Pressure sensors for CNG and LPG

Product type

DS-K-TF

Part number

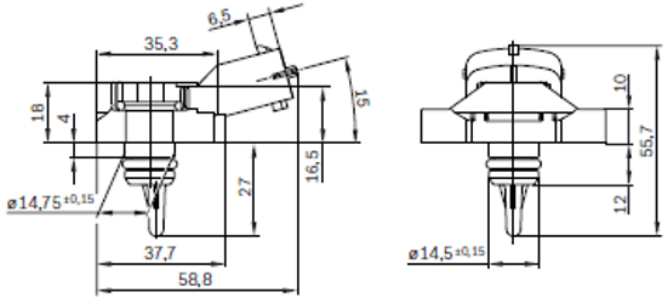
0 261 230 255

Picture

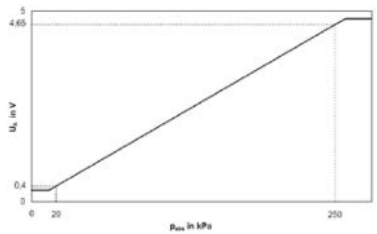
Technical data

Parameter		min.	type	Max.
Features		integrated temperature sensor		
Application/medium		approved for CNG and LPG		
Pressure range (p_1...p_2)	kPa	20		250
Supply voltage U_V	V	4,75	5	5,25
Current input I_v at U_V = 5 V	mA	6	9	12,5
Load current I_L at output	mA	-1		0,5
Load resistance to ground or U_v	kΩ	5		10
Lower limit at U_V = 5 V	V	0,25	0,3	0,35
Upper limit at U_V = 5 V	V	4,75	4,8	4,85
Output resistance to ground, U_V open	kΩ			
Output resistance to U_V, ground open	kΩ			
Response time $\tau_{10/90}$	ms		1	
Operating temperature	°C	-40		130

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0.5...1.0 mm²	1 928 498 056
Contact pins (tin-plated)	For Ø 1.5...2.5 mm²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600
Dummy plug		1 928 300 601

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

▶ Product groups

Pressure sensors for CNG and LPG

Product type

DS-K-TF

Part number

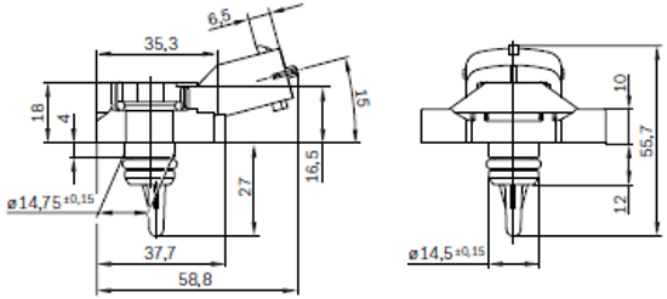
0 261 230 275

Picture

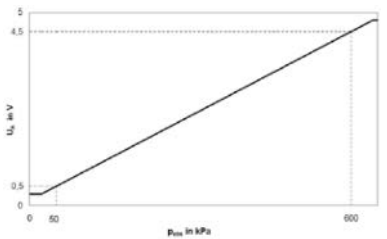
Technical data

Parameter		min.	type	Max.
Features		integrated temperature sensor		
Application/medium		approved for CNG		
Pressure range (p_1...p_2)	kPa	50		600
Supply voltage U_V	V	4,75	5	5,25
Current input I_v at U_V = 5 V	mA	6	9	12,5
Load current I_L at output	mA	-1		0,5
Load resistance to ground or U_V	kΩ	5		
Lower limit at U_V = 5 V	V	0,25	0,3	0,35
Upper limit at U_V = 5 V	V	4,75	4,8	4,85
Output resistance to ground, U_v open	kΩ			
Output resistance to U_V, ground open	kΩ			
Response time $\tau_{10/90}$	ms		1	
Operating temperature	°C	-40		130

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0.5...1.0 mm²	1 928 498 056
Contact pins (tin-plated)	For Ø 1.5...2.5 mm²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600
Dummy plug		1 928 300 601

