup> Temperature specifications for the specific types see tech. data, page 4

<sup>3)</sup> Except for the probe type





## PRODUCT DESCRIPTION

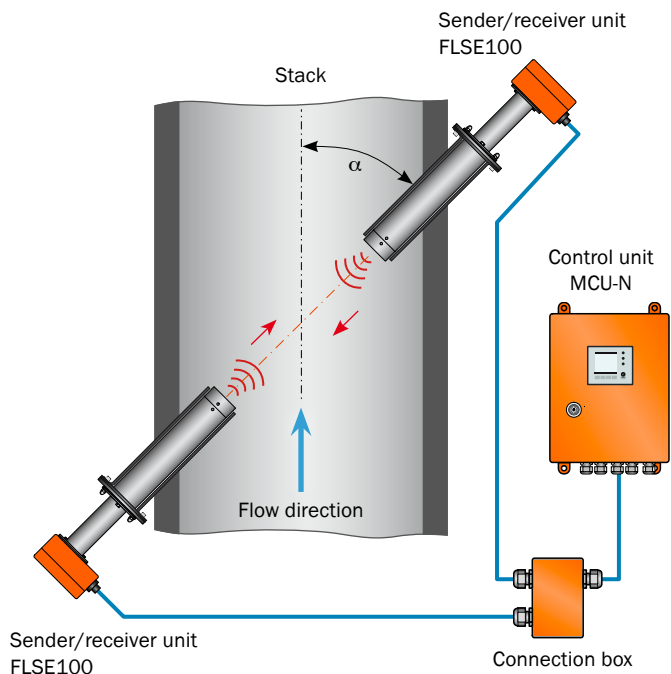
The FLOWSIC100 standard version contains two FLSE100 sender/receiver units, a MCU control unit and a connection box. The MCU is used for input and output of signals, for calculation of volume flow to reference conditions (standardization) as well as for user friendly LCD interface.

### Installation of the sender/receiver units

- Cross-stack installation:  
2 sender/receiver units are mounted on both sides of a stack at a specific angle  $\alpha$  to the gas flow direction.
- One-side installation:  
Only a single sender/receiver unit (probe type) is mounted at a specific angle  $\alpha$  to the gas flow. Both ultrasonic transducers are installed on the probe with a fixed measuring path.

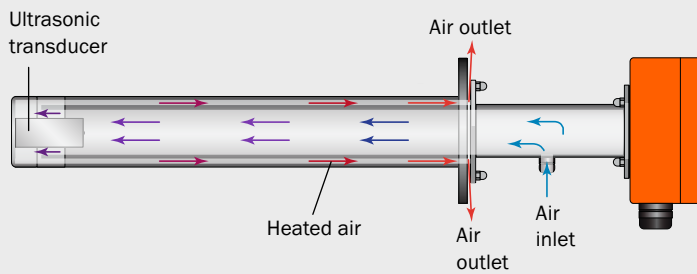
### Optional components

- MCU control unit with integrated blower unit (for internal cooled types only)
- Interconnection of an additional measuring path (2 path measurement) or dust measurements in one control unit possible



## INNOVATIVE INTERNAL COOLING (AC-TYPES)

The internal cooled types FLOWSIC100 M-AC and H-AC operate at gas temperatures up to 450 °C. The necessary cooling of the transducers is realized by using an integrated air cooling supply. The cooling is made internally in the ultrasonic transducer. Cooling air does not contact the measured medium.



Technical data	FLWSIC100 for continuous emission monitoring				
Device model	H	M	PR	H-AC	M-AC
Measuring parameters					
Measuring principle	Ultrasonic transit time measurement				
Measuring values	Gas velocity, volume flow (actual condition), volume flow (standard condition), gas temperature, speed of sound				
Measuring range	0 ... ± 40 m/s				
Accuracy	± 0.1 m/s				
Inner stack diameter	1.4 ... 13 m	0.15 ... 3.4 m	>0.4 m	1.4 ... 10 m	0.15 ... 3.4 m
Measurement conditions					
Meas. gas temperature	−40 ... +260 °C			−40 ... +450 °C	
Max. inner duct pressure	± 100 hPa				
Ambient conditions					
Ambient temperature	−40 ... +60 °C −40 ... +45 °C for MCU-P control unit (with running blower)				
Approval					
Conformities	2001/80/EC, 2000/76/EC, 27 <sup>th</sup> BImSchV, TA air, MCERTS, GOST				
Protection class	<ul style="list-style-type: none"><li>• IP65</li><li>• IP54 for MCU-P (controll unit with integrated blower unit)</li></ul>				
Electrical safety	CE				
Inputs, outputs, controls via MCU control unit					
Analog outputs	1 output: 0/2/4 ... 22 mA, max. load 750 Ω Optional: additional analog outputs when using I/O modules				
Analog inputs	2 inputs: 0 ... 5/10 V or 0 ... 20 mA, Optional: additional analog inputs when using I/O modules				
Digital outputs	5 outputs: 30 V DC/2 A, 48 V AC/1 A; floating Status signals: operation/malfunction, maintenance, check cycle, limit value, maintenance request Optional: additional digital outputs when using I/O modules				
Digital inputs	4 inputs for connection of floating contacts Optional: additional digital inputs when using I/O modules				
Interfaces	<ul style="list-style-type: none"><li>• USB</li><li>• RS232 (service)</li></ul>				
Bus protocol	<ul style="list-style-type: none"><li>• TCP/IP via ethernet (optional interface module)</li><li>• PROFIBUS DP via RS485 (optional interface module)</li><li>• MODBUS via RS485 (optional interface module)</li></ul>				
General					
System components	<ul style="list-style-type: none"><li>• Sender/receiver unit(s) FLSE100</li><li>• MCU control unit</li><li>• Connection box</li></ul>			<ul style="list-style-type: none"><li>• Connection cables</li><li>• Flanges with tube</li></ul>	
Operation	Via display on the MCU control unit or SOPAS ET software				
Check function	Internal check cycle for zero-point and span check				
Mounting (typ. angle)	45° ... 60°		45° (PR type)	45° ... 60°	



## FLOWSIC100 Process Gas Flow Measuring Device

Volume Flow Measurement  
for Process Applications

# FLWSIC100 PROCESS

Easy installation, wide measuring range,  
reliable and precise measurement

## AREAS OF APPLICATION

- Natural gas industry
- Chemical and plastics manufacturing industries
- Petrochemical industry and refineries
- Processing industries (cement manufacturing, steel and iron production)
- Pharmaceutical industry
- Glass industry
- Food industry

### FLWSIC100 CL150/PN16

- Process pressure up to 16 barg
- Material: hermetically sealed stainless steel or titanium

### FLWSIC100 EX-Z2/EX-Z2-RE

- Process pressure up to 16 barg
- Ex-protected version for use in hazardous area zone 2 according to ATEX guidel. 94/9/EC<sup>1)</sup>
- Material: hermetically sealed stainless steel or titanium
- Optional: flange with retraction mechanism for sender/receiver units

<sup>1)</sup> Version for zone 1 on request

### FLWSIC100 PR-EX-Z2

- Process pressure up to 0.1 barg
- Ex-protected probe version for use in hazardous area zone 2 according to ATEX guidel. 94/9/EC
- Material: hermetically sealed stainless steel or titanium
- Installation from one side only

## KEY FEATURES

- Rugged transducers in stainless steel or titanium for higher durability
- Corrosion resistant probe materials available for use with aggressive gases
- Integral measurement over the entire duct diameter<sup>2)</sup> for representative measuring results also at difficult flow conditions
- Contact-free measurement
- No moving parts results in low maintenance
- Independent of pressure, temperature and gas composition
- High measuring accuracy even at gas velocity near zero
- Fully automatic zero and span check

<sup>2)</sup> Except for probe version





## SYSTEM COMPONENTS

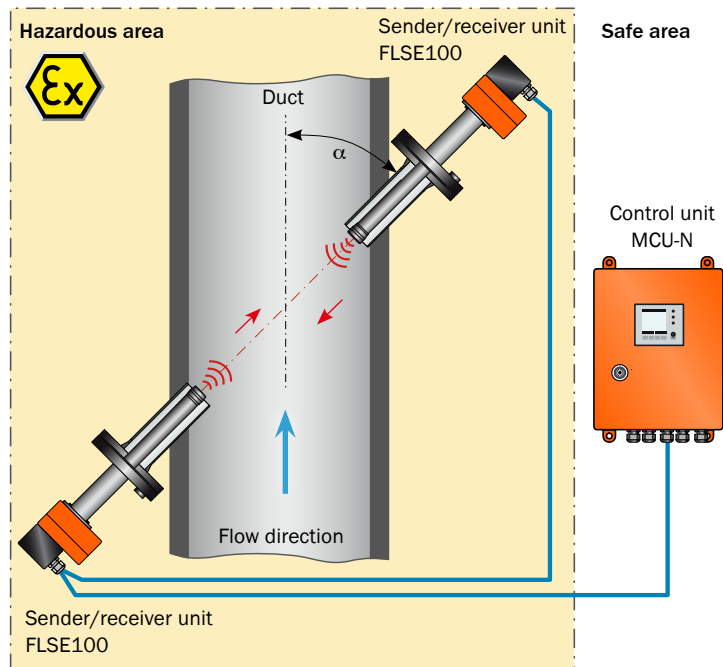
The FLOWSIC100 standard version contains two FLSE100 sender/receiver units, an MCU control unit. The MCU is used for input and output of signals, for calculation of volume flow to reference conditions (standardization) as well as user friendly LCD interface.

Installation of the sender/receiver units

- Cross-duct installation:  
2 sender/receiver units are mounted on both sides of a duct at a specific angle  $\alpha$  to the gas flow direction.
- One-side installation:  
Only a single sender/receiver unit (probe version) is mounted at a specific angle  $\alpha$  to the gas flow. Both ultrasonic transducers are installed on the probe with a fixed measuring path.

Optional components

- MCU control unit for use in Ex-zone 2, ex-certification according to ATEX guideline 94/9/EC
- Spool-piece version



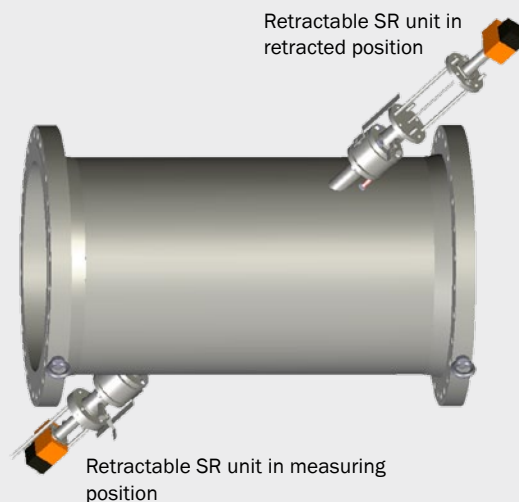
Example: Installation of FLOWSIC100 EX-Z2

## COMPREHENSIVE SOLUTION WITH SPOOL-PIECE

The FLOWSIC100 can be mounted on a measuring tube and delivered as a system solution. Optimized factory setting of the sender/receiver unit reduces geometrical tolerances to a minimum, thereby achieving maximum measuring accuracy.

Retraction mechanism

With the EX-Z2-RE device it is possible to remove the probe for maintenance purposes during plant operation and pressure of up to 16 barg.



Technical Data		FLWSIC100 PROCESS	
Version	CL150/PN16	EX-Z2/EX-Z2-RE	PR-EX-Z2
Measuring parameter			
Measuring principle	Ultrasonic transit time measurement method		
Measuring values	Gas velocity, volume flow (actual condition), volume flow (standard condition), gas temperature, speed of sound, mass flow (on request)		
Measuring range	0 ... ±40 m/s, higher velocity on request		
Reproducibility <sup>1)</sup>	± 1 % for v >2 m/s ± 0.02 m/s for v <2 m/s		
Inner duct diameter	0.15 ... 1.7 m	≥ 0.35 m	
Measurement conditions			
Gas temperature	-40 ... +260 °C	-40 ... +260 °C	-40 ... +260 °C
Pressure range	-0.5 ... 16 barg	±0.1 barg	
Ambient conditions			
Temperature range	-40 ... +60 °C		
Approval			
Ex-certification	-	ATEX II 3G Ex nA II T4 (ATEX zone 1 on request)	ATEX II 3G Ex nA II T4
	MCU: optional as Ex-protected version for application in Ex zone 2 Ex classification ATEX II 3G Ex nA II T4		
Protection class	<ul style="list-style-type: none"><li>EX-Z2/EX-Z2-RE: IP65</li><li>PR-EX-Z2: IP65</li><li>MCU: IP65</li></ul>		
Inputs, outputs, controls via MCU control unit			
Analog output	1 output: 0/2/4 ... 22 mA, max. load 500 Ω Optional: additional analog outputs when using I/O modules		
Analog inputs	2 inputs: 0 ... 5/10 V or 0 ... 20 mA, Optional: additional analog inputs when using I/O modules		
Digital outputs	5 outputs: 30 V DC/2 A, 48 V AC/1 A; floating; Status signals: operation/malfunction, maintenance, check cycle, limit value, maintenance request. Optional: additional digital outputs when using I/O modules		
Digital inputs	4 inputs for connection of floating contacts Optional: additional digital inputs when using I/O modules (option)		
Interfaces	<ul style="list-style-type: none"><li>USB</li><li>RS232 (service)</li><li>RS485 via optional interface module</li><li>Ethernet via optional interface module</li></ul>		
Bus protocol	<ul style="list-style-type: none"><li>TCP/IP via ethernet (optional interface module)</li><li>PROFIBUS DP via RS485 (optional interface module)</li><li>MODBUS via RS485 (optional interface module)</li></ul>		
General			
System components	<ul style="list-style-type: none"><li>Sender/receiver unit(s) FLSE100</li><li>MCU control unit, optional 24 V DC version</li><li>Connecton box (for FL100 CL150/PN16 only)</li><li>Connection cables</li><li>Nozzles</li></ul>		
Operation	Via MCU control unit or SOPAS ET software		
Check function	Internal check cycle for zero-point and span check		
Mounting (typ. angle)	60°	45° (type PR-EX-Z2)	

<sup>1)</sup> Accuracy of flow measurement 1.5 ... 5.0 % for fully developed flow profile (1-path configurations)



## FLOWSIC100 Flare

RELIABLE GAS FLOW MEASUREMENT  
IN FLARE GAS APPLICATIONS

Mass flow measuring devices

**SICK**  
Sensor Intelligence.

## MEASUREMENT CERTAINTY AND PRECISION EVEN UNDER EXTREME APPLICATION CONDITIONS – FLOWSIC100 FLARE.

The measurement of flare gas in the chemical and petrochemical industry is widely considered to be the leading discipline in gas flow measurement. In no other area do the application conditions and resulting requirements for measuring technology pose such a challenge.

The primary area of application involves calculating greenhouse gas emissions based on the amount of flare gas measured in accordance with regulatory requirements. FLOWSIC100 Flare has been developed for precisely this purpose.

State-of-the-art sensor technology and high-quality components ensure high accurate and reliable measurement with the utmost failure safety protection – even under extreme conditions on oil rigs and at remote oil fields. Even very low flow rates can be accurately detected, the measuring device is also suitable for continuous process monitoring and optimization as well as for detecting the smallest leaks in the flare gas network.



### Performance and durability

FLAWSIC100 Flare is based on more than 30 years of experience in ultrasonic sensor technology at SICK and offers outstanding performance and durability. Changing gas compositions and corrosive components have no impact on the measurements, as all parts that come into contact with the gas flow are made of resistant materials.

### Reliable low flow measurements

A high signal time resolution combined with state-of-the-art signal processing mean that even very small amounts of gas can be detected accurately with flow velocities of close to zero. As a result, the measuring device offers excellent reliability when monitoring processes and detecting leakages in the flare gas system.

### Works even under extreme conditions

The optimized sensor design even allows measurements to be taken during emergency system shutdowns and at extreme gas velocities of up to 120 m/s. In tandem with a high-speed measuring algorithm, the measuring process is also safeguarded in the event that conventional ultrasonic technology has failed due to extreme system noise and turbulence.

### Excellent application reliability

The high power EX/EX-RE model is specially designed for use in pipes with large diameters of up to 72 inches and with extremely challenging gas compositions. Even flare gas with excessive contamination (e.g., associated gas) does not affect the measurement. All device versions meet explosion protection requirements according to ATEX, CSA, and IECEx.

### Comprehensive diagnostic functions

An automatic control cycle checks the device function periodically, while the integrated self-diagnosis continually monitors all important function parameters. In the event of impermissible deviations that could affect the measurement result, warning messages are generated so that maintenance can be planned in time. A special testing procedure allows the device functions to be verified according to factory standards with ease – even for quality assurance in the field.

### Ideal configuration

FLAWSIC100 Flare is available as 1- or 2-path version. The 2-path version offers higher measurement accuracy even in the event that flow conditions are less than ideal. The FLAWSIC100 EX-PR probe version is a special device providing simple and cost-saving installation on one side of the flare gas line. A device retraction mechanism allows sensors to be replaced quickly and simply during plant operation.

#### Product overview

FLAWSIC100 Flare is available in three different versions, each capable of overcoming all of the difficulties that arise from the measuring task. These include extreme flow conditions, challenging gas compositions, special installation and ambient conditions.



FLAWSIC100 EX-S

- Cross-duct high-speed version (patent pending)
- 90° nozzle installation
- Retractable under process conditions
- Hermetically sealed stainless steel and titanium probes
- ATEX, IECEx, and CSA approved for use in hazardous areas



FLAWSIC100 EX/EX-RE

- Cross-duct high-speed version for exceptionally large nominal pipe sizes and gaseous mixtures with a high CO<sub>2</sub> content (patent pending)
- Retractable under process conditions
- Hermetically sealed stainless steel and titanium probes
- ATEX, IECEx, and CSA approved for use in hazardous areas



FLAWSIC100 EX-PR

- High-speed probe version (patent pending)
- Single nozzle installation only
- Retractable under process conditions
- Hermetically sealed titanium probe
- ATEX, IECEx, and CSA approved for use in hazardous areas

# CUTTING-EDGE ULTRASONIC TECHNOLOGY FOR ONE OF THE MOST DEMANDING APPLICATIONS IN GAS FLOW MEASUREMENT.

## Ultrasonic technology by SICK

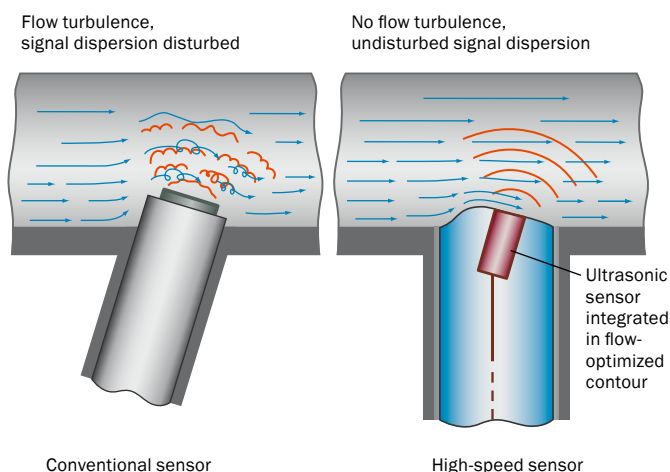
FLWSIC100 Flare combines state-of-the-art ultrasonic sensor technology with proven, high-precision signal processing from the field of custody transfer measurement.

The ultrasonic sensors can operate even under atmospheric pressure conditions without any restrictions on performance. Under practical application conditions, the acoustic signal resolution reaches a value of up to  $\pm 5$  ns, which enables gas velocities of up to 0.001 m/s to be detected, and the tiniest quantities of flare gas to be reliably recorded. To ensure this performance, every device in the FLWSIC100 Flare series passes a specially developed testing procedure under zero point conditions, in which extremely demanding performance criteria must be met.

The upper measuring range presents yet a further challenge: In the case of emergency shutdowns in the flare gas system, the gas velocity can reach well over 100 m/s within just a few seconds, leading to heavy background noise, gas flow turbulence, and signal drift effects. This is where a good flow measuring device comes into its own. FLWSIC100 Flare has already recorded low flow measurements in the flare gas system, now it is switching its attention to extreme measuring. Its unique, streamlined sensor design smoothens turbulence and minimizes background noise on the sensor surface. Even at 120 m/s.

### High-speed sensor design

An innovative sensor design has been developed for the FLWSIC100 Flare. The ultrasonic sensors are embedded in a flow-optimized contour that has been specially designed for high gas flows. The unique sensor design reduces flow noise and signal drift to a minimum and provides stable and reliable measured values. The optimized 2-stage signal algorithm offers optimum signal processing across the entire measuring range.



### Outstanding reliability and durability

Significant fluctuations in gas compositions and/or corrosive process conditions are taken into account by selecting specially adapted ultrasonic sensors.

The broadband transmission behavior and large signal amplitudes ensure a reliable measuring operation in a variety of gas mixtures with a molecular weight of between 2 and 120 g/mol. The large signal range and good coverage of the SICK ultrasonic sensors are yet further factors of success for optimal functioning of the device.

Depending on the gaseous mixture, specially adapted switching frequencies with optimal transmission properties can be used. "High-power transducers" allow a cross-duct measurement in the case of nominal pipe sizes of up to 72 inches and sound-absorbing gases with an extremely high carbon dioxide content. The sensors are made exclusively in hermetically sealed, solid metal designs, preferably from titanium. For particularly aggressive gas compositions, highly-resistant alloys (e.g., Hastelloy) are used to ensure durability.



### Device testing to factory standards

To provide regular evidence of its functionality, FLOWSIC100 Flare can also be checked in the field according to SICK factory standards. Zero point deviation and time-of-flight measurements are checked in a specially designed testing box and adjusted if necessary. By comparing the theoretical and measured speed of sound under defined test conditions (pressure, temperature, humidity), it is possible to assess the accuracy of the time-of-flight measurement and provide evidence of its zero point stability with ease.

Even if the measuring device cannot be removed from the measuring line, a periodic functional test is carried out via an integrated control cycle (zero point test, span test).

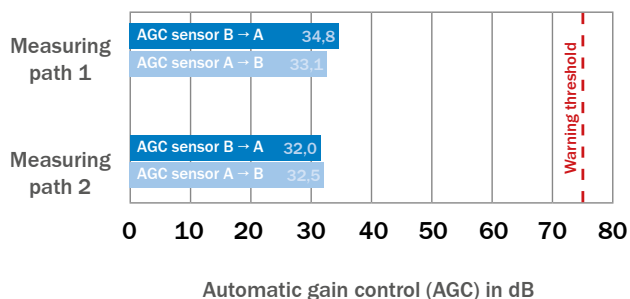
### Continuous self-diagnosis

Using ultrasonic technology parameters such as automatic gain control, error rate, and signal-noise ratio, the device is automatically monitored for compliance with the permitted operating range using the integrated self-diagnosis. Impermissible deviations from the parameters can be signaled immediately by means of a continuous internal evaluation before the measuring function is even affected. This means that any signs of wear, sensor contamination, or background noise can be detected and eliminated as early as possible.

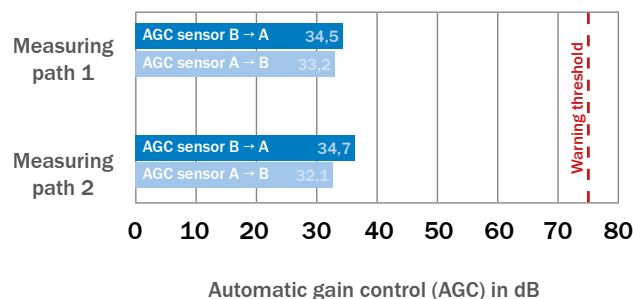
By comparing diagnostic values when commissioning the device ("fingerprint") and at any given point in the future, it is possible to continue to identify changes in process conditions. In this case, device performance can be ensured even under special challenging conditions by parameter optimization. Thus application reliability can be increased. Under conditions where conventional ultrasonic technology has already failed.

### Device diagnosis by evaluating gain control values using the example of a 2-path measuring system and a measuring operation of one year

Automatic gain control (AGC) during device commissioning



Automatic gain control (AGC) after one year of measuring operation



# FLARE GAS MEASURING DEVICE RETROFIT SOLUTION

## THE FLOWSIC100 FLARE 90°UPGRADE KIT

Retrofitting an ultrasonic flare gas meter installation is child's play with the SICK retrofit solution. Keep your nozzles, shut-off valves, p/T transmitters and even cabling and revamp your flare gas system with the latest flare gas meter technology of SICK.

Since the existing nozzles and shut-off valves can be used, no hot-tapping or depressurization of the flare gas line is needed.

### Rugged transducers you can trust

The rugged transducers of the 90° upgrade kit are made to last! Even under extreme application conditions up to 180 m/s (590 ft/s), the transducers won't break. That is ensured by the unique robust barrel design and the fully titanium construction. Vibration resistance analysis and extensive laboratory testing prove the extraordinary durability of the transducers and give you peace of mind.

### Service yourself – verification when you want it – support when you need it

In addition to the internal check cycle, SICK makes it possible to validate the measuring device function with an optional zero flow box. Whenever your local plant or area regulations require you to prove the measuring device function, you can do it yourself and save money on service expenditures. Of course, the experienced SICK customer service can also help you with your regular checks – the carefree solution.

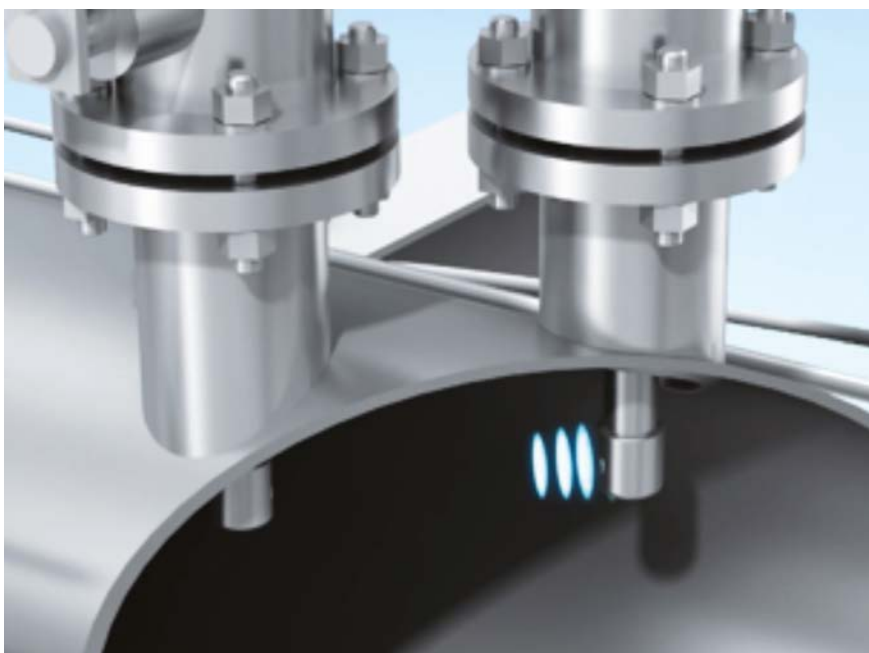
### Annual recalibration – not required

SICK ultrasonic flare measuring devices are drift-free and have virtually no need for maintenance. The continuous self-diagnosis constantly monitors the measuring device function and reliability.

Whenever the measuring device performance changes, you will be informed prior to any signal loss. With the FLOWSIC100 Flare, no periodic calibration is needed.

### Retrofitting while the system is running

Installation of the sender/receiver units on the existing nozzles makes it possible to retrofit without depressurization of the flare gas line. Welding is not required. With the adapter plate included in the delivery, the MCUP can be installed in the same place as the previously installed electronics unit. This reduces installation effort to a minimum. Keep installed pressure and temperature transmitters and connect them to the MCUP using already existing cables. You can also continue to use the communication cable to the SCADA system. Retrofitting a measurement system has never been so easy.



Solid cylinder construction



Installation after retrofitting

## Measurement performance even under extreme conditions

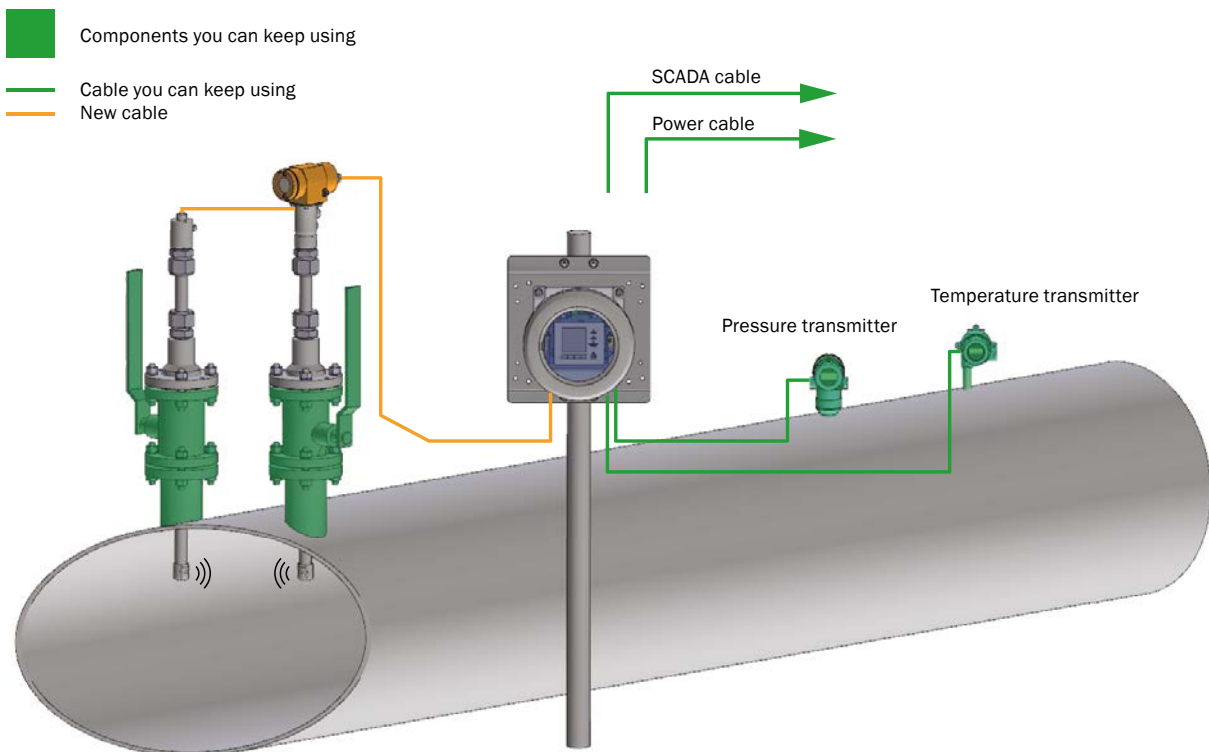
The outstanding ultrasonic transducer technology combined with state-of-the-art signal processing gives you the best measurement performance at very low speeds close to zero. Even during emergency shutdown events and at extremely high speeds, the measuring device stays accurate due to its optimized sensor shape in combination with high-speed measurement algorithms.

## Kit components

- Multi control unit (MCUP)
- Ultrasonic sender/receiver units
- Mounting accessories
- Sender/receiver unit connection cables
- Sender/receiver units connection cables - MCUP (optional)

## Components you can keep using

- Nozzles
- Shut-off Valves
- p/ T transmitters
- Most of the cabling



# RELIABLE GAS FLOW MEASUREMENT IN FLARE GAS APPLICATIONS



## Product description

The FLOW SIC100 Flare product family features a unique flow-optimized sensor design. This innovative design minimizes flow-generated noise and signal drift when gas velocities are particularly high. Modern signal processing and high-efficiency transducers enable high time resolution for signals and thus deliver accurate measurements, even at extremely low gas flow rates.

The standard system configuration includes two sender/receiver units or one measuring probe and the MCUP control unit. The MCUP unit is used to input and output signals; to calculate reference values (normalization), molecular weight and mass flow; to record gas volumes; and to provide user-friendly control via the LCD display.

## At a glance

- High-resolution measurement and short response time
- Innovative sensor design for very high gas velocities
- Optimal signal transmission even under atmospheric pressure
- Detached installation of the control unit up to 1,000 m away
- Single and multi-path configuration, opt. Probe version
- Zero point test in the field according to factory standard
- Control cycle for automatic self-diagnosis / signal optimization

## Your benefits

- Reliable process monitoring due to exact measurement near the zero point
- High measurement availability even in the case of emergency shutdowns with gas velocities of up to 120 m/s
- Cost savings due to detached installation of the control unit possible in the safe area
- System solution for the control of three different measuring points with a common control unit
- Cost savings due to one-sided installation when using FLOW SIC100 EX-PR probe version
- Guarantee of optimal device performance due to continual function monitoring and extended diagnostic functions in the field



## More information

Fields of application .....	9
Detailed technical data .....	9
Ordering information .....	14
Dimensional drawings .....	14

→ [www.sick.com/FLOWSIC100\\_Flare](http://www.sick.com/FLOWSIC100_Flare)

For more information, simply visit the above link to obtain direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

## Fields of application

- Emissions control for accounting of CO<sub>2</sub> emissions
- Detection of flare gas leaks
- Monitoring of steam injection when burning flare gas
- Monitoring of gas losses
- Exact mass balance and process optimization

## Detailed technical data

The precise device specifications and product performance data may vary and are dependent on the respective application and customer specifications.

