



FLAWSIC150 CARFLOW Ultrasonic Measurement System

Measurement of Exhaust Gas Volume Flow Rate
on Roll and Engine Test Stands

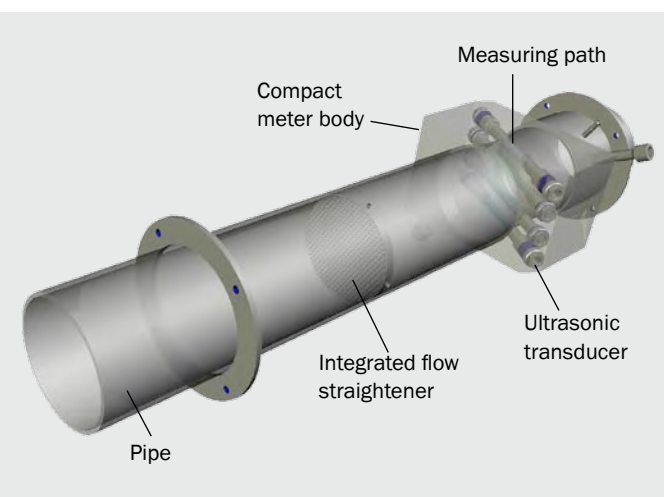
FLOWSIC150 CARFLOW

Optimizing the Engines on Test Stands



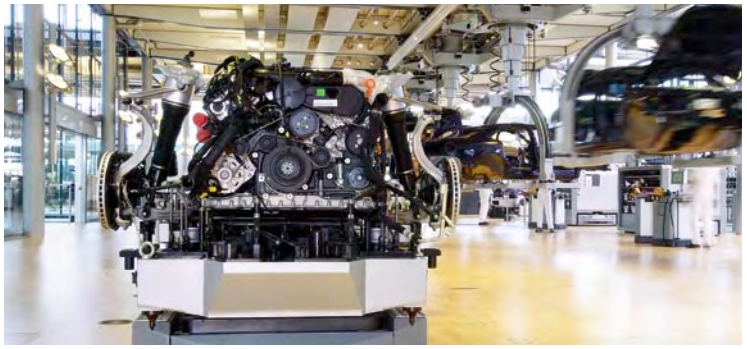
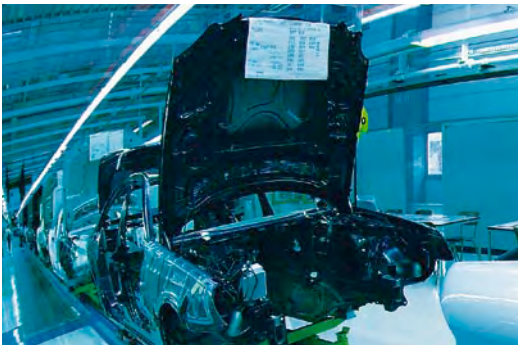
COMPACT TECHNOLOGY

- **Ultrasonic measurement**
Non-contact and direct measurement of gas velocities – independent from pressure, temperature and gas composition (total gas components).
- **Compact design and mobile system – specifically adapted to the requirements of roll test stands**
“Plug and play” – just move the FLOWSIC150 to the test stand, connect the exhaust gas hose, switch on. *Ready!*
 - Simple installation with quick-release connectors
 - Integrated heating unit prevents gas condensation
- **1-path, 3-paths or 4-paths measurement with digital measuring value processing**
Very high measurement accuracy – even at low gas velocities
- **Measurement in undiluted exhaust gas**
Simultaneous gas analysis at lowest concentrations possible



BENEFITS

- High response time (“real time” flow measurement)
- Direct and accurate classification (time related) of emissions – optimizing engine and electronics components possible
- Very low loss of pressure (refer to technical data), no influence on engine characteristics
- No moving parts, no wear-and-tear
- Almost maintenance free by use of titanium ultrasonic transducers

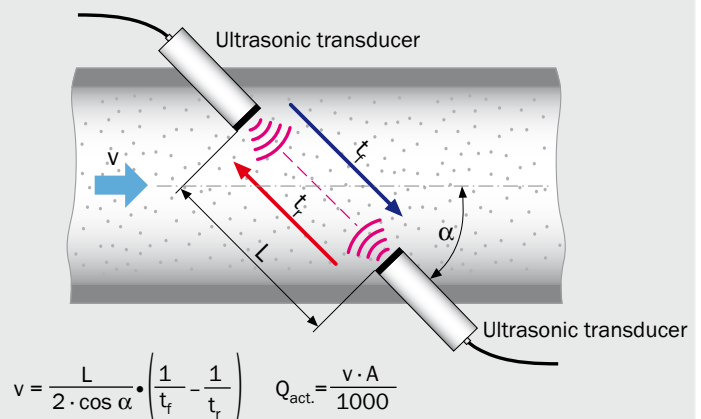


INNOVATIVE MEASURING PRINCIPLE

The transit time of the ultrasonic pulses are measured on up to 4 measuring paths. Both transducers of a measuring path operate intermittently as a transmitter and a receiver. The gas flow will affect the transit time of a pulse travelling along a path between two transducers. In the forward direction, the transit time (t_f) is shortened, in the reverse direction the transit time (t_r) is extended. The difference between the transit times is used to detect the gas velocity in the path.

