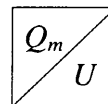


# Hot-wire air-mass meters

Measurement of the air-mass flow rate up to 900 kg/h



- Measurement of air mass (gas mass) throughput per unit of time independent of density and temperature
- Constant-temperature principle
- Small time constant
- Wear-free, due to absence of moving parts

## Application

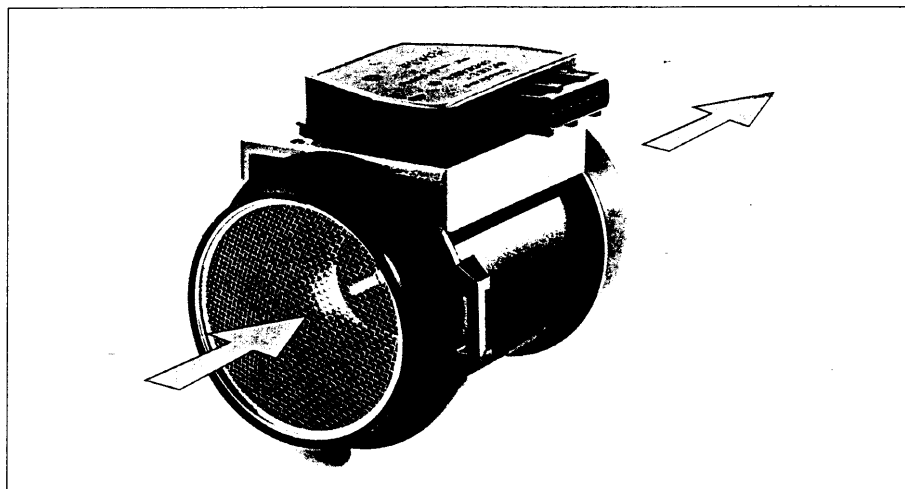
Measurement of air-mass flow rate as needed for clean combustion.

Air-mass meters are suitable for use with other gaseous media, but recalibration is necessary in such cases.

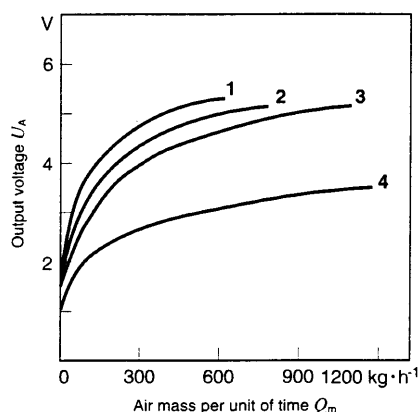
## Design and function

The flow diameter of the air-mass meter determines the flow rate. A wire grid is fitted at the inlet and outlet ends to protect the hot-wire element against mechanical damage. The trapezoidal hot-wire element is suspended between the walls of the internal measuring tube and is only 70 µm thick. The cast-on housing contains the electronic control and burn-off circuitry as well as the bridge resistors. The hot-wire air-mass meter operates according to the constant-temperature principle, whereby the hot-wire element is an integral part of the bridge circuit whose output voltage is maintained at zero by varying the heating current through the hot wire. An increase in the intake-air quantity causes a drop in the temperature of the hot-wire and its resistance decreases correspondingly. This leads to an unbalance of the resistance ratios in the bridge circuit which the control electronics responds to immediately by increasing the heating current. This current increase is of such a magnitude that the hot-wire regains its original temperature again.

In other words, the heating current needed to maintain the hot-wire temperature is a measure of the air flow rate, and is independent of air density and temperature. Since the hot-wire air-mass meter has no moving parts it is wear-free. The control process has no effect upon the hot wire's heat balance so that it responds very quickly to every change in flow rate. During operation of the air-mass meter, deposits can form on the hot-wire element which would have a negative effect upon the measuring results. In order to burn off these contaminants, it is therefore necessary after a given operating period to heat the hot wire up to around 1000 °C for about 1 second. In automotive applications, a potentiometer is also provided for adjusting the mixture at idle.



Characteristic curves



## Explanation of symbols:

- $R_H$  Hot-wire resistance
- $R_K$  Resistance of the temperature-compensation sensor
- $R_1, R_2$  High-ohm resistors
- $R_M$  Precision measuring resistor
- $U_m$  Signal voltage for air flow rate
- $I_H$  Heating current
- $Q_m$  Air mass per unit of time
- $\vartheta_L$  Air temperature

## Technical data / Range

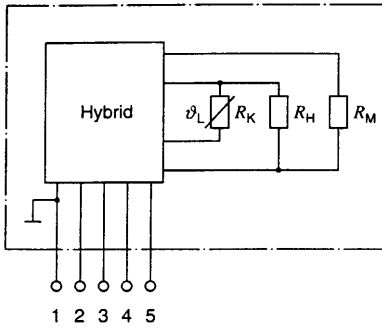
Part Number	0 280 211 007	0 280 212 022	0 280 213 012	0 280 214 004
Characteristic curve	1	2	3	4
Measuring range				
Air flow rate	kg · h <sup>-1</sup> 15 ... 350	15 ... 470	15 ... 640	15 ... 950
Accuracy (referred to measured value)	% ±4	±4	±4	±4
Supply value	V 14	14	14	14
Current input at				
Air-flow rate = 0	A ≤0.5	≤0.5	≤0.5	≤0.55
Nominal air-flow rate	A ≤1.5	≤1.7	≤1.7	≤1.7
Loading resistance	kΩ ≥10	≥10	≥10	≥10
Response time for changes of air-flow rate	ms <5	<5	<5	<5
Temperature range	°C -30 ... +110	-30 ... +110	-30 ... +110	-30 ... +110
Permissible vibration acceleration	m · s <sup>-2</sup> 150	150	150	150
Connection pipe Ø	mm 60	70	80	95,6/88