### FLOWSIC100 Flare system

<b>Measurands</b>	Mass flow, volumetric flow at actual and standard conditions, molecular weight, gas volume and mass, gas velocity, gas temperature, speed of sound
<b>Number of measuring paths</b>	1, 2
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Measuring medium</b>	Hydrocarbon mixture with or without H <sub>2</sub> content
<b>Repeatability</b>	0.2% at ≥ 10 m/s
<b>Resolution</b>	+ 0.001 m/s
<b>Measurement uncertainty</b>	<p>Operational volume flow (1-path measurement): ± 1.5% to 5% of the measured value (in the range of 0.3 m/s to the upper range value) <sup>1</sup></p> <p>Operational volume flow (1-path measurement): ± 0.5% of the measured value (in the range of 1 m/s to the upper range value) <sup>1,2</sup></p> <p>Operational volume flow (2-path measurement): ± 1% to 3% of the measured value (in the range of 0.3 m/s to the upper range value) <sup>1</sup></p> <p>Operational volume flow (2-path measurement): ± 0.5% of the measured value (in the range of 1 m/s to the upper range value) <sup>1,2</sup></p> <p>Mass flow (1-path measurement): ± 2.5% to 5% of the measured value (in the range of 0.3 m/s to the upper range value) <sup>1,3</sup></p> <p>Mass flow (2-path measurement): ± 2% to 4% of the measured value (in the range of 0.3 m/s to the upper range value) <sup>1,3</sup></p> <p>Molecular weight: ≤ 2% of the measured value (in area 2 to 120 kg/kmol) <sup>3</sup></p> <p><sup>1</sup> For fully developed flow profiles</p> <p><sup>2</sup> After throughput calibration</p> <p><sup>3</sup> Hydrocarbon mixture with non-hydrocarbon content &lt; 10%</p>
<b>Gas temperature</b>	<p>Standard: -70 °C ... +180 °C</p> <p>High-temperature zone 1: -70 °C ... +280 °C</p> <p>High-temperature zone 2: -70 °C ... +260 °C</p> <p>Low temperature: -196 °C ... +100 °C</p> <p>not for FLOWSIC100 EX/EX-RE zone 1 / class I, division 1</p>
<b>Operating pressure</b>	<p>-0.5 bar (g) to 16 bar (g)</p> <p>FLOWSIC100 EX-S 90°: -0.5 bar (g) to 19 bar (g)</p>
<b>Ambient temperature</b>	<p>Sensors, ignition group IIC T4: -40 °C ... +70 °C</p> <p>Sensors, ignition group IIC T4: -50 °C ... +70 °C optional</p> <p>Sensors, ignition group IIC T6: -40 °C ... +55 °C</p> <p>Sensors, ignition group IIC T6: -50 °C ... +55 °C optional</p>
<b>Storage temperature</b>	<p>-40 °C ... +70 °C</p> <p>-50 °C ... +70 °C optional</p>

<b>Ambient humidity</b>	≤ 95% relative humidity
<b>Electrical safety</b>	CE

**FLOWSIC100 EX-S**

<b>Measuring ranges</b>		
	Gas velocity	0.03 ... 120 m/s
<b>Measuring span</b>		4000 : 1
<b>Nominal pipe size</b>		
	1-path measurement:	4" ... 24" depending on gas composition
	2-path measurement:	12" ... 24" depending on gas composition
<b>Ex-approvals</b>		
	IECEx	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
	ATEX	II 1/2 G Ex d [ia Ga] IIC T4 Ga/Gb II 1/2 G Ex d e [ia Ga] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors II 3 G Ex nA IIC T4 Gc
	NEC/CEC (US/CA)	CI I, div1 group B, C, D T4 Ex/AEx d [ia] IIB + H2 T4 optional: temperature class T6 CI I, div2 group A, B, C, D T4 Ex/AEx nA [ia] IIC T4 optional: temperature class T6
	INMETRO	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
<b>Enclosure rating</b>		
	ATEX zone 1 with terminal box	IP65
	ATEX zone 1 without terminal box	IP65 / IP67
	ATEX zone 2 with terminal box	IP65
	NEC/CEC (US/CA)	Housing type 4, IP65
	INMETRO	IP65 / IP67
<b>Dimensions (W x H x D)</b>		Details, see dimensional drawings
<b>Weight</b>		≤ 11 kg

**FLOWSIC100 EX-S 90°**

<b>Measuring ranges</b>		
	Gas velocity	0.03 ... 90 m/s Depending on gas composition
<b>Measuring span</b>		3000 : 1
<b>Nominal pipe size</b>		
	1-path measurement:	12" ... 72"
<b>Ex-approvals</b>		
	IECEx	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
	ATEX	II 1/2 G Ex d [ia Ga] IIC T4 Ga/Gb II 1/2 G Ex d e [ia Ga] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors II 3 G Ex nA IIC T4 Gc

	NEC/CEC (US/CA)	CI I, div1 group B, C, D T4; Ex/AEx x d [ia] IIB + H2 T4 optional: temperature class T6 CI I, div2 group A, B, C, D T4; Ex/AEx x nA [ia] IIC T4 optional: temperature class T6
	INMETRO	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
<b>Enclosure rating</b>		
	ATEX zone 1 with terminal box	IP65
	ATEX zone 1 without terminal box	IP65 / IP67
	ATEX zone 2 with terminal box	IP65
	NEC/CEC (US/CA)	Housing type 4, IP65
	INMETRO	IP65 / IP67
<b>Dimensions (W x H x D)</b>		Details, see dimensional drawings
<b>Weight</b>		≤ 12 kg

**FLOWSIC100 EX/EX-RE**

<b>Measuring ranges</b>		
	Gas velocity	0.03 ... + 120 m/s
<b>Measuring span</b>		4000 : 1
<b>Nominal pipe size</b>		
	1-path measurement:	8" ... 72" depending on gas composition
	2-path measurement:	12" ... 72" depending on gas composition
<b>Ex-approvals</b>		
	IECEX	Ex d IIC T4 optional: temperature class T6
	ATEX	II 2G Ex d IIC T4 II 2G Ex de IIC T4 optional: temperature class T6 II 3 G Ex nA IIC T4 Gc
	NEC/CEC (US/CA)	CI I, div1 group B, C, D T4 Ex/AEx d IIB + H2 T4 optional: temperature class T6 CI I, div2 group A, B, C, D T4 Ex/AEx nA IIC T4 optional: temperature class T6
	INMETRO	Ex d IIC T4 optional: temperature class T6
<b>Enclosure rating</b>		
	ATEX zone 1 with terminal box	IP65
	ATEX zone 1 without terminal box	IP65 / IP67
	Version for Ex zone 2	IP65
	NEC/CEC (US/CA)	Housing type 6, IP65/67, single seal
	INMETRO	IP65 / IP67
<b>Dimensions (W x H x D)</b>		Details, see dimensional drawings
<b>Weight</b>		≤ 14 kg

**FLOWSIC100 EX-PR**

<b>Measuring ranges</b>		
	Gas velocity	0.03 ... + 90 m/s
<b>Measuring span</b>		3000 : 1

<b>Nominal pipe size</b>		
	1-path measurement:	12" ... 72" depending on gas composition
	2-path measurement:	18" ... 72" depending on gas composition
<b>Ex-approvals</b>		
	IECEX	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
	ATEX	II 1/2 G Ex d [ia Ga] IIC T4 Ga/Gb II 1/2 G Ex d e [ia Ga] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors II 3 G Ex nA IIC T4 Gc
	NEC/CEC (US/CA)	CI I, div1 group B, C, D T4 Ex/AEx d [ia] IIB + H2 T4 optional: temperature class T6 CI I, div2 group A, B, C, D T4 Ex/AEx nA [ia] IIC T4 optional: temperature class T6
	INMETRO	Ex d [ia] IIC T4 Ga/Gb optional: temperature class T6; Ex zone 0 for ultrasonic sensors
<b>Enclosure rating</b>		
	ATEX zone 1 with terminal box	IP65
	ATEX zone 1 without terminal box	IP65 / IP67
	Version for Ex zone 2	IP65
	NEC/CEC (US/CA)	Housing type 4, IP65
	INMETRO	IP65 / IP67
<b>Dimensions (W x H x D)</b>		Details, see dimensional drawings
<b>Weight</b>		≤ 32 kg

## MCUP control unit

<b>Description</b>		Unit for controlling the sender/receiver units, and offsetting, evaluating, and outputting measured value data
<b>Ambient temperature</b>		
	MCUP control unit (non-Ex):	-40 °C ... +60 °C
	MCUP control unit (CI I, div2, zone 2, 115/230 V AC):	-25 °C ... +60 °C
	MCUP control unit (CI I, div2, zone 2, 24 V DC):	-40 °C ... +60 °C
	MCUP control unit (CI I, div1, group A, B, C, D):	-25 °C ... +50 °C
	MCUP control unit (CI I, div1, group C, D):	-50 °C ... +50 °C
	MCUP control unit (Ex zone 1):	-40 °C ... +55 °C for ATEX/IECEX devices
	MCUP control unit (Ex zone 1):	-55 °C ... +55 °C for ATEX/IECEX devices, 24 V DC on request
<b>Ex-approvals</b>		
	IECEX	Ex de IIC T6
	ATEX	II 2G Ex de IIC T6 II 3 G Ex nA II T4
	NEC/CEC (US/CA)	CSA CI 1, div2; CI1, zone 2 group A, B, C, D T4 Ex/AEx nA IIC T4
<b>Enclosure rating</b>		
	Version for Ex zone 1	IP66
	Version for Ex zone 2, div2, div1	Housing type 4 or 4X/IP66
	Version for nonhazardous areas	IP66
	19" version	IP20

<b>Analog outputs</b>		1 output: 0/2/4 ... 22 mA, 500 $\Omega$ in acc. with NAMUR NE43; up to 7 outputs when using I/O modules (option)
<b>Analog inputs</b>		2 inputs: 0 ... 5 V 0 ... 10 V or 2 inputs: 0 ... 20 mA without galvanic isolation; up to 12 inputs when using I/O modules (option)
<b>Digital outputs</b>		5 relay contacts: + 48 V DC, 1 A volt-free; for status signals; up to 7 outputs when using I/O modules (option); pulse/frequency output (option) 5 relay contacts: / 30 V DC, 1 A MCUP for zone 2/Div2; volt-free; for status signals; up to 7 outputs for using I/O modules (option); pulse/frequency output (option)
<b>Digital inputs</b>		2 inputs:  for connecting volt-free contacts
<b>USB</b>	Function	✓ Connection to SOPAS ET software
<b>Serial</b>	Type of fieldbus integration	✓ RS-232 RS-485
	Function	Connection to SOPAS ET software Internal system bus
<b>Ethernet</b>	Type of fieldbus integration	✓ Via optional interface module
	Function	Connection to SOPAS ET software
<b>Modbus</b>	Type of fieldbus integration	✓ ASCII RS-485 (via optional interface module; standard for 90° upgrade kit) RTU RS-485 (via optional interface module; standard for 90° upgrade kit) TCP (via optional interface module; standard for 90° upgrade kit)
<b>HART</b>	Type of fieldbus integration	✓ Via optional interface module
<b>PROFIBUS DP</b>	Type of fieldbus integration	✓ Via optional interface module
<b>Foundation Fieldbus</b>	Type of fieldbus integration	✓ Via optional interface module
<b>Indicator</b>		LC display Status LEDs: "Power," "Maintenance," and "Fault"
<b>Operation</b>		Via LC display or SOPAS ET software
<b>Dimensions (W x H x D)</b>		Details, see dimensional drawings
<b>Weight</b>		Zone 1, housing size 4: $\pm 14$ kg Zone 1, housing size 6: $\pm 18$ kg Zone 1, stainless-steel housing: $\pm 70$ kg Zone 2 and versions without Ex-protection: $\pm 5$ kg 19" rack housing: $\pm 6$ kg CSA Cl I, div 1, housing size 4: $\pm 12$ kg CSA Cl I, div 1, housing size 6: $\pm 16$ kg
<b>Electrical connection</b>	Voltage	Version for nonhazardous areas: 90 to 250 V AC Version for Ex zone 1: 90 to 250 V AC Version for Ex zone 2, div2, div1: 115 V AC / 230 V AC Version for Ex zone Cl1, div1: 100 to 240 V

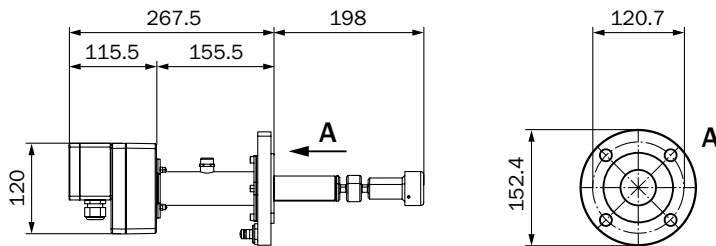
	Frequency	Versions optionally available with 24 V DC 50 Hz / 60 Hz
	Power consumption	≤ 20 W
<b>Options</b>	Interface module(s) I/O module(s)	

## Ordering information

Our regional sales organization will be glad to advise you on which device configuration is best for you.

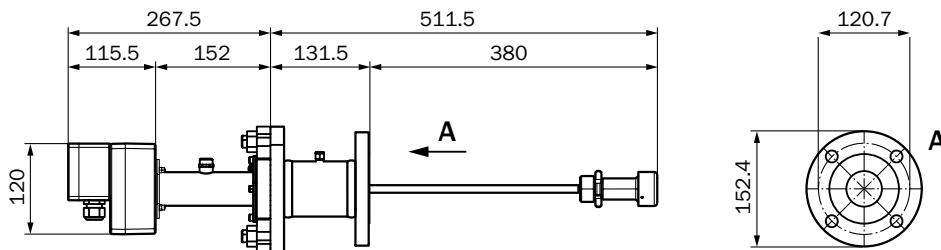
## Dimensional drawings (dimensions in mm)

FLOWSIC100 EX, sender/receiver unit, not retractable



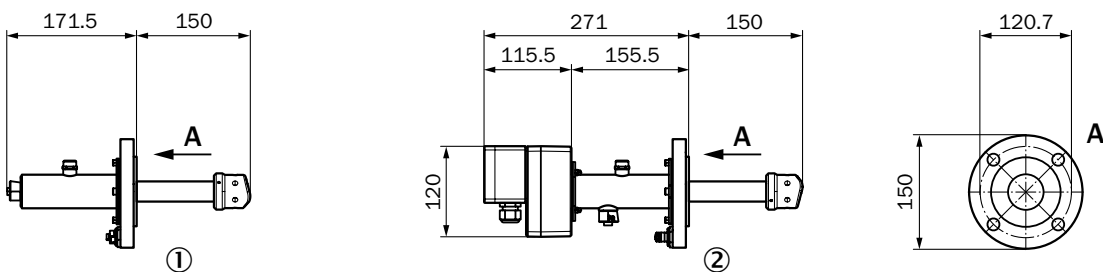
Sender/receiver unit (digital) with electronic unit for ATEX zone 2

FLOWSIC100 EX-RE, sender/receiver unit, retractable



Sender/receiver unit (digital) with electronic unit for ATEX zone 2

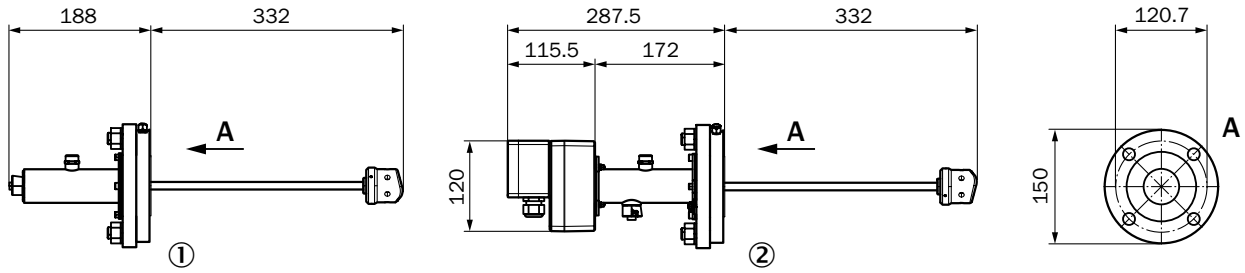
FLOWSIC100 EX-S, sender/receiver unit, not retractable



① Sender/receiver unit (analog) for ATEX Ex zone 1, Ex zone 2, and CSA Cl I, div 1/div 2

② Sender/receiver unit (digital) for ATEX Ex zone 2

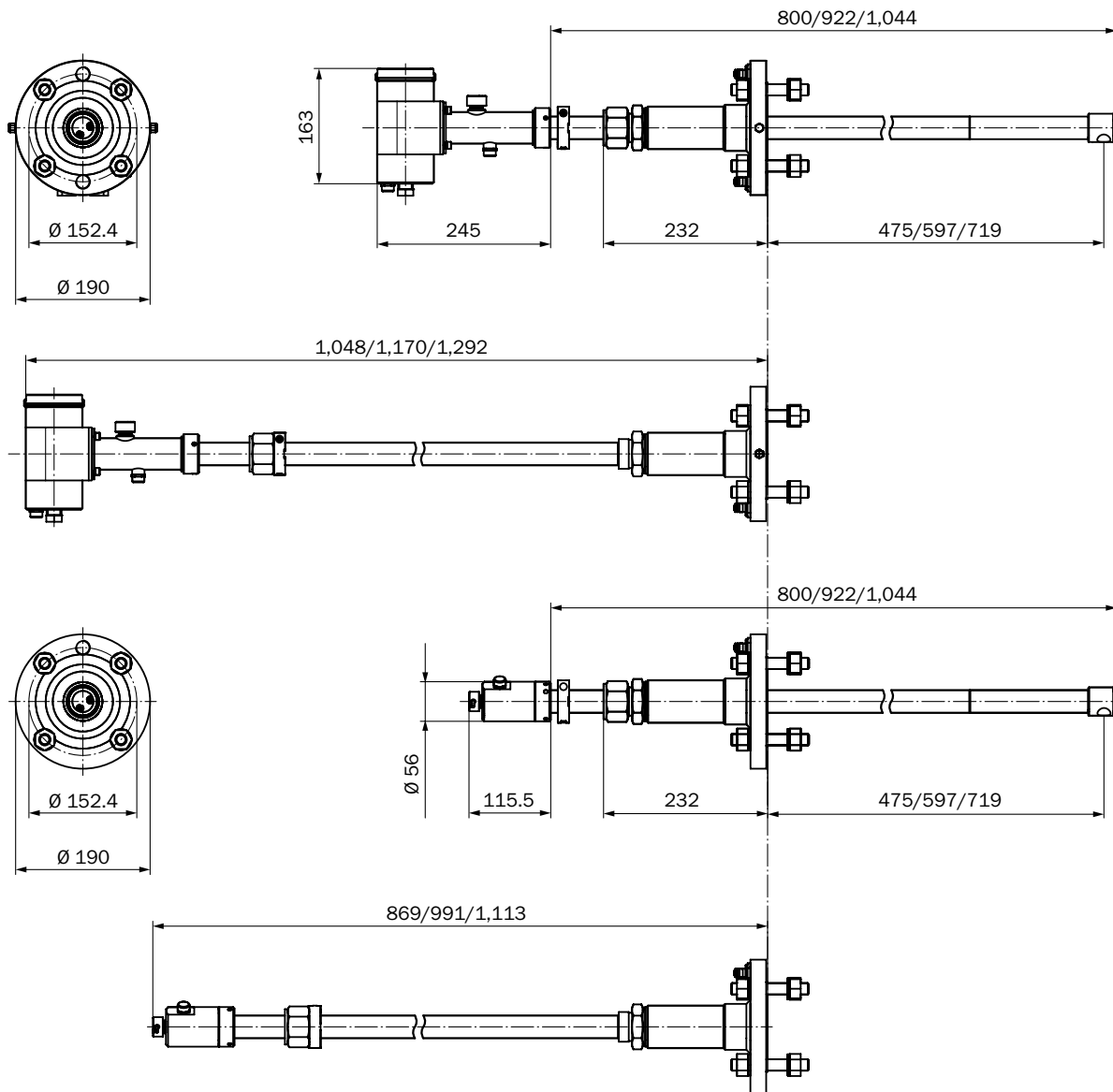
FLOWSIC100 EX-S, sender/receiver unit, retractable



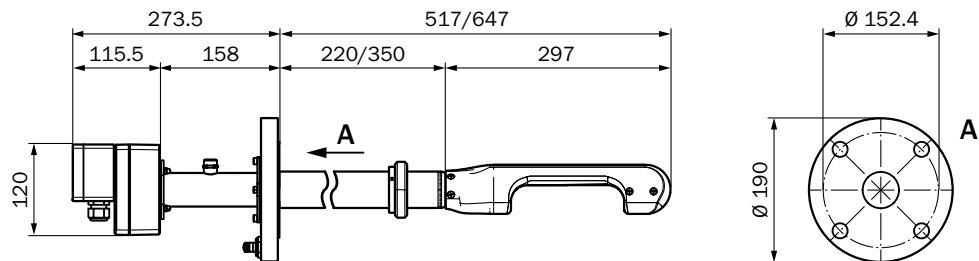
① Sender/receiver unit (analog) for ATEX Ex zone 1, Ex zone 2, and CSA Cl I, div 1/div 2

② Sender/receiver unit (digital) for ATEX Ex zone 2

FLOWSIC100 EX-S 90°, sender/receiver unit

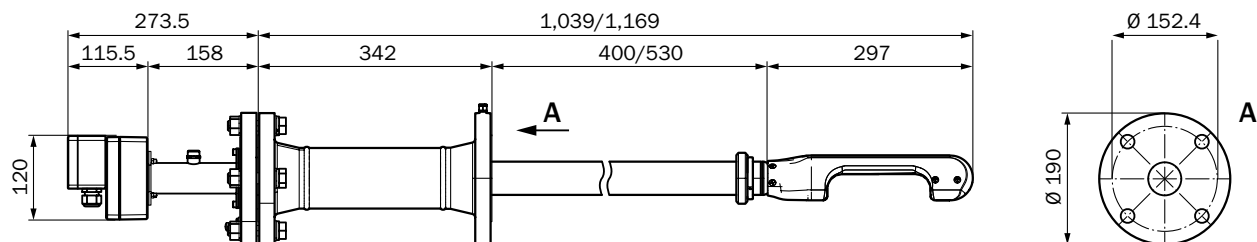


## FLOWSIC100 EX-PR, sender/receiver unit, not retractable



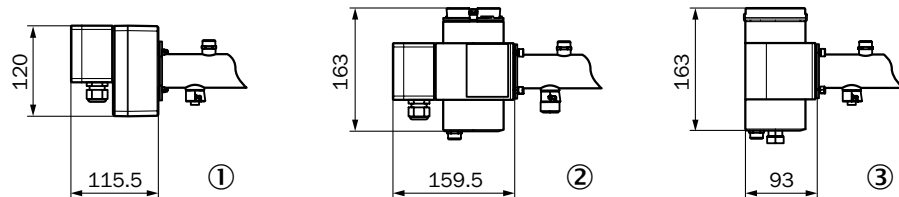
Sender/receiver unit (digital) with electronic unit for ATEX zone 2: Nominal length 220 mm for pipe diameters up to 48"; nominal length 350 mm for pipe diameters > 48" to 72"

## FLOWSIC100 EX-PR, sender/receiver unit, retractable



Sender/receiver unit (digital) with electronic unit for ATEX zone 2: Nominal length 400 mm for pipe diameters up to 48"; nominal length 530 mm for pipe diameters > 48" to 72"

## Electronics units of the sender/receiver units (digital)

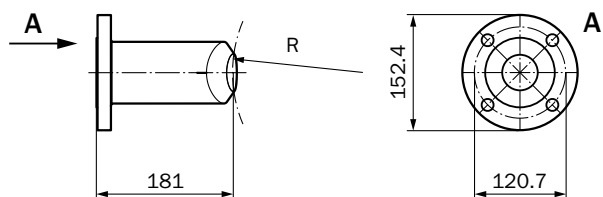


① Electronics unit of the sender/receiver unit (digital) for ATEX zone 2

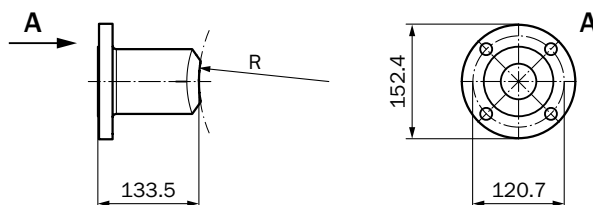
② Electronics unit of the sender/receiver unit (digital) for ATEX zone 1

③ Electronics unit for the sender/receiver unit (digital) for ATEX/IECEx zone 1 and CSA Cl I, div 1/div 2

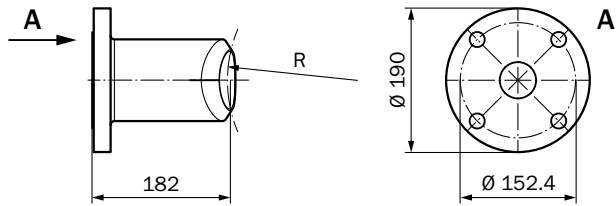
## Mounting stud for FLOWSIC100 EX



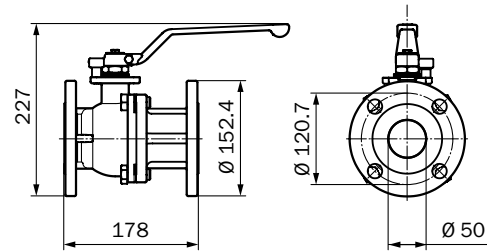
## Mounting stud for FLOWSIC100 EX-S



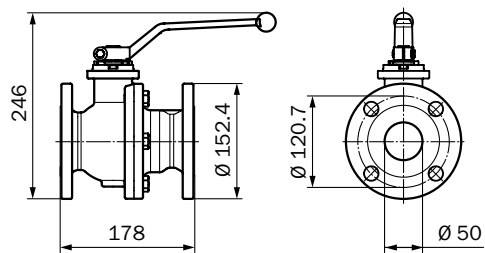
Mounting stud for FLOWSIC100 EX-PR



Ball valve, 2" version for standard temperatures

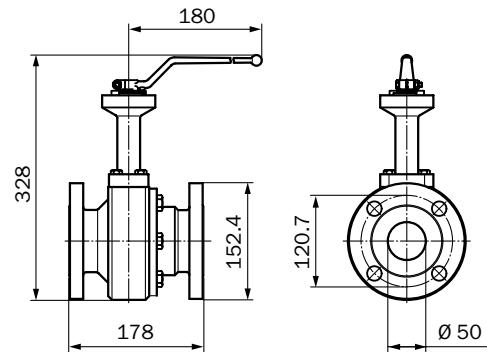


Ball valve, 2" version for high temperatures



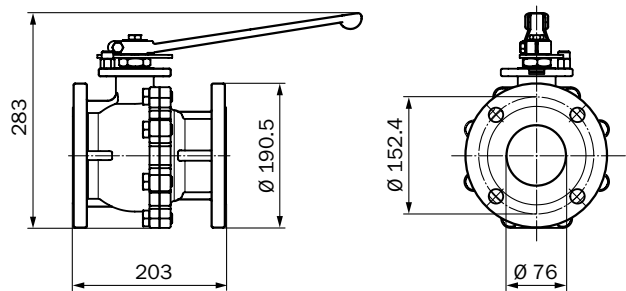
For FLOWSIC100 EX-S, EX and EX-RE

Ball valve, 2" version for low temperatures



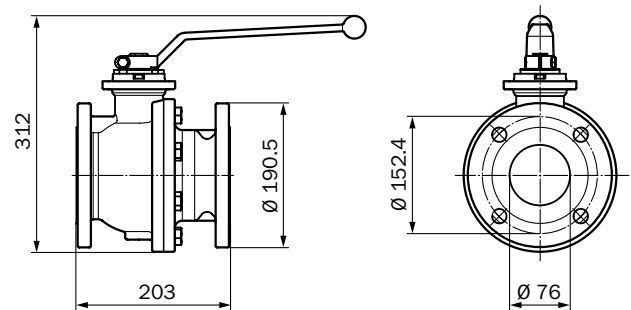
For FLOWSIC100 EX-S, EX and EX-RE

Ball valve, 3" version for standard temperatures



For FLOWSIC100 EX-S, EX and EX-RE

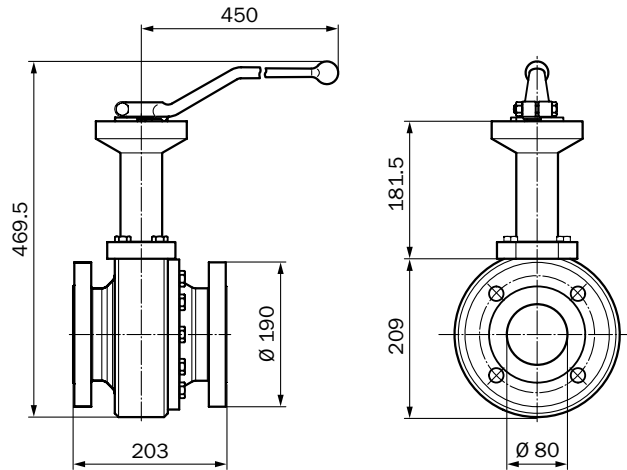
Ball valve, 3" version for high temperatures



For FLOWSIC100 EX-PR

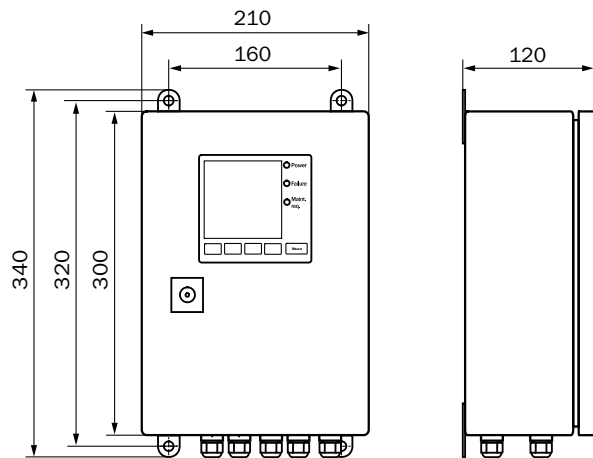
For FLOWSIC100 EX-PR

Ball valve, 3" version for low temperatures

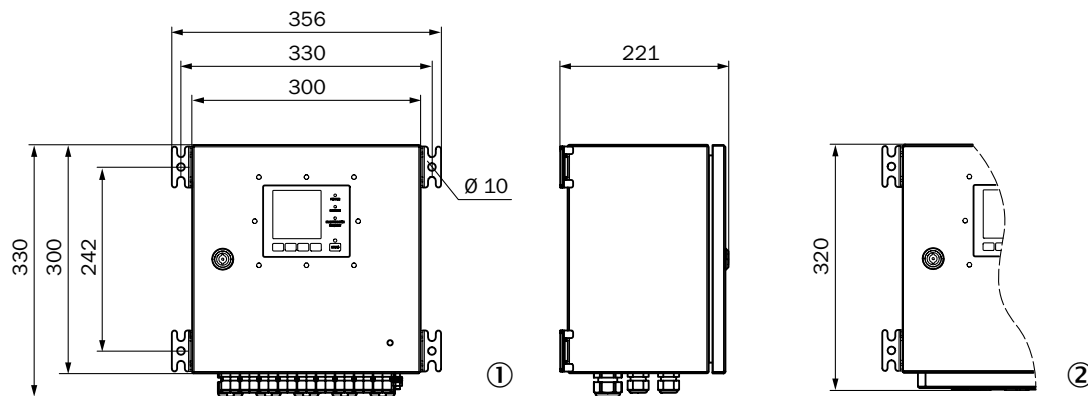


For FLOW SIC100 EX-PR

MCUP control unit; wall housing, compact version (only for nonhazardous areas)



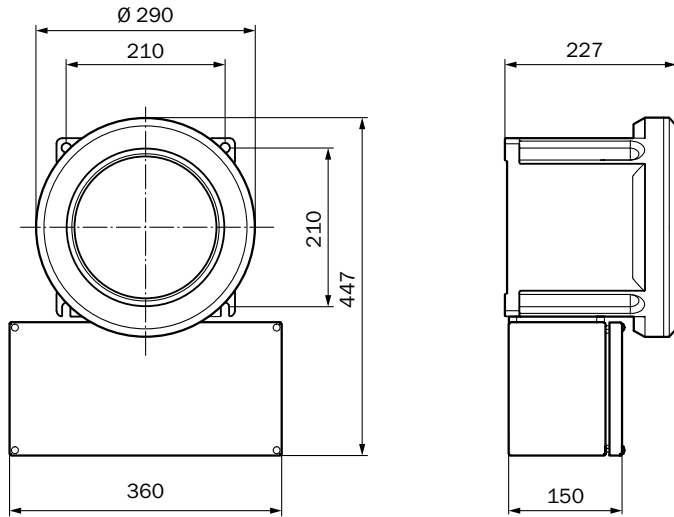
MCUP control unit, wall housing, medium version



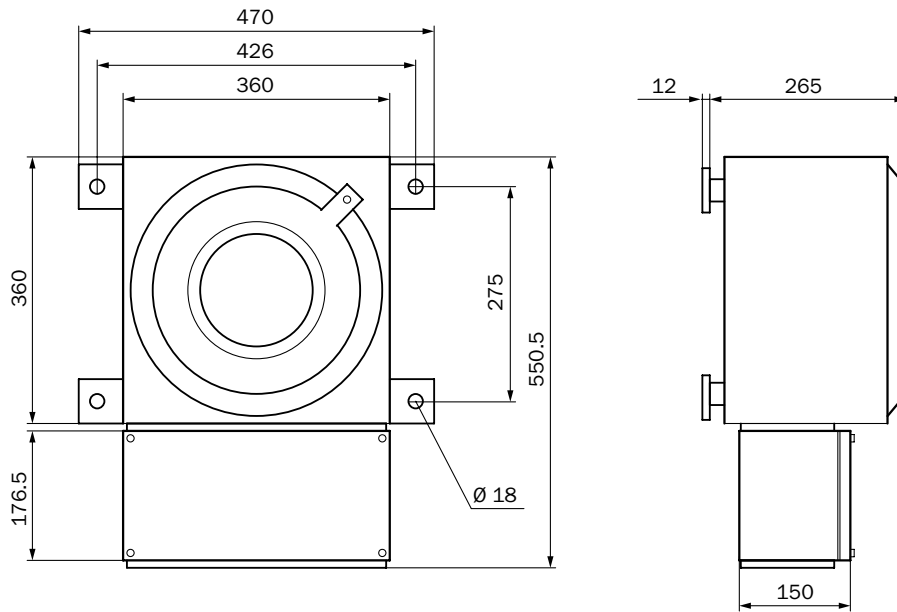
① Wall housing for ATEX zone 2 and nonhazardous areas

② Wall housing for CSA Cl I, div2

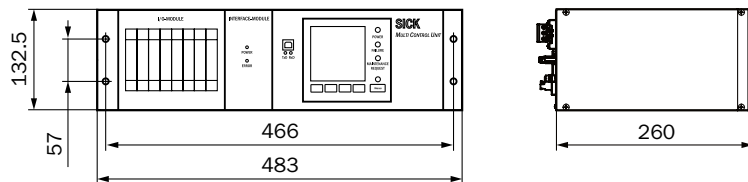
MCUP control unit; wall housing Ex d/Ex e, size 4, aluminum, ATEX zone 1



MCUP control unit; wall housing Ex d/Ex e, stainless steel, ATEX zone 1



MCUP control unit; 19" rack housing (only for nonhazardous areas)



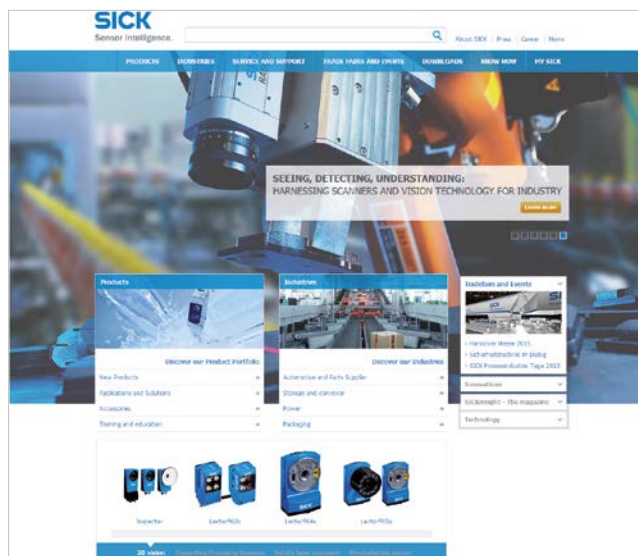






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We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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Detailed addresses and further locations → [www.sick.com](http://www.sick.com)



## FLAWSIC150 Carflow Ultrasonic Flowmeter

Exhaust gas flow measurement for vehicle and engine  
test benches up to 600 °C

# FLWSIC150 CARFLOW –

## Exhaust gas flow measurement for vehicle and engine test benches up to 600 °C

### PRODUCT DESCRIPTION

FLWSIC150 Carflow offers first class performance in combination with a compact design. This combination of state-of-the-art sensor technology and powerful electronics enables excellent measurement accuracy for exhaust gas temperatures up to 600 °C. The ultrasonic measuring system generates no pressure loss, has no moving parts, and works independently of pressure, temperature

and gas composition, ensuring reliable, low-maintenance operation. Due to direct measurement of the undiluted exhaust gas, FLWSIC150 Carflow is easy to install, is non-reactive and is ideally suited for flexible exhaust gas measurement on vehicle and engine test benches.