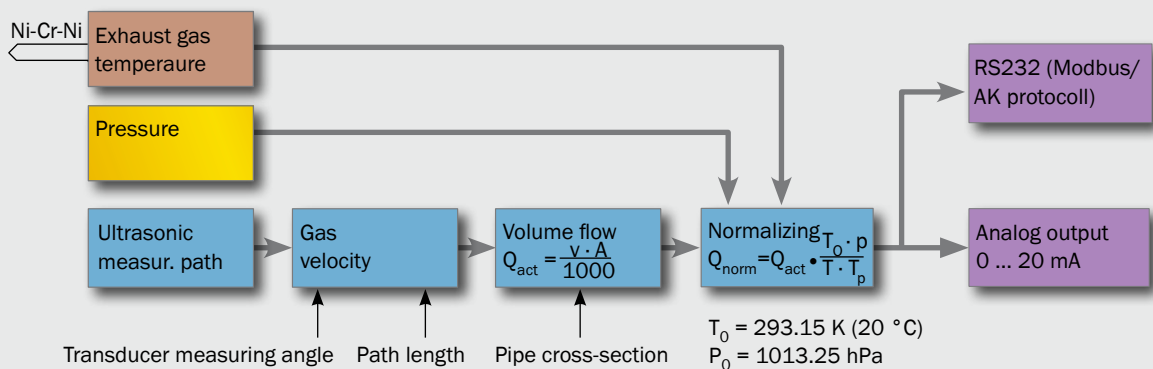
In addition with the internal pressure and temperature measurement the FLOWSIC150 determines standardized volume flow rate values.

Ultrasonic transit time difference



- v = gas velocity [m/s]
- L = path length [m]
- α = measuring angle [°]
- $Q_{act.}$ = actual volumetric flow rate [l/s]
- A = internal pipe cross-sectional area [m²]
- t_f = signal transit time in forward direction of the gas flow
- t_r = signal transit time in reverse direction of the gas flow

Signal flow chart



Technical Data FLOWSIC150 CARFLOW			
Measurement data			
Measuring variables	<ul style="list-style-type: none"> • Gas velocity • Volume flow rate (actual), volume flow rate (normalized) • Speed of sound • Gas temperature • Absolut pressure 		
Measuring range flow rate measurement (actual) ¹⁾	<ul style="list-style-type: none"> • Pipe cross-section 2 ½", 1 or 3 path(s) 0 ... 150 l/s • Pipe cross-section 4", 4 paths 0 ... 300 l/s 		
Temperature measurement	0 ... 400 °C, thermocouple Ni-CrNi "type K"		
Pressure measurement	660 ... 1100 mbar		
Measurement (pulse) rate	1-path measurement: 1 x 80/s	3-path measurement: 3 x 30/s	4-path measurement: 4 x 30/s
Typ. Measuring accuracy ²⁾	< ± 2,5 % of meas. vaule, from 0.1 Q _{max} to Q _{max}	< ± 0,7 % of meas. value, from 0.05 Q _{max} to Q _{max}	< ± 0,5 % of meas. vaule, from 0.05 Q _{max} to Q _{max}
Loss of pressure	<ul style="list-style-type: none"> • 1 or 3 paths: appr. 0.45 mbar at 20 l/s • 4 paths: appr. 0.50 mbar at 50 l/s 		
Installation			
Gas temperature	Max. 300 °C (<10 min per 1 hr, total load max. 100 cycles)		
Transducer temperature	Max. 280 °C		
Connection thread ³⁾	<ul style="list-style-type: none"> • 1 or 3 paths G 2½" external thread • 4 paths G 4" external thread 		
Signals and interfaces			
Measurement value output	<ul style="list-style-type: none"> • Analog output: 0/2/4... 20 mA; max. load 760 Ω; updating rate 10/s • RS232 (Modbus/AK): 10/s (in burst mode) 		
RS232	For parameter setting via PC using the MEPA CARFLOW software		
Device data			
Power supply	90 ... 140 V AC; 50/60Hz or 190 ... 260V AC; 50/60Hz		
Power consumption	<ul style="list-style-type: none"> • 1 or 3 paths: appr. 695 W • 4 paths: appr. 1095 W 		
Dimensions (W x H x D)	900 x 630 x 380 mm		
Weight	Appr. 80 kg		

¹⁾ Higher volume flow rates on request

²⁾ Tested under ambient air conditions

³⁾ Other connections on request