



FLAWSIC200

ULTRASONIC FLOW MEASUREMENT FOR AIR VELOCITY IN
TUNNEL SYSTEMS

Flow velocity measuring devices

SICK
Sensor Intelligence.

RELIABLE MEASUREMENT OF FLOW VELOCITY FOR TUNNEL VENTILATION

Air flow velocity monitoring in road and rail tunnels is a key component of ventilation technology in tunnel systems.

Measurement of the air flow is subject to strict requirements. The measuring technology used must reliably and accurately measure the flow in the tunnel cross section, even when there is varying traffic volume. In order to avoid traffic interruptions, maintenance work on the measuring device must be kept to a minimum. SICK has over 30 years' experience in developing and manufacturing sensors, which is reflected in the FLOWSIC200: The FLOWSIC200 combines modern and powerful ultrasound technology and also exceptional durability. Using the FLOWSIC200, ventilation systems in tunnels are controlled and sufficient aeration and ventilation of the tunnel is ensured over the long term. Another advantage of the FLOWSIC200 is that it has a maintenance interval of up to 5 years.



Representative measurement

The FLOWSIC200 measures the air flow over the entire width of the tunnel and therefore gives representative results of the air flow in the tunnel. Tunnel fittings such as fans or lighting and varying traffic can change the flow profile of the air in the tunnel. The FLOWSIC200 has a decisive advantage over single point measuring methods here: The influence of tunnel fittings and traffic on the measured result is significantly lower. Thanks to the FLOWSIC200's rugged technology, differences in density and temperature fluctuations in the tunnel air do not influence the measurement result.

High level of robustness and device availability

The FLOWSIC200 is manufactured from rugged stainless steel or die-cast aluminum components. For corrosive tunnel atmospheres SICK offers highly resistant titanium transducers. A further advantage: The maintenance interval of the measuring device is up to 5 years. Additionally, in case of fire, its rugged full-metal components have a clear advantage compared to conventional measuring technology made from plastic.

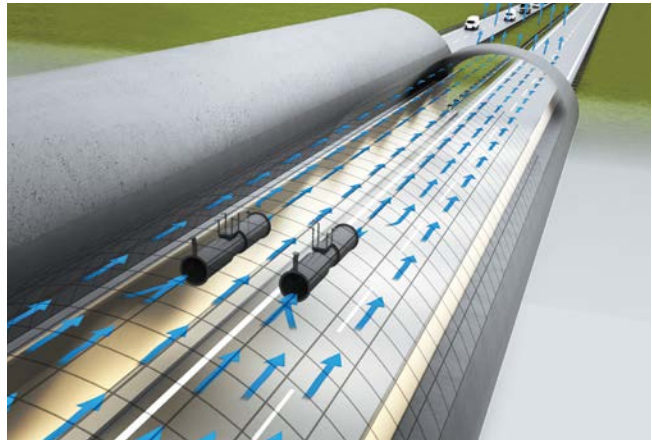
Powerful sensors

The FLOWSIC200 ultrasonic sensors are the result of SICK's 30 years' plus experience in the area of ultrasonic technology. The sonic coupling of the ultrasonic transducer in the air is performed in a highly efficient manner with minimal signal losses. Signal transmission works reliably, even in challenging measurement conditions with damp and particle-laden tunnel air or fluctuating temperatures, the measuring device's fully automated gain control ensured by.

For tunnels with widths up to 35 m, the FLOWSIC200 offers a version with increased acoustic power.

Comprehensive diagnostic functions

A fully automated check cycle periodically validates the device functions, while the integrated self-diagnosis continuously monitors all important function parameters. In case of impermissible measurement deviations, the FLOWSIC200 provides alert messages. This allows maintenance work to be planned well in advance and signs of wear to be fixed promptly, which ensures that the device continues to measure accurately.



PRODUCT OVERVIEW

The FLOWSIC200 consists of the ultrasonic sensors and the MCU control unit.