### AT A GLANCE

- Real-time ultrasonic measurement of the exhaust gas flow
- Independent of pressure, temperature and gas composition
- Excellent measurement accuracy and response time
- Patented sensor cooling for use with exhaust gas temperatures up to 600 °C
- Direct measurement in undiluted exhaust gas
- Fully heated measurement section
- Unique pre-heated section for thermal and flow-related exhaust gas conditioning
- Minimal exhaust gas back pressure
- Small footprint, mobile concept, flexible connection options.

### YOUR BENEFITS

- Extraordinary performance from the leading manufacturer of ultrasonic flowmeter technology
- Reliable flow measurement even under minimal flow and during idling
- Reliable operation due to high exhaust gas temperature design
- Versatile concept - ideal for use on existing test benches
- Low cost of investment due to mobile application with various test benches
- Convenient installation without feedback on engine characteristics and exhaust gas analysis systems
- Extended operating time through patented sensor cooling
- Low operating costs thanks to minimal maintenance requirements

### FIELDS OF APPLICATION

- Exhaust gas flow measurement in automotive industry research and development facilities
- Real-time exhaust gas flow measurement for vehicle and engine test benches
- Determination of modal emissions characteristics in combination with standard exhaust gas analyzers
- Proportional regulation of sampling in Bag-Mini-Diluter emissions measurement systems (BMD)

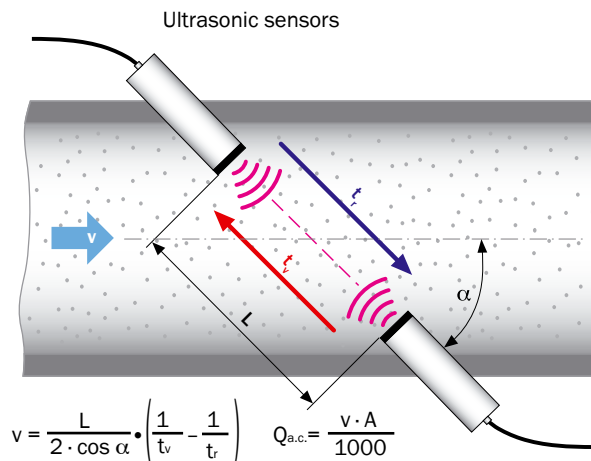




## MEASURING PRINCIPLE

Four measuring circuits measure the run-time of the ultrasonic pulses. The two ultrasonic sensors in each circuit operate alternately as sender and receiver. Due to the gas flow, the run-times of the ultrasonic pulses vary as a result of 'entrainment and braking' effects. In the forward direction, run-time  $t_v$  is shortened. In the opposite direction,  $t_r$  is extended. The gas speed is determined by the circuit, based on the differences in run-time. Simultaneous measurement across four measurement circuits covers a large area of the flow profile and thereby increases the measurement accuracy. The intelligent signal algorithm effectively filters signal disturbances out, in order to ensure high measurement availability and low susceptibility, even under highly dynamic flow conditions.

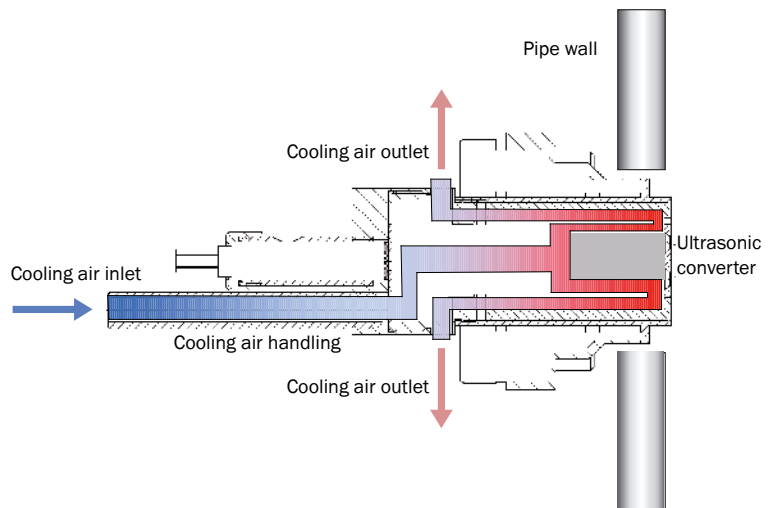
### Ultrasonic run-time difference



- $v$  = gas speed [m/s]
- $L$  = measured section [m]
- $\alpha$  = angle of installation [°]
- $Q_{a.c.}$  = volumetric flow actual condition [l/s]
- $A$  = pipe internal cross section [m²]
- $t_v$  = signal transmission time with gas flow in forward direction
- $t_r$  = signal transmission time with gas flow in opposite direction

## PATENTED INTERNAL SENSOR COOLING

The ultrasonic sensors used in FLOWSIC150 Carflow work with an innovative, patented sensor cooling system which enables permanent application of the device at exhaust gas temperatures of up to 600 °C. The cooling air supply is integrated into the device. Cooling air cannot penetrate into the measuring medium. An emergency power supply maintains the sensor cooling system in the event of power failure to protect the sensors from overheating.



Technical data FLOWSIC150	
<b>Measured data</b>	
Measured variables	Gas velocity, volumetric flow (actual condition), volumetric flow (standard condition), exhaust gas temperature (absolute), acoustic velocity
Measuring range Volumetric flow (actual condition)	<ul style="list-style-type: none"> <li>2.5 inch version: 0 - 180 l/s (0 - 650 m³/h; 0 ft³ - 380 ft³)</li> <li>4 inch version: 0 - 500 l/s (0 - 1800 m³/h; 0 ft³ - 1060 ft³)</li> </ul>
Measuring principle	Ultrasonic run-time difference method, 4 ultrasonic measuring circuits, flow-calibrated
Temperature measurement (internal)	2x sheathed thermocouples type K (NiCr-Ni), weighted mean
Pressure measurement	Absolute pressure sensor, measuring range 700 - 1300 mbar (a)
<b>Displays</b>	
4-line LCD	Measured variables, diagnostic values, warning and error messages, splash-proof
Status LED	Operation, warning, fault
<b>Installation</b>	
Exhaust gas temperature	Max. 600 °C
Ambient conditions	Ambient temperature -10 ... +40 °C, humidity 5 - 95%
Connection versions for inlet and outlet	<ul style="list-style-type: none"> <li>Outer thread type G in accordance with ISO 228/1 (e.g., for Kamlok quick-release coupling)</li> <li>Quick-release coupling (Kamlok, E-Line, Marman, Tri-Clamp)</li> </ul>
Pressure loss device	< 12 mbar (dependent on process connection used)
<b>Output of measured values and interfaces</b>	
Analog outputs	2 x analog outputs 0/2/4 - 20 mA, 10 Hz, for volumetric flow (i.N.) and exhaust gas pressure, apparent ohmic resistance max. 750 ohms, scale freely configurable
AK interface	RS232 via 9-pin D-sub or Ethernet (virtual COM port)
Service interface	RS232 via USB and Ethernet (virtual COM port) for configuration and diagnostics via SOPAS ET software
<b>Connections for external devices</b>	
Heating line connections	2 x, controlled, for PT100 or thermocouple type K (NiCr-Ni), connection via 7-pin Amphenol plug
Temperature sensors	1 x PT100 or thermocouple type K (NiCr-Ni)
<b>Electrical connection</b>	
Voltage supply	<ul style="list-style-type: none"> <li>90 - 125 V AC; 50/60Hz</li> <li>190 - 250V AC; 50/60Hz</li> </ul>
Power consumption	Max. 1700 W (without external heating lines)
Max. power external heating	<ul style="list-style-type: none"> <li>190 - 250 V AC: 1600 W</li> <li>90 - 125 V AC: 1000 W</li> </ul>
<b>Dimensions, weight</b>	
Weight	2.5 inch version: approx. 95 kg 4.0 inch version: approx. 140 kg
Dimensions (L x W x H)	2.5 inch version: 1060 mm x 495 mm x 715 mm 4.0 inch version: 1180 mm x 495 mm x 715 mm



# FLOWSIC30

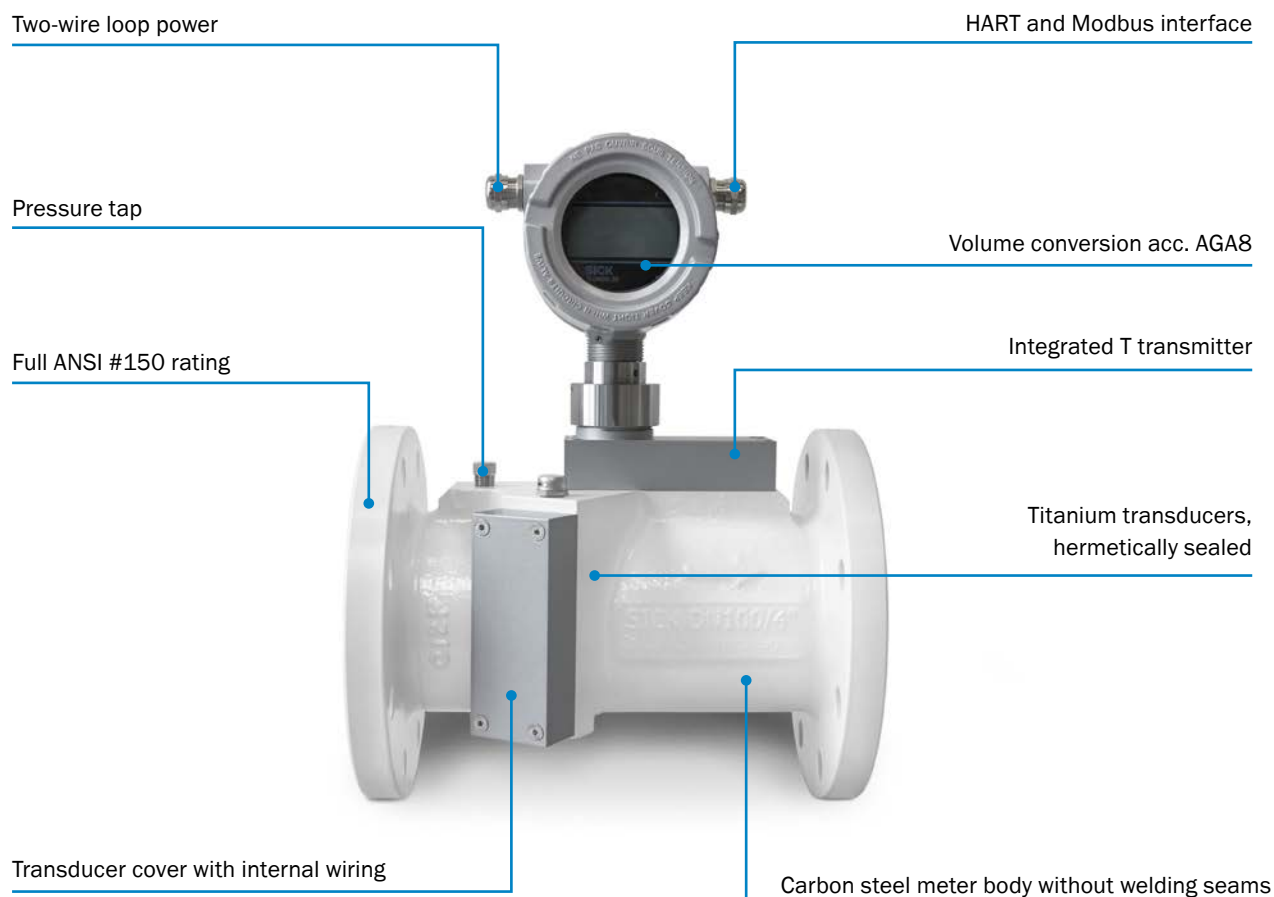
ULTRASONIC GAS FLOW METER FOR WELLHEAD APPLICATIONS

Gas flow meters

**SICK**  
Sensor Intelligence.

## COST EFFICIENCY IN ULTRASONIC BASED WELLHEAD METERING

Coal bed methane is a major part of the huge unconventional gas resources worldwide and is becoming increasingly important for the world's energy supplies. Thousands of wells must be drilled to produce this gas, each with varying quality, impurities and unpredictable flow rates over lifetime. A robust wellhead meter that operates reliably under these conditions, that covers the full range of well flow rates and that lowers costs by being virtually maintenance-free can contribute significantly to the profitability of this business. Ultrasonic gas flow meters are perfectly suited for this job and SICK is a leader in the ultrasonic gas flow metering technology. With our vast experience in natural gas metering even for dirty and wet gases, we have created a customized ultrasonic gas flow meter for gas production applications. FLOW SIC30 – a meter that combines reliability and longevity for long, unmanned operation in remote locations.



### Reliability is vital

Maintenance on wellheads is costly, especially if the wells are in remote locations. FLOWSIC30 requires virtually no maintenance since it has no moving parts and is not subject to wear. Without flow obstructions and with retracted sensor positions, the potential for scaling of the meter is minimized. The sensor pockets are enlarged so that liquids can easily drain off. This gives you the certainty of reliable and long-term stable readings without the need for regular maintenance.

### Continuous readings in all conditions

With our ultrasonic gas flow meters for gas production applications, SICK has a track record of more than 10 years of field experience. We have gained vast experience from these installations worldwide and are continuously improving our meters. SICK's ultrasonic sensors have proven they can overcome the challenges of contaminants, liquids and oil in the gas stream in various field installations as well as in international research projects. This know-how has been combined to create FLOWSIC30 – a meter consequently designed for wellhead metering in harsh ambient conditions.

### Fast, easy and secure integration

Two major aspects drive wellhead skid design: Safety and cost. With full ANSI Class 150 design and a carbon steel meter body, FLOWSIC30 can be easily integrated into standard piping skids without restrictions. In order to lower costs, meter commissioning has been kept simple and can be completed in just a few steps. An integrated temperature transmitter, minimal power consumption of less than 65 mW and the two-wire loop power concept reduce wiring and require only a minimal RTU infrastructure – a contribution to profitable wellhead skids.

### Diagnostics not only for the meter

FLOWSIC30 diagnostics permanently monitor the meter performance and generate warnings in case of findings that require detailed diagnosis by operators. With the optional RS485 interface, the powerful FLOWgate device software can be used to visualize detailed diagnostic data and to access the device event log and data archives.

In addition FLOWSIC30 is equipped with a unique liquid indication diagnosis that provides valuable information for well monitoring. The liquid indication detects relevant amounts of liquids in the gas stream and enables operators to take appropriate action. This is sensor intelligence.

### Digital communication versatility

Meter readings and diagnosis results are usually routed via a Remote Terminal Unit to a DCS or SCADA.

In the standard configuration, FLOWSIC30 is fitted with a with loop-powered 4...20 mA, HART compatible interface that uses standardized commands to transfer the meter readings. Optionally, FLOWSIC30 can be ordered with an additional Modbus RS485 interface, which has become an oil and gas industry standard, to give full (remote) access with the FLOWgate software. Thanks to this communication versatility, FLOWSIC30 can be easily integrated into existing communication networks.

### AGA8 volume conversion

In order to compare gas flows from different wells and balance them through different stages in the gas production process they are usually converted to standard volume by taking pressure, temperature and compressibility into consideration. FLOWSIC30 is optionally available with integrated volume conversion according to AGA report No. 8. It thus provides standard flow rate readings in accordance with common standards. The pressure signal can be read via the HART bus, and the temperature transmitter is part of the FLOWSIC30.



# VERSATILE ULTRASONIC GAS FLOW METER FOR GAS PRODUCTION



## Product description

Ultrasonic gas flow meter FLOWSIC30 is designed for use in natural gas production applications such as coal bed methane. The dual-path meter comes with a robust carbon steel meter body and full-titanium transducers. The ultrasonic measurement technology has no moving parts and is virtually maintenance free. The rugged design with integrated wires protects the meter from harsh ambient conditions while the large turn-down ratio typically covers all flow rates from a gas production well. FLOWSIC30 is

equipped with integrated diagnostics that monitor the meter status and indicate the presence of liquids in the gas stream. With integrated temperature measurement and volume conversion according AGA 8 it provides standard flow readings and reduces installation efforts. Power consumption of only 65 mW and the two-wire loop powered concept make integration easy while HART® and Modbus communication provide versatility in data transfer.

## At a glance

- Reliable and continuous readings
- Hermetically sealed full-titanium transducers
- Loop-powered two-wire transmitter with digital HART® interface
- Turndown ratio  $\geq 80:1$
- ANSI Class 150 carbon steel meter body without welds
- Rugged design with integrated wires
- Smart meter diagnostics
- Integrated temperature transmitter as a standard

## Your benefits

- High uptime of wells – Minimized meter scaling and long-term stable readings
- High field reliability and continuous readings – Titanium transducers and 30 years of experience in ultrasonic gas flow metering
- Reduced maintenance – Smart meter diagnostics allow for long unmanned operation
- A meter for well lifetime – Turn-down ratio  $\geq 80:1$  covers all well flow rates
- Long service-life – Rugged meter design with integrated wires
- Fast, easy and secure integration into wellhead skids
- Low installation effort – Loop-powered two-wire concept requires minimal RTU infrastructure
- Easy remote monitoring – User-friendly device software



## Additional information

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Ordering information . . . . .	6
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Instruction for installation . . . . .	7

→ [www.sick.com/FLOWSIC30](http://www.sick.com/FLOWSIC30)

For more information, simply visit the above link to obtain direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

## Fields of application

- Natural gas production
- Wellhead metering of coal-seam gas / coal-bed methane

## Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

### System

<b>Measured values</b>	Gas volume s. c., gas volume a. c., error volume a. c., error volume s. c., volumetric flow s. c., volumetric flow, a. c., gas temperature, sound velocity
<b>Number of measuring paths</b>	2
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Measuring medium</b>	Coal seam gas, natural gas, methane
<b>Measuring ranges</b>	
Volumetric flow, a. c.	20 ... 1,600 m³/h
<b>Repeatability</b>	≤ 0.5 % of the measured value
<b>Uncertainty of measurement</b>	
Volumetric flow, a. c.:	≤ ± 1.5 % In the range from 100 ... 1,600 m³/h
	≤ ± 3 % In the range from 20 ... 100 m³/h
	Factory adjusted at ambient air and ambient pressure Verified with pipe configurations acc. OIML R-137:2012 Annex B (mild)
<b>Diagnostics functions</b>	Integrated device diagnosis Liquid indication
<b>Gas temperature</b>	
	-10 °C ... +80 °C
<b>Operating pressure</b>	0 bar (g) ... 19.6 bar (g)
<b>Nominal pipe size</b>	
	DN100 / 4 inch, schedule STD
<b>Ambient temperature</b>	
	-25 °C ... +60 °C
<b>Storage temperature</b>	-25 °C ... +70 °C
<b>Ambient humidity</b>	≤ 95 % Relative humidity
<b>Ex-approvals</b>	
IECEX	Ex d e ia [ia] IIA T4 Gb
ATEX	II 2G Ex d e ia [ia] IIA T4 Gb
<b>Enclosure rating</b>	
	IP 66 / IP 67
<b>Analog outputs</b>	1 output: 4 ... 20 mA
<b>Interfaces</b>	RS-485 (option), externally powered
<b>Bus protocol</b>	HART® compatible Modbus ASCII / RTU (option)
<b>Dimensions (W x H x D)</b>	300 mm x 375 mm x 229 mm (for details see dimensional drawings)
<b>Weight</b>	28 kg
<b>Material</b>	Meter body: carbon steel (ASTM A350 LF2 or ASTM A352 Gr. LCC)
<b>Electrical connection</b>	
Voltage	16 ... 30 V DC

	Via AO loop, 2-wire-concept
Power consumption	< 65 mW
Process connections	Connection flanges: 4" ANSI B16.5, Class 150 RF

#### Volume correction

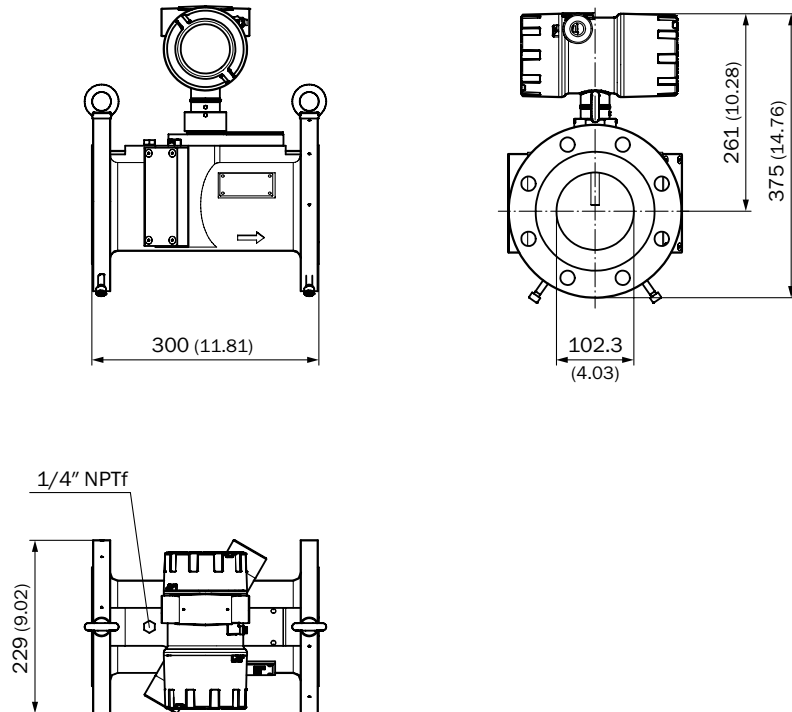
Accuracy	
	≤ ± 0.5 % Depending on the uncertainty of pressure measurement
Correction method	PTZ or TZ
Compressibility	AGA 8 Gross method 1 AGA 8 Gross method 2

#### Integrated temperature sensor

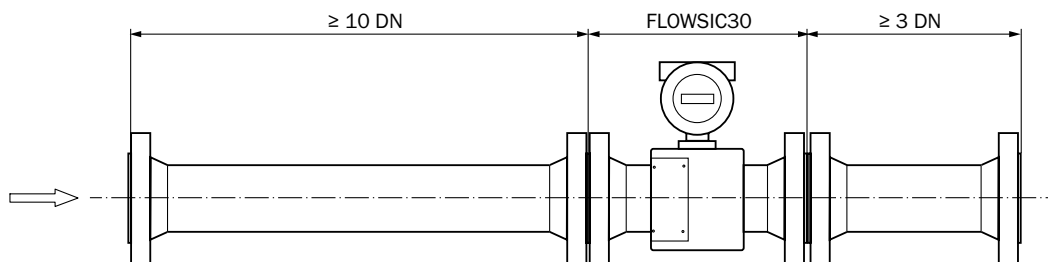
Description	Digital sensor, mounted into thermowell
Measuring ranges	
Temperature	-10 ... +80 °C
Uncertainty of measurement	
	≤ ± 0.3 % Of the measured value in K

#### Ordering information

Our regional sales organization will help you to select the optimum device configuration.

**Dimensional drawings** (Dimensions in mm (inch))**Instruction for installation**

FLOWSIC30 integration for unidirectional use



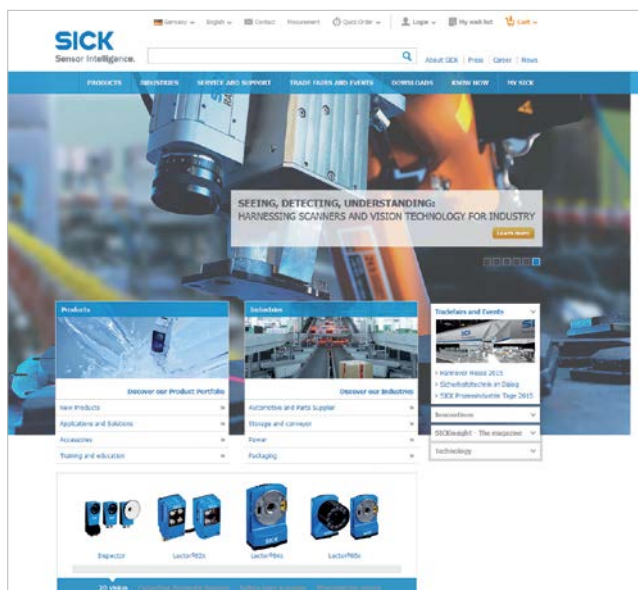






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## SERVICES FOR MACHINES AND SYSTEMS: SICK LifeTime Services

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Safe and professional



### Product and system support

Reliable, fast and on-site



### Verification and optimization

Safe and regularly inspected



### Upgrade and retrofits

Easy, safe and economical



### Training and education

Practical, focused and professional

## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With almost 7,000 employees and over 50 subsidiaries and equity investments as well as numerous representative offices worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

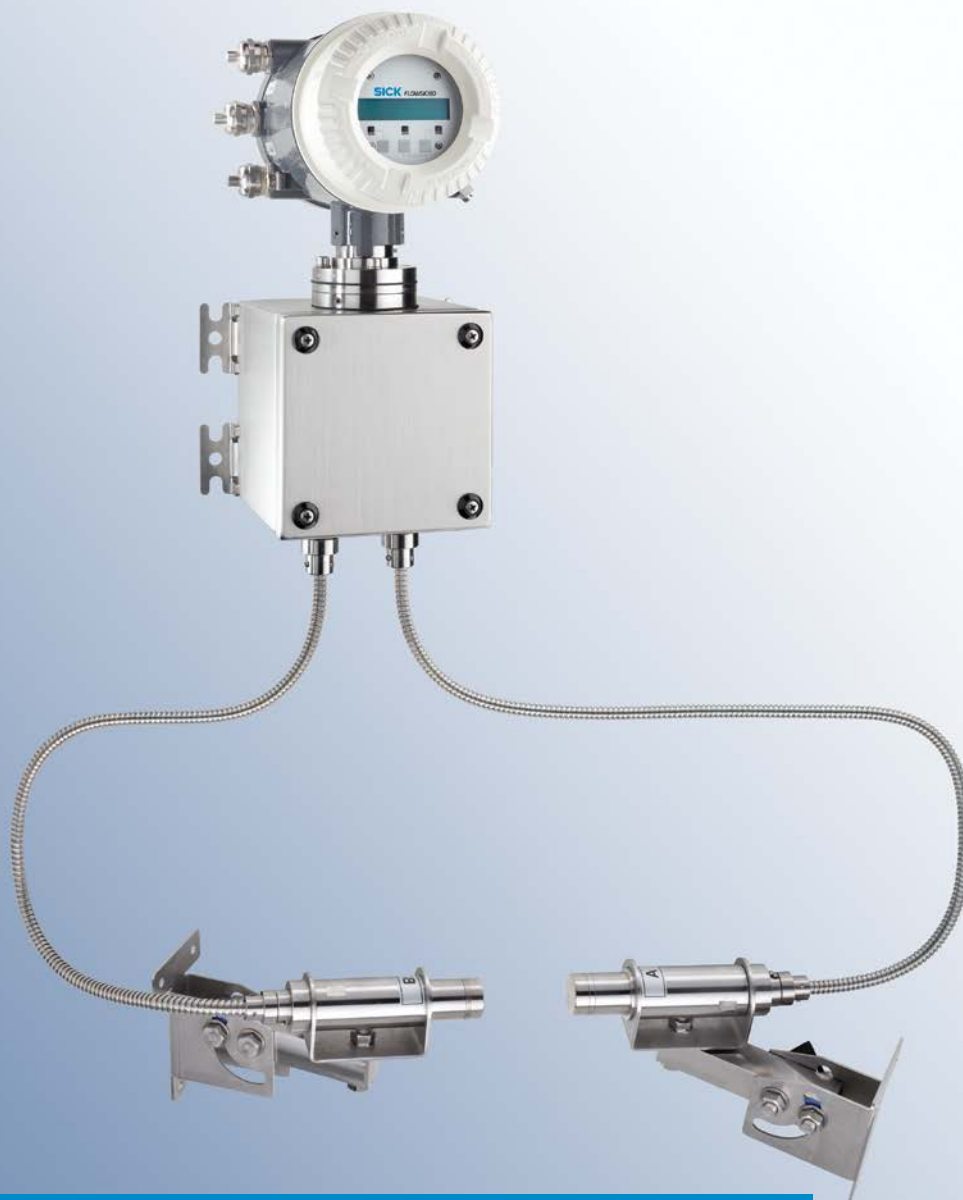
Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

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Detailed addresses and additional representatives → [www.sick.com](http://www.sick.com)

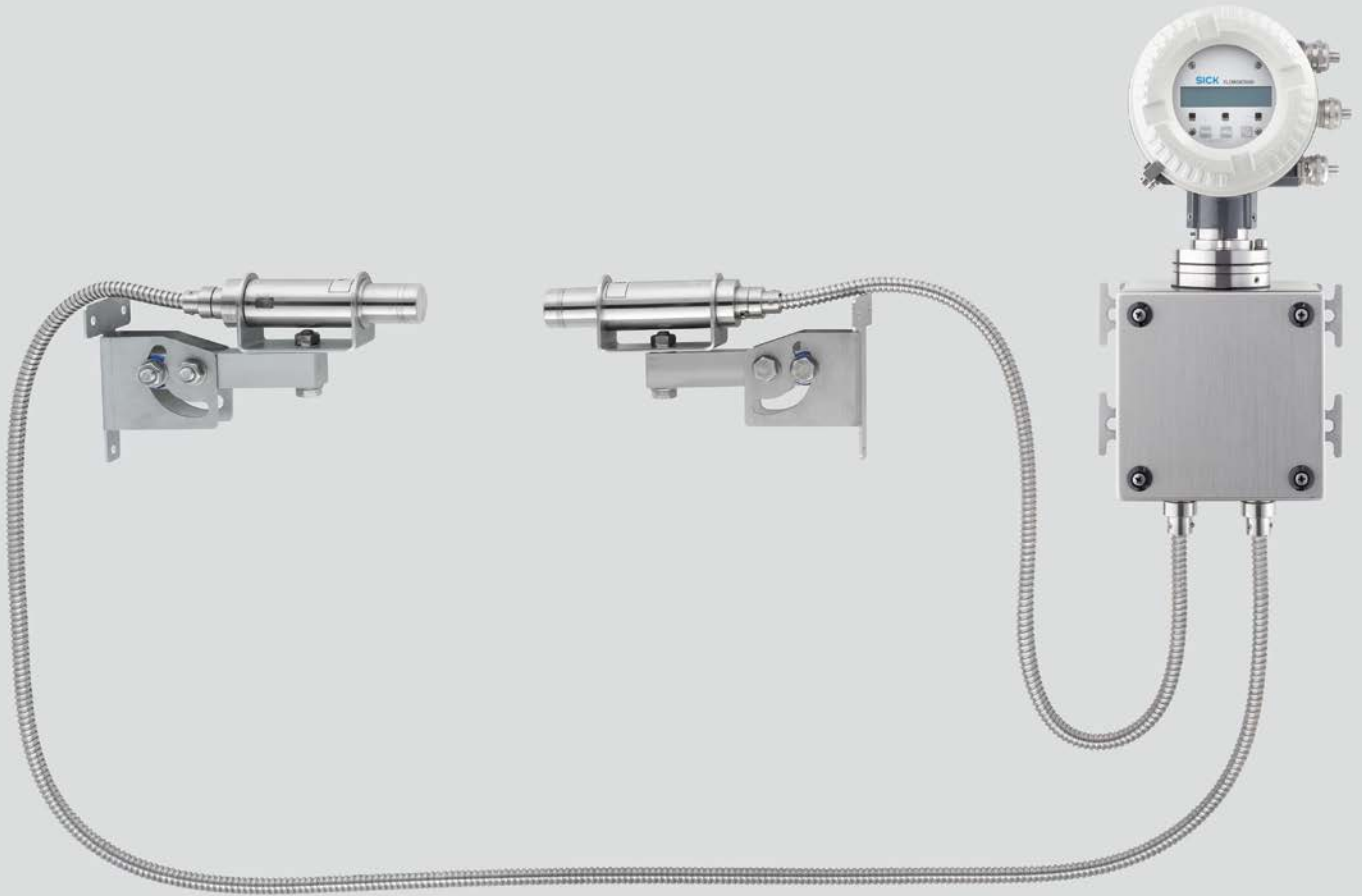


## **FLOWSIC60**

### **Ultrasonic air velocity meter**

Continuous air flow measurement  
for mining applications

## Continuous air flow measurement in mining – safe and reliable



It's often the little things that matter – take fresh air, for example, it is of crucial importance in mining. Therefore, sufficient ventilation must be ensured at all times. For this, the supply and exhaust air flows are measured regularly, which is often manually intensive and time consuming by anemometer. The FLOWSIC60 from SICK, one of Germany's leading sensor manufacturers, performs this task automatically. The ultrasonic measurement principle operates wear-free and continuously measures air velocity across the entire tunnel cross section. It offers maximum reliability in harsh environments and saves time. Due to its intrinsically safe design, the FLOWSIC60 is also well suited for other applications in potentially explosive atmospheres.

### Maximum reliability

The FLOWSIC60 measures air velocity using ultrasonic technology. It operates without mechanically moving parts and is largely resistant to contamination. Air velocity is measured across the entire tunnel cross section. This ensures maximum reliability even in challenging ambient conditions.

### Simple operation

Only a few settings are made from the operator display after mounting the device. The FLOWSIC60 then operates automatically and without interruption. In addition to the measured value, various diagnostic values can be displayed.