## Accessories

Connector for	Part Number
0 280 211 007	1 287 013 004
0 280 212 022	1 287 013 004
0 280 213 012	1 287 013 004
0 280 214 004	upon request

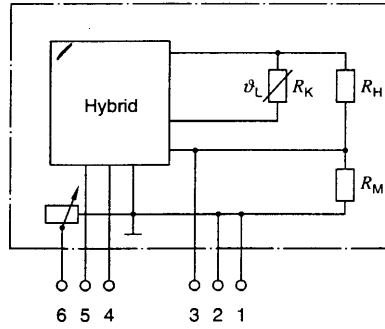
**Diagram 0 280 214 004**

1 Ground, 2 Measurement signal (-),  
3 Burn-off signal, 4 Supply voltage (+),  
5 Measurement signal (+).



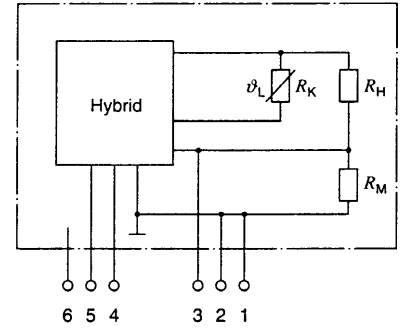
**Diagram 0 280 211 007 and ... 212 022**

1 Ground, 2 Measurement signal (-),  
3 Measurement signal (+), 4 Burn-off signal,  
5 Supply voltage (+), 6 Idle potentiometer  
(on ... 212 022).



**Diagram 0 280 213 012**

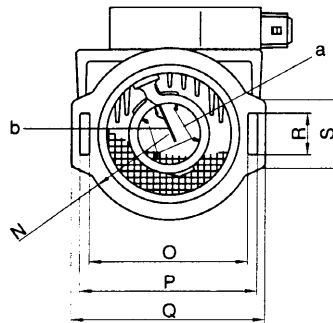
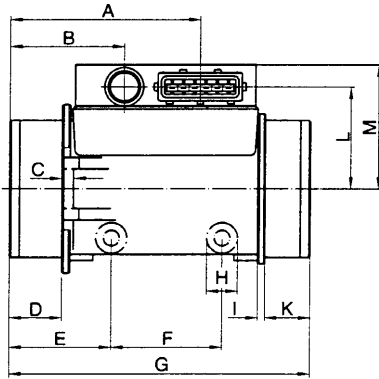
1 Ground, 2 Measurement signal (-),  
3 Measurement signal (+), 4 Burn-off signal,  
5 Supply voltage (+), 6 Vacant.



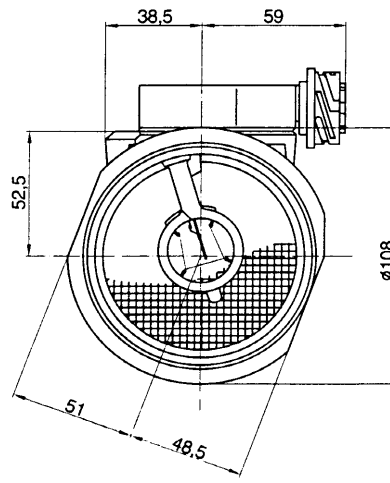
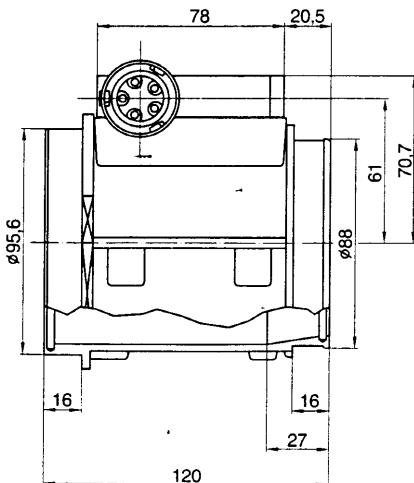
**Dimension drawings. a Hot wire, b Thin-film temperature sensor.**

Part No.	Dimensions (mm)																	
	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S
0 280 211 007	81.45	48.2	5	22.3	-	-	130	-	3	20	44.75	54.2	R37	67	75	82	18	28
0 280 211 022	81.45	48.2	5	22.3	42	50	130	16	3	20	44.75	58.2	R42	76.2	85	92	18	28
0 280 211 012	81.45	-	5	22.3	-	-	130	-	3	20	55.25	64.7	R47	86.2	95	102	18	28

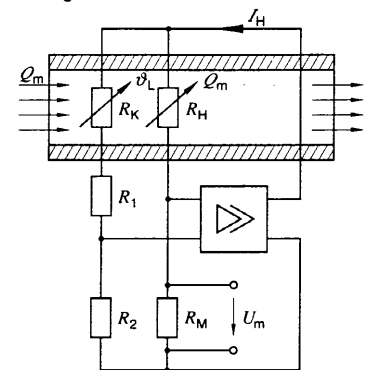
**0 280 211 007, 0 280 212 022, 0 280 213 012**



**0 280 214 004**



**Operating principle  
With bridge circuit**



**Installation instructions**

The air-mass meter is to be installed in such a manner that no water, oil, or condensate can enter the housing. Care must be taken that the intake air remains free of dust, a fact which makes it imperative that an air filter is fitted.