The FLOWSIC200 offers a solution for multiple applications resulting from the measuring task. Even large tunnel widths and corrosive ambient conditions are no problem for this solution.



FLAWSIC200 M

- Medium transducer power for tunnel widths up to 22 m
- Design featuring aluminum die-cast housing
- For tunnels with low salt input or environments with low levels of corrosion.
- Maintenance interval typically 1 to 2 years



FLAWSIC200 H-M

- Medium transducer power for tunnel widths up to 22 m
- Design featuring stainless-steel housing and titanium transducer for corrosive tunnel environments
- Maintenance interval typically up to 5 years



FLAWSIC200 H

- High transducer power for tunnel widths up to 35 m
- Design featuring stainless-steel housing and titanium transducer for corrosive tunnel environments
- Maintenance interval typically up to 5 years
- Tested in fires

I/O concept suitable for modular expansion:

- Analog and digital inputs and outputs
- Modbus RS485
- Modbus TCP
- Ethernet
- PROFIBUS DP



LC display with status LED and operating buttons (option)

- Measured value display
- Diagnostic information
- Parameterization

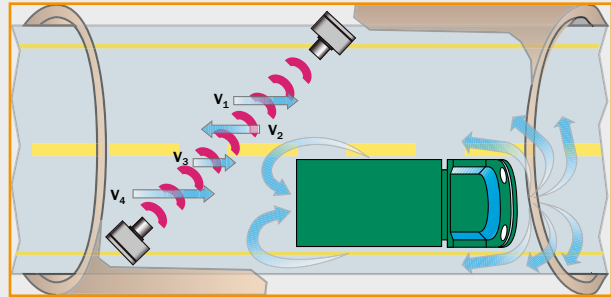
The MCU control unit is used to input and output signals and enables simple connection of the FLOWSIC200 to higher-level distributed control systems. Various interfaces are available for this which can be optionally expanded if necessary. A display unit enables simple operation of the FLOWSIC200. 19-inch housing version available for mounting the control unit in a control cabinet.

ULTRASONIC MEASUREMENT PRINCIPLE

Two ultrasonic transducers, which are typically installed at an angle of 45° ... 60° to the tunnel axis, alternately function as sender and receiver. Different transit times result for each sonic impulse depending on the flow velocity and direction. In the forward direction, the runtime is shortened; in the opposite direction, it is extended. The flow velocity is determined by the differences in ultrasonic transit time.

Advantages of this method:

- Measured and actual flow velocity (measured over the entire tunnel cross-section) always match very closely. With spot-measuring devices, large differences, or even incorrect indication of the flow direction, can occur.
- Independent of pressure and temperature
- Acoustic temperature measurement possible
- No moving parts ensure high reliability.



Reliable measurement in the event of fire

Measuring conditions completely change in the event of a fire in the tunnel. A large amount of thick smoke can develop in a short time. The gas composition changes significantly. The temperature increases very quickly at the site of the fire. The overall thermodynamic situation leads to a considerable change in the flow dynamics at the fire source. As part of fire testing with the Forschungsgesellschaft für Verbrennungskraftmaschinen und Thermodynamik mbH (FVT mbH) Austria, the FLOWSIC200 also proved itself under these extreme conditions.