### Rugged components

Conditions underground are rough – the FLOWSIC60 is made to handle them. The rugged stainless steel components are connected to each other by metal-reinforced sensor cables. In addition, all components are protected against the ingress of dirt and moisture. Reliability is increased and maintenance kept to a minimum.

### Convenient application

Space-saving installation on both sides of the tunnel ensures flexibility and keeps installation costs low. Once mounted, the FLOWSIC60 continuously measures air velocity in the tunnel and makes measurement results available as an analog signal. Both the direction of flow and measurement malfunctions are detected and signaled.

### Low maintenance costs

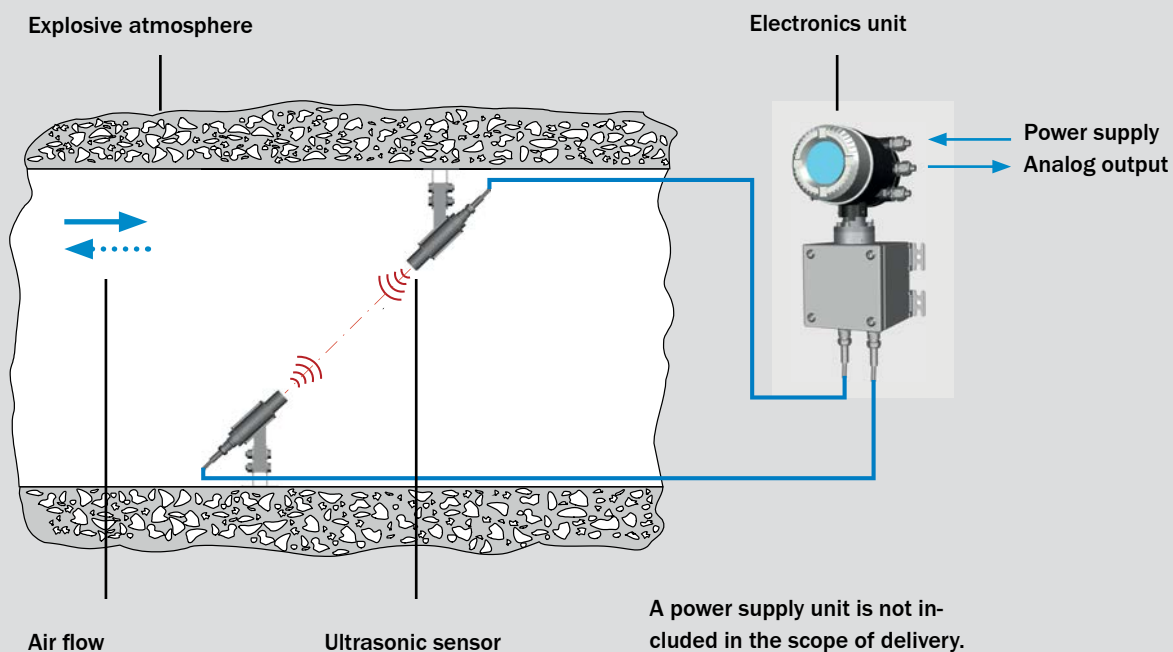
The ultrasonic measurement principle of the FLOWSIC60 is nearly maintenance and wear-free. Additionally, integrated self-diagnostics continuously monitors the status of the FLOWSIC60 and warns against incorrect measurements before they occur. Maintenance can be carried out at long intervals or based on the status of the device.

### Intrinsically safe system

The design of the FLOWSIC60 is intrinsically safe and approved according to IECEx with the equipment protection level (EPL) "Ma" for use in potentially explosive atmospheres. It meets the strictest international explosion protection requirements for use in mining and helps provide maximum safety.

## Product overview

The FLOWSIC60 consists of three components. The two ultrasonic sensors are mounted on opposite sides of the tunnel and connected by a pre-assembled sensor cable to the electronics unit. The electronics unit operates the FLOWSIC60 and uses the analog output to make the current air velocity in the tunnel available.



## Continuous air flow measurement for mining applications



### Product description

The FLOW SIC60 ultrasonic measuring device uses ultrasonic signals to continuously measure air velocity in tunnels and shafts. The rugged measuring device consists of high-quality stainless steel components and is ideal for use in harsh environments. Once installed, the FLOW SIC60 continuously and automatically measures air velocity across the entire tunnel cross section and displays the

measurement result via the analog output, making integration in monitoring systems simple. Because safety underground is top priority, the FLOW SIC60 is intrinsically safe and certified for use in mining according to IECEx. Low Maintenance, wear-free operation and integrated self-monitoring offer a high degree of safety and convenience for air flow measurement in explosion proof areas.

### At a glance

- Continuous air flow measurement
- Intrinsically safe with IECEx approval for zone 0 (EPL Ma)
- Ultrasonic technology with no moving parts
- Representative measurement across the entire tunnel cross section
- For tunnel diameters from 0.5 m to 8.5 m
- Stainless steel components and cable protective tubing for a long service life in harsh environments
- Integrated self-diagnostics
- Analog output with error current output

### Your benefits

- Safe operation by intrinsically safe measuring system
- Automatic air flow measurement
- Reliable results by measurement across the entire tunnel cross section
- Long service life due to the use of durable stainless steel components and the wear-free measurement principle
- Low operating costs due to minimal maintenance work and integrated self-diagnostics
- Reduced installation and commissioning effort due to flexible mounting positions and simple electrical installation
- Low maintenance and long service intervals due to no moving parts and high tolerance to contamination
- Easy connection to monitoring and control systems via analog measurement signal



### Additional information

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Characteristics .....	9

→ [www.mysick.com/en/FLAWSIC60](http://www.mysick.com/en/FLAWSIC60)

For more information, just enter the link and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

## Fields of application

- Air flow measurement in explosion proof areas
- Measurement of the supply and exhaust air in mines
- Ventilation monitoring and control in mining shafts and tunnels

## Detailed technical data

### System

Measured variables	Air velocity
Measurement principle	Ultrasonic propagation time delay measurement
Measurement medium	Air (atmospheric conditions)
Measuring ranges	
Air velocity	–10 to 10 m/s
Measurement uncertainty	At 0.1 to 0.5 m/s: $\pm 0.1$ m/s At 0.5 to 10 m/s: $\pm 2$ %
Ambient temperature	–40 °C to +60 °C
Storage temperature	–40 °C to +70 °C
Ambient humidity	$\leq 95$ % Relative humidity; non-condensing
Ex-approvals	
IECEX	Ex ia [ia] I Ma Ex ia [ia] IIA T4 Ga
Electrical safety	CE, IECEX
Enclosure rating	IP 66 / IP 67
Signal outputs	1 analog output, passive, 4...20 mA, $< 250 \Omega$ , galvanically isolated 1 status output, passive, galvanically isolated, acc. to NAMUR (EN 50227)
Dimensions (W x H x D)	Details, see dimensional drawings
Weight	Transmitter/receiver unit: approx. 4 kg Control unit SPU: approx. 6 kg
Mounting	Universal wall/ceiling bracket Mounting components included Sensor cable length: 15 m
Electrical connection	
Voltage	13.5 to 24 V DC Intrinsically safe supply
Power consumption	$\leq 1$ W
Scope of delivery	The scope of delivery depends on application and customer specifications

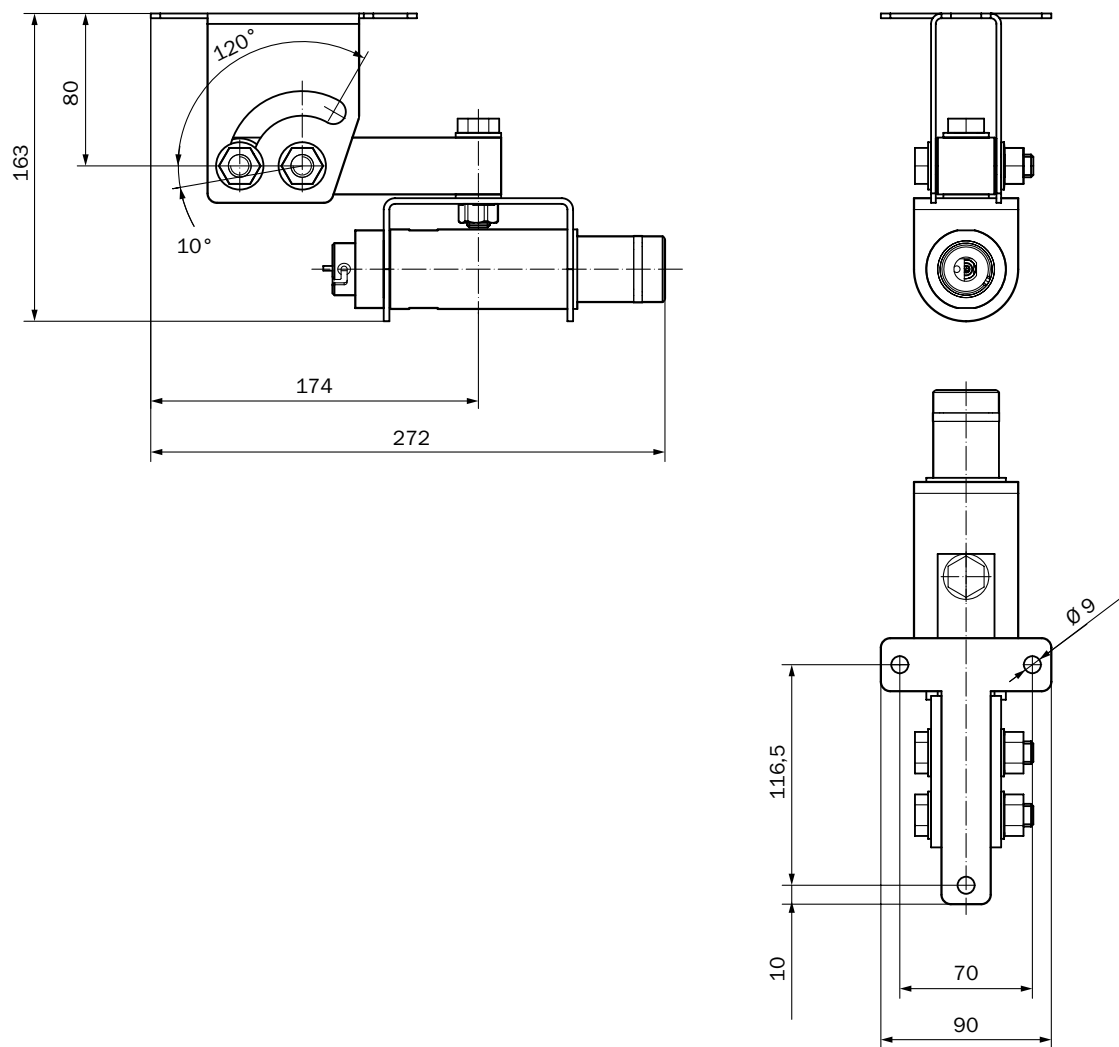
## Ordering information

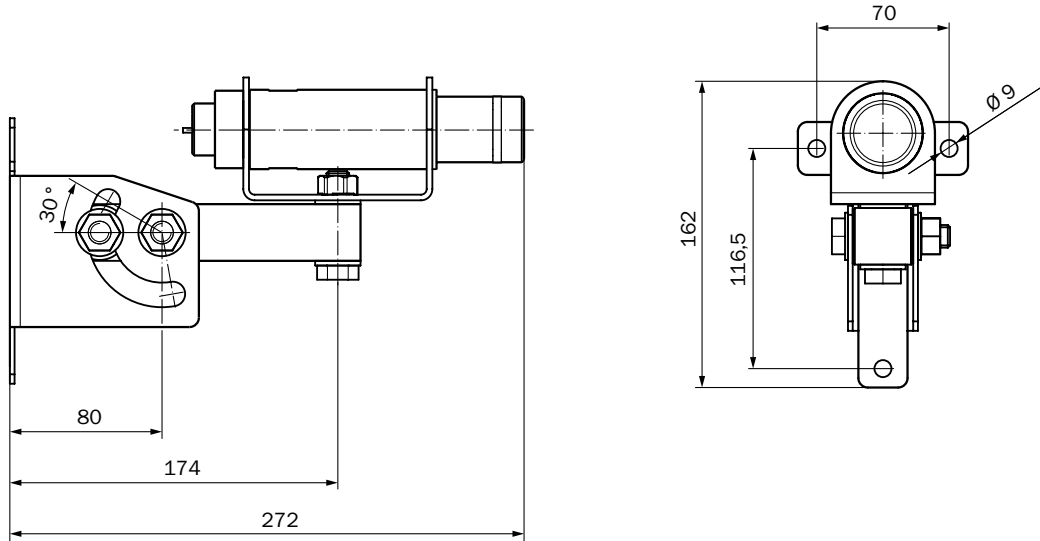
Our regional sales organization will help you to select the optimal device configuration.

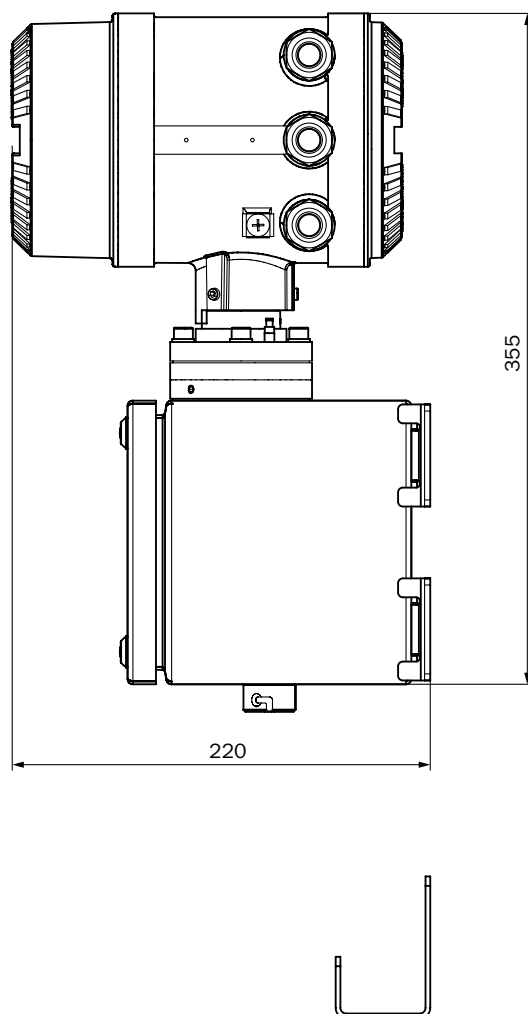
## Dimensional drawings

Dimensions in mm

### Sender/receiver unit: Ceiling mount

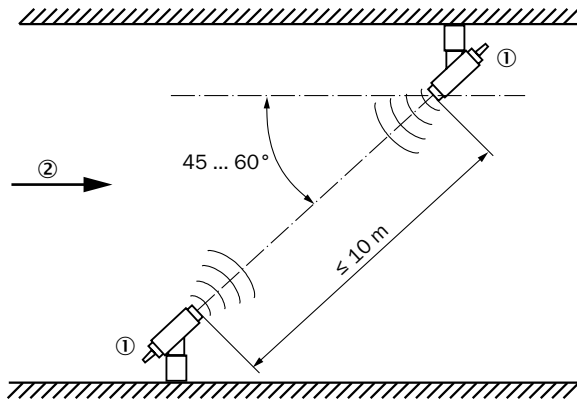


**Sender/receiver unit: Wall mount**

[illegible]

## Installation instructions

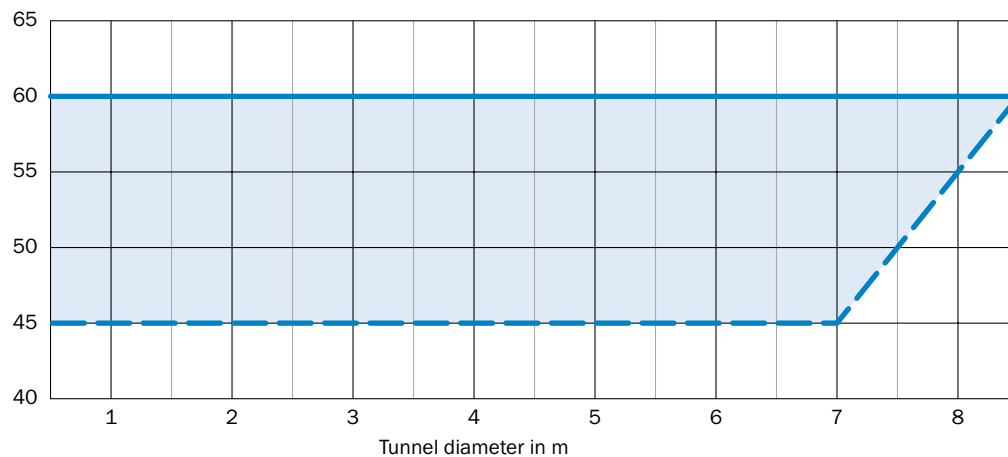
### Path layout



- ① Sender/receiver unit
- ② Direction of the airflow

### Approved installation angle

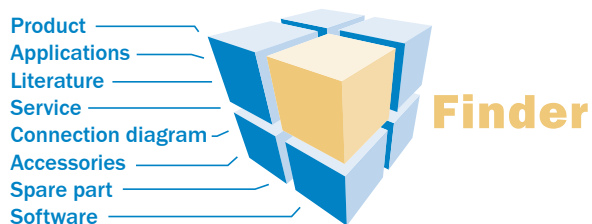
Installation angle in degrees





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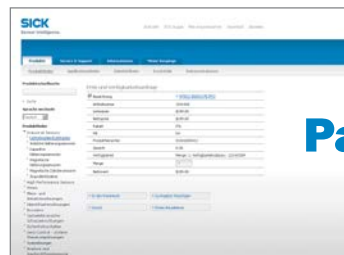


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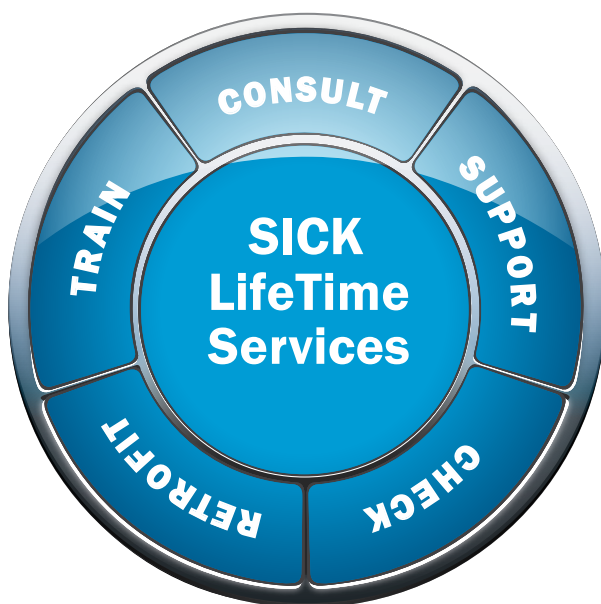
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## For safety and productivity: SICK LifeTime Services

SICK LifeTime Services is a comprehensive set of high-quality services provided to support the entire life cycle of products and applications from system design all the way to upgrades. These services increase the safety of people, boost the productivity of machines and serve as the basis for our customers' sustainable business success.



### Consulting & Design

Globally available experts for cost-effective solutions



### Product & System Support

Fast and reliable, by telephone or on location



### Verification & Optimization

Checks and recommendations for increased availability



### Upgrade & Retrofits

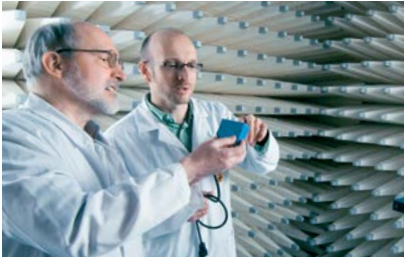
Uncovers new potential for machines and systems



### Training & Education

Employee qualification for increased competitiveness

## SICK at a glance



### Leading technologies

With a staff of more than 6,000 and over 40 subsidiaries and representations worldwide, SICK is one of the leading and most successful manufacturers of sensor technology. The power of innovation and solution competency have made SICK the global market leader. No matter what the project and industry may be, talking with an expert from SICK will provide you with an ideal basis for your plans – there is no need to settle for anything less than the best.



### Unique product range

- Non-contact detecting, counting, classifying, positioning and measuring of any type of object or media
- Accident and operator protection with sensors, safety software and services
- Automatic identification with bar code and RFID readers
- Laser measurement technology for detecting the volume, position and contour of people and objects
- Complete system solutions for analysis and flow measurement of gases and liquids



### Comprehensive services

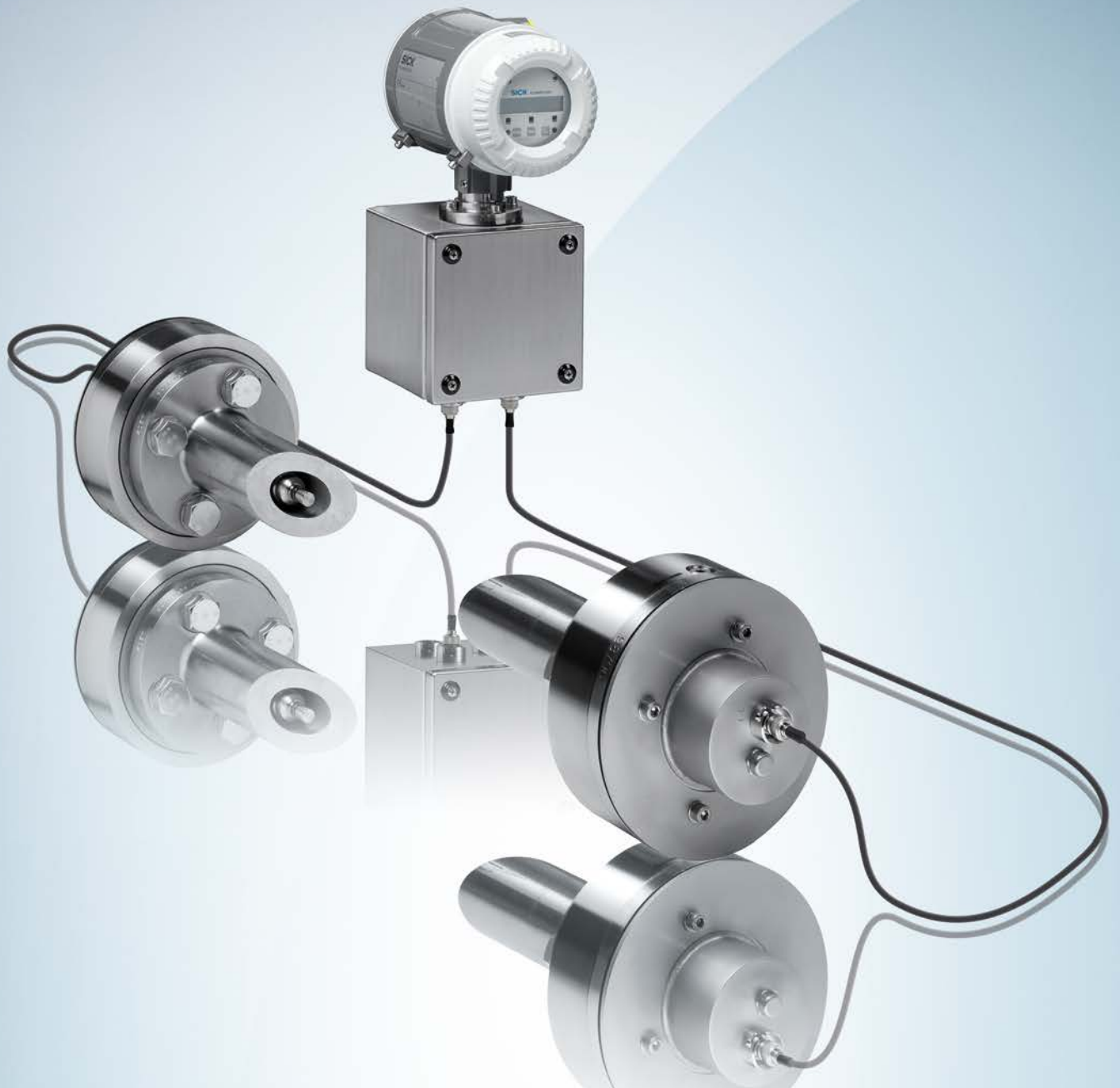
- SICK LifeTime Services – for safety and productivity
- Application centers in Europe, Asia and North America for the development of system solutions under real-world conditions
- E-Business Partner Portal [www.mysick.com](http://www.mysick.com) – price and availability of products, requests for quotation and online orders

Worldwide presence with subsidiaries in the following countries:

Australia  
Belgium/Luxembourg  
Brasil  
Česká Republika  
Canada  
China  
Danmark  
Deutschland  
España  
France  
Great Britain  
India  
Israel  
Italia  
Japan

México  
Nederland  
Norge  
Österreich  
Polska  
România  
Russia  
Schweiz  
Singapore  
Slovenija  
South Africa  
South Korea  
Suomi  
Sverige  
Taiwan  
Türkiye  
United Arab Emirates  
USA

Please find detailed addresses and additional representatives and agencies in all major industrial nations at [www.sick.com](http://www.sick.com)



# FLOWSIC300

NON-CUSTODY TRANSFER MEASUREMENT AND  
PROCESS MONITORING

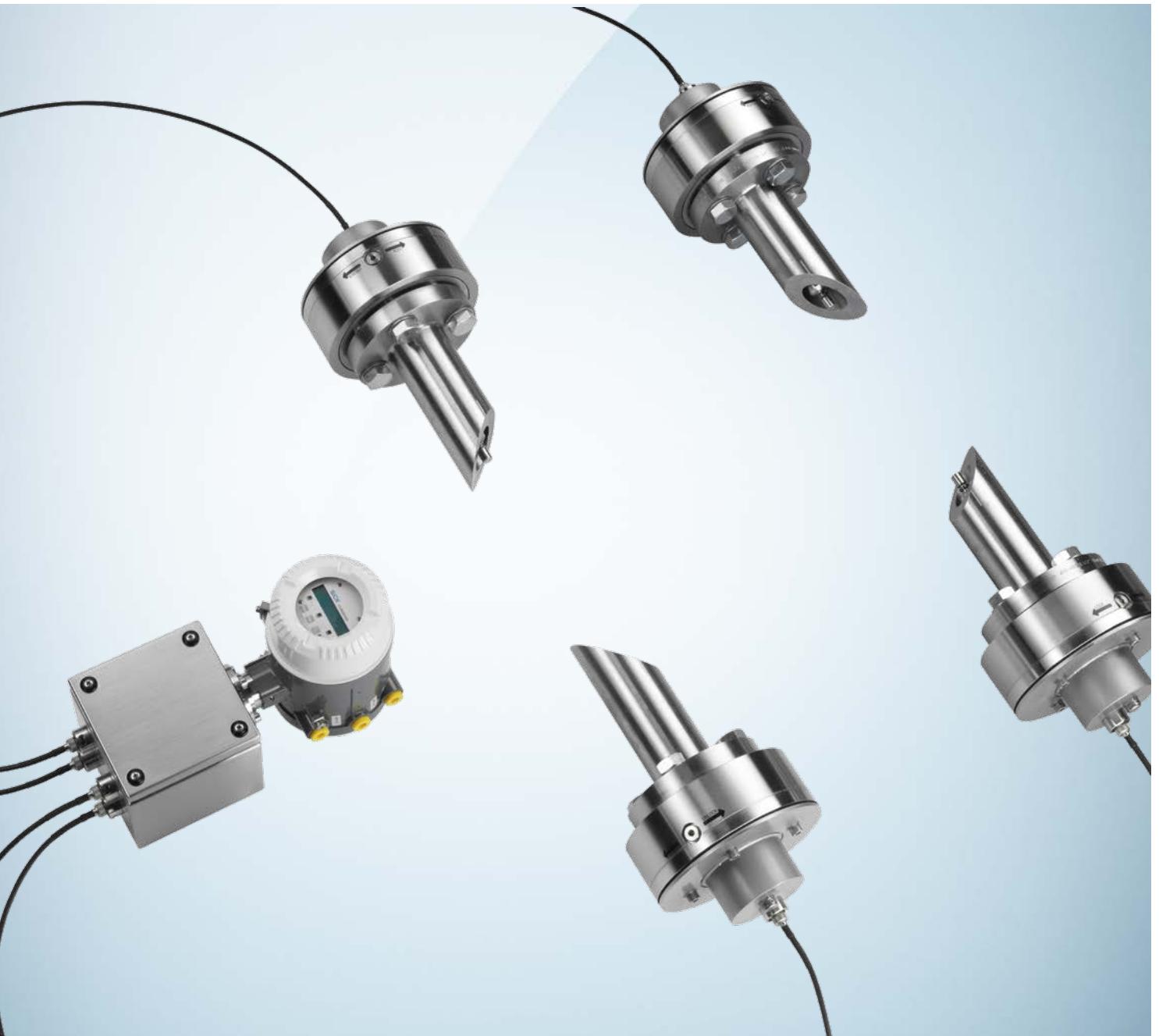
Gas flow meters

**SICK**  
Sensor Intelligence.

## FLOW MEASUREMENT THAT PROVIDES BOTH COST-EFFECTIVENESS AND QUALITY

Worldwide, gas in the natural gas networks needs to be measured, even if it is not billed – for example for process monitoring and balancing or for leak detection. Carrying out these measurements using conventional gas flow meters is not cost-effective in large pipelines. The components used must meet high quality requirements to withstand the most challenging environments.

The FLOWSIC300 from SICK, a leading sensor manufacturer, is the ideal solution for this apparent contradiction: It combines quality components and software to produce an economic gas flow meter for flexible use. It can be installed into existing pipelines with a space-saving layout. It is suitable both for non-custody transfer measurement of natural gas and for process measurements in the petrochemical industry.



### Maximum reliability

The FLOWSIC300 measures gas flow using ultrasonic technology. It operates without mechanically moving parts, and is largely resistant to contamination and wear. The FLOWSIC300 incorporates proven technology and components of the custody transfer gas flow meters from SICK. This ensures maximum reliability even in challenging ambient conditions.

### Simple installation

The FLOWSIC300 can be installed into existing pipelines in a space-saving layout, it is versatile in usage and installation costs are low. The installation site can be chosen flexibly thanks to remote electronics. Installation in underground compartments is also possible. For installation with the hot-tapping procedure, it is not necessary to interrupt the ongoing process.

### Reduced purchase costs

The lack of a meter body reduces investment costs in particular with line sizes over 12 inches. After the installation, only the equipment that is absolutely essential remains on the pipeline. For sensor replacement during operation, a ball valve only forms part of the optional sensor extraction tool that is suitable for different measuring points.

### Low operating costs

The ultrasonic measuring principle does not generate any pressure loss, wear and is low maintenance. The integrated diagnostics also continuously monitor the status of the FLOWSIC300 and warn against incorrect measurements before they occur. This means that condition-based maintenance can be carried out and costs can be reduced. Thanks to the low power consumption, the power supply can even be realized via a solar module.

### Integrated volume correction

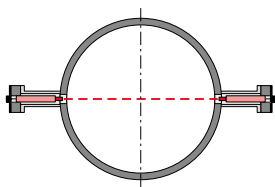
With the optionally integrated volume correction functionality using recognized algorithms a flow computer is unnecessary in many cases. The pressure and temperature sensors can be fed directly into the FLOWSIC300 to achieve this. An easy-to-implement connection to standard flow computers is still guaranteed where required.

### Powerful software

The software offers multiple data and parameter logs, comprehensive reports and continuous self-monitoring of the equipment with early warnings. All this combines to provide an easy-to-understand interface.

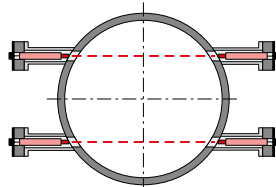
## Product overview

The FLOWSIC300 is available in 1-path and 2-path configurations. The **1-path configuration** is ideal for installation onto pipes with small nominal diameters and for basic control measurements. The **2-path configuration** offers a higher level of accuracy, in particular with flow disturbances. Suitable for installation and sensor replacement during ongoing operations is the universal **sensor extraction tool** that offers maximum security with pressure lock. For the highest possible measurement accuracy and ease-of-use, the FLOWSIC300 can be pre-installed and calibrated at SICK in a **pipe section (spool)**.



1-path configuration

- Low installation costs
- Ideal for diameters less than 12 inches
- Cost-effective



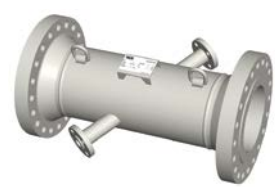
2-path configuration

- Higher measurement accuracy
- Ideal for diameters over 12 inches
- Increased resistance to flow disturbances



Optional sensor extraction tool

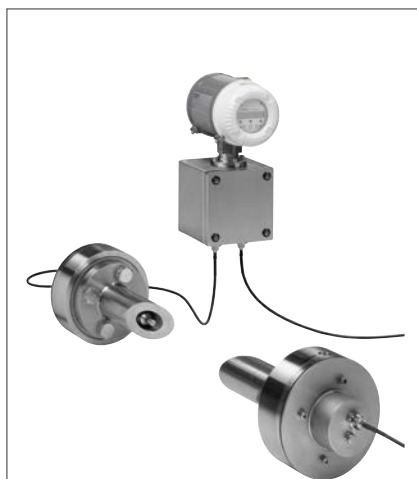
- For installation during ongoing operations (hot-tapping procedure)
- For probe replacement during ongoing operations
- Can be used universally for all FLOWSIC300 devices



Optional pre-installation into a pipeline

- Maximum measurement accuracy
- Complete configuration at factory
- Easy installation on site

# NON-CUSTODY TRANSFER MEASUREMENT AND PROCESS MONITORING



## Product description

The FLOWSIC300 ultrasonic flowmeter features a unique combination of high quality components, large measuring range, simple installation and low installation costs. It can be used anywhere where custody approval is not required: for internal measurements in the natural gas grid and with process measurements in the petrochemical industry. The FLOWSIC300 incorporates proven technology and components of the custody transfer gas flow meters from SICK

for custody transfer and combines these to produce a cost-effective flowmeter for a variety of applications. The transmitter at a distance of up to 15 m away from the measuring point facilitates a high level of flexibility in installation and includes continuous self-diagnostics. The ultrasonic measurement principle does not generate any pressure loss, has no moving parts, is resistant to pulsations and pressure regulator noise and is ideal for reliable and drift-free operation.