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

► Product groups

6.4 Pressure sensors

Pressure sensors for CNG and LPG

Product type

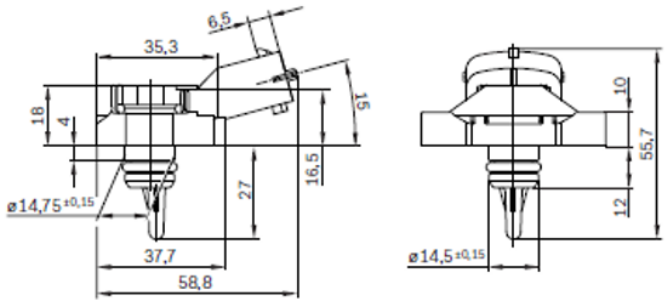
DS-K-TF

Part number

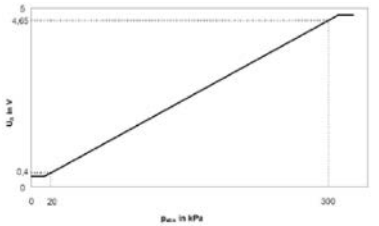
0 281 006 243

Picture

Dimensional drawings



Characteristic curve



Technical data

Parameter		min.	type	max.
Features		integrated temperature sensor		
Application/medium		approved for CNG		
Pressure range (p_1...p_2)	kPa	20		300
Supply voltage U_V	V	4,75	5	5,25
Current input I_V at U_V = 5V	mA	6	9	12,5
Load current I_L at output	mA	-1		0,5
Load resistance to ground or U_V	kΩ	5		10
Lower limit at U_v = 5 V	V	0,25	0,3	0,35
Upper limit at U_V = 5 V	V	4,75	4,8	4,85
Output resistance to ground, U_V open	kΩ			
Output resistance to U_V, ground open	kΩ			
Response time $\tau_{10/90}$	ms		1	
Operating temperature	°C	-40		130

Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (gold-plated)	For Ø 0.5...1.0 mm²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm²	1 928 498 055
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600
Dummy plug		1 928 300 601

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

► Product groups

7 Temperature sensors

Measurement of air/liquid temperatures

- ► Temperature range -40C - 130C
- ► Measurement of air, coolant, fuel and oil
- ► Measurement with temperature sensitive resistors
- ► Broad temperature range

Application

The temperature sensor is a sensor, converting a temperature into an electrical signal . Temperature sensors are negative temperature coefficient thermistors, i.e. they reduce their resistance with increasing temperature. The temperature sensor described in this TKU is suitable for the measurement of liquid media, e.g. coolant, fuel and oil.

Design and operation

NTC thermistors have a negative temperature coefficient, i. e. their conductivity increases with increasing temperature; their resistance decreases. The conductive element of the temperature sensor consists of semi-conducting heavy metal oxides and oxidized mixed crystals pressed or sintered into wafers or beads with the aid of binding agents and provided with a protective casing. In combination with a suitable evaluation circuit, such resistors permit precise temperature determination. Depending on the housing design, the sensors are suitable for measuring temperatures in liquids and gases. In motor vehicles they are used to measure the temperature of the intake air, i.e. in the range -40...130 °C.

Explanation of characteristic data

R	Resistance
ϑ	Temperature

Installation instructions

The sensor is installed such that the front section with the sensing element is directly exposed to the air flow.

Measurement of air/liquid temperatures

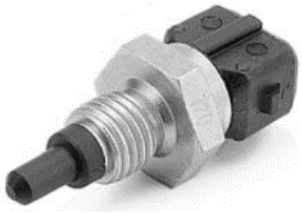
Product type

TF-L

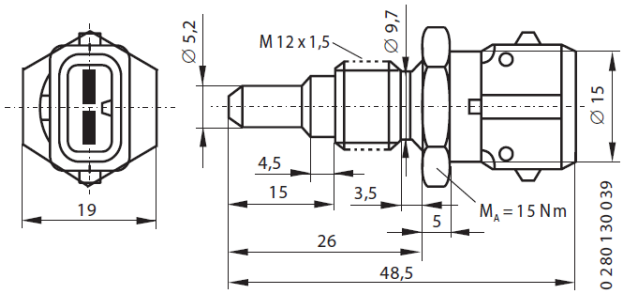
Part number

0 280 130 039

Picture



Dimensional drawings



Technical data

Temperature range	°C	-40 ... + 130
Features	Sensor in steel housing with threaded connection.	
Application/medium		air
Rated resistance at 20 °C	kΩ	2,5 ± 5 %
Resistance at -10 °C	kΩ	8,325 ... 10,572
Resistance at +20 °C	kΩ	2,280 ... 2,736
Resistance at +80 °C	kΩ	0,288 ... 0,359
Nominal voltage	V	5 ± 0,15
Max. measurement current	mA	1
Self-heating with max. perm. Power loss of P = 2 mW and still air (23 °C)	K	≤ 2
Temperature/time constant τ_{63} [1)]	s	≤ 38
Approximate value for permissible Vibration acceleration a_{sin} (sinusoidal vibration)	m/s²	300
Corrosion-tested as per		DIN 50 018

[1)] Time required to attain a difference in resistance of 63% of the final value given an abrupt change in measurement temperature from 20°C to 80°C; flow velocity of air 6 m/s.