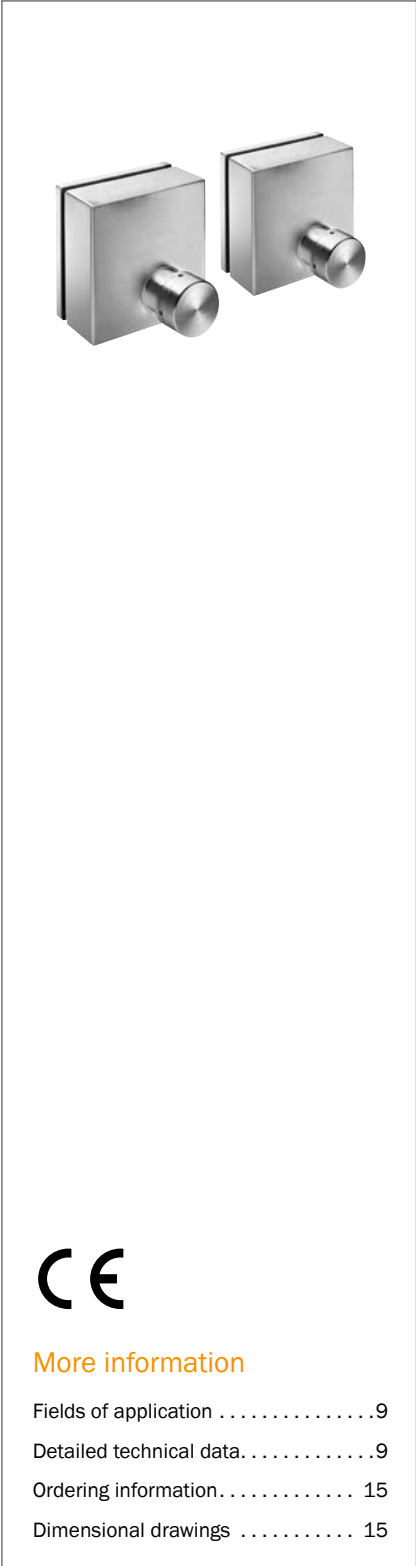
Thanks to the high acoustic power and the automated signal gain control integrated in the device, transmission of the sonic signal is ensured at all times. Advanced signal evaluation algorithms reliably process the signals. This means that the measuring function of the FLOWSIC200 remains intact if the dynamics of the flow drastically increase within a short time as a consequence of a tunnel fire.



High acoustic power – for very large tunnel dimensions and reliable measurements, even in the event of fire



THE TUNNEL FLOW MEASURING DEVICE FOR LONG-TERM OPERATION



Product description

The FLOWSIC200 is used for the non-contact and accurate measurement of flow velocity and flow direction inside tunnels or exhaust ventilation ducts. Ultrasonic measurement process provides the mean average value of the flow velocity across the tunnel width. The measuring device is vital for ensuring efficient and economical tunnel ventilation control when air flow is dictated by

climatic conditions or by traffic. Even in the event of a fire in the tunnel, reliable, exact, and representative measurement of the flow velocity and direction over the entire tunnel width is now a requirement. Only in this way can the smoke dispersion be measured and the required information for optimal ventilation regulation be received.

At a glance

- Internal non-contact measurement
- High switching capacity for measuring across large tunnel widths
- Rugged components made of titanium, stainless steel, or die cast
- Versions for corrosive tunnel atmospheres
- No mechanical moving parts
- Advanced diagnostics for early detection of faults

Your benefits

- Representative measurement across the entire width of the tunnel
 - Very reliable measuring, compared to spot-measuring process
 - Exact measurement of even very low flow velocities
 - Long maintenance interval of up to 5 years
 - Low operating costs thanks to reliable operation and low maintenance
- High device availability and therefore also the measurement data



More information

Fields of application 9

Detailed technical data 9

Ordering information 15

Dimensional drawings 15

→ www.sick.com/FLOWSIC200

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

- Measuring in road and rail tunnels
- Controlling the tunnel ventilation
- Identifying the smoke dispersion