## At a glance

- Quality components
- Modular flexible installation
- Non-contact ultrasonic technology without pressure loss
- Measuring range span greater than 100 : 1
- Sensors can be replaced under pressure
- Low sensitivity to pulsation and pressure regulator noise
- Remote electronics (max. 15 m)
- Bi-directional measurement with automated diagnostics

## Your benefits

- Reliable flow measurement for checking purposes
- Simple installation into existing pipelines
- Efficient solution, especially for pipe diameters over 12 inches, thanks to installation onto existing pipelines and without need for a meter body
- Reduced acquisition costs – the sensor extraction tool can be used for multiple devices
- Low maintenance, wear and no deterioration
- Low operating costs thanks to automated diagnostics and condition-based maintenance
- Suitable for installation in underground compartments via remote electronics and sensors with enclosure rating IP 68



## Additional information

Fields of application . . . . .	5
Detailed technical data . . . . .	5
Measuring ranges . . . . .	6
Ordering information . . . . .	7
Dimensional drawings . . . . .	7

→ [www.mysick.com/en/FLOWSIC300](http://www.mysick.com/en/FLOWSIC300)

For more information, just enter the link and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

## Fields of application

- Gas flow measurement in non custody transfer applications
- Control measurements in the field of natural gas transfer and storage
- Internal measurements for balancing purposes
- Associated gas measurement
- Efficiency monitoring in gas compressor stations
- Flare gas and process measurements for design pressure of over 16 bar
- Pipeline leakage detection

## Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

### System

<b>Measured values</b>	Volumetric flow, a. c., volume a. c., gas velocity, sound velocity
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Number of measuring paths</b>	1, 2
<b>Measuring medium</b>	Natural gas, process gases, high pressure flare gases, air
<b>Measuring ranges</b>	Gas velocity 0.3 ... 60 m/s Depending on the nominal size of the pipe
<b>Measuring span</b>	Max. 1 : 130
<b>Repeatability</b>	< 0.5 % of the measured value
<b>Uncertainty of measurement</b>	1 % ... 5 % Of the measured value (depending on device configuration)
<b>Gas temperature</b>	-40 °C ... +180 °C
<b>Operating pressure</b>	10 bar (g) ... 100 bar (g)
<b>Nominal pipe size</b>	4" ... 56"
<b>Ambient temperature</b>	-40 °C ... +60 °C
<b>Storage temperature</b>	-40 °C ... +70 °C
<b>Ambient humidity</b>	≤ 95 % Relative humidity; non-condensing
<b>Ex-approvals</b>	ATEX II 1/2G Ex de iB [ia] IIC Ta IECEX Gb/Ga Ex de ib [ia Ga] IIC T4 CSA On request The ultrasonic sensors are intrinsically safe: "ia"
<b>Electrical safety</b>	CE
<b>Enclosure rating</b>	Sender/receiver units IP 68 SPU control unit IP 65 / IP 67
<b>Analog outputs</b>	1 output: 4 ... 20 mA, 200 Ω Active/passive, electrically isolated
<b>Digital outputs</b>	3 outputs:  Passive, electrically isolated, Open Collector or according to NAMUR (EN 50227), $f_{\max} = 6 \text{ kHz}$ (scalable)
<b>Interfaces</b>	1 x RS-485 (for configuration, measured value output and diagnosis)
<b>Bus protocol</b>	Modbus ASCII / RTU HART

<b>Dimensions (W x H x D)</b>	See dimensional drawings		
<b>Weight</b>	Sender/receiver unit: approx. 15 kg SPU control unit: approx. 6 kg Retraction device in case: approx. 45 kg Adapter 1.5" Cl.600: approx. 5 kg		
<b>Mounting</b>	Assembly nozzle 1.5" Cl.600 according ANSI B16.5 for welding on the pipe Length of sensor cables: 5 m or 15 m Installation of control unit SPU on 2"-tube or wall mounting		
<b>Electrical connection</b>			
	Voltage	12 ... 28.8 V	
		With active analog output: 15 ... 28.8 V	
	Power consumption	≤ < 1 W	

## Measuring ranges

### System

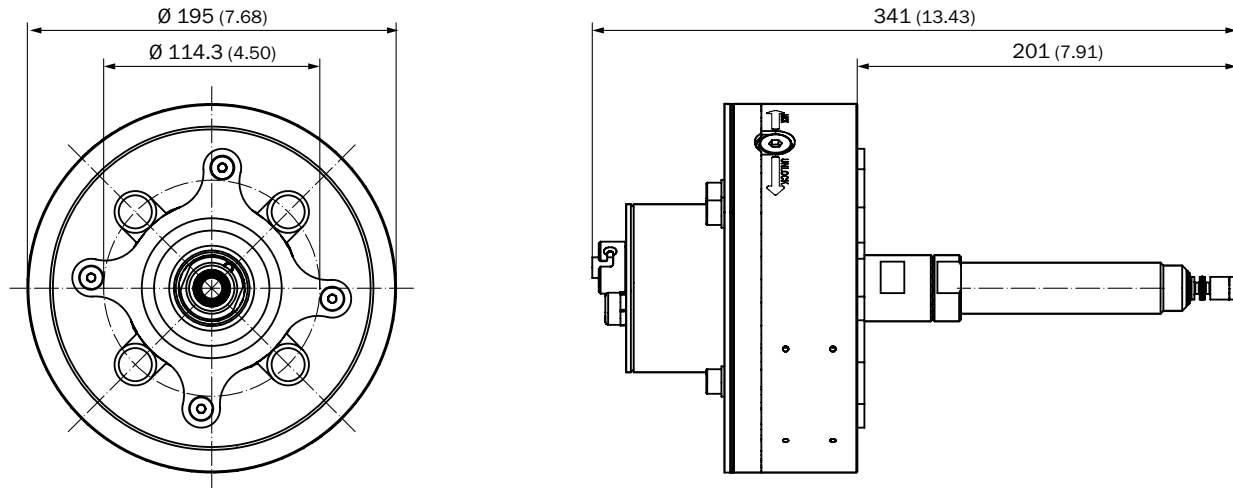
Nominal size		Inner diameter, typical	Maximum volume flow a. c.		Maximum velocity
		mm	m³/h	ft³/h	m/s
DN 100	4"	102.3	1,700	59,500	60
DN 150	6"	154.1	3,300	115,500	50
DN 200	8"	202.7	5,200	182,000	45
DN 250	10"	254.4	7,300	255,500	40
DN 300	12"	304.8	8,600	301,000	33
DN 350	14"	336.6	10,500	367,500	33
DN 400	16"	387.4	14,000	490,000	33
DN 450	18"	438.2	17,900	626,500	33
DN 500	20"	489	22,300	780,500	33
DN 600	24"	590.6	32,500	1,137,500	33
DN 700	28"	692.2	40,600	1,421,000	30
DN 750	30"	743	46,800	1,638,000	30
DN 800	32"	793.8	53,400	1,869,000	30
DN 900	36"	895.4	68,000	2,380,000	30
DN 1000	40"	992.2	83,500	2,922,500	30
DN 1050	42"	1,043	92,200	3,227,000	30
DN 1100	44"	1,093.8	94,700	3,314,500	28
DN 1200	48"	1,195.4	109,000	3,815,000	27
DN 1300	52" *	1,290	122,300	4,280,500	26
DN 1400	56" *	1,390	136,500	4,777,500	25
The maximum volume flow may be additionally limited by the operation pressure and damping effects.					
* Not standardized according to ANSI B36.10.					

## Ordering information

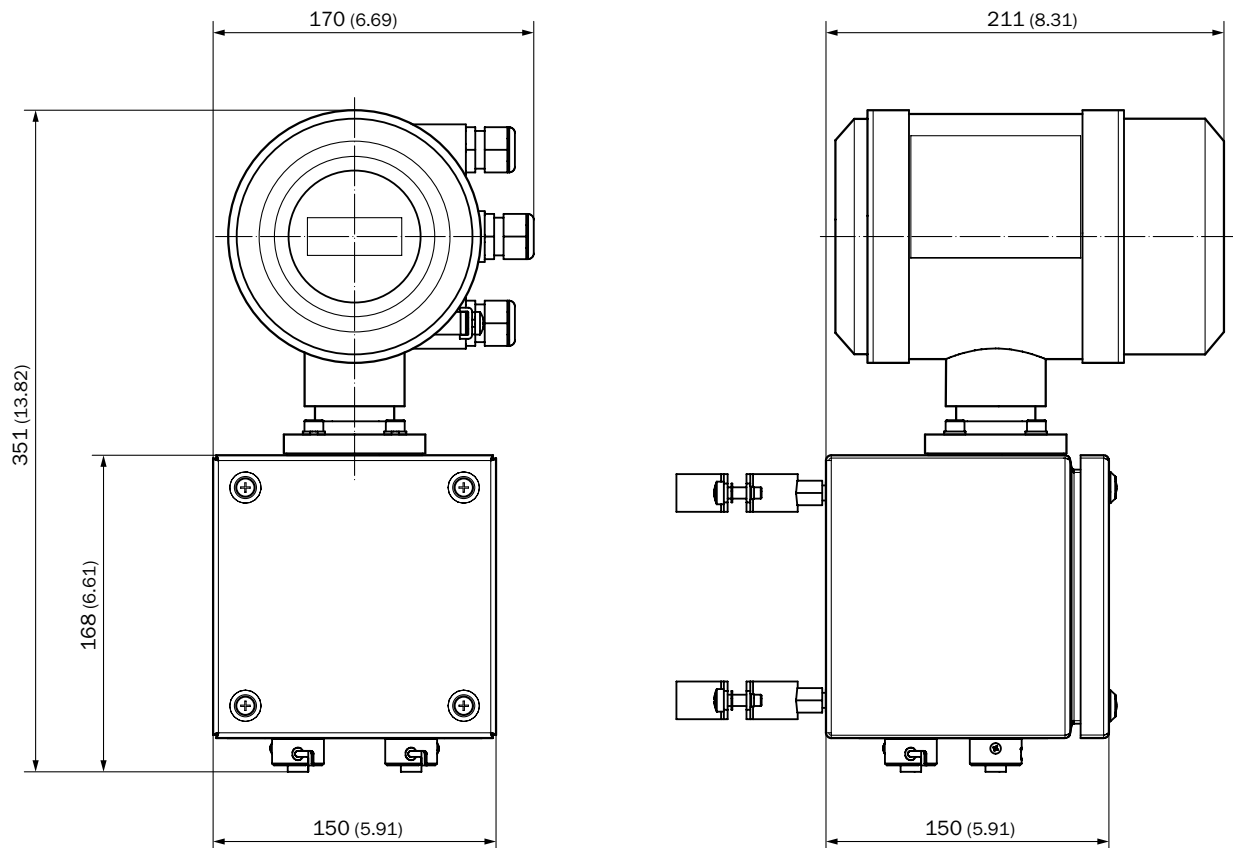
Our regional sales organization will help you to select the optimum device configuration.

## Dimensional drawings (Dimensions in mm (inch))

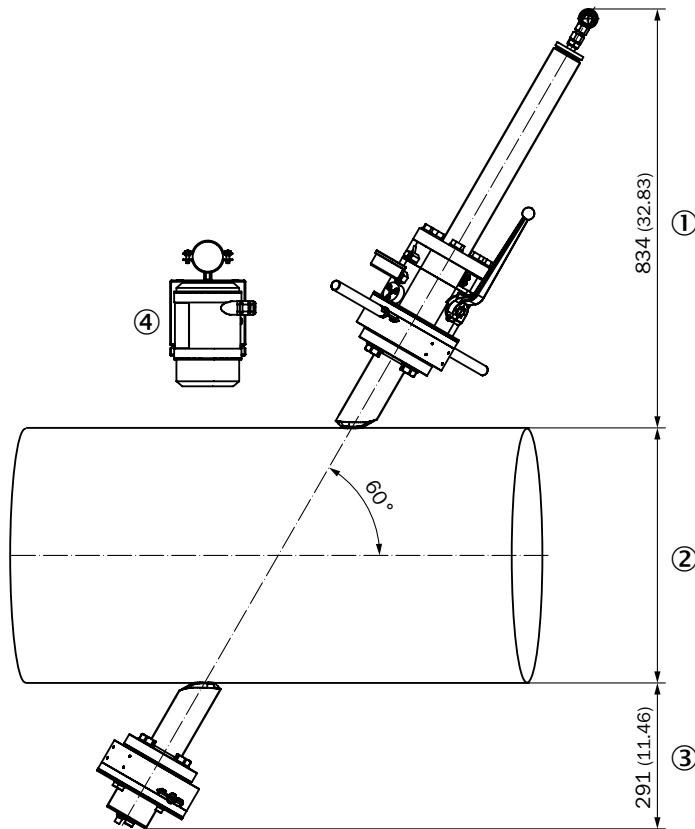
### Sender/receiver unit



### SPU control unit



## Installation



- ① Maximum lateral place requirement using the sensor extraction tool
- ② Nominal pipe size
- ③ Maximum lateral place requirement during operation
- ④ SPU control unit





## REGISTER AT [WWW.SICK.COM](http://WWW.SICK.COM) TO TAKE ADVANTAGE OF OUR FOLLOWING SERVICES FOR YOU

- ✓ Access information on net prices and individual discounts.
- ✓ Easily order online and track your delivery.
- ✓ Check your history of all your orders and quotes.
- ✓ Create, save, and share as many wish lists as you want.
- ✓ Use the direct order to quickly order a big amount of products.
- ✓ Check the status of your orders and quotes and get information on status changes by e-mail.
- ✓ Save time by using past orders.
- ✓ Easily export orders and quotes, suited to your systems.



## SERVICES FOR MACHINES AND PLANTS: SICK LifeTime Services

Our comprehensive and versatile LifeTime Services are the perfect addition to the comprehensive range of products from SICK. The services range from product-independent consulting to traditional product services.



**Consulting and design**  
Safe and professional



**Product and system support**  
Reliable, fast, and on-site



**Verification and optimization**  
Safe and regularly inspected



**Upgrade and retrofits**  
Easy, safe, and economical



**Training and education**  
Practical, focused, and professional

## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,800 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

That is “Sensor Intelligence.”

### Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations → [www.sick.com](http://www.sick.com)



# FLOWSIC500

CUSTODY TRANSFER MEASUREMENT IN NATURAL GAS DISTRIBUTION

Gas flow meters

**SICK**  
Sensor Intelligence.



## ULTIMATE MEASUREMENT CERTAINTY. FOR MUNICIPAL GAS SUPPLIERS AND INDUSTRIAL CONSUMERS

Local authorities purchase natural gas and sell it to users such as power stations, primary industries, and other industrial consumers. Because considerable volumes of gas are involved, the input and output measurement should be precise, but above all, reliable in the long term. Conventional mechanical gas meters are very difficult to monitor. On top of that, they require costly maintenance and are not as easy to handle. Now, the FLOWSIC500, the world's first ultrasonic gas meter for the natural gas distribution market, changes all that. FLOWSIC500 comes from SICK, one of the leading German sensor specialists.

### High level of measurement certainty

FLWSIC500 measures the gas flow with ultrasonic technology. It operates with no mechanical moving parts, and is not liable to wear. This provides stable measurement certainty in the long term. SICK developed ultrasonic transducers especially for the FLOWIC500, which are not sensitive to interferences. FLOWIC500: ideal for fiscal metering.

### Increased measurement reliability

FLWSIC500 is self-monitoring, in the event of an issue, such as change in electronics performance or contamination, the meter will generate an alarm. This means that there is no need for maintenance on a timed basis – resulting in a reduced cost of ownership.

### Easy handling

FLWSIC500 is more straightforward than conventional gas meters. Due to its exceptional design, the recalibration procedure on-site is much easier and quicker. The measuring components are installed in a "cartridge", which is replaced in only a few steps.

### Compact design

FLWSIC500 operates without straight inlet or outlet piping requirements. It can be equipped with an integrated volume corrector. Thus, the FLOWIC500 requires considerably less space than conventional gas meters.

### Suitable for demanding applications

With the FLOWIC500, no part of the measurement device interferes with the gas flow. Therefore, it can be used in applications where a continuous gas supply is vital, for example in hospitals.

### Power supply: No problem

Due to PowerIn Technology™, FLOWIC500 measures fail-safe in intrinsically safe line powered operation with battery back-up. Alternatively, the meter operates by battery as an energy self-sufficient configuration for a period of at least five years.

### Insensitive to overload

FLWSIC500 does not get harmed by overloading. It processes dynamic load changes without any loss in accuracy.

### Exact replacement fitting

FLWSIC500 is designed to mount easily where a conventional gas meter has been in place.

### Approved worldwide

FLWSIC500 complies with all relevant standards and regulations for natural gas distribution. This also includes the international requirements for explosion-proof areas.

## FLWSIC500



Meter size: 50 mm (2")



Meter size: 80 mm (3")



Meter size: 100 mm (4")



Meter size: 150 mm (6")

- FLOWIC500 is available in four meter sizes, all fitting to the common flange-to-flange dimensions used in natural gas distribution: DN50, DN80, DN100 and DN150 (2", 3", 4" and 6").
- The electrical connections for the transfer of measurement data and power supply are easily accessible and can be installed in just a few steps. Removing the "cartridge" requires just loosening of a few screws.
- It is possible to install the gas meter horizontally or vertically. The display can be rotated for easier reading of metering data.
- The most important functions of the measurement device can be accessed directly from the display using the key pad. User-friendly software supports the FLOWIC500 via an optical interface.

## A GAS METER AND VOLUME CORRECTOR IN ONE – SIMPLE, CONVENIENT, RELIABLE. MORE THAN JUST ONE OPTION.

Why use two devices for one task? Gas flow measurement and volume correction have the same goal: providing a precise measurement of the quantity of gas supplied. It makes sense to combine both into one device saving on installation costs and reducing the number of interfaces. Everything is conveniently available from a single source, with the same end result: precise and reliable measurement of the gas quantity in line with recognized, approved processes.

### Volume correction in line with MID

The volume corrector can be integrated into the FLOWSIC500 on request and supports all typical correction algorithms, such as SGERG88, AGA 8, and AGA NX-19. There is the option of TZ or pTZ correction, with the pTZ version approved in accordance with MID. The right temperature and pressure sensors always come with the meter.

### Redefining user-friendliness

The FLOWSIC500 operating display offers full access to all settings and measured values of the FLOWSIC500. However, it is the FLOWgate™ software that makes this device really stand out. Using simple step-by-step instructions, it guides the operator through the key functions, so commissioning or "cartridge" replacement during recalibration couldn't be easier.

### Simple installation

Just attach and connect. That's how easy it is to install the FLOWSIC500. With the integrated volume corrector and the internal pressure and temperature sensors, only the signal for the standard flow needs to be led through the system. There is no need for the usual process of connecting the gas meter to the volume corrector.

### Everything from a single source

Featuring a gas meter, volume correction, and pressure and temperature sensors all in one, the FLOWSIC500 offers everything you need, making integration simple and keeping installation costs low. SICK is your ideal partner for any application.

#### FLOWSIC500 variant overview

##### Simply an outstanding gas meter

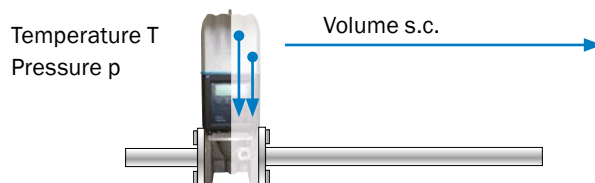
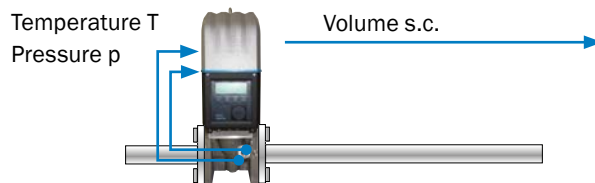
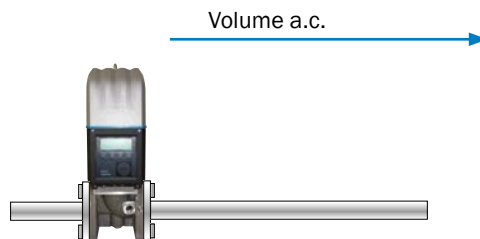
- Simple installation in the pipeline
- Connection to all standard volume correctors via LF, HF, encoder, or RS-485 output

##### Gas meter with volume corrector and external p/T sensor technology

- Minimal installation costs
- The meter is preconfigured in line with the p/T sensor technology supplied with it
- Easy access to the p/T sensors for field verification
- Option of using the p/T tapings on the meter for connecting the sensors

##### Gas meter with volume corrector and internal p/T sensor technology

- Maximum convenience during installation
- Integrated sensor technology for p/T fully pre-configured
- Just install, connect the signal output, and you're done





FLOW500 installation

### Never lose anything – comprehensive data archive and log books



#### Monthly archive

- Monthly actual, minimum, maximum, and  $\emptyset$  values
- Up to 25 entries



#### Daily archive

- Daily actual values
- Up to 600 entries



#### Measurement period archive

- Adjustable measuring period between 5 and 60 min
- Up to 6,000 entries



#### Event log book

- All events have time stamps
- Up to 1,000 entries



#### Parameter log book

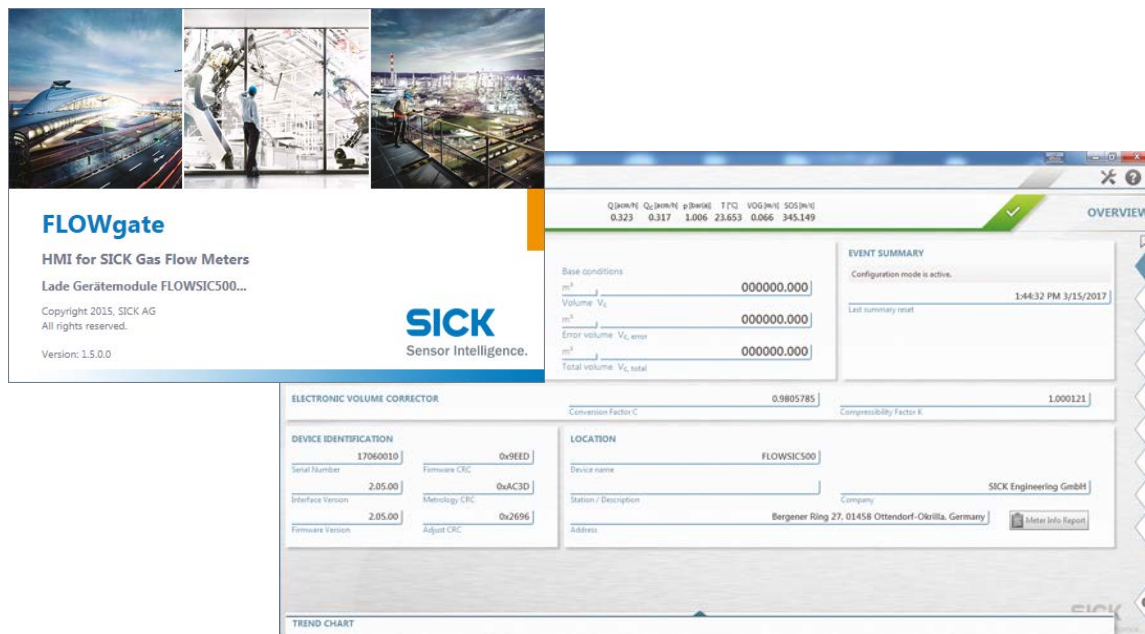
- All parameter changes are recorded
- Up to 250 entries



#### Metrology log book

- Recording of all calibration-related changes
- Up to 100 entries

### Intuitive user program – software platform FLOWgate™



Software platform FLOWgate™ – FLOW500 "Overview"

# CUSTODY TRANSFER MEASUREMENT IN NATURAL GAS DISTRIBUTION



## Product description

The cutting-edge technology for natural gas measurement:

The FLOWSIC500 ultrasonic compact gas meter from SICK ensures highly accurate metering in natural gas distribution. In absence of mechanical moving parts, the FLOWSIC500 is a robust, fail-safe and low-maintenance device – allowing for a significant reduction in operating costs. It is overload-proof, accurate and is monitored by an intelligent diagnostics system.

Recalibration is simple and straightforward by replacing the "cartridge". FLOWSIC500 can easily be integrated into existing measuring stations. The FLOWSIC500 operates either in an energy self-sufficient configuration or failsafe in network operation with battery back-up. It complies with all relevant standards and regulations. When utilized in transfer and measuring stations, FLOWSIC500 ensures a continuous and blockage free gas supply.

## At a glance

- Cutting-edge technology: ultrasound
- Diagnostics and permanent operational check
- Durable and reliable without moving parts
- Replacable "cartridge"
- Straight inlet/outlet piping not required
- Overload-proof
- Optional integrated volume correction/data registration
- Battery or intrinsically safe power supply

## Your benefits

- Ultimate measurement certainty and safety of continuous gas supply
- Reduction of installation costs due to integrated volume correction
- Simple installation, compatible with conventional technologies (turbine and rotary displacement meters)
- Minimal operating costs due to being nearly maintenance-free
- Easy recalibration due to straightforward "cartridge" replacement
- Reliable under dynamic load changes
- Self-sufficient operation



## Additional information

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Custody transfer measuring ranges ..	8
Ordering information .....	10
Dimensional drawings .....	10
Characteristic curve.....	14

→ [www.mysick.com/en/FLOWSIC500](http://www.mysick.com/en/FLOWSIC500)

For more information, just enter the link and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

## Fields of application

- Natural gas distribution in transfer and measuring stations for municipal and regional gas suppliers
- Applications where continuous gas supply must be ensured
- Measuring stations in industrial and commercial applications

## Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

## System

<b>Measured values</b>	Volume a.c., volume flow a.c., gas velocity In addition, for integrated volume correction: volume s.c., volume flow s.c.
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Measuring medium</b>	Natural gas (dry, odorized)
<b>Measuring ranges</b>	
Volume flow, a. c., (2")	35 ... 5,650 ft <sup>3</sup> /hr
Volume flow, a. c., (3")	88 ... 14,125 ft <sup>3</sup> /hr
Volume flow, a. c., (4")	141 ... 22,954 ft <sup>3</sup> /hr
Volume flow, a. c., (6")	141 ... 35,314 ft <sup>3</sup> /hr
<b>Reproducibility</b>	≤ 0.1 %
<b>Accuracy</b>	Accuracy class 1, typical error limits:
$Q_{min}$ up to $0.1 Q_{max}$	≤ ± 1 %
$0.1 Q_{max}$ up to $Q_{max}$	≤ ± 0.5 %
	Accuracy class 1, maximum allowed error limits:
$Q_{min}$ up to $0.1 Q_{max}$	≤ ± 2 %
$0.1 Q_{max}$ up to $Q_{max}$	≤ ± 1 %
	After high pressure flow calibration: ±0.2 % at test pressure; otherwise ±0.5 %
<b>Diagnostics functions</b>	Permanent monitoring of measured values
<b>Gas temperature</b>	
	–40 °C ... +70 °C (–40 °F ... +158 °F)
<b>Operating pressure</b>	Class 150 (ASME B16.5): 0 bar (g) ... 20 bar (g) (0 PSI (g) ... 290 PSI (g)) PN16 (EN 1092-1): 0 bar (g) ... 16 bar (g) (0 PSI (g) ... 232 PSI (g))
<b>Ambient temperature</b>	
:	–40 °C ... +70 °C (–40 °F ... +158 °F)
<b>Storage temperature</b>	–40 °C ... +80 °C (–40 °F ... +176 °F)
<b>Conformities</b>	OIML R137 1&2, 2012 EN 12405 : 2010 (with integrated volume correction) MID: 2014/32/EU PED: 2014/68/EU ATEX: 2014/34/EU EMC: 2014/30/EU
<b>Ex-approvals</b>	
NEC/CEC (US/CA)	CSA: I.S. for Class 1 Division 1 Groups C & D T4; Ex/AEx ia IIB T4 Ga, Class I, Division 2, Groups A, B, C, and/or D, T4
IECEX	Ex ia [ia] IIC T4 Gb, Ex op is IIC T4 Gb
ATEX	II 2G Ex ia [ia] IIC T4 Gb, II 2G Ex op is IIC T4 Gb
<b>Enclosure rating</b>	
	IP 66

<b>Digital outputs</b>	Configurations: <ul style="list-style-type: none"> <li>• LF pulses + malfunction, electrically isolated (<math>f_{\max} = 100</math> Hz)</li> <li>• HF pulses + malfunction, electrically isolated (<math>f_{\max} = 2</math> kHz)</li> <li>• Encoder + LF pulses, electrically isolated (<math>f_{\max} = 100</math> Hz)</li> <li>• Encoder, electrically isolated + HF pulses, not electrically isolated (<math>f_{\max} = 2</math> kHz)</li> <li>• 2 x LF pulses, electrically isolated (<math>f_{\max} = 100</math> Hz)</li> </ul>
<b>Interfaces (Optional)</b>	RS-485 module (externally powered) alternative to digital outputs, Modbus RTU protocol, Optical interface (according to EN62056-21 (Section 4.3)
<b>Dimensions (W x H x D)</b>	See dimensional drawings
<b>Weight</b>	See dimensional drawings
<b>Material in contact with media</b>	Aluminum AC-42100-S-T6
<b>Mounting</b>	Horizontal or vertical installation with 0 D straight inlet/outlet piping
<b>Electrical connection</b>	
<b>Voltage</b>	Intrinsically safe supply: 4.5 ... 16 V DC
	Inclusive 3-months back-up battery
<b>Options</b>	Battery powered meter configuration (more than 5 years battery runtime)

### Volume correction

<b>Accuracy</b>	Accuracy class 0.5; Maximum allowed error limits:
<b>Correction factor C:</b>	$\leq \pm 0.5$ % (at reference conditions)
<b>Correction method</b>	pTZ or TZ
<b>Compressibility</b>	SGERG88 AGA 8 Gross method 1 AGA 8 Gross method 2 AGA NX-19 AGA NX-19 mod. GERG91 Fixed value
<b>Data archives</b>	Measurement period archive (6,000 entries) Daily archive (600 entries) Monthly archive (25 entries)
<b>Log books</b>	<ul style="list-style-type: none"> <li>• Event log book (1,000 entries)</li> <li>• Parameter log book (250 entries)</li> <li>• Metrology log book (100 entries)</li> </ul>

### Pressure sensor

<b>Measuring ranges</b>	
<b>Relative pressure</b>	0 ... 290 PSI (g)

### Temperature sensor

<b>Measuring ranges</b>	
<b>Temperature</b>	-40 °C ... 70°C (-40 °F ... +158 °F)
<b>Sensor type</b>	Platinum resistance sensor Pt1000 in stainless steel protective tube
<b>Ambient temperature</b>	-40 °C ... +85°C (-40 °F ... +185 °F)

## Custody transfer measuring ranges

Nominal pipe size	Meter rating	Measuring range				Rangeability
		min. [cfh] ±1%	max. [cfh]	min. [m³/h] ±1%	max. [m³/h]	
2" 5.5M285 (DN50)	5.6 M (G 100)	35	5,650	1.6	160	160:1
3" 14M285 (DN80)	14 M (G 250)	88	14,126	2.5	400	160:1
4" 23M285 (DN100)	23M (G 400)	141	22,956	4.0	650	160:1
6" 35M285 (DN150)	35 M (G 650)	141	35,315	4.0	1,000	250:1

## Sizing tables

Corrected Capacity at Metering Pressure in MSCFH at Various Operating Pressures (psig)					
Meter Size	2"	3"	4"	6"	
Model	5.5M	14M	23M	35M	
Rating (ACFH)	5600	14,000	23,000	35,000	
Operating Pressure (psig)	1	5.85	14.64	24.05	36.59
	3	6.62	16.54	27.17	41.34
	5	7.38	18.44	30.29	46.10
	10	9.28	23.19	38.10	57.98
	15	11.18	27.94	45.91	69.86
	20	13.08	32.70	53.71	81.74
	25	14.98	37.45	61.52	93.62
	30	16.88	42.20	69.33	105.50
	40	20.68	51.70	84.94	129.26
	50	24.48	61.21	100.56	153.02
	60	28.29	70.71	116.17	176.78
	70	32.09	80.22	131.79	200.54
	80	35.89	89.72	147.40	224.30
	90	39.69	99.23	163.01	248.07
	100	43.49	108.73	178.63	271.83
	110	47.29	118.23	194.24	295.59
	120	51.10	127.74	209.86	319.35
	130	54.90	137.24	225.47	343.11
	140	58.70	146.75	241.09	366.87
	150	62.50	156.25	256.70	390.63
	175	72.01	180.01	295.74	450.03
	200	81.51	203.77	334.77	509.44
	225	91.01	227.54	373.81	568.84
	250	100.52	251.30	412.84	628.24
	275	110.02	275.06	451.88	687.64
	285	113.82	284.56	467.49	711.41

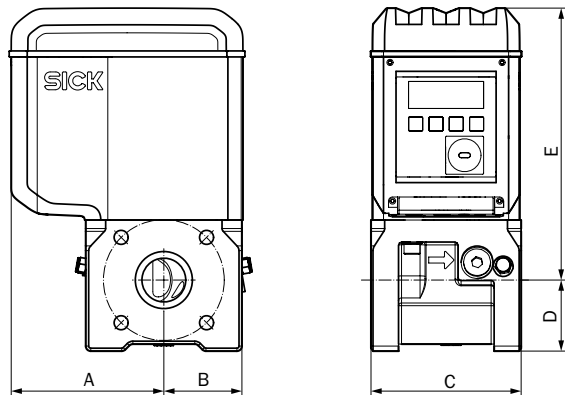
Corrected Capacity at Metering Pressure in MSCMH at Various Operating Pressures (kPag)							
Model			G100	G250	G400	G650	
Rating	kPa	Bar	0.16 160	0.4 400	0.65 650	1 1000	
Operating Pressure (kPag)	1	6.9	0.1	0.17	0.42	0.68	1.05
	3	20.7	0.2	0.19	0.47	0.77	1.18
	5	34.5	0.3	0.21	0.53	0.86	1.32
	10	69.0	0.7	0.27	0.66	1.08	1.66
	15	103.4	1.0	0.32	0.80	1.30	2.00
	20	137.9	1.4	0.37	0.93	1.52	2.34
	25	172.4	1.7	0.43	1.07	1.74	2.67
	30	206.9	2.0	0.48	1.21	1.96	3.01
	40	275.8	2.7	0.59	1.48	2.40	3.69
	50	344.8	3.4	0.70	1.75	2.84	4.37
	60	413.7	4.1	0.81	2.02	3.28	5.05
	70	482.7	4.8	0.92	2.29	3.72	5.73
	80	551.6	5.5	1.03	2.56	4.17	6.41
	90	620.6	6.2	1.13	2.84	4.61	7.09
	100	689.5	6.9	1.24	3.11	5.05	7.77
	110	758.5	7.6	1.35	3.38	5.49	8.45
	120	827.4	8.3	1.46	3.65	5.93	9.12
	130	896.4	9.0	1.57	3.92	6.37	9.80
	140	965.3	9.6	1.68	4.19	6.81	10.48
	150	1034.3	10.3	1.79	4.46	7.25	11.16
	175	1206.6	12.1	2.06	5.14	8.36	12.86
	200	1379.0	13.8	2.33	5.82	9.46	14.56
	225	1551.4	15.5	2.60	6.50	10.56	16.25
	250	1723.8	17.2	2.87	7.18	11.67	17.95
	275	1896.1	18.9	3.14	7.86	12.77	19.65
	285	1965.1	19.6	3.25	8.13	13.21	20.33

Ordering information

Our regional sales organization will help you to select the optimum device configuration.

