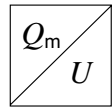


# Hot-film air-mass meter, type HFM 2

Measurement of air-mass throughflow up to 1080 kg/h



- Measurement of air mass (gas mass) throughflow per unit of time, independent of density and temperature.
- Extensive measuring range.
- Highly sensitive, particularly for small changes in flow rate.
- Wear-free since there are no moving parts.
- Insensitive to dirt and contamination.



## Application

Measurement of air-mass flow rate to provide data needed for clean combustion. Air-mass meters are suitable for use with other gaseous mediums.

## Design and function

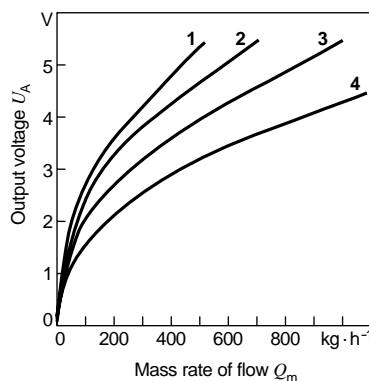
The sensor element comprises a ceramic substrate containing the following thick-film resistors which have been applied using silk-screen printing techniques: Air-temperature-sensor resistor  $R_\theta$ , heater resistor  $R_H$ , sensor resistor  $R_S$ , and trimmer resistor  $R_1$ .

The heater resistor  $R_H$  maintains the platinum metallic-film resistor  $R_S$  at a constant temperature above that of the incoming air. The two resistors are in close thermal contact.

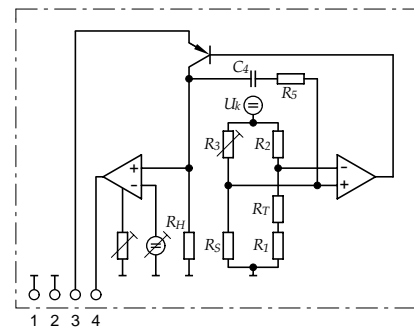
The temperature of the incoming air influences the resistor  $R_\theta$  with which the trimmer resistor  $R_1$  is connected in series. Throughout the complete operating-temperature range it compensates for the bridge circuit's temperature sensitivity. Together with  $R_2$  and  $R_\theta$ ,  $R_1$  forms one arm of the bridge circuit, while the auxiliary resistor  $R_3$  and sensor resistor  $R_S$  form the other arm. The difference in voltage between the two arms is tapped off at the bridge diagonal and used as the measurement signal. The evaluation circuit is contained on a second thick-film substrate. Both hybrids are integrated in the plastic housing of the plug-in sensor.

The hot-film air-mass meter is a thermal flowmeter. The film resistors on the ceramic substrate are exposed to the air mass under measurement. For reasons associated with flow, this sensor is far less sensitive to contamination than, for example, a hot-wire air-mass meter, and there is no need for the ECU to incorporate a self-cleaning burn-off function.

## Characteristic curves.



## Operating principle.



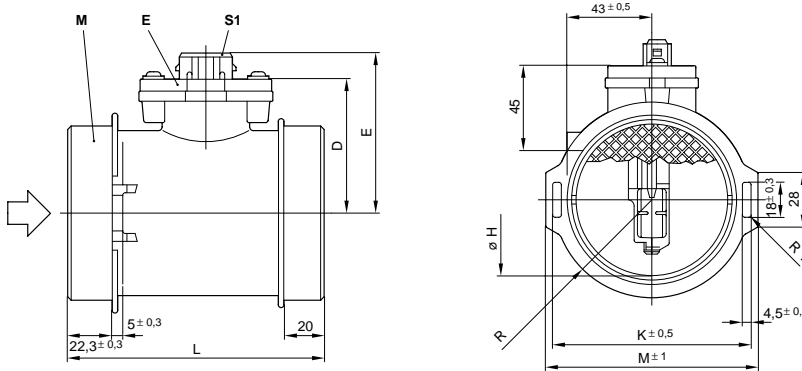
## Technical data / Range

Part number	0 280 217 102	0 280 217 120	0 280 217 519	0 280 217 801
Characteristic curve	1	2	3	4
Installation length L	mm	130	130	130
		96		
Air-flow measuring range	kg · h <sup>-1</sup>	10...350	10...480	12...640
				20...1080
Accuracy referred to measured value	%	±4	±4	±4
Supply voltage	V	14	14	14
Input current				
at 0 kg · h <sup>-1</sup>	A	≤ 0,25	≤ 0,25	≤ 0,25
at Q <sub>m nom.</sub>	A	≤ 0,8	≤ 0,8	≤ 0,8
Time constant <sup>1)</sup>	ms	≤20	≤20	≤20
Temperature range				
Sustained	°C	-30...+110	-30...+110	-30...+110
Short-term	°C	-40...+125	-40...+125	-40...+125
Pressure drop				
at nominal air mass	hPa			
	mbar	<15	<15	<15
Vibration acceleration				
max.	m · s <sup>-2</sup>	150	150	150