Detailed technical data

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

FLAWSIC200 system

Measurands	Flow velocity, flow direction, temperature
Measurement principle	Ultrasonic transit time difference measurement
Measuring range	Flow velocity: 0 ... ± 20 m/s
Accuracy	± 0.1 m/s Depends on application
Diagnostic functions	Internal zero and reference point check Extended device diagnosis with SOPAS ET software
Tunnel width	FLAWSIC200 M, FLAWSIC200 H-M: 3.5 m ... 22 m FLAWSIC200 H: 3.5 m ... 35 m
Ambient temperature	-40 °C... +60 °C
Storage temperature	-40 °C... +70 °C
Ambient humidity	≤ 100% Relative humidity
Conformities	RABT 2006 ASTRA A "Guideline – Ventilation of Road Tunnels" (2008) RVS 09.02.22 (FLAWSIC200 H-M, FLAWSIC200 H)
Electrical safety	CE
Enclosure rating	IP66
Operation	Via LC display (option) or SOPAS ET software
Responsible	FLSE200-M: Die-cast aluminum housing, aluminum sensor FLSE200-H-M/-H: Stainless-steel housing, titanium sensor
Dimensions (W x H x D)	Details, see dimensional drawings
Mounting	Typical height above the road surface: 4.2 m; 45° ... 60° to tunnel axis
System components	2 x FLSE200 sender/receiver unit 1 x MCU control unit 2 x connection box 2 x connection cable 2 x wall bracket

MCU control unit

Description	Obligatory control and evaluation unit for up to eight FLAWSIC200 measuring points
Enclosure rating	IP65
Analog outputs	1 output: 0/2/4 ... 20 mA, 750 Ω Electrically isolated; further outputs when I/O modules are used (optional)
Analog inputs	2 inputs: 0 ... 20 mA Not electrically isolated; additional inputs with use of I/O modules (option)

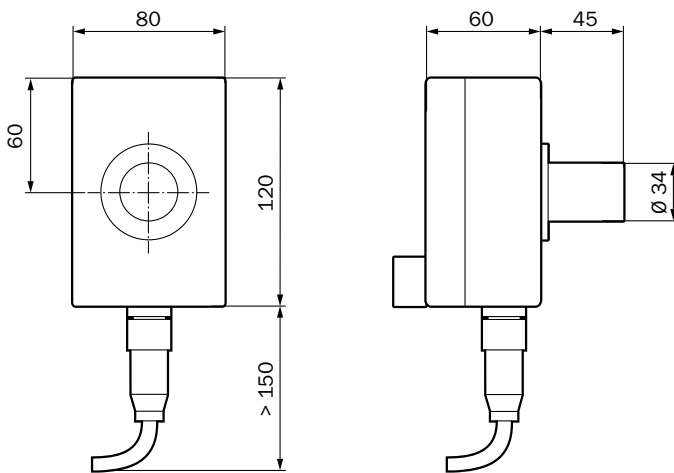
Digital outputs	5 relay outputs (changeover contacts), volt-free: 48 V AC, 1 A Safety extra-low voltage; for status signals “Operation/Fault”, “Limit value”, “Warning”, “Maintenance” and “Control cycle”
Digital inputs	4 volt-free contacts: Additional inputs with use of I/O modules
Interfaces	USB 1.1 (virtual COM port; service interface) RS-232 (via terminal connection; service interface) RS-485 (for connection of sender/receiver unit(s))
Bus protocol	Ethernet TCP/IP (via optional interface module) Modbus (via optional interface module) Modbus TCP (via optional interface module) PROFIBUS DP (via optional interface module)
Display	LC display Status LEDs: “Power”, “Maintenance”, and “Fault”
Operation	Via LC display or SOPAS ET software
Dimensions (W x H x D)	Details, see dimensional drawings
Weight	≤ 5 kg
Electrical connection	Voltage 90 to 250 V AC Frequency 50 Hz / 60 Hz Power consumption ≤ 50 W
Options	Interface module(s) I/O module(s)