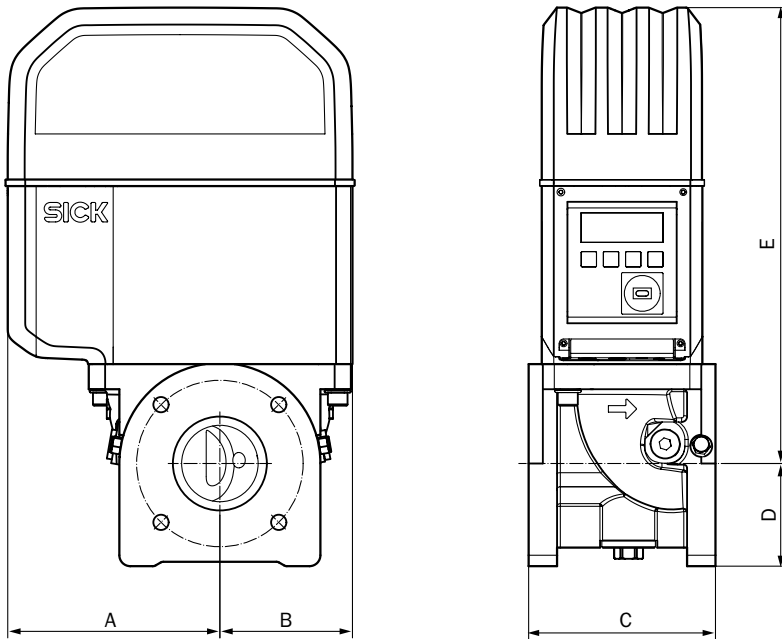
Dimensional drawings

FLOWSIC500, nominal size 2"



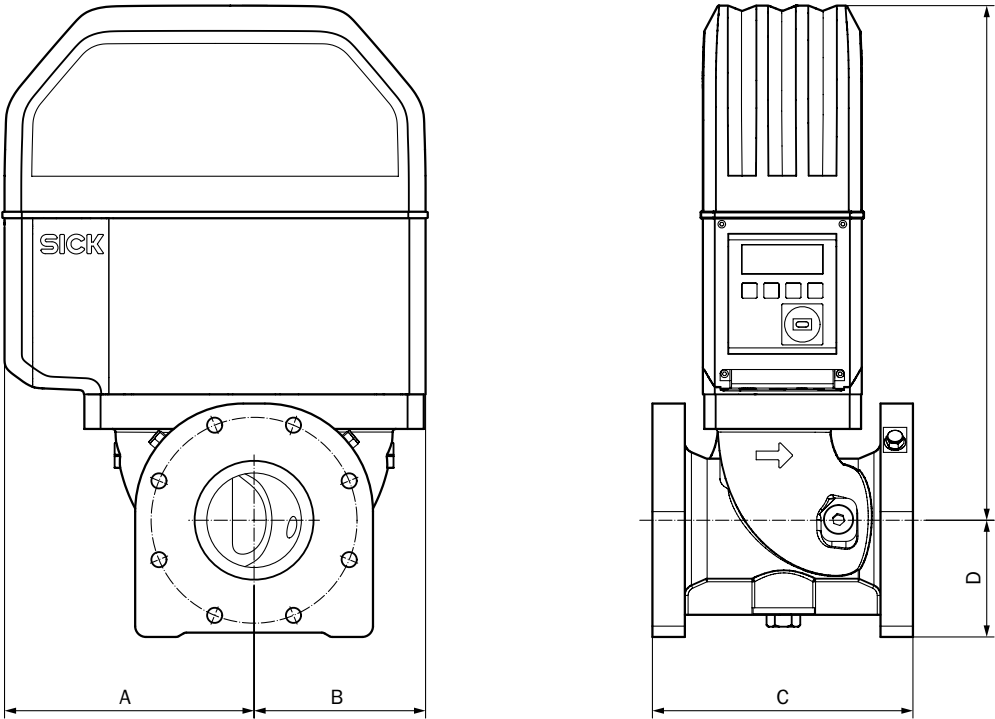
Nominal size	Weight	Dimensions				
		A	B	C	D	E
2"	23.4	6.02	3.07	5.91	2.80	10.71
				6.73		
All dimensions in inch. All weights in lbs.						

FLOWSIC500, nominal size 3"



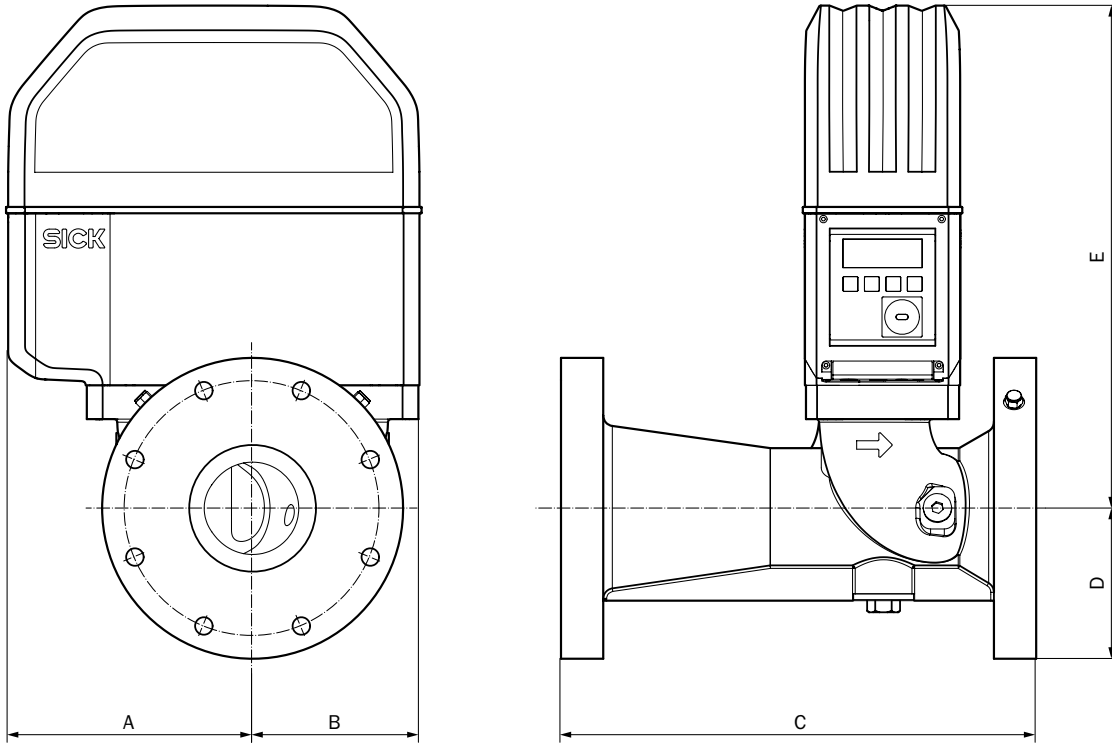
Nominal size	Weight	Dimensions				
		A	B	C	D	E
3"	40.3	7.64	4.76	6.73	3.70	16.42
	45.2			9.49		
All dimensions in inch. All weights in lbs.						

FLOWSIC500, nominal size 4"



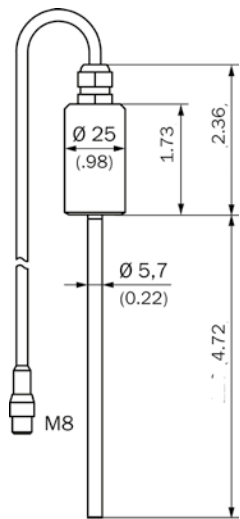
Nominal size	Weights	Dimensions				
		A	B	C	D	E
4"	60	9.09	6.26	9.49	4.25	18.74
	64.8			11.81		
All dimensions in inch. All weights in lbs.						

FLOWSIC500, nominal size 6"



Nominal size	Weight	Dimensions				
		A	B	C	D	E
6"	77.2	9.13	6.22	17.72	5.63	18.74
All dimensions in inch. All weights in lbs.						

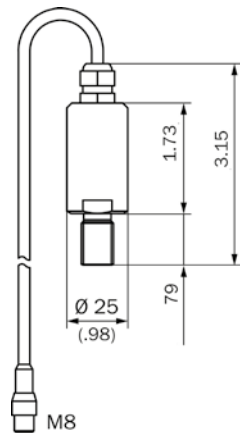
Temperature sensor (Dimensions in mm (inch))



Digital temperature transmitter

Sensor type	Platinum resistance sensor Pt1000 in stainless steel protective tube
Ambient temperature	-40 °F ... 185 °F (-40 °C ... +85°C)
Accuracy	± 0.5°F (0.3°C) throughout the temperature range

Pressure sensor (Dimensions in mm (inch))

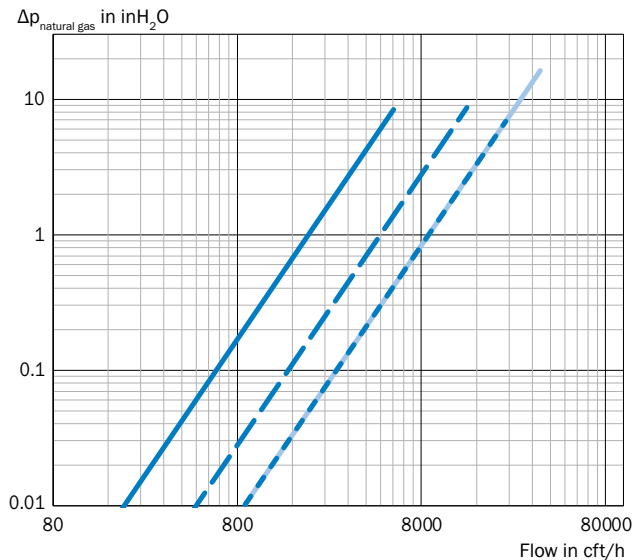


Digital pressure transmitter

Ambient temperature	-40 °F ... 185 °F (-40 °C ... +85°C)
Accuracy	± 0.1% of the full scale reading (all ranges)

Reference

Pressure loss (typical)



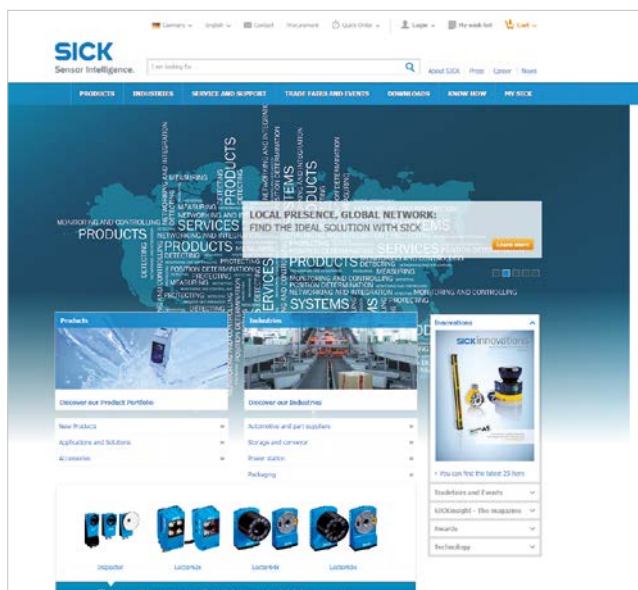
Nominal size

- 2"
- 3"
- 4"
- 6"

Reference density natural gas:  $\rho = 0.052 \text{ lb/ft}^3$

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## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With almost 8,800 employees and over 50 subsidiaries and equity investments as well as numerous representative offices worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

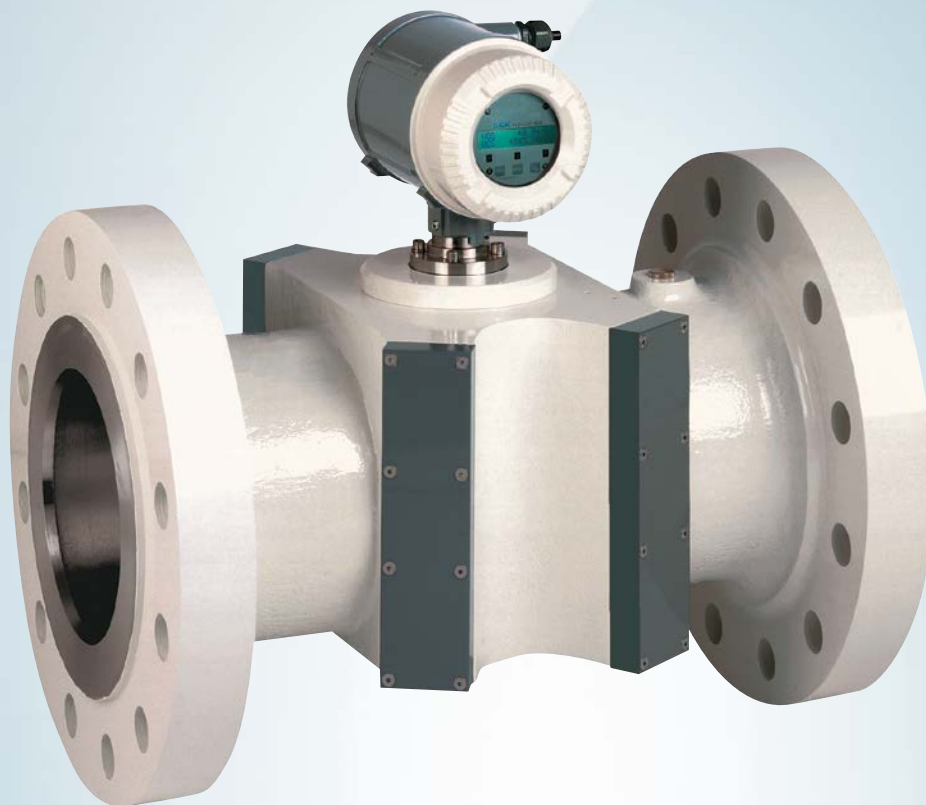
Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

**For us, that is “Sensor Intelligence.”**

### **Worldwide presence:**

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and additional representatives → [www.sick.com](http://www.sick.com)



# FLOWSIC600

CUSTODY TRANSFER GAS FLOW MEASUREMENT  
AND PROCESS MONITORING

Gas flow meters

**SICK**  
Sensor Intelligence.

## INVESTING IN A HIGH-QUALITY METER SAVES MONEY

Every day natural gas flows in great quantities through pipelines or into storage facilities, thus changing owners. Precise gas quantity measurement is of the utmost importance, as even very small measurement errors could result in substantial economic loss. In addition, challenging ambient measurement conditions often play a decisive role. Moisture, ice, cold, heat and desert sand place great demands on the instruments in the field. This is why a gas flow meter is needed that is both accurate and reliable.

The FLOWSIC600 gas flow meter from SICK achieves both of these goals. It is ideal for both natural gas custody transfer and the highly precise measurement of process gases in the chemical industry.



Natural gas pipeline in Bawu-Changnan using FLOWSIC600

### Highly Durable

The FLOWSIC600 compact gas flow meter hermetically shields all of its measurement equipment from the environment. The use of internal cable routing prevents harsh climate conditions and contamination from harming the device. The FLOWSIC600 is virtually maintenance-free.

### High Measurement Accuracy

The FLOWSIC600 measures gas flow using ultrasonic technology. The arrangement of the ultrasonic sensors in the measurement device (path layout) matches its performance parameters perfectly. With the FLOWSIC600, SICK developed ultrasonic sensors designed for maximum immunity to noise.

### Maximum Reliability

The FLOWSIC600 uses ultrasonic measurement and operates without mechanically moving parts making it largely resistant to contamination and wear. The result is maximum measurement reliability even under adverse measurement conditions.

### Excellent System Integration

The FLOWSIC600 is available for nominal pipe sizes from DN80 to DN1200 for custody transfer applications, and as small as DN50 for process applications. Easy connection to flow computers allows straightforward integration into any measurement station. SICK also provides inlet and outlet sections, flow computers, and pressure and temperature transmitters.

### Worldwide Approvals

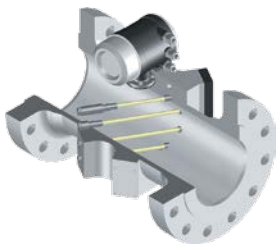
The FLOWSIC600 conforms to all relevant natural gas guidelines and has worldwide approval.

### Low Power Consumption

SICK ultrasonic sensors combine high performance with low power consumption. Due to low power consumption, it is possible to use a stand-alone power supply, such as a solar module.

## The FLOWSIC600 is available in four types

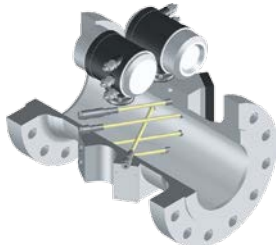
Ideal for custody transfer applications



FLOWSIC600, 4-path

- The standard design is equipped with a fourpath system in which the measured values of the individual sensor pairs are averaged.

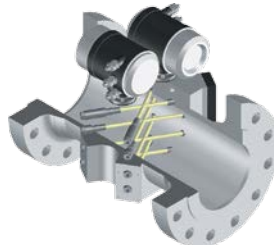
Ideal for applications having additional monitoring



FLOWSIC600 2plex

- The 2plex design provides enhanced diagnostics, combining a custody transfer meter with a check meter.

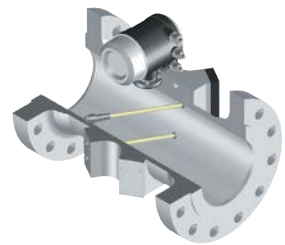
Ideal for fully redundant measurements



FLOWSIC600 Quatro

- The FLOWSIC600 Quatro provides a redundant solution, integrating two meters into one meter body while retaining the same overall length.

Ideal for process gas measurement and internal billing



FLOWSIC600, 2-path

- A reliable two-path design provides adequate measurement accuracy in both custody and non-custody applications.

# EXCELLENT MEASUREMENT TECHNOLOGY IN AN OUTSTANDING MEASUREMENT DEVICE

The FLOWSIC600 is a top-quality measurement device. It features a robust meter body incorporating measurement equipment, performs measurement with high noise immunity and long-term stability, and is nearly maintenance-free.

## Ultrasonic Sensors from SICK

The FLOWSIC600 is equipped with high-performance ultrasonic sensors developed by SICK. A hermetically sealed titanium housing contains ultrasonic transducers that operate at a selectable ultrasonic frequency of 80 kHz, 135 kHz, 200 kHz, or 300 kHz to match the operating conditions.

The sensors can also be deployed at very high or very low temperatures (from  $-194^{\circ}\text{C}$  to  $+280^{\circ}\text{C}$ ), at high pressures (up to 450 barg), under corrosive conditions, and with heavy background noise. They exhibit unrivaled reliability in sound-absorbing gases that are high in carbon dioxide.

The FLOWSIC600 features an efficient transducer for performing measurements at atmospheric pressure, allowing calibration using air.

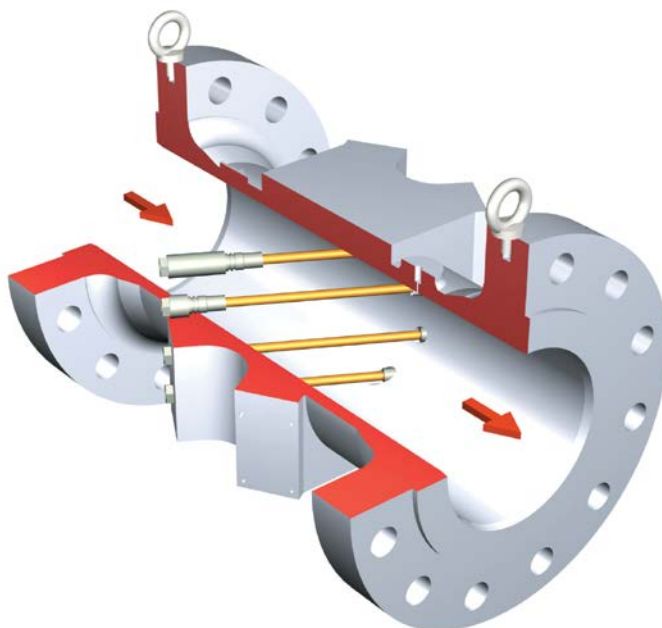


Sensor

## Direct Path Layout

The transit time difference principle is used for performing ultrasonic gas flow measurement. This measurement principle uses ultrasonic transit time to determine the gas flow rate. The direct path layout minimizes the influence of turbulence, contamination, moisture, and background noise.

Two ultrasonic sensors are installed opposite each other at a specific angle to the gas flow and operate alternately as a transmitter and receiver.



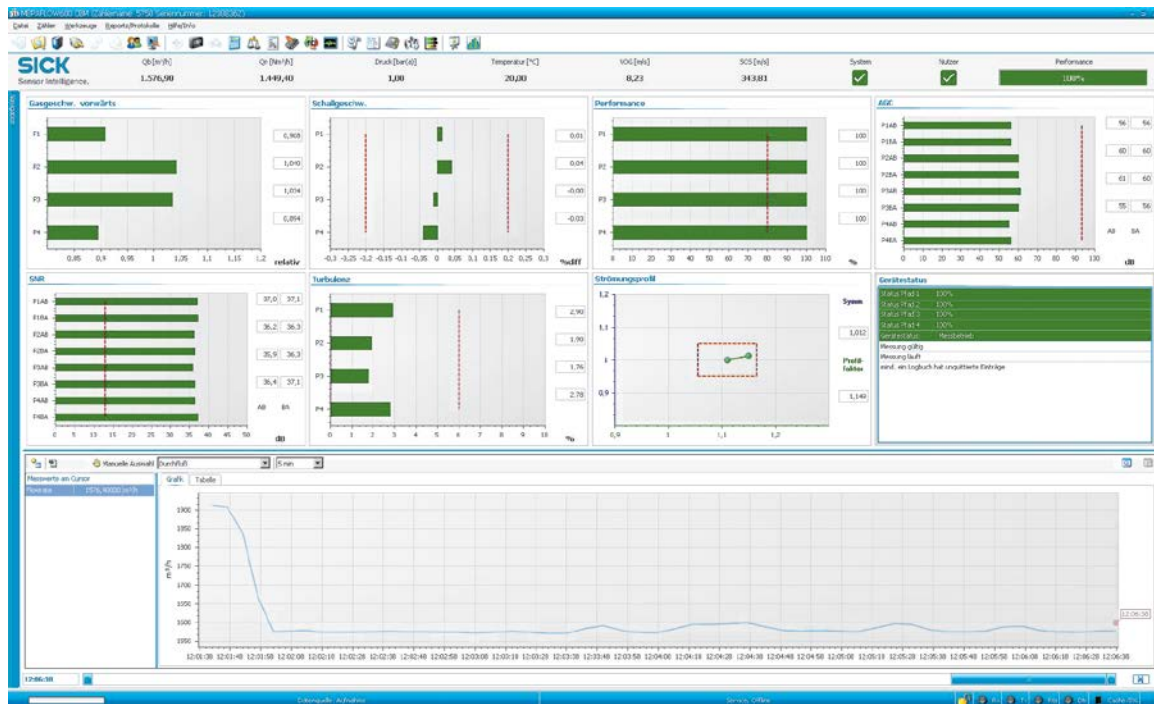
Direct path layout

## Automatic Self-Diagnostics

The FLOWSIC600 is equipped with a warning signal that informs the user of a malfunction before the measured value is affected. To do this, current diagnostic indicators are compared to indicators that were learned by the device under normal measurement conditions. The results of the self-diagnostics are permanently logged by an internal electronic data log to allow a retroactive check of the measurement process. Important measured variables such as gas flow and gas velocity (VOG) or diagnostic parameters such as signal-to-noise ratio (SNR) or speed can be read directly.

## Operating Software

MEPAFLOW600 CBM operating software allows efficient and effective meter and data management and provides extensive diagnostics options. The software provides simple, user-friendly access to FLOWSIC600 data. MEPAFLOW600 CBM provides permanent online and offline access to the FLOWSIC600. In addition to easy-to-understand visualization, the software supports the user with logs and assistance functions when operating the gas flow meter.



# GAS FLOW METERS FOR CUSTODY TRANSFER TRAFFIC AND PROCESS APPLICATIONS



## Product description

The FLOWSIC600 measurement device is an ultrasonic gas flow meter and sets the standard in its market segment. The visually technical design demonstrates that it is geared to the tough industry conditions. The compact design with integrated cable routing means that the measuring system is durable, failsafe, low-maintenance, and has long-term

stability. The FLOWSIC600 features extensive diagnostics options to allow detection of malfunctions even before the measurement is affected. Types having 2, 4, 4 + 1, or 4 + 4 measuring paths enable a variety of process applications, including custody transfer measurements.

## At a glance

- High efficient ultrasonic transducers
- Direct path layout (Westinghouse design)
- Intelligent self-diagnostics
- Compact, robust design
- Integrated log book and data logger
- Large measuring range 1:120
- Bidirectional measurement
- Low power consumption: <1 W

## Your benefits

- Long-term stability, reliable measurement
- Low maintenance due to intelligent self-diagnostics
- Virtually immune to pressure regulator noise
- Ultrasonic transducers can be exchanged under operating pressure
- Wide application range



## Additional information

Fields of application . . . . .	7
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Dimensions . . . . .	10
Instruction for installation . . . . .	14

→ [www.mysick.com/en/FLOWSIC600](http://www.mysick.com/en/FLOWSIC600)

For more information, just enter the link and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

## Fields of application

- Custody transfer applications (natural gas, N<sub>2</sub>, O<sub>2</sub>, air, ethylene)
- Onshore and offshore applications
- Underground gas storage facilities (bidirectional measurement possible)
- Cryogenic gas applications down to -194 °C
- Also for process gases
- For gases with high H<sub>2</sub>S component such as sour gas or biogas

## Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

### System

<b>Measured values</b>	Volumetric flow, a. c., volume a. c., gas velocity, sound velocity
<b>Number of measuring paths</b>	2, 4, 4+1, 4+4
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Measuring medium</b>	Natural gas, air, C <sub>2</sub> H <sub>4</sub> , steam, process gases (e. g. CO <sub>2</sub> up to 100%, N <sub>2</sub> , O <sub>2</sub> , Cl <sub>2</sub> etc.), gases like sour gas or bio gas with high H <sub>2</sub> S content
<b>Measuring ranges</b>	Volumetric flow, a. c. 4 ... 400 m <sup>3</sup> /h / 1,600 ... 100,000 m <sup>3</sup> /h Measuring ranges depend on nominal pipe size
<b>Repeatability</b>	< 0.1 % of the measured value
<b>Accuracy</b>	Error limits 2-path version <sup>1</sup> : ≤ ± 1 % 4-path version <sup>2</sup> : ≤ ± 0.5 % Dry calibrated 4-path version <sup>2</sup> : ≤ ± 0.2 % After flow calibration and adjustment with constant factor 4-path version <sup>2</sup> : ≤ ± 0.1 % After flow calibration and adjustment with polynomial or piecewise correction <sup>1</sup> In the range Q <sub>t</sub> ... Q <sub>max</sub> with straight 20D/3D inlet/outlet section or with 10D/3D flow conditioner <sup>2</sup> In the range Q <sub>t</sub> ... Q <sub>max</sub> with undisturbed 10D/3D inlet/outlet section or with 5D/3D flow Conditioner
<b>Diagnostics functions</b>	Integrated device diagnosis and extended diagnosis via MEPAFLOW600 CBM software
<b>Gas temperature</b>	-40 °C ... +180 °C On request: -194 °C ... +280 °C
<b>Operating pressure</b>	0 bar (g) ... 250 bar (g) On request: Up to 450 bar (g)
<b>Nominal pipe size</b>	2 " ... 48 " (DN 50 ... DN 1200)
<b>Ambient temperature</b>	ATEX, CSA: -40 °C ... +60 °C IECEx: -40 °C ... +70 °C Optional IECEx: -50 °C ... +70 °C
<b>Storage temperature</b>	-40 °C ... +70 °C
<b>Ambient humidity</b>	≤ 95 % Relative humidity

<b>Conformities</b>		AGA-Report No. 9 API 21.1 OIML D11 OIML R137-1 ISO 17089-1 BS 7965 Pattern approval: MID, PTB, NMI, Measurement Canada, GOST ...
<b>Ex-approvals</b>		<div>IECEX</div> <div>ATEX</div> <div>NEC/CEC (US/CA)</div> <div>Gb/Ga Ex d e ib [ia Ga] IIA T4</div> <div>Gb/Ga Ex d e ib [ia Ga] IIC T4</div> <div>Ultrasonic transducers intrinsically safe</div> <div>II 1/2G Ex de ib [ia] IIA T4</div> <div>II 1/2G Ex de ib [ia] IIC T4</div> <div>Ultrasonic transducers intrinsically safe</div> <div>Class I, Division 1, Groups B, C, D T4</div> <div>Class I, Division 2, Groups A, B, C, D T4</div> <div>Class I, Division 1, Group D T4</div> <div>Class I, Division 2, Group D T4</div> <div>Ultrasonic transducers intrinsically safe</div>
<b>Electrical safety</b>		CE
<b>Enclosure rating</b>		IP 65 / IP 66 / IP 67
<b>Analog outputs</b>		1 output: 4 ... 20 mA, 200 $\Omega$ Active/passive, electrically isolated
<b>Digital outputs</b>		3 outputs: 30 V, 10 mA Passive, electrically isolated, Open Collector or according to NAMUR (EN 50227), $f_{\max} = 6$ kHz (scalable)
<b>Interfaces</b>		RS-485 (2x, for configuration, output of measured values and diagnosis)
<b>Bus protocol</b>		Modbus ASCII Modbus RTU HART
<b>Operation</b>		Via meter display and software MEPAFLOW600
<b>Dimensions (W x H x D)</b>		See dimensional drawings
<b>Weight</b>		Depending on device version
<b>Material in contact with media</b>		Low temperature carbon steel, stainless steel, duplex steel
<b>Electrical connection</b>		<div>Voltage</div> <div>Power consumption</div> <div>12 ... 28.8 V DC</div> <div>With active current output: 15 ... 28.8 V DC</div> <div><math>\leq 1</math> W</div>

## Measuring ranges

Measuring ranges

Nominal size		Flow rate				Max. velocity *	
		m <sup>3</sup> /h		ft <sup>3</sup> /h		m/s	ft/s
		Min.	Max.	Min	Max.		
DN 50	2"	4	400	140	14,000	65	213
DN 80	3"	8	1,000	280	35,000	65	213
DN 100	4"	13	1,600	460	56,000	60	197
DN 150	6"	20	3,000	710	106,000	50	164
DN 200	8"	32	4,500	1,130	159,000	45	148
DN 250	10"	50	7,000	1,770	247,000	40	131

Nominal size		Flow rate				Max. velocity *	
		m <sup>3</sup> /h		ft <sup>3</sup> /h		m/s	ft/s
		Min.	Max.	Min	Max.		
DN 300	12"	65	8,000	2,300	282,000	33	108
DN 350	14"	80	10,000	2,830	353,000	33	108
DN 400	16"	120	14,000	4,240	494,000	33	108
DN 450	18"	130	17,000	4,600	600,000	33	108
DN 500	20"	200	20,000	7,070	707,000	33	108
DN 550	22"	260	26,000	9,185	919,000	33	108
DN 600	24"	320	32,000	11,300	1,131,000	33	108
DN 650	26"	360	36,000	12,700	1,272,500	32	103
DN 700	28"	400	40,000	14,100	1,414,000	30	98
DN 750	30"	400	45,000	14,100	1,590,000	30	98
DN 800	32"	400	50,000	14,100	1,767,000	30	98
DN 850	34"	525	58,000	18,550	2,050,000	30	98
DN 900	36"	650	66,000	23,000	2,333,000	30	98
DN 950	38"	650	73,000	23,000	2,580,500	30	98
DN 1000	40"	650	80,000	23,000	2,828,000	30	98
DN 1050	42"	1,300	85,000	46,000	3,004,000	30	98
DN 1100	44"	1,400	90,000	49,500	3,181,000	28	92
DN 1150	46"	1,500	95,000	53,050	3,358,000	28	91
DN 1200	48"	1,600	100,000	56,600	3,535,000	27	89

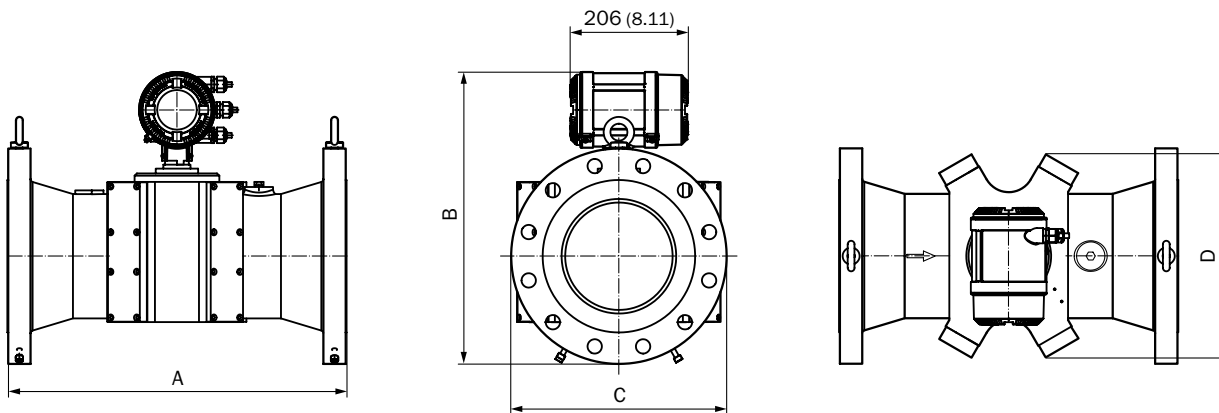
\* When using installation configuration 2 (with flow conditioner) the maximum allowed gas velocity in the pipe is limited to 40 m/s (131 ft/s).

## Ordering information

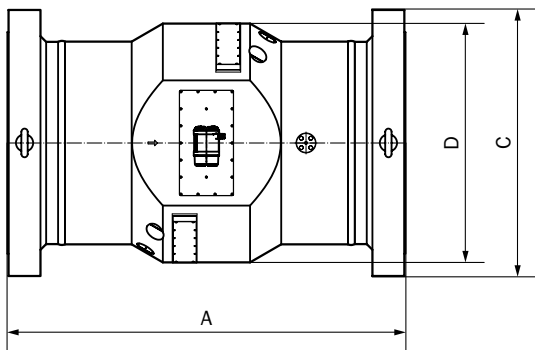
Our regional sales organization will help you to select the optimum device configuration.

