

Hot-film air mass meter, type HFM 5

Measurement of air-mass flow up to 1200 kg/h

Input quantity: \dot{m}

Output quantity: U

- Compact design.
- Low weight
- Fast response time
- Low power input.
- Return flow detection



Application

To comply with the legally specified emission limits for motor vehicles, a specific air-fuel ratio must be precisely maintained. This requires the use of sensors which accurately record the actual air-mass flow and output this in the form of an electrical signal to the control electronics. The sensor is used to measure the air-mass flow in internal-combustion engines for precise adaptation of the injected fuel quantity to the current power requirement, atmospheric pressure and air temperatures.

Design

The micromechanical sensor element is located in the flow duct of the plug-in sensor. The plug-in sensor is suitable for installation in air filters or, together with a measurement tube, in the air duct. Measurement tubes of various sizes are available to suit the required air throughput. A micromechanical measurement system with a hybrid circuit permits evaluation of the measurement data to also detect backflow in a pulsating air-mass flow.

Principle of operation

In the air mass meter, the amount of heat extracted from a heated sensor element by heat transfer from the heating element to the air flow increases with an increasing air mass. The resulting difference in temperature is a measure of the air mass flow. An electronic hybrid circuit evaluates the measurement data and thus permits precise recording of the air volume, including the direction of flow.

The sensor element only detects part of the air mass flow. The total air mass flowing through the measurement tube is determined by calibration (characteristic

curve definition).

Explanatory notes on characteristic quantities

\dot{m}_N Air mass throughput $\Delta\dot{m}$ Absolute accuracy $\Delta\dot{m}/\dot{m}$ Relative accuracy $\tau\Delta$ Time until measurement error 5% τ_{63} Time for 63% measured value change

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Part number

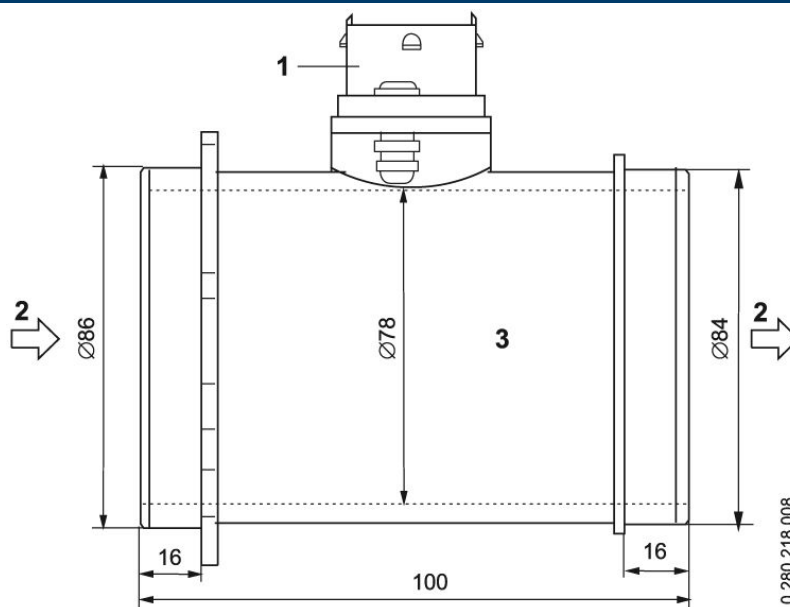
0 280 218 089

Technical data

Measuring range	\dot{m}_N	-50 ... 1100 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	8 ... 17 V
Accuracy	$\Delta\dot{m}/\dot{m}$	$\leq 3\%$
Pressure drop at $\dot{m}_N^1)$	Δp	< 15 hPa
Output voltage	U_A	0 ... 5 V
Current input	I_V	$< 0,1$ A
Permissible vibration acceleration		≤ 150 m/s ²
Time constant	$\tau_{63^2)$	≤ 15 ms
Time constant	$\tau_{\Delta^3)$	≤ 30 ms
Temperature range ⁴⁾		-40 ... + 120 °C

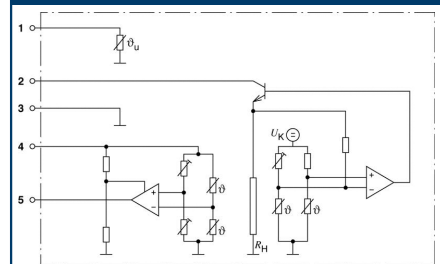
Accessories are not included in the scope of delivery of the sensor and are therefore to be ordered separately as required.

Dimensional drawing



- 1 Plug-in sensor
- 2 Flow direction
- 3 Measurement tube

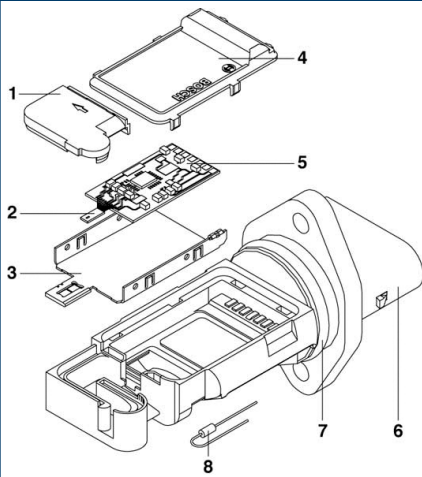
Block diagram with pin assignment



- 1 Additional temperature sensor (not for version 4, part no. 0 280 218 008)
- 2 Supply voltage U_V
- 3 Signal ground
- 4 Reference voltage
- 5 V 5 Measurement signal U_A .
- ϑ Temperature-sensitivity of resistor
- R_H Heating resistor
- U_K Constant voltage

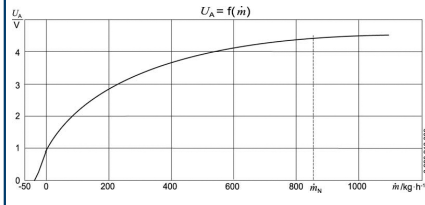


Design of HFM 5 plug-in sensor

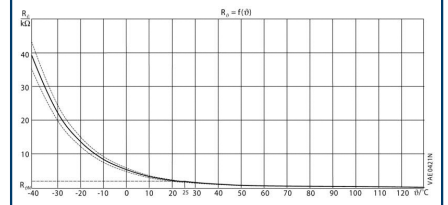


- 1 Measurement-channel cover
- 2 Sensor
- 3 Mounting plate
- 4 Hybrid cover
- 5 Hybrid
- 6 Plug-in sensor
- 7 O-ring
- 8 Additional temperature sensor

Air-mass characteristic curve at ambient temperature



Resistance profile of temperature sensor



Accessories

Part number

Compact connector	5-pin	1 928 403 836
Contact pins	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seals	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seals	For Ø 1.5...2.5 mm ² ; Contents: 10 x	1 928 300 600

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