Accessories

Connector housing	2-pin	1 928 402 078
Protective cap	Temperature-resistant	1 280 703 031
Contact pins	For Ø 0.5...1.0 mm²	AMP 929 939-3
Contact pins	For Ø 1.5...2.5 mm²	AMP 929 937-3
Individual seal	For Ø 0.5...1.0 mm²	1 987 280 106
Individual seal	For Ø 1.5...2.5 mm²	1 987 280 107

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

► Product groups

Measurement of air/liquid temperatures

Product type

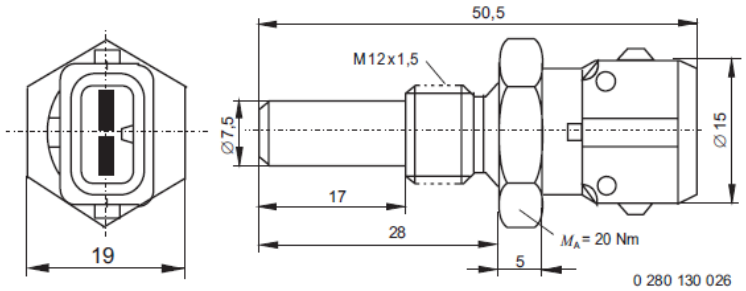
TF-W

Part number

0 280 130 026

Picture

Dimensional drawings



Technical data

Measuring range	°C	-40 ... +130
Features		Sensor in brass housing.
Application/medium		Oil/water
Rated resistance at 100 °C	kΩ	2,5 ± 5 %
Resistance at -10 °C	kΩ	8,325 ... 10,572
Resistance at +20 °C	kΩ	2,280 ... 2,736
Resistance at +80 °C	kΩ	0,288 ... 0,359
Temperature/time constant τ_{63} [1)]	s	≤ 15
Degree of protection [1)]		IP 5K9K
Thread		M 12 x 1,5
Corrosion-tested as per		DIN 50 021
Tightening torque	Nm	20
Rated voltage	V	5 ± 0,15

[1)] With individual seal.

Accessories

Connector housing	2-pin	1 928 402 078
Protective cap	Temperature-resistant	1 280 703 031
Contact pins	For Ø 0.5...1.0 mm²	AMP 929 939-3
Contact pins	For Ø 1.5...2.5 mm²	AMP 929 937-3
Individual seal	For Ø 0.5...1.0 mm²	1 987 280 106
Individual seal	For Ø 1.5...2.5 mm²	1 987 280 107

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

► Product groups

Measurement of air/liquid temperatures

Product type

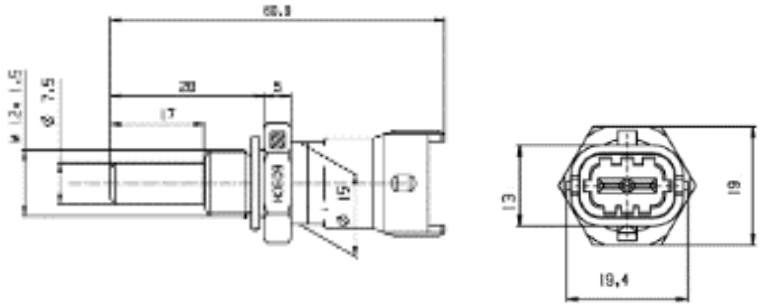
TF-W

Part number

0 280 130 093

Picture

Dimensional drawings



Technical data

Temperature range	°C	-40 ... +130
Features		Sensor in brass housing.
Application/medium		Coolants, fuel, oil
Tolerance at +100 °C	kΩ	0,1886 ± 2%
Rated resistance at 100 °C	kΩ	2,5 ± 5%
Resistance at -10 °C	kΩ	8,727 ... 10,067
Resistance at +20 °C	kΩ	2,375 ... 2,625
Resistance at +80 °C	kΩ	0,323 ... 0,349
Temperature/time constant τ_{63} [1)]	s	= 15 s
Degree of protection [1)]		IP 5K 9K
Thread		M12 x 1,5
Corrosion-tested as per		DIN EN 60068-2-11
Tightening torque	Nm	20
Rated voltage	V	5 ± 1,5

Accessories

Connector housing	2-pin	1 928 403 137
Contact pins (tin-plated)	For Ø 0.5...1.0 mm²	AMP 929 939 3
Contact pins (tin-plated)	For Ø 1.5...2.5 mm²	AMP 929 937 3
Single-wire seal	For Ø 0.5...1.0 mm²	AMP 828 904
Single-wire seal	For Ø 1.5...2.5 mm²	AMP 828 905
Dummy plug		AMP 828 922