## Dimensional drawings (Dimensions in mm (inch))

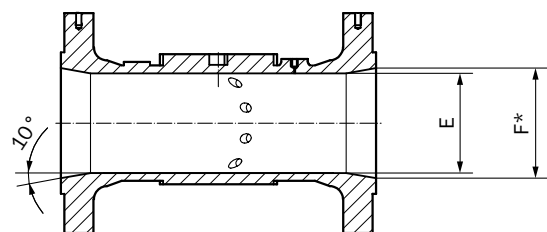
Versions with nominal sizes from 3" up to and including 14" (cast)



Versions for nominal sizes from 16" (forged)



Longitudinal section for nominal widths up to 48"



## Dimensions

Nominal pipe size	Connection flange	Standard	Weight [kg]	Length (A) [mm]	Height (B) [mm]	Flange diameter (C) [mm]	Width of measuring section (D) [mm]	Internal diameter (E) [mm]
3"	Cl. 150	ANSI B16.5	37	240	344	190	180	73
	Cl. 300		38		354	210		
	Cl. 600		42		354	210		
	Cl. 900		84		395	240		
DN 80	PN 16	DIN 2633	37	240	349	200		
	PN 63	DIN 2636	40		356	215		
	PN 100	DIN 2637	43		364	230		
4"	Cl. 150	ANSI B16.5	44	300	375	230	240	95
	Cl. 300		55		388	255		
	Cl. 600		66		398	275		
	Cl. 900		99		408	290		
DN 100	PN 16	DIN 2633	40	300	372	220		
	PN 63	DIN 2636	52		405	250		
	PN 100	DIN 2637	61		410	265		
6"	Cl. 150	ANSI B16.5	100	450	445	280	300	142
	Cl. 300		110		465	320		
	Cl. 600		140		483	355		
	Cl. 900		220		496	380		
DN 150	PN 16	DIN 2633	90	450	448	285		
	PN 63	DIN 2636	110		478	345		
	PN 100	DIN 2637	130		483	355		

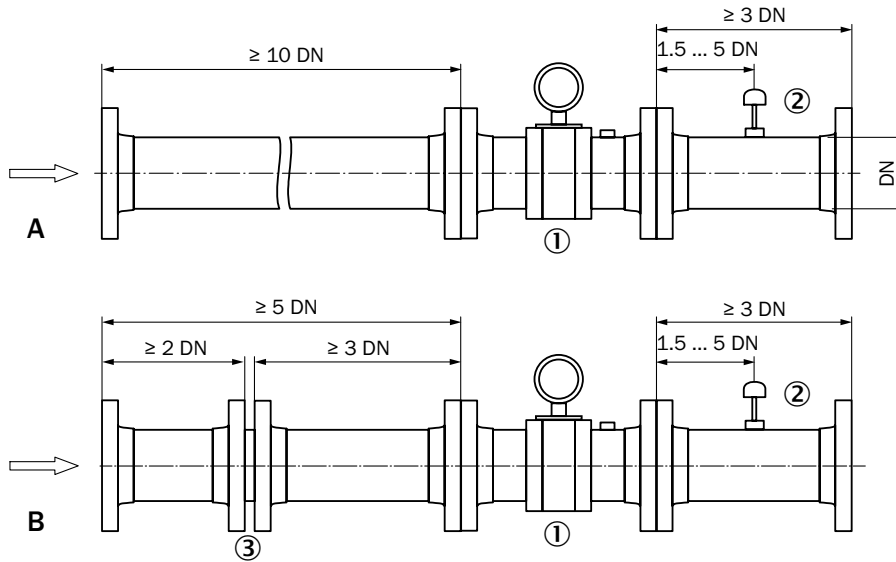
Nominal pipe size	Connection flange	Standard	Weight	Length (A)	Height (B)	Flange diame- ter (C)	Width of mea- suring section (D)	Internal diame- ter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
8"	Cl. 150	ANSI B16.5	150	600	498	345	350	190
	Cl. 300		180		516	380		
	Cl. 600		210		536	420		
	Cl. 900		300		562	470		
DN 200	PN 16	DIN 2633	140		498	340		
	PN 63	DIN 2636	190		535	415		
	PN 100	DIN 2637	210		543	430		
10"	Cl. 150	ANSI B16.5	240	750	548	405	410	235
	Cl. 300		250		568	445		
	Cl. 600		330		600	510		
	Cl. 900		470		625	545		
DN 250	PN 16	DIN 2633	220		547	405		
	PN 63	DIN 2636	270		580	470		
	PN 100	DIN 2637	320		597	505		
12"	Cl. 150	ANSI B16.5	350	900	586	485	470	270
	Cl. 300		400		605	520		
	Cl. 600		490		625	560		
	Cl. 900		720		685	610		
DN 300	PN 16	DIN 2633	325		575	460		
	PN 63	DIN 2636	425		610	530		
	PN 100	DIN 2637	525		638	585		
14"	Cl. 150	ANSI B16.5	475	1,050	642	535	540	315
	Cl. 300		600		667	585		
	Cl. 600		675		677	605		
	Cl. 900		850		700	640		
DN 350	PN 16	DIN 2633	475		635	520		
	PN 63	DIN 2636	625		675	600		
	PN 100	DIN 2637	750		705	655		
For all meter ≥ 16" an installation length of 3D is optionally available								
16"	Cl. 150	ANSI B16.5	475	762	700	595	570	360
	Cl. 300		550		728	650		
	Cl. 600		640		745	685		
	Cl. 900		1,025	800	755	705		
DN 400	PN 16	DIN 2633	370	762	693	580		
	PN 63	DIN 2636	600		738	670		
18"	Cl. 150	ANSI B16.5	660	820	754	635	620	405
	Cl. 300		760		792	710		
	Cl. 600		960		820	745		
	Cl. 900		1,300	900	830	785		
DN 450	PN 16	Data on request						

Nominal pipe size	Connection flange	Standard	Weight	Length (A)	Height (B)	Flange diame- ter (C)	Width of mea- suring section (D)	Internal diame- ter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
20"	Cl. 150	ANSI B16.5	750	902	815	700	670	450
	Cl. 300		930		853	775		
	Cl. 600		1,080		872	815		
	Cl. 900		1,500	1,000	892	855		
DN 500	PN 16	DIN 2633	700	902	823	715		
22"	Cl. 150	Data on request						
	Cl. 300							
	Cl. 600							
	Cl. 900							
DN 550	PN 16							
24"	Cl. 150	ANSI B16.5	1,090	991	927	815	760	540
	Cl. 300		1,390		978	915		
	Cl. 600		1,615		990	940		
	Cl. 900		2,100	1,200	1,040	1,040		
DN 600	PN 16	DIN 2633	1,015	991	940	840		
26"	Cl. 150	ASME B16.47	1,475	1,050	965	870	828	585
	Cl. 300		1,825		1,016	972		
	Cl. 600		2,100		1,038	1,016		
	Cl. 900		2,500	1,250	1,073	1,086		
DN 650	PN16	Data on request						
28"	Cl. 150	ASME B16.47	1,950	1,100	1,027	927	862	630
	Cl. 300		2,225		1,080	1,035		
	Cl. 600		2,450		1,100	1,073		
	Cl. 900		3,000	1,300	1,150	1,169		
DN 700	PN16	Data on request						
30"	Cl. 150	ASME B16.47	2,195	1,150	1,080	985	902	675
	Cl. 300		2,545		1,135	1,092		
	Cl. 600		2,820		1,154	1,130		
	Cl. 900		3,350	1,350	1,205	1,232		
DN 750	PN16	Data on request						
32"	Cl. 150	ASME B16.47	2,485	1,200	1,145	1,061	979	720
	Cl. 300		2,835		1,190	1,150		
	Cl. 600		3,110		1,212	1,194		
	Cl. 900		3,800	1,400	1,272	1,315		
DN 800	PN 16	Data on request						
34"	Cl. 150	Data on request						
	Cl. 300							
	Cl. 600							
	Cl. 900							
DN 850	PN 16							
36"	Cl. 150	ASME B16.47	3,125	1,250	1,250	1,169	1,082	810
	Cl. 300		3,525		1,300	1,270		
	Cl. 600		3,850		1,323	1,315		
	Cl. 900		5,225	1,450	1,396	1,461		

Nominal pipe size	Connection flange	Standard	Weight	Length (A)	Height (B)	Flange diame- ter (C)	Width of mea- suring section (D)	Internal diame- ter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
DN 900	PN 16	Data on request						
38"	Cl. 150	ASME B16.47	3,800	1,300	1,310	1,238	1,160	855
	Cl. 300		3,725		1,275	1,169		
	Cl. 600		4,300		1,325	1,270		
	Cl. 900		Data on request		1,421	1,461		
DN 950	PN 16	Data on request						
40"	Cl. 150	ASME B16.47	3,825	1,350	1,359	1,289	1,213	900
	Cl. 300		4,125		1,334	1,239		
	Cl. 600		4,675		1,375	1,321		
	Cl. 900		Data on request		1,470	1,512		
DN 1000	PN 16	Data on request						
42"	Cl. 150	ASME B16.47	4,675	1,450	1,415	1,346	1,261	945
	Cl. 300		4,650		1,386	1,289		
	Cl. 600		5,450		1,444	1,404		
	Cl. 900		Data on request		1,523	1,562		
DN 1050	PN 16	Data on request						
44"	Cl. 150	Data on request						
	Cl. 300							
	Cl. 600							
	Cl. 900							
	DN 1100	PN 16						
46"	Cl. 150	Data on request						
	Cl. 300							
	Cl. 600							
	Cl. 900							
DN 1150	PN 16							
48"	Cl. 150	ASME B16.47	6,400	1,600	1,574	1,511	1,416	1,080
	Cl. 300		6,475		1,552	1,467		
	Cl. 600		7,850		1,615	1,594		
	Cl. 900		12,100	1,900	1,711	1,785		
DN 1200	PN 16	Data on request						

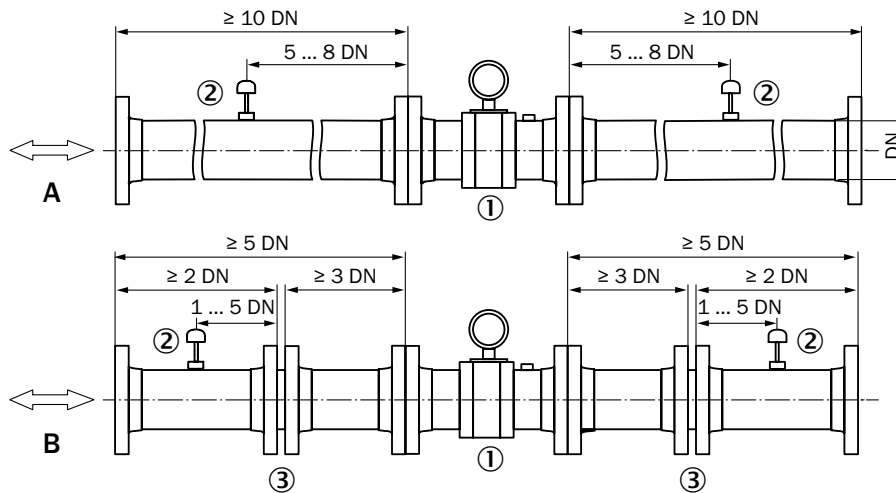
## Instruction for installation

FLWSIC600 integration into the pipeline for unidirectional use in configuration 1 (A) and configuration 2 (B)



- ① FLWSIC600
- ② Temperature measuring point
- ③ Flow conditioner

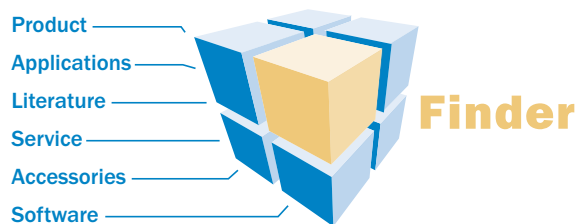
FLWSIC600 integration into the pipeline for bidirectional use in configuration 1 (A) and configuration 2 (B)



- ① FLWSIC600
- ② Temperature measuring point
- ③ Flow conditioner

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# FLOWSIC600-XT

THE PERFECT MATCH

Gas flow meters

**SICK**  
Sensor Intelligence.

# FLOWSIC600-XT: THE PERFECT MATCH

Just how can the market leader for reliable, maximum precision ultrasonic gas flow measuring devices get any better? The answer is easy: by carefully listening to and consistently responding to the requirements of individual users.

With four device versions, the FLOWSIC600-XT is able to meet any application requirement as a stand-alone or system solution – and deliver best possible measuring performance at the same time. Along with its groundbreaking design, this product family impresses with innovative intrinsic value: i-diagnostics™ the built-in solution, which delivers intelligent application diagnostics and PowerIn Technology™ continues to take measurements and save valuable data for up to three weeks in the event of a mains power failure. FLOWSIC600-XT delivers the ideal combination of maximum measurement accuracy, long-term stability, and unrivaled operational safety, yet is entirely unassuming.







### Measurement data reliability and availability

The FLOWSIC600 ultrasonic gas flow measuring device already provides best-in-class long-term stability in extreme ambient conditions, and now the FLOWSIC600-XT combines the features of its predecessor with unprecedented usability. It meets all the requirements for safe and stable custody transfer gas measurement throughout its service life. Measurement and diagnostics data and status changes can be recorded permanently in six accessible data archives, and the FLOWSIC600-XT's PowerIn Technology™ ensures that measurements continue to be taken and data stored in the event of a mains power failure.

### Simple device integration – even in compact systems

Continuous improvement of ultrasound technologies is a tradition at SICK, Germany. The FLOWSIC600-XT boasts state-of-the-art measurement technology, meaning it delivers extremely precise measurement results. Compliant with ISO 17089 and AGA9 and compatible with its predecessor the FLOWSIC600, it can be integrated successfully into any system. Plus, the new FLOWSIC600-XT Forte meets the requirements of compact installations and complies with all of the specifications of OIML R 137 Classes 1.0 and 0.5.

### Quick and easy device commissioning and checks

i-diagnostics™ helps make device commissioning and status checks quick and easy, and provides extensive flow meter and application diagnostics during operation. Should maintenance ever be required, the intelligent solution assistant provides support. The built-in infrared interface means measured value and diagnostics data can be accessed in no time, making servicing quick and efficient.

## FLWSIC600-XT – PROVIDING YOU WITH THE PERFECT GAS FLOW METER FOR ANY APPLICATION

Each of the ultrasonic gas flow meters in the FLWSIC600-XT product family has been designed for custody transfer applications and fulfills the requirements of all the common national and international standards. There are four device versions to choose from to meet specific gas flow meter performance requirements. Determining which one to use varies, which is why our performance-oriented classification of the FLWSIC600-XT, -XT Forte, -XT 2plex, and -XT Quatro is the ideal first step in ensuring there is a focus on the task at hand and customer requirements, allowing a unique solution to be provided. All of the FLWSIC600-XT versions can be installed with ease into any custody transfer measurement application with a nominal width of between 3 and 48 inches, and they can also be conveniently connected to all of the most popular flow computers on the market.



### FLWSIC600-XT

The FLWSIC600-XT has proven to be a versatile device suitable for all custody transfer natural gas applications, with 15 years of field experience gained from the FLWSIC600 having been incorporated into this four-path technology.



### FLWSIC600-XT Forte

Providing impressive meter performance in a limited space and combining eight paths on two different path levels in one device, the FLWSIC600-XT Forte guarantees maximum measurement accuracy. It is the natural first choice for installations in systems with short inlet and outlet piping.



### FLWSIC600-XT 2plex

The extremely compact FLWSIC600-XT 2plex is the combination of a gas flow meter for custody transfer applications and a check measurement device, featuring extended diagnostic functionality thanks to its additional independent measurement path.



### FLWSIC600-XT Quatro

The FLWSIC600-XT Quatro combines two measurement devices for redundant measurements in custody transfer natural gas applications in one, with an installation length equivalent to that of a single device.

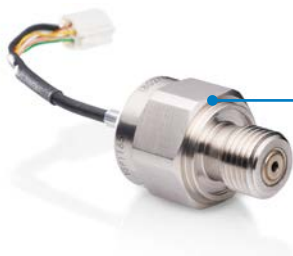
### Quick and easy data access

In addition to its numerous interfaces, the FLOWSIC600-XT also enables quick and easy access to measured value and diagnostics data thanks to the infrared communications port built into its front display. All of the necessary settings and device data are accessible via this interface. The FLOWSIC600-XT can also be extended for wireless communication.



### PowerIn Technology™ – data security guaranteed

Operating with an extremely low power consumption and measurement algorithms that have been further optimized, the FLOWSIC600-XT is setting new standards for ultrasonic gas flow meters. It boasts a highly efficient energy concept, including a backup battery that guarantees a continuous power supply even in the event of a mains power failure. If this does happen, the power consumption of all of the electronics is automatically reduced to the minimum level possible. We call this PowerIn Technology™. It makes sure that measurements can continue to be taken for up to three weeks without the need for external power and saves important measurement data. This extremely efficient electronics concept is forward-thinking in the way it allows for autonomous device operation, for example using a solar power supply.



### Automatic correction of measured values under changing operating conditions

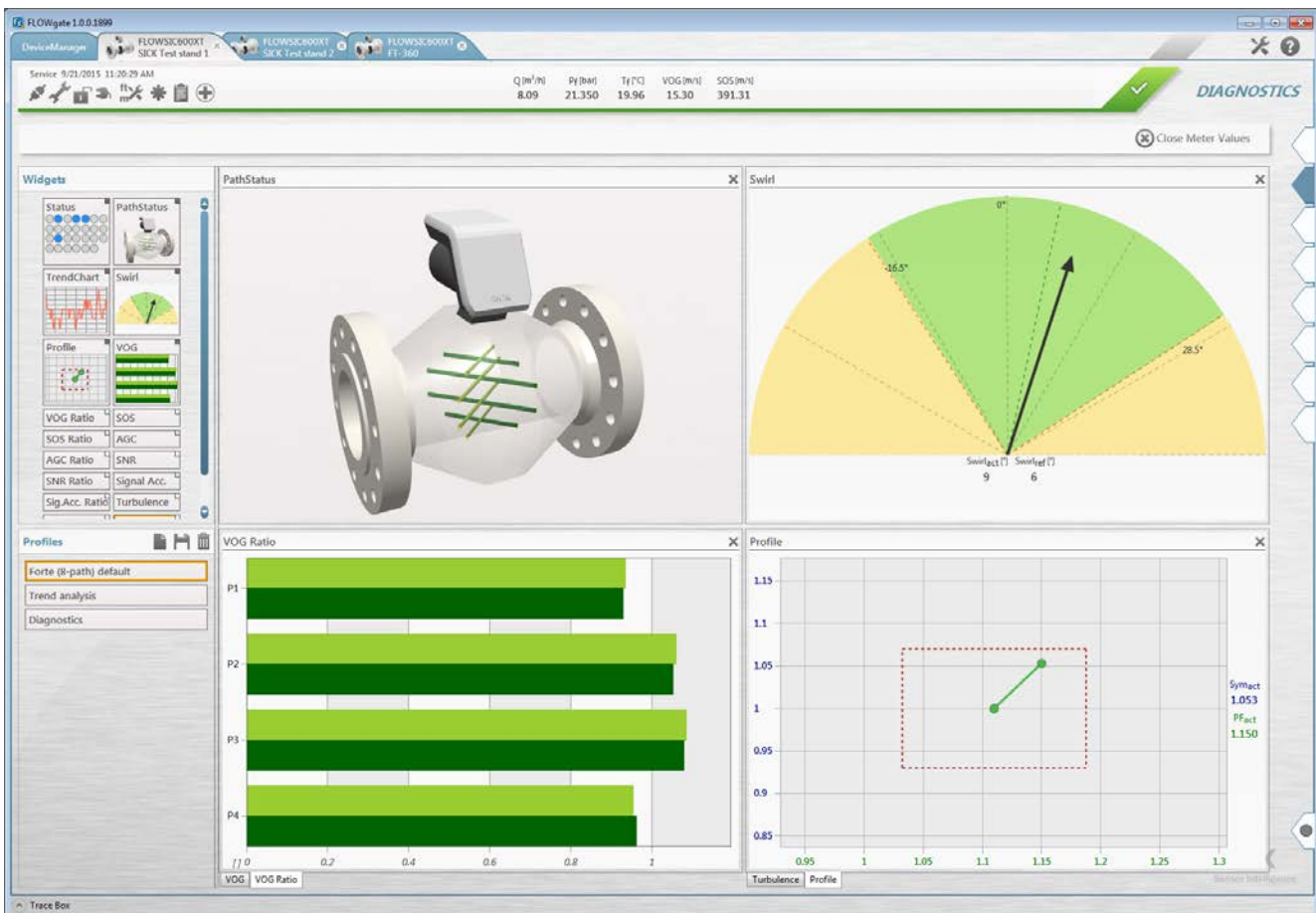
The FLOWSIC600-XT provides even more accurate measurements than its predecessor, with its integrated geometry and Reynolds number correction function boosting measurement accuracy under changing pressure and temperature conditions. Another advantage of the integrated pressure and temperature correction function is the ease and safety with which calibration conditions can be transferred over to application conditions. The pressure and temperature values required to enable this feature are provided by built-in sensors, transmitters externally connected via HART, or a flow computer.

### i-diagnostics™ – an essential tool for effective and efficient device and application diagnostics

i-diagnostics™ has so much more to offer than just diagnostics – it is an intelligent combination of firmware and software that means the device is safe, reliable, and easy to use for the entire operating time. i-diagnostics™ builds on the FLOWSIC600's CBM (condition based maintenance) smart self-diagnosis functionality, providing useful information about the system status and any changes to it, in addition to device diagnostics. In order to assess the application, diagnostics data from cross-eyed beams is first factored in, with application faults, such as blocked flow conditioners, background noise, contamination, and liquids in the gas, being detected immediately – making lengthy troubleshooting a thing of the past. Process data is constantly assessed on the basis of the integrated FingerPrint concept. This means that the measurement conditions during calibration can be compared with the measurement conditions during commissioning and with the current measurement and diagnostics data. An internal data logger continuously logs measured values for trend analyses to allow the historical measurement processes to be checked, as well as the results of the self-monitoring. A retroactive thorough check of the measurement process in the form of a graphic trend analysis is also possible.

### FLOWgate™ – new and intuitive operating software

FLOWgate™ intelligently links diagnostics data together and then displays it. The quick status function provides immediate information about the current status of the application, and if a warning limit is reached, the solution assistant can be used to analyze the problem at the click of a button. In order to get a quick overview or analysis, each user can put together measured values and diagnostics parameters as required in the measured value overview, and then amend or save their overview. FLOWgate™ allows the FLOWSIC600-XT, and in turn all of the measured value and diagnostics data, to be accessed at any time via a PC or tablet – whether online or offline. The graphical display of trend analyses in charts facilitates the analysis of the measurement process and provides information on changes to the process. Concise diagnostics, maintenance, and calibration reports can be created at any time using the report manager, while a range of wizards, including one for commissioning, make it much easier to operate the device.



FLOWgate™ overview

## THE PERFECT MATCH



### Product description

As the follow-up to the successful FLOWSIC600, the FLOWSIC600-XT ultrasonic gas flow measuring device is setting new standards in its market segment. The FLOWSIC600-XT is available in variants with 4, 4+1, 4+4, and 8 measurement paths to meet the requirements of every application, whether it is being used as a stand-alone or system solution. In addition to the OIML R 137 Class 1.0 requirements, the FLOWSIC600-XT meets the requirements of Class 0.5 and AGA9 in their entirety.

The FLOWSIC600-XT contains i-diagnostics™ – an intelligent application diagnostics function – and PowerIn Technology™, which enables continuous measurement operation for up to three weeks in the event of a mains voltage failure. These functions help ensure usability and unparalleled operational safety – and what's more, the equipment offers the very best possible measurement accuracy and long-term stability.

### At a glance

- User-friendly product family
- Automatic correction of pressure and temperature effects
- Available for all operating conditions
- PowerIn Technology™ for reliable backup operation
- Intelligent application diagnostics with i-diagnostics™
- Extendable with flow computers per connect-and-go

### Your benefits

- Low measurement uncertainty in every application
- Excellent measurement data reliability and availability
- The right ultrasonic gas flow measuring device for every application – without compromise
- Simple device integration – even in compact systems
- Quick and easy commissioning and checks



### Additional information

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→ [www.sick.com/FLWSIC600-XT](http://www.sick.com/FLWSIC600-XT)

For more information, simply visit the above link to obtain direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

## Fields of application

- Custody transfer measurement of natural gas
- Transport and storage of gas
- Onshore and offshore applications
- Gas production applications with H<sub>2</sub>S and CO<sub>2</sub> content

## Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

### System

<b>Measured values</b>	Volumetric flow, a. c., volume a. c., gas velocity, sound velocity, Optional volume correction via integrated EVC
<b>Number of measuring paths</b>	4, 4+1 (2plex), 4+4 (Quatro), 8 (Forte)
<b>Measurement principle</b>	Ultrasonic transit time difference measurement
<b>Measuring medium</b>	Natural gas, air, natural gases with contents of CO <sub>2</sub> , N <sub>2</sub> , H <sub>2</sub> S, O <sub>2</sub>
<b>Measuring ranges</b>	<div>Q<sub>min</sub> from ... to 5 ... 750 m<sup>3</sup>/h</div> <div>Q<sub>max</sub> from ... to 1,000 ... 120,000 m<sup>3</sup>/h</div> <div>Measuring ranges depend on nominal pipe size</div>
<b>Repeatability</b>	≤ 0.05 % of the measured value
<b>Accuracy</b>	<div>Error limits Q<sub>t</sub> ... Q<sub>max</sub></div> <div>4-path and 8-path version: ≤ ± 0.5 % Dry calibrated</div> <div>4-path and 8-path version: ≤ ± 0.2 % After flow calibration and adjustment with constant factor. Without uncertainty of the calibration test facility.</div> <div>4-path and 8-path version: ≤ ± 0.1 % After flow calibration and adjustment with polynomial or piecewise correction. Without uncertainty of the calibration test facility.</div>
<b>Min. piping requirements</b>	<div>4-path version According OIML Class 1.0: with straight inlet section of ≥ 10D or ≥ 5D with flow conditioner According OIML Class 0.5: with straight inlet section of ≥ 10D and flow conditioner</div> <div>8-path version According OIML Class 1.0: with straight inlet section of ≥ 2D According OIML Class 0.5: with straight inlet section of ≥ 5D</div> <div>For details see operating instructions</div>
<b>Diagnostics functions</b>	i-diagnostics™: integrated device diagnostics and intelligent extended device and application diagnostics via FLOWgate™ software
<b>Gas temperature</b>	<div>–40 °C ... +180 °C</div> <div>On request: –194 °C ... +280 °C</div>
<b>Operating pressure</b>	<div>0 bar (g) ... 160 bar (g)</div> <div>On request: 0 bar (g) ... 450 bar (g)</div>
<b>Nominal pipe size</b>	<div>3 " ... 56 "</div> <div>(DN 80 ... DN 1400), other nominal pipe sizes on request</div>
<b>Ambient temperature</b>	<div>–40 °C ... +70 °C</div> <div>(–60 °C ... +70 °C with enclosure for electronics)</div>
<b>Storage temperature</b>	<div>–40 °C ... +70 °C</div> <div>(–60 °C ... +70 °C meter body only)</div>
<b>Ambient humidity</b>	<div>≤ 95 %</div> <div>Relative humidity; non-condensing</div>

<b>Conformities</b>		OIML R 137-1&2:2012 OIML D 11:2013 ISO 17089-1 AGA-Report No. 9 MID: 2014/32/EU PED: 2014/68/EU ATEX: 2014/34/EU EMC: 2014/30/EU GOST 8.611-2013 GOST 8.733-2011
<b>Ex-approvals</b>		<div> <div>IECEX</div> <div>           Ex db ia op is [ia Ga] IIA/IIC T4 Gb            Ex db eb ia op is [ia Ga] IIA/IIC T4 Gb            Ex ia op is IIA/IIC T4 Ga            Ex ia nA op is IIC T4 Gc         </div> </div> <div> <div>ATEX</div> <div>           II 2 (1) G Ex db ia op is [ia Ga] IIA/IIC T4 Gb            II 2 (1) G Ex db eb ia op is [ia Ga] IIA/IIC T4 Gb            II 1G Ex ia op is IIA/IIC T4 Ga            II 3G Ex ia nA op is IIC T4 Gc         </div> </div> <div> <div>NEC/CEC (US/CA)</div> <div>           Explosion-proof / non-incendive:            CI I, Div. 1 Group D, T4 / Ex d ia [ia Ga] IIA T4 Gb / CI I, Zone 1 AEx d ia op is [ia Ga] IIA T4 Gb            CI I, Div. 1 Groups A, B, C, D, T4 / Ex ia IIC T4 Ga / CI I, Zone 0, AEx ia op is IIC T4 Ga            CI I, Div. 1 Groups B, C, D, T4 / Ex d ia [ia Ga] IIC T4 Gb / CI I, Zone 1 AEx d ia op is [ia Ga] IIC T4 Gb            Intrinsically safe:            CI I, Div. 1 Group D T4 / Ex ia IIA T4 Ga / CI I, Zone 0, AEx ia op is IIA T4 Ga            CI I, Div. 1 Groups A, B, C, D, T4 / Ex ia IIC T4 Ga / CI I, Zone 0, AEx ia op is IIC T4 Ga            Non-incendive            CI I, Div. 2 Groups A, B, C, D, T4 / Ex ia nA IIC T4 Gc / CI I, Zone 2, AEx ia nA op is IIC T4 Gc         </div> </div>
<b>Enclosure rating</b>		IP66 / IP67
<b>Analog outputs</b>		1 output: 4 ... 20 mA, $\leq 250 \Omega$ Active/passive, electrically isolated
<b>Digital outputs</b>		4 outputs: 2 x status, 2 x pulse $\leq 30 \text{ V}, 50 \text{ mA}$ Passive, electrically isolated, Open Collector or according to NAMUR (EN 50227), $f_{\max} = 10 \text{ kHz}$ (scalable)
<b>Modbus</b>	Type of fieldbus integration	✓ TCP RTU RS-485 (3x) ASCII RS-485 (3x)
	Remark	Option
<b>Ethernet</b>		✓
<b>HART</b>		✓
	Remark	HART master (for connection of external pressure and temperature transmitters)
<b>Optical interface</b>		✓
	Remark	Service interface (IR, according IEC 62056-21)
<b>Serial</b>		✓
	Remark	Encoder
<b>Operation</b>		Via display and software FLOWgate™
<b>Dimensions (W x H x D)</b>		See dimensional drawings and tables
<b>Weight</b>		See table "Dimensions"
<b>Material in contact with media</b>		Low temperature carbon steel, stainless steel, duplex steel

<b>Electrical connection</b>	Voltage	Electrically isolated: 12 ... 24 V DC Intrinsically safe: 6 ... 16 V DC PowerIn technology™ with back-up battery (2,400 mAh, 10.8 V), optional
	Power consumption	0.45 W ... 2.45 W Depending on electronics configuration
<b>Integrated components</b>		Integrated pressure sensor and temperature sensor for correction of pressure and temperature effects (option)

## Volume correction

<b>Correction method</b>	PTZ (optional integrated)
<b>Compressibility</b>	SGERG88 AGA 8 Gross method 1 AGA 8 Gross method 2 AGA NX-19 AGA NX-19 mod. NX-19 mod. (GOST) GERG91 mod. (GOST) Fixed value
<b>Data archives</b>	1 diagnostics archive (6,000 entries) 2 measurement periodic archives (6,000 entries each)
<b>Logbooks</b>	Event log book (1,000 entries) Parameter log book (200 entries) Metrology log book (50 entries)

## Measuring ranges

Measuring ranges, metric

Nominal pipe size	Extended flow rate range acc. MID				
	Standard flow rate range acc. MID				Non-MID maximum flow rate m³/h
	Extended MID minimum flow rate m³/h	Standard MID minimum flow rate m³/h	MID transition flow rate m³/h	MID maximum flow rate m³/h	
	Extended $Q_{min}$	Standard $Q_{min}$	Acc. ISO 17089 $Q_t$	Standard $Q_{max}$	Extended $Q_{max}$
DN 80 (3")	5	8	40	650	1,000
DN 100 (4")	8	13	65	1,000	1,600
DN 150 (6")	16	20	100	2,500	3,000
DN 200 (8")	20	32	160	4,000	4,500
DN 250 (10")	25	50	240	6,500	7,000
DN 300 (12")	35	65	310	7,800	8,000
DN 350 (14")	45	80	420	10,000	10,000
DN 400 (16")	60	120	550	13,000	14,000
DN 450 (18")	100	130	700	16,000	17,000
DN 500 (20")	130	200	850	20,000	20,000
DN 550 (22")	150	260	1,000	24,000	24,000
DN 600 (24")	180	320	1,200	28,000	32,000
DN 650 (26")	240	450	1,400	32,000	35,000
DN 700 (28")	280	650	1,700	36,000	40,000
DN750 (30")	320	650	1,900	40,000	45,000
DN 800 (32")	360	800	2,200	43,000	50,000
DN 850 (34")	400	900	2,500	47,000	55,000
DN 900 (36")	450	1,000	2,800	51,000	66,000
DN 950 (38")	500	1,100	3,100	56,000	70,000
DN 1000 (40")	550	1,200	3,400	60,000	80,000
DN 1050 (42")	600	1,300	3,800	65,000	85,000
DN 1100 (44")	650	1,400	4,100	70,000	90,000
DN 1150 (46")	700	1,500	4,500	72,000	95,000
DN 1200 (48")	750	1,600	4,800	80,000	100,000
DN 1300 (52")	900	1,700	5,600	90,000	110,000
DN 1400 (56")	1,000	1,800	6,500	100,000	120,000

When using an installation configuration with flow conditioner the maximum allowed gas velocity in the pipe is limited to 40 m/s

## Measuring ranges, imperial

Nominal pipe size	Extendet flow rate range acc. MID				
		Standard flow rate range acc. MID			
	Extended MID minimum flow rate	Standard MID minimum flow rate	MID transition flow rate	MID maximum flow rate	Non-MID maximum flow rate
	Ft³/h	Ft³/h	Ft³/h	Ft³/h	Ft³/h
	Extended Q <sub>min</sub>	Standard Q <sub>min</sub>	Acc. ISO 17089 Q <sub>t</sub>	Standard Q <sub>max</sub>	Extended Q <sub>max</sub>
3" (DN 80)	180	280	1,400	23,000	35,000
4" (DN 100)	290	460	2,300	35,300	56,000
6" (DN 150)	570	710	3,500	88,000	106,000
8" (DN 200)	710	1,130	5,700	141,300	159,000
10" (DN 250)	880	1,800	8,500	230,000	247,000
12" (DN 300)	1,200	2,300	10,900	276,000	283,000
14" (DN 350)	1,600	2,800	14,800	353,000	354,000
16" (DN 400)	2,100	4,200	19,400	459,000	495,000
18" (DN 450)	3,500	4,600	24,700	565,000	602,000
20" (DN 500)	4,600	7,100	30,000	706,000	708,000
22" (DN 550)	5,300	9,200	35,000	848,000	850,000
24" (DN 600)	6,400	11,300	42,000	989,000	1,133,000
26" (DN 650)	8,500	15,900	49,000	1,130,000	1,240,000
28" (DN 700)	9,900	23,000	60,000	1,271,000	1,420,000
30" (DN 750)	11,300	23,000	67,000	1,413,000	1,590,000
32" (DN 800)	12,700	28,300	78,000	1,519,000	1,770,000
34" (DN 850)	14,200	31,800	88,000	1,660,000	1,950,000
36" (DN 900)	15,900	35,300	99,000	1,801,000	2,337,000
38" (DN 950)	17,700	38,800	109,000	1,978,000	2,479,000
40" (DN 1000)	19,500	42,400	120,000	2,119,000	2,833,000
42" (DN 1050)	21,200	45,900	134,000	2,296,000	3,010,000
44" (DN 1100)	23,000	49,400	145,000	2,472,000	3,187,000
46" (DN 1150)	24,800	53,000	159,000	2,543,000	3,364,000
48" (DN 1200)	26,600	56,500	170,000	2,825,000	3,541,000
52" (DN 1300)	31,800	60,000	198,000	3,178,000	3,885,000
56" (DN 1400)	35,300	63,600	230,000	3,532,000	4,238,000

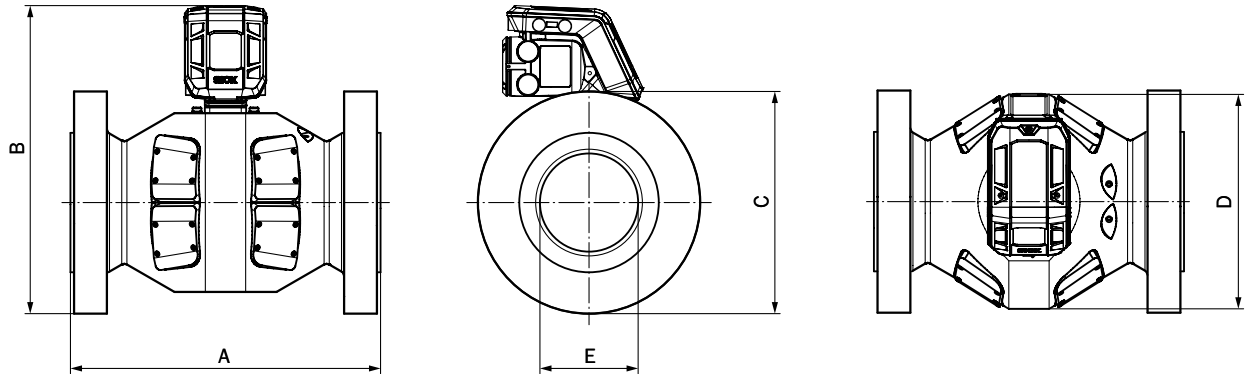
When using an installation configuration with flow conditioner the maximum allowed gas velocity in the pipe is limited to 131 ft/s

## Ordering information

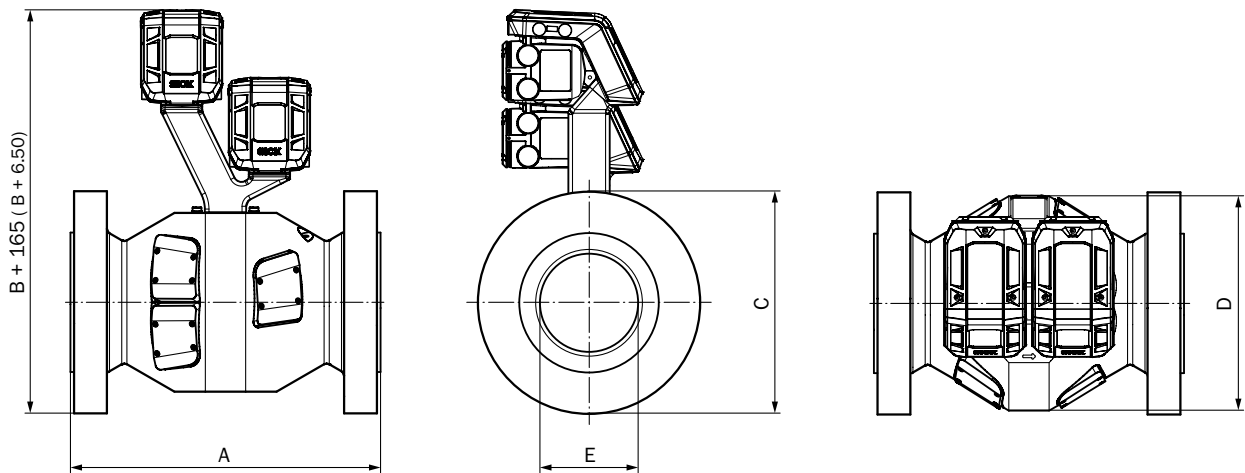
Our regional sales organization will help you to select the optimum device configuration.