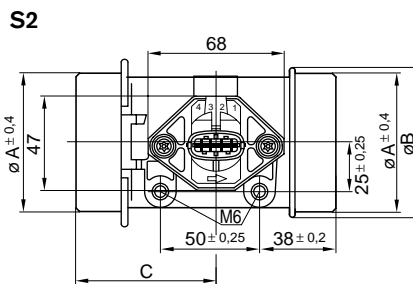
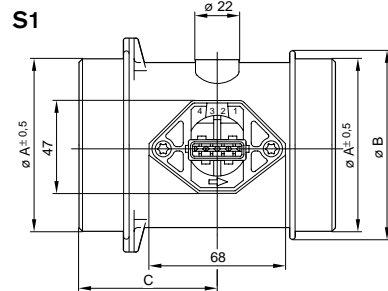
<sup>1)</sup> In case of sudden increase of the air-mass flow from 10 kg · h<sup>-1</sup> auf 0.7 Q<sub>m nominal</sub>, time required to reach 63% of the final value of the air-mass signal.

**Dimension drawings.**

E Plug-in sensor, M Measurement venturi, S1/S2 Plug connection

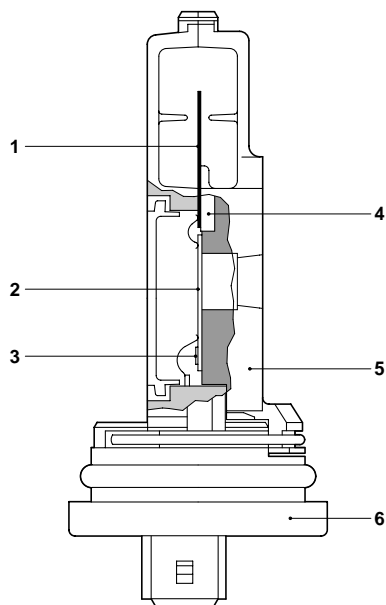


∅ A	∅ B	C	D	E	H	K	L	M	R	Measurement venturi	Plug-in connection	Part number
60	66	70	73	86	33	75	130	82	37	KS	S1	<b>0 280 217 102</b>
70	76	50	69	82	34.8	–	96	–	42	KS	S1	<b>0 280 217 107</b>
70	76	70	69	82	33.5	85	130	92	42	KS	S2	<b>0 280 217 120</b>
80	86	70	73	86	39	–	130	–	–	KS	S2	<b>0 280 217 519</b>
95.6	102	70	76.2	91.2	45	110	130	117	54	Alu	S1	<b>0 280 217 801</b>



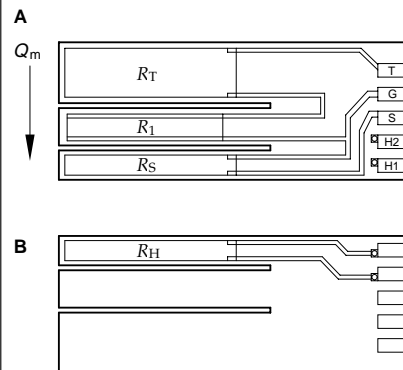
**Plug-in sensor.**

1 Sensor, 2 Hybrid, 3 Power module, 4 Mounting plate, 5 Heat sink, 6 Plug housing



**Sensor element with thick-film resistors.**

$Q_M$  Mass rate of flow,  $R_1$  Trimmer resistor,  $R_H$  Heater resistor,  $R_S$  Sensor resistor,  $R_T$  Air-temperature measuring resistor, A Front, B Rear



**Installation instructions**

Water and other liquids must not collect in the measurement venturi. The measurement venturi must therefore be inclined by at least 5° relative to the horizontal. Since care must be taken that the intake air is free of dust, it is imperative that an air filter is fitted.

**Explanation of symbols:**

- $R_1$  Trimmer resistor
- $R_2, R_3$  Auxiliary resistors
- $R_5, C_4$  RC element
- $R_H$  Heater resistor
- $R_S$  Platinum metal-film resistor
- $R_T$  Resistance of the air-temperature-sensor resistor
- $U_K$  Bridge supply voltage
- $U_A$  Output voltage
- $U_V$  Supply voltage

**Connector-pin assignment**

- Pin 1 Ground
- Pin 2  $U_A(-)$
- Pin 3  $U_V$
- Pin 4  $U_A(+)$

**Accessories**

**For 0 280 217 102, .. 107, .. 801**

Plug housing	<b>1 284 485 118</b>
Receptacle	<b>1 284 477 121 1)</b>
Protective cap	<b>1 280 703 023 1)</b>

Each 4-pole plug requires 1 plug housing, 4 receptacles, and 1 protective cap.

1) Quantity 5 per package

**For 0 280 217 120, .. 519**

Designation	For conductor cross-section	Part number
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Plug housing	–	<b>1 928 403 112</b>
Contact pin	0.5...1.0 mm <sup>2</sup>	<b>1 987 280 103</b>
Individual gasket	1.5...2.5 mm <sup>2</sup>	<b>1 987 280 105</b>
Individual gasket	0.5...1.0 mm <sup>2</sup>	<b>1 987 280 106</b>
Individual gasket	1.5...2.5 mm <sup>2</sup>	<b>1 987 280 107</b>

Each 4-pole plug requires 1 plug housing, 4 contact pins, and 4 individual gaskets.

**Note**

For automotive applications, original AMP crimping tools must be used.