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

► Product groups

Measurement of air/liquid temperatures

Product type

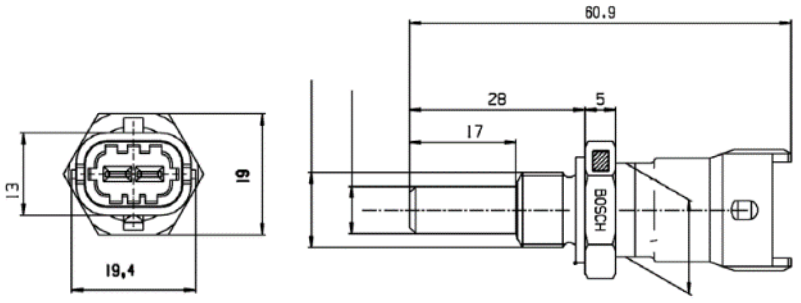
TF-W

Part number

0 281 002 170

Picture

Dimensional drawings



Technical data

Temperature range	°C	-40 ... +130
Features		Sensor in brass housing.
Application/medium		Oil/water
Rated resistance at 100 °C	kΩ	0,19 ± 2 %
Resistance at -10 °C	kΩ	8,64 ... 10,15
Resistance at +20 °C	kΩ	2,35 ... 2,65
Resistance at +80 °C	kΩ	0,31 ... 0,33
Temperature/time constant τ_{63} [1)]	s	≤ 15
Degree of protection [1)]		IP 5K 9K
Thread		M 12 x 1,5
Corrosion-tested as per		DIN 38 52-1
Tightening torque	Nm	25
Rated voltage	V	5 ± 0,15

[1)] With single-wire seal.

Accessories

Connector housing	2-pin	1 928 403 137
Contact pins (gold-plated)	For Ø 0.5...1.0 mm²	AMP 2 929 939 1
Contact pins (gold-plated)	For Ø 1.5...2.5 mm²	AMP 2 929 937 1
Single-wire seal	For Ø 0.5...1.0 mm²	AMP 828 904
Single-wire seal	For Ø 1.5...2.5 mm²	AMP 828 905
Dummy plug		AMP 828 922

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

▶ Product groups

Measurement of air/liquid temperatures

Product type

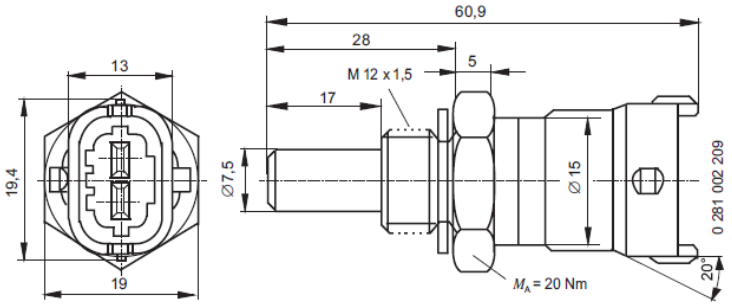
TF-W

Part number

0 281 002 209

Picture

Dimensional drawings



Technical data

Temperature range	°C	-40 ... + 130
Features		Sensor in brass housing.
Application/medium		Oil/water
Rated resistance at 100 °C	kΩ	2,5 ± 6 %
Resistance at -10 °C	kΩ	8,640 ... 10,149
Resistance at +20 °C	kΩ	2,351 ... 2,648
Resistance at +80 °C	kΩ	0,313 ... 0,332
Temperature/time constant τ_{63} [1)]	s	≤ 15
Degree of protection [1)]		IP 5K 9K
Thread		M 12 x 1,5
Corrosion-tested as per		DIN 50 021
Tightening torque	Nm	25
Rated voltage	V	5 ± 0,15

[1)] With single-wire seal.