## Dimensional drawings (Dimensions in mm (inch))

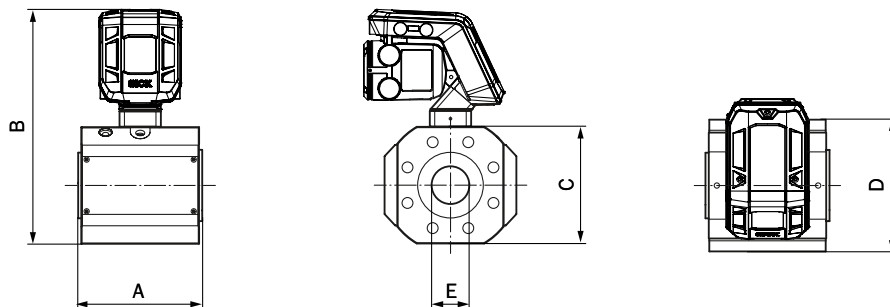
FLWSIC600-XT and FLWSIC600-XT Forte



FLWSIC600-XT 2plex and FLWSIC600-XT Quatro

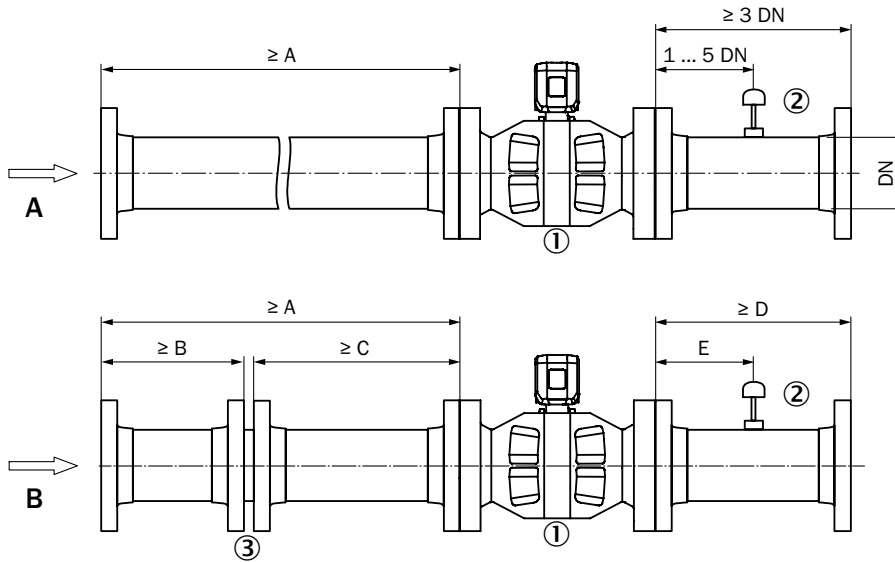


FLWSIC600-XT: 3" design for up to Class 600/PN100 pressure levels



## Instruction for installation

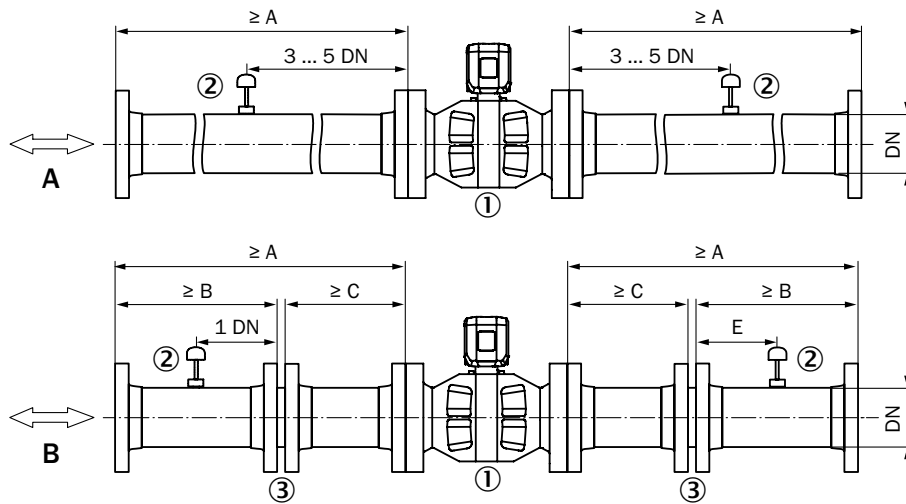
Installation of FLOWSIC600-XT in pipeline for unidirectional use (minimum requirements)



- ① FLOWSIC600-XT
- ② Temperature measuring point
- ③ Flow conditioner

Configuration A			Configuration B						
Number of measuring paths	OIML R 137	A	Number of measuring paths	OIML R 137 A <sup>1)</sup>	A	B	C	D	E
4	Class 1.0	10 DN	4	Class 1.0	5 DN	2 DN	3 DN	3 DN	1 ... 5 DN
8	Class 1.0	2 DN	4	Class 0.5	10 DN	2 DN	8 DN	3 DN	1 ... 5 DN
8	Class 0.5	5 DN	8	Class 1.0/0.5	5 DN	2 DN	3 DN	3 DN	1 ... 5 DN
Number of measuring paths	AGA Report 9, 3 <sup>rd</sup> Edition, July 2017	A	Number of measuring paths	AGA Report 9, 3 <sup>rd</sup> Edition, July 2017 <sup>2)</sup>	A	B	C	D	E
4	"Metering package performance" acc. § 6.3	20 DN	4	"Metering package performance" acc. § 6.3	10 DN	5 DN	5 DN	5 DN	2.5 DN
8	"Metering package performance" acc. § 6.3	5 DN	8	"Metering package performance" acc. § 6.3	5 DN	2 DN	3 DN	5 DN	2.5 DN
			<sup>1)</sup> Minimum requirements with PTB flow conditioner; recommended installation for other flow conditioners on request						
			<sup>2)</sup> Minimum requirements with CPA 50 E flow conditioner; recommended installation for other flow conditioners on request						

Installation of FLOWSIC600-XT in pipeline for bidirectional use (minimum requirements)



- ① FLOWSIC600-XT
- ② Alternative temperature measurement points
- ③ Flow conditioner

Configuration A			Configuration B					
Number of measuring paths	OIML R 137	A	Number of measuring paths	OIML R 137 A <sup>1)</sup>	A	B	C <sup>3)</sup>	E
4	Class 1.0	10 DN	4	Class 1.0	5 DN	2 DN	3 DN	1 DN
8	Class 1.0	5 DN	4	Class 0.5	10 DN	2 DN	8 DN	1 DN
8	Class 0.5	5 DN	8	Class 1.0/0.5	5 DN	2 DN	3 DN	1 DN
Number of measuring paths	AGA report 9, 3 <sup>rd</sup> Edition, July 2017	A	Number of measuring paths	AGA report 9, 3 <sup>rd</sup> Edition, July 2017 <sup>2)</sup>	A	B	C	D <sup>4)</sup>
4	"Metering package performance" acc. § 6.3	20 DN	4	"Metering package performance" acc. § 6.3	10 DN	5 DN	5 DN	2,5 DN
8	"Metering package performance" acc. § 6.3	5 DN	8	"Metering package performance" acc. § 6.3	6 DN	3 DN	3 DN	2,5 DN
			<sup>1)</sup> Minimum requirements with PTB flow conditioner; recommended installation for other flow conditioners on request					
			<sup>2)</sup> Minimum requirements with CPA 50 E flow conditioner; recommended installation for other flow conditioners on request					
			<sup>3)</sup> When C ≥ 5 DN, the temperature measuring point in pipe section C must be positioned with a distance of 3 ... 5 DN					
			<sup>4)</sup> Meter packages shall be flow calibrated with thermowells installed					

## Dimensions

Nominal pipe size	Connection flange	Standard	Weight <sup>1)</sup>	Length (A)	Hight <sup>2)</sup> (B)	Flange diameter (C)	Width of measuring section (D)	Internal diameter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
3"	Cl. 150	ANSI B16.5	75	240	454	190	205	73
	Cl. 300		75		454	210		
	Cl. 600		75		454	210		
	Cl. 900		120		461	240		
DN 80	PN 16	DIN 2633	75	240	454	200		
	PN 63	DIN 2636	75		454	215		
	PN 100	DIN 2637	75		454	230		
4"	Cl. 150	ANSI B16.5	100	300	490	230	248	95
	Cl. 300		110		490	255		
	Cl. 600		120		490	275		
	Cl. 900		130		490	290		
DN 100	PN 16	DIN 2633	110	300	490	220		
	PN 63	DIN 2636	120		490	250		
	PN 100	DIN 2637	126		490	265		
6"	Cl. 150	ANSI B16.5	128	450	540	280	330	142
	Cl. 300		145		540	320		
	Cl. 600		170		540	355		
	Cl. 900		238		540	380		
DN 150	PN 16	DIN 2633	140	450	540	285		
	PN 63	DIN 2636	162		540	345		
	PN 100	DIN 2637	176		540	355		
8"	Cl. 150	ANSI B16.5	255	600	617	345	415	190
	Cl. 300		276		617	380		
	Cl. 600		316		617	420		
	Cl. 900		360		617	470		
DN 200	PN 16	DIN 2633	260		617	340		
	PN 63	DIN 2636	298		617	415		
	PN 100	DIN 2637	360		617	430		
10"	Cl. 150	ANSI B16.5	377	750	691	405	420	235
	Cl. 300		411		691	445		
	Cl. 600		485		691	510		
	Cl. 900		528		691	545		
DN 250	PN 16	DIN 2633	383		691	405		
	PN 63	DIN 2636	434		691	470		
	PN 100	DIN 2637	486		691	505		
12"	Cl. 150	ANSI B16.5	445	900	728	485	500	270
	Cl. 300		494		728	520		
	Cl. 600		560		728	560		
	Cl. 900		645		685	610		
DN 300	PN 16	DIN 2633	441		728	460		
	PN 63	DIN 2636	509		728	530		
	PN 100	DIN 2637	585		638	585		

Nominal pipe size	Connection flange	Standard	Weight <sup>1)</sup>	Length (A)	Hight <sup>2)</sup> (B)	Flange diame- ter (C)	Width of mea- suring section (D)	Internal diame- ter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
14"	Cl. 150	ANSI B16.5	475	1,050	642	535	540	315
	Cl. 300		600		667	585		
	Cl. 600		675		677	605		
	Cl. 900		850		700	640		
DN 350	PN 16	DIN 2633	475		635	520		
	PN 63	DIN 2636	625		675	600		
	PN 100	DIN 2637	750		705	655		
Fore al meters ≥ 16" an installation length of 3D is optionally available								
16"	Cl. 150	ANSI B16.5	672	762	844	595	610	360
	Cl. 300		760		844	650		
	Cl. 600		857		844	685		
	Cl. 900		926	800	755	705		
DN 400	PN 16	DIN 2633	658	762	844	580		
	PN 63	DIN 2636	794		844	670		
18"	Cl. 150	ANSI B16.5	660	820	754	635	620	405
	Cl. 300		760		792	710		
	Cl. 600		960		820	745		
	Cl. 900		1,300	900	830	785		
DN 450	Data on request							
20"	Cl. 150	ANSI B16.5	750	902	815	700	670	450
	Cl. 300		930		853	775		
	Cl. 600		1,080		872	815		
	Cl. 900		1,500	1,000	892	855		
DN 500	PN 16	DIN 2633	700	902	823	715		
22"	Data on request							
DN 550	Data on request							
24"	Cl. 150	ANSI B16.5	1,090	991	927	815	760	540
	Cl. 300		1,390		978	915		
	Cl. 600		1,615		990	940		
	Cl. 900		2,100	1,200	1,040	1,040		
DN 600	PN 16	DIN 2633	1,015	991	940	840		
26"	Cl. 150	ASME B16.47	1,475	1,050	965	870	828	585
	Cl. 300		1,825		1,016	972		
	Cl. 600		2,100		1,038	1,016		
	Cl. 900		2,500	1,250	1,073	1,086		
DN 650	Data on request							
28"	Cl. 150	ASME B16.47	1,950	1,100	1,027	927	862	630
	Cl. 300		2,225		1,080	1,035		
	Cl. 600		2,450		1,100	1,073		
	Cl. 900		3,000	1,300	1,150	1,169		
DN 700	Data on request							

Nominal pipe size	Connection flange	Standard	Weight <sup>1)</sup>	Length (A)	Hight <sup>2)</sup> (B)	Flange diame- ter (C)	Width of mea- suring section (D)	Internal diame- ter (E)
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
30"	Cl. 150	ASME B16.47	2,195	1,150	1,080	985	902	675
	Cl. 300		2,545		1,135	1,092		
	Cl. 600		2,820		1,154	1,130		
	Cl. 900		3,350	1,350	1,205	1,232		
DN 750	Data on request							
32"	Cl. 150	ASME B16.47	2,485	1,200	1,145	1,061	979	720
	Cl. 300		2,835		1,190	1,150		
	Cl. 600		3,110		1,212	1,194		
	Cl. 900		3,800	1,400	1,272	1,315		
DN 800	Data on request							
34"	Data on request							
DN 850	Data on request							
36"	Cl. 150	ASME B16.47	3,125	1,250	1,250	1,169	1,082	810
	Cl. 300		3,525		1,300	1,270		
	Cl. 600		3,850		1,323	1,315		
	Cl. 900		5,225	1,450	1,396	1,461		
DN 900	Data on request							
38"	Cl. 150	ASME B16.47	3,800	1,300	1,310	1,238	1,160	855
	Cl. 300		3,725		1,275	1,169		
	Cl. 600		4,300		1,325	1,270		
	Cl. 900		Data on request		1,421	1,461		
DN 950	Data on request							
40"	Cl. 150	ASME B16.47	3,825	1,350	1,359	1,289	1,213	900
	Cl. 300		4,125		1,334	1,239		
	Cl. 600		4,675		1,375	1,321		
	Cl. 900		Data on request		1,470	1,512		
DN 1000	Data on request							
42"	Cl. 150	ASME B16.47	4,675	1,450	1,415	1,346	1,261	945
	Cl. 300		4,650		1,386	1,289		
	Cl. 600		5,450		1,444	1,404		
	Cl. 900		Data on request		1,523	1,562		
DN 1050	Data on request							
44"	Data on request							
DN 1100	Data on request							
46"	Data on request							
DN 1150	Data on request							
48"	Cl. 150	ASME B16.47	6,400	1,600	1,574	1,511	1,416	1,080
	Cl. 300		6,475		1,552	1,467		
	Cl. 600		7,850		1,615	1,594		
	Cl. 900		12,100	1,900	1,711	1,785		
DN 1200	Data on request							
<sup>1)</sup> Devices with single SPU; devices with double SPU: weight + 7 kg								
<sup>2)</sup> Optional neck extension: B + 200 mm								

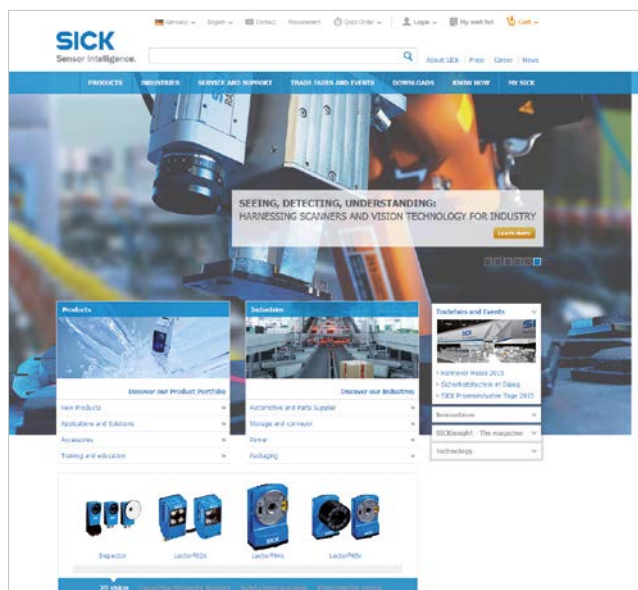






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SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With almost 8,000 employees and over 50 subsidiaries and equity investments as well as numerous representative offices worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

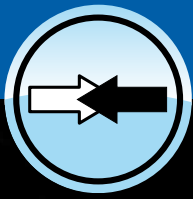
### Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and additional representatives → [www.sick.com](http://www.sick.com)

**D-FL 220 T**

## Ultrasonic Air Flow Monitor



## Ultrasonic Air Flow Monitor

**Measuring system for continuous evaluation of air flow rate and flow direction in tunnels.**

### Features & benefits

- Reliable measurement across the tunnel profile
- No separate control unit required
- Easy configuration
- Corrosion resistant
- Sensors can be exchanged very quickly
  - no tools required
  - no re-alignment required
- Signal transmission by analogue signal/ relay or by RS 485 MODBUS RTU
- Reduced spare requirements
- Immune against ambient noise
- Extremely low maintenance requirements

### Description

Two identical sensors alternately emit or receive ultrasonic pulses.

If air flow is present along the measuring path the transition time is slightly different for both directions.

This propagation delay is precisely determined and transformed to the measuring values: air velocity, air flow rate, air flow direction and air temperature.

Two hardware identical sensors are combined, one parametrized as master, the other as slave.

The slave is fully operated and controlled by the master.

The system can be checked and set by access to the master only, either through local USB port or remotely using RS 485 bidirectional MODBUS RTU interface.

This prevents necessity of blocking traffic.

Each sensor allows inspection by help of LED, visible from the outside.

D-FL 220T executes internal self testing routines automatically and requires extremely low maintenance.



#### D-FL 220T M Sensor

measuring principle	determination of direction dependant differential transition time of ultrasonic pulses
components measured (access via RS 485 modbus RTU)	air velocity, air flow rate, flow direction, temperature
measuring range	-40 to 40 m/s
response time	minimum 1s, can be configured up to 180 s
resolution	0.1 m/s, accuracy dependant upon measuring distance, flow profile, installation, typ. $\pm 0.2$ m/s @ 3 m/s
analog output range	can be configured, typically: -20 to 20 m/s
measuring path	1.2 - 25 m
orientation of measuring path	(0) 30 - 60°C to direction of tunnel axis, typically 45°
signal transmission	1x 4-20mA, 400 Ohm, isolated can be assigned by any measured component and output range
status contacts	1x fault contact, NC, 1x flow direction, NC, rating 48 V, 2 A, variable assignment
transfer of values:	1x RS 485 MODBUS RTU, bi directional to control room etc. 1x intercom RS 485 master-slave
service interface	USB 1.1 port
service tool	software D-ESI 100, requires netbook / laptop and Windows XP™ OS
control cycle	internal automated routines, self test
power supply (sensor)	24 VDC $\pm 10\%$ , approx. 1 A
ambient temperature	-25 to 55 °C
protection, weight	IP 67, approx. 2,2 kg
sensor material	stainless steel 1.4571/316Ti, polyamide, ca. RAL5017 flammability rating: B1 (UL 94 V0),
conformity	2004/108 EC (EMV directive), 2006/95 EC ( Low voltage directive), EN 61 326-1 (2006), EN 61 010-1 (2001), RABT 2006, ASTRA guide line -ventilation of road tunnels - 2008, V2.01, RVS 09.02.22 2007

#### D-FL 220T BW Mounting Bracket

material	1.4571/316Ti
fixation at tunnel wall	4x bolt od = 8 mm

#### D-TB 100T Terminal Box

power supply (terminal box)	90-264 VAC, approx. 30 VA (for master, for slave as an option)
fixation at tunnel wall	4x bolt od = 8 mm
protection	IP 66, 1.5 kg
material	polycarbonate, approx. RAL 7035 flammability rating: B1 (UL 94 V0)
system components	2x D-FL 220T M sensor incl. 1.5m cable with plug 2x D-FL 220T BW 1.4571/316Ti mounting bracket 2x D-TB 100T terminal box w. socket

## DURAG

DURAG GmbH  
Kollastraße 105,  
22453 Hamburg, Germany  
Tel. +49 40 55 42 18-0  
E-Mail: info@durag.de

DURAG Brazil Office  
Tel. +55 11 3902 3306  
E-Mail: edinaldo@durag.com.br

DURAG China  
Tel. +21 60732979-206  
E-Mail: lianggc@durag-cn.com

DURAG France  
Tel. +33 1 301 811 80  
E-Mail: info@durag-france.fr

DURAG India  
Tel. +91 80 2314 5626 / 4215 1191  
E-Mail: info@duragindia.com

DURAG Italia  
Tel. +39 0321 679569  
E-Mail: info@durag.it

DURAG Japan Office  
Tel. +81 55 977 3994  
E-Mail: saito@durag.jp

DURAG Korea Office  
Tel. +82 2 761 8970  
E-Mail: mac\_lim@durag-group.co.kr

DURAG UK Office  
Tel. +44 1785 760 007  
E-Mail: durag.uk@durag.de

DURAG USA  
Tel. +1 651 451-1710  
E-Mail: durag@durag.com

## DURAG

DURAG data systems  
Kollastraße 105,  
22453 Hamburg, Germany  
Tel. +49 40 55 42 18-3000  
E-Mail: info@durag-data.de

DURAG process & systems technology gmbh,  
Kollastraße 105,  
22453 Hamburg, Germany  
Tel. +49 40 55 42 18-0  
E-Mail: info@durag-process.de

## Hegwein

Hegwein GmbH,  
Am Boschwerk 7  
70469 Stuttgart, Germany  
Tel. +49 711 135 788-0  
E-Mail: info@hegwein.de

SMITSVONK®  
SMITSVONK Holland B.V.  
Loodstraat 57  
2718 RV Zoetermeer  
Netherlands  
Tel. +31 79 361 35 33  
E-Mail: sales@smitsvonk.nl

## VEREWA

VEREWA GmbH  
Kollastraße 105  
22453 Hamburg, Germany  
Tel. +49 40 55 42 18-0  
E-Mail: verewa@durag.de

www.durag.de



## FLOWSIC200

### Flow speed measuring device

Measuring flow velocity and air temperature in tunnels

# FLAWSIC200

## The measuring titan in the tunnel for long-term operation

### FIELDS OF APPLICATION

- Measuring the air velocity and flow direction as well as optionally the temperature for
  - ventilation control in road and railway tunnels or similar structures
  - detection of smoke propagation during tunnel fires for efficient fire fighting

#### FLAWSIC200 M

- For tunnel diameters up to 22 m (installation angle for 60°)
- Aluminium version with die-cast enclosure for tunnels with low road salt usage or minimal corrosive atmospheres
- Maintenance interval: typically 1 to 2 years
- Ultrasonic transducers made of aluminium

#### FLAWSIC200 H-M

- For tunnel diameters up to 22 m (installation angle for 60°)
- Stainless steel version
- Ultrasonic transducers from long-lasting titanium – for high durability also in corrosive tunnel atmospheres
- Maintenance interval: typically up to 5 years

#### FLAWSIC200 H

- High acoustic power for large tunnel diameters up to 35 m (installation angle for 60°)
- Stainless steel version
- Ultrasonic transducers from long-lasting titanium – for high durability also in corrosive tunnel atmospheres
- Maintenance interval: typically up to 5 years

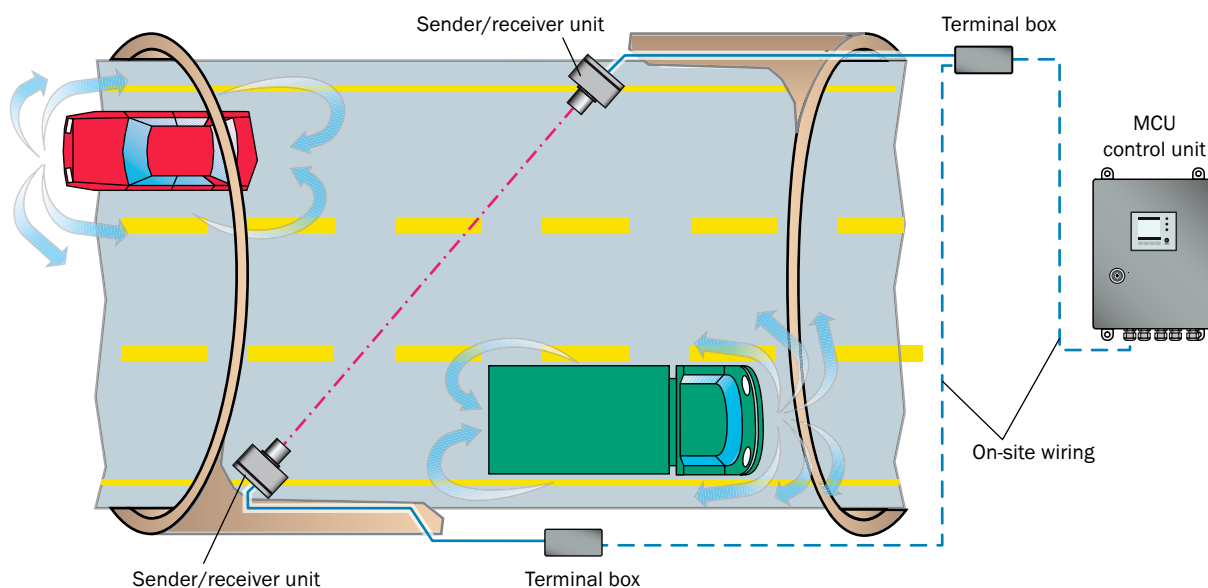
### AT A GLANCE

- Non-contact measuring system without any moving parts for lowest operating costs and long maintenance intervals
- Integral measurement over the full tunnel width for representative measuring results – imperative according to tunnel experts, especially when the system is designed for fire hazards
- Precise measurement also for very low flow velocities; therefore perfectly suitable for the assessment of portal emissions





## PRODUCT DESCRIPTION

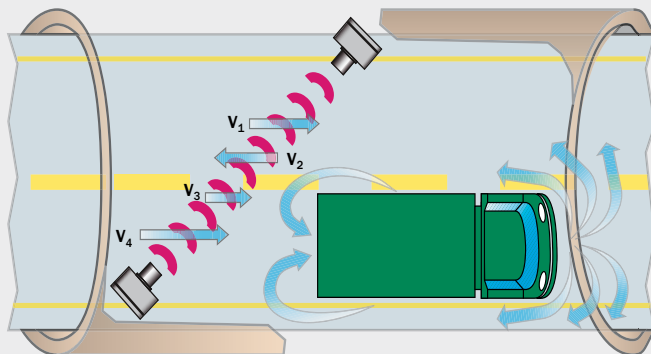


## ULTRASONIC MEASUREMENT PRINCIPLE

Two ultrasonic transducers typically installed at an angle of  $45^\circ \dots 60^\circ$  to the tunnel axis operate alternately as sender and receiver. The transit time of each sonic pulse depends on air velocity and direction, with the transit time being shorter in forward and longer in reverse direction. Air velocity is calculated from the ultrasonic transit time difference.

### Advantages of this method:

- Measured and actual air velocity (averaged over the complete tunnel cross-section) are very much in agreement. Large differences can occur with single-point measurements – even indication of the wrong flow direction.
- Independent of pressure and temperature
- Acoustic temperature measurement possible
- Long operating time because of no moving parts



Technical Data	FLWSIC200		
Type of models	FLWSIC200 M	FLWSIC200 H-M	FLWSIC200 H
Measuring Parameters			
Measuring principle	Measurement of difference in ultrasonic transit time		
Measuring components	Air velocity, direction and temperature		
Measuring ranges	−20 m/s ... +20 m/s; continuously variable		
Active measuring path	5 ... 25 m with FLSE200-M and -HM for tunnel width from 3,5 ... 22 m	5 ... 40 m with FLSE200-H; longer on request for tunnel width from 3,5 ... 35 m	
Accuracy	±0.1 m/s (depending on calibration, installation, flow profile, temperature and measuring distance)		
Ambient Conditions			
Ambient temperature	−40 ... +60 °C		
Approvals			
Compliances	<ul style="list-style-type: none"><li>• RABT 2006</li><li>• ASTRA “Guideline – Ventilation of Road Tunnels”, 2004, V1.2</li><li>• RVS 09.02.22<sup>1)</sup></li></ul>		
Protection class	<ul style="list-style-type: none"><li>• IP 66 for FLSE</li><li>• IP 65 for MCU</li></ul>		
Electrical safety	CE		
Control Unit Inputs and Outputs			
Analog outputs <sup>2)</sup>	1 output: 0/2/4 ... 22 mA, max. load 750 Ω		
Analog inputs <sup>2)</sup>	2 inputs: 0 ... 5/10 V or 0 ... 20 mA		
Digital outputs	5 outputs: 30 V DC/2 A or 48 V/1 A; potential-free Status signals: Operation/malfunction, maintenance, function check, service requirement, limit value		
Digital inputs <sup>2)</sup>	2 inputs for the connection of potential-free contacts		
Interfaces	<ul style="list-style-type: none"><li>• USB (service)</li><li>• RS232</li><li>• RS485 with optional interface module</li><li>• Ethernet with optional interface module</li></ul>		
Bus protocol	<ul style="list-style-type: none"><li>• TCP/IP via Ethernet (optional interface module)</li><li>• PROFIBUS DP via RS485 (optional interface module)</li><li>• Modbus via RS485 or Ethernet on request</li></ul>		
General			
System components (for the 3 versions)	<ul style="list-style-type: none"><li>• 2 sender/receiver units FLSE200 M or FLSE200 H-M or FLSE200 H</li><li>• 1 MCU control unit (19" rack, option)</li><li>• 2 terminal boxes</li><li>• 2 connection cables (FLSE200 – terminal boxes)</li><li>• 2 mounting brackets</li></ul>		
Operation	Via the display on the MCU control unit or the SOPAS ET software		
Control function	Internal function check (zero and control point test)		

<sup>1)</sup> Only version with stainless steel enclosure

<sup>2)</sup> Extendible by additional I/O modules