Ordering information

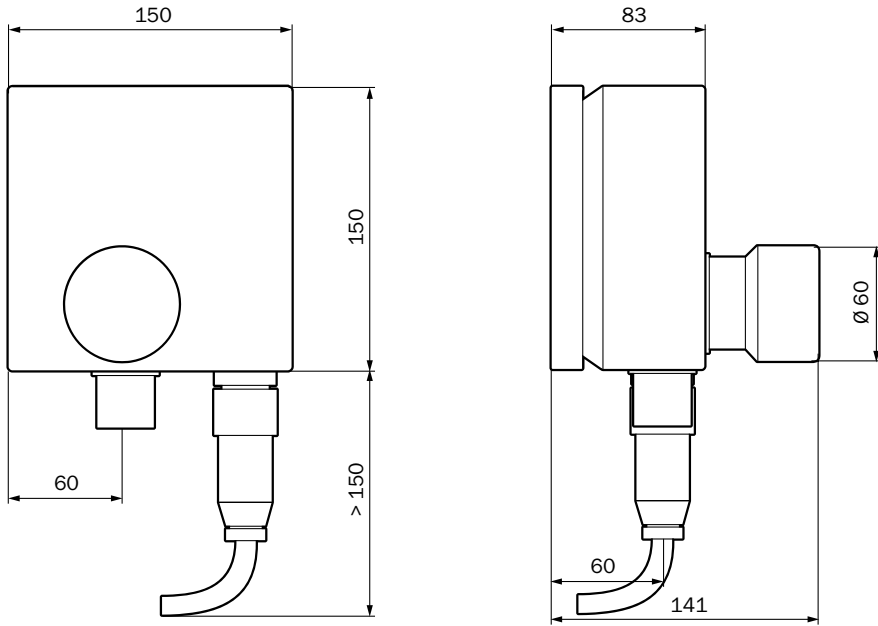
Our regional sales organization will be glad to advise you on which device configuration is best for you.

Dimensional drawings (dimensions in mm)

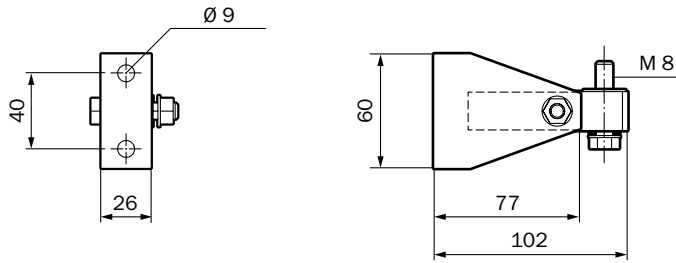
FLSE200-M sender/receiver unit



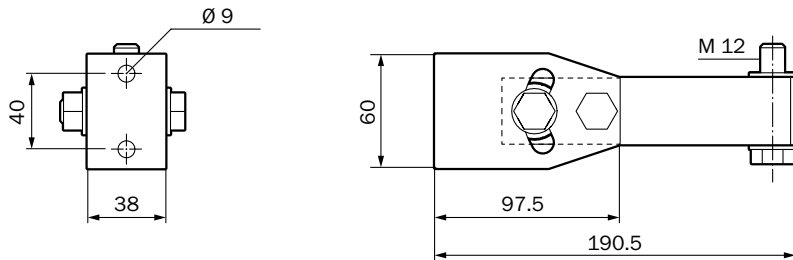
FLSE200-H and FLSE200-HM sender/receiver units



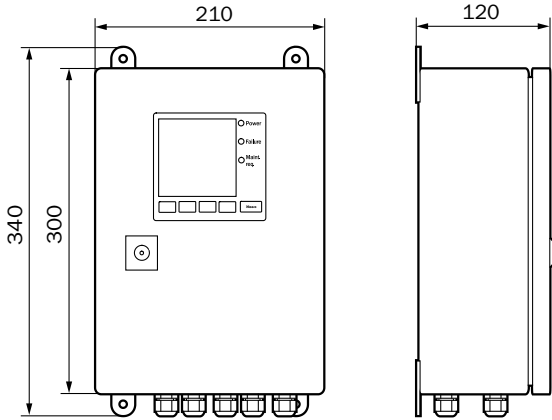
Wall bracket for FLSE200-M



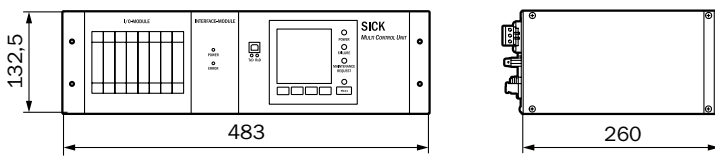
Wall bracket for FLSE200-H and FLSE200-HM



