FLOW
TEMPERATURE
HUMIDITY
CONDUCTIVITY

Flow Sens FS5 / FS5A
Thermal Mass Flow Sensor for all-purpose use in Gases

RoHS

Product

The Flow Sens FS5 is the successor of the proven FS1 and is characterised by a sensing structure thermally more efficient. This leads to a higher chip temperature, which is thus more sensitive.
The Flow Sens FS5 is a thermal flow sensor based on the conductometric principle. It includes two platinum resistors on one chip. A small resistance is used as heater; a high resistance is used for the temperature measurement of the fluid. Thermal conductometric flow sensors are based on the heat transfer coefficient, which is a function of the flow speed. The range of flow measurements is very wide and can be adjusted to specific applications, e.g. from 0…0.1 m/s or 0…100 m/s.
Through an electronic circuit, it is possible to increase the temperature of the heater with respect to the temperature of the medium. Flow speed changes the thermal energy lost by the heater: An increase in flow speed results in a higher cooling. This effect leads to a heat transfer coefficient change. Hence, cooling is a function of the mass flow. By adapting controllers, a constant temperature difference between the heater and the temperature sensor can be achieved. The supplied electrical power, which controls this temperature difference, is a function of the fluid's flow speed. The power is converted into a voltage output signal with a bridge circuit and can be easily readout.
The small thermal mass of the sensor provides a fast response and heating times. The chip is also available with a housing of 6 mm in diameter. With this option, the sensor can be easily implemented into custom specific housings (e.g. T-piece) by the user.

Advantages

- Easily adaptable for different applications or into housings
- Simple signal processing and calibration
- No mechanical moving part
- Excellent reproducibility
- Excellent long-term stability
- Best price to performance ratio

Applications

- HVAC and building control solutions
- Automotive industry
- Medical devices
- Device monitoring
- Cooling devices
- Food industry

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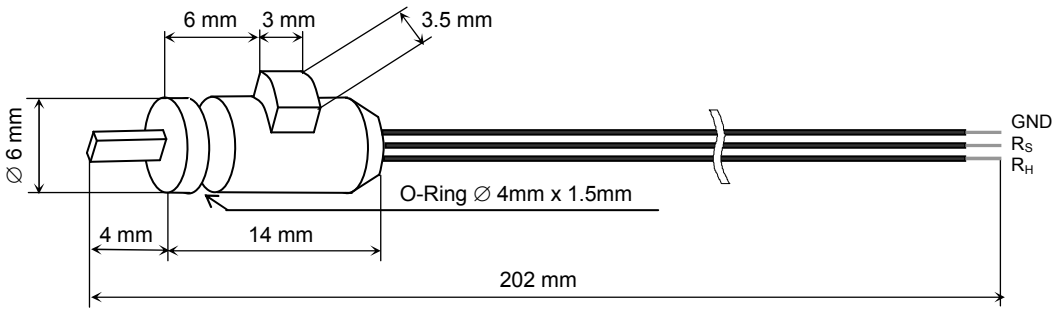
Technical Data

Measuring principle	Thermal
Measuring range	0 ... 100 m/s
Sensitivity	0.01 m/s
Accuracy	< 3% of measured value (depends on electronic and calibration)
Response time $t_{63\%}$	< 2 s
Temperature range	-20 ... +150 °C
Temperature sensitivity	< 0.1 % / K (depends on electronic)
Electrical connection	3 pins, Leads AWG 30, insulated with PTFE, or custom specific
Heater resistance	R_H(0°C) = 45 Ω ± 1%
Temperature sensor	R_s(0°C) = 1200 Ω ± 1%
Supply voltage	Typical 2 … 5 V @ Δ T = 30 K (0 ≤ $v_{ström}$ ≤ 100 m/s)
Max. heater voltage @ 0 m/s	3 V
Substrate material	Special ceramic with low thermal conductivity
In general	Smaller specifications upon request

Construction sizes



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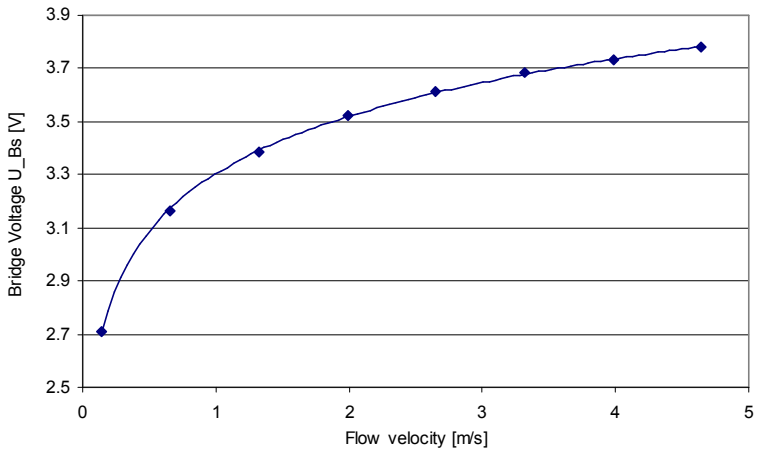
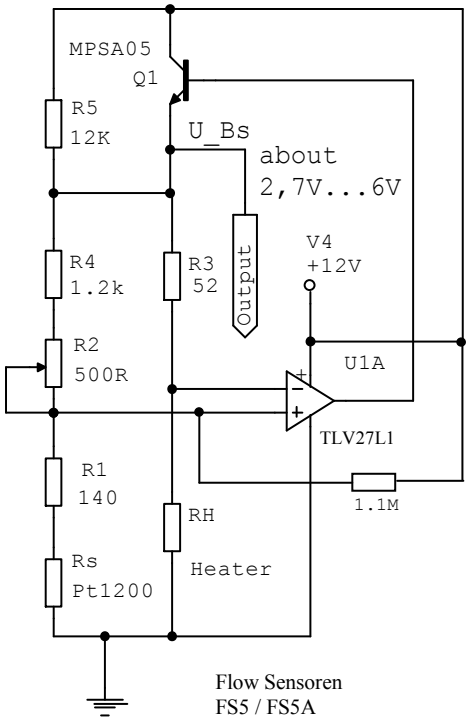
Electronic circuit recommendation of a CTA (constant temperature anemometer)

The flow sensor can be implemented as a constant temperature anemometer (CTA), like shown in the figure below. With this electronic, the heater can be set up to a higher temperature compared to the fluid. The electrical power has to be controlled to achieve a constant temperature difference ΔT at different flow speeds.
Hence, a flow-depending bridge voltage U_Bs is obtained as output signal. The resistors R1 to R5 can be chosen as shown in the circuit below. The temperature difference ΔT between heater (R_H) and fluid (R_S) is set up by resistor R1, e.g. ΔT=30K for air.
The resistor R2 should be adjustable within ±10% for calibration. Adjustment depends on the application. Electronic circuit and curve progression are examples. An individual calibration is necessary and depends on the application.



Typical signal – curve between 0 .... 5 m/s



Custom specific solutions

The sensor electrical connections or connectors (e.g. JST EHR3) can be custom specific.
Development and fabrication of custom specific chip design and sensor packaging on request.

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