PRODUCT INFORMATION

FLOWSIC150 Carflow
Ultrasonic Flowmeter

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

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FLOWSIC150 CARFLOW – Exhaust gas flow measurement for vehicle and engine test benches up to 600 °C

PRODUCT DESCRIPTION

FLOWSIC150 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, FLOWSIC150 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

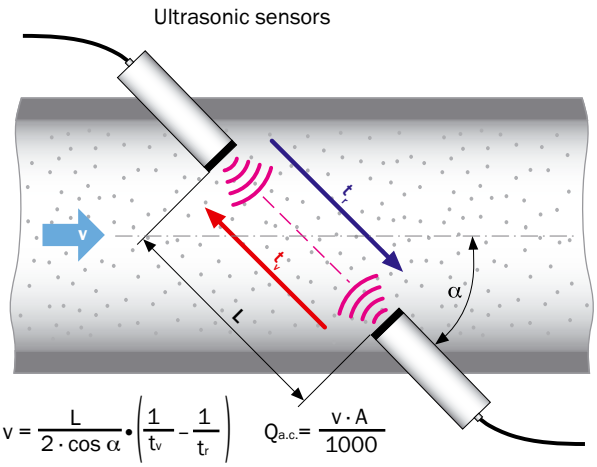
FIELDS OF APPLICATION

- 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

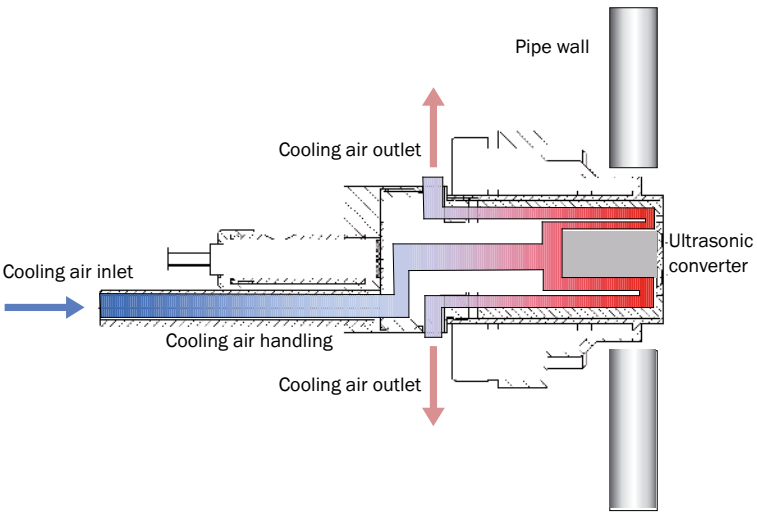


$$v = \frac{L}{2 \cdot \cos \alpha} \bullet \left(\frac{1}{t_v} - \frac{1}{t_r} \right) \qquad Q_{a.c.} = \frac{v \cdot A}{1000}$$

v = gas speed [m/s]
L = measured section [m]
α = angle of installation [°]
$Q_{a.c.}$ = volumetric flow actual condition [l/s]
A = pipe internal cross section [m^2]
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.



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Technical data FLOWSIC150	
Measured data	
Measured variables	Gas velocity, volumetric flow (actual condition), volumetric flow (standard condition), exhaust gas temperature (absolute), acoustic velocity
Measuring range Volumetric flow (actual condition)	• 2.5 inch version: 0 - 180 l/s (0 - 650 m³/h; 0 ft³ - 380 ft³) • 4 inch version: 0 - 500 l/s (0 - 1800 m³/h; 0 ft³ - 1060 ft³)
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)
Displays	
4-line LCD	Measured variables, diagnostic values, warning and error messages, splash-proof
Status LED	Operation, warning, fault
Installation	
Exhaust gas temperature	Max. 600 °C
Ambient conditions	Ambient temperature -10 ... +40 °C, humidity 5 - 95%
Connection versions for inlet and outlet	• Outer thread type G in accordance with ISO 228/1 (e.g., for Kamlok quick-release coupling) • Quick-release coupling (Kamlok, E-Line, Marman, Tri-Clamp)
Pressure loss device	< 12 mbar (dependent on process connection used)
Output of measured values and interfaces	
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
Connections for external devices	
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)
Electrical connection	
Voltage supply	• 90 - 125 V AC; 50/60Hz • 190 - 250V AC; 50/60Hz
Power consumption	Max. 1700 W (without external heating lines)
Max. power external heating	• 190 - 250 V AC: 1600 W • 90 - 125 V AC: 1000 W
Dimensions, weight	
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

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