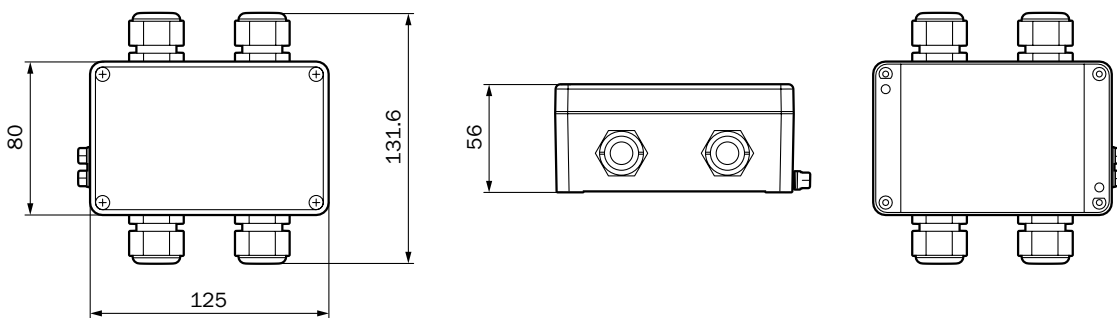
MCU control unit, stainless steel wall housing



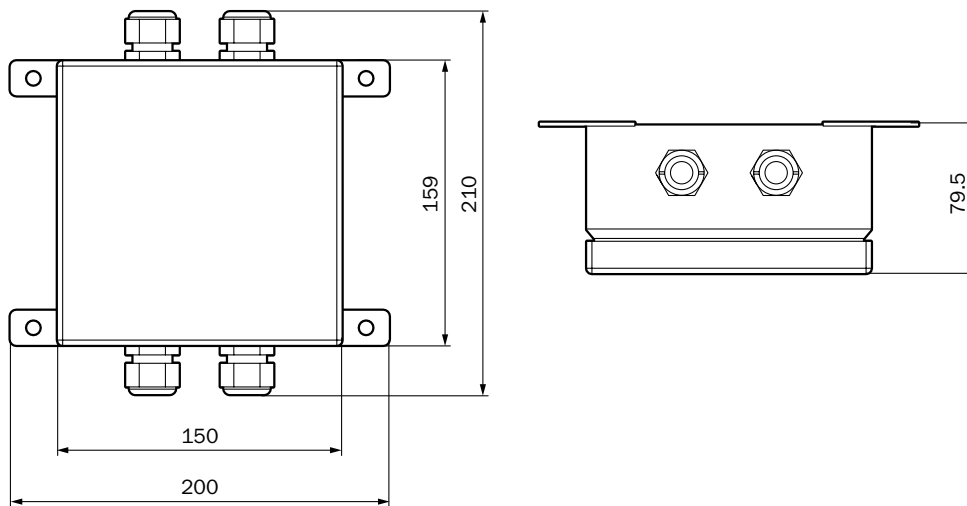
MCU control unit, 19" rack housing



Connection box, aluminum housing version



Connection box, stainless steel housing version



REGISTER NOW AT WWW.SICK.COM AND ENJOY THE FOLLOWING BENEFITS

- ✓ View net price and individual discount for each product.
- ✓ Simple ordering and delivery tracking.
- ✓ Overview of all quotes and orders.
- ✓ Create, save and share personalized wish lists.
- ✓ Direct ordering: place large orders quickly.
- ✓ View status of all quotes and orders. Notification by e-mail in the event of status changes.
- ✓ Simple reuse of previous orders.
- ✓ Convenient export of quotes and orders in the right format for your systems.



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