Accessories

Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm²	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600

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

► Product groups

Measurement of air/liquid temperatures

Product type

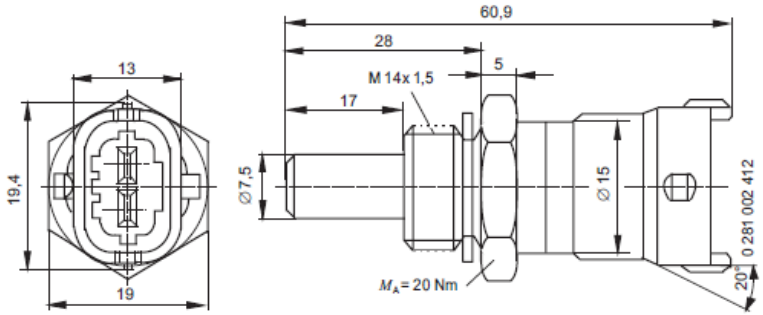
TF-W

Part number

0 281 002 412

Picture

Dimensional drawings



Technical data

Temperature range	°C	-40 ... +130
Features		Sensor in brass housing.
Application/medium		Oil/water
Tolerance at +100 °C	K	0,1886 ± 2%
Rated resistance at 100 °C	kΩ	2,5 ± 6 %
Resistance at -10 °C	kΩ	8,640 ... 10,149
Resistance at +20 °C	kΩ	2,351 ... 2,648
Resistance at +80 °C	kΩ	0,313 ... 0,332
Temperature/time constant τ_{63} [1)]	s	≤ 15
Degree of protection [1)]		IP 5K 9K
Thread		M 14 x 1,5
Corrosion-tested as per		DIN 50 021
Tightening torque	Nm	20
Rated voltage	V	5 ± 0,15

[1)] With single-wire seal.

Accessories

Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm²	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600

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

► Product groups

Measurement of air/liquid temperatures

Product type

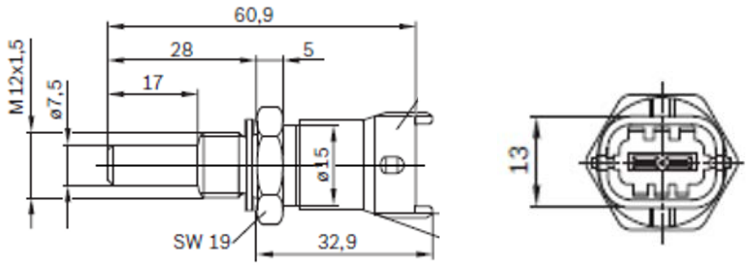
TF-W

Part number

0 281 002 704

Picture

Dimensional drawings



Technical data

Temperature range	°C	-40 ... +130
Features		Sensor in brass housing.
Application/medium		Coolants, fuel, oil
Tolerance at +100 °C	kΩ	0,1886 ± 2%
Rated resistance at 100 °C	kΩ	2,5 ± 6 %
Resistance at -10 °C	kΩ	8,640 ... 9,395
Resistance at +20 °C	kΩ	2,351 ... 2,648
Resistance at +80 °C	kΩ	0,313 ... 0,332
Temperature/time constant τ_{63} [1)]	s	= 15 s
Degree of protection [1)]		IP 5K 9K
Thread		M12 x 1,5
Corrosion-tested as per		DIN EN 60068-2-11
Tightening torque	Nm	20
Rated voltage	V	5 ± 1,5

Accessories

Connector housing	2-pin	1 928 403 874
Contact pins (gold-plated)	For Ø 0.5...1.0 mm²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm²	1 928 498 055
Single-wire seal	For Ø 0.5...1.0 mm²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²	1 928 300 600

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

- ► Nominal air-flow up to 1.050 kg/h
- ► Analog interface
- ► Compact design
- ► Low weight
- ► Fast response time
- ► Low power input
- ► Pulsation flow detection

Application

The air-mass sensor (HFM) is designed to meter the mass air and temperature of the intake air in motor vehicles with diesel and gasoline applications. The sensor is used to measure the air-mass flow for precise adaption of the injected fuel quantity to the current power requirement, atmospheric pressure and air temperatures

Design and operation

The standard HFM consists of a plug-in sensor and cylinder housing. The electronic module, with the evaluation circuit and the sensor element, is located in the plug-in sensor. The sensor element is positioned on the electronic module and extends into the metering duct (bypass channel) of the connector housing. The location of the temperature sensor (NTC) is on the backside of the connector housing.

The HFM is a thermal flowmeter. From the intake air flow within the cylinder housing, a portion of the total mass air flow will pass across the sensor element in the bypass channel. In the center exists a heating zone which is controlled to a certain temperature, depending on the temperature of the intake air. Without air flow, the temperature from the heating zone to the edges decreases linearly, and the temperature sensors up- and downstream of the heating zone indicate the same value. With air flow, the sensor area upstream will be cooled by the heat transfer in the boundary layer.

The downstream temperature sensor will keep its temperature because the air is heated as it passes over the heating zone. The temperature sensors show a temperature difference which depends on amount and direction of the air flow. The difference between the signals of the temperature sensors is evaluated in a bridge circuit.

Explanation of characteristic data

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

HFM-5

Part number

0 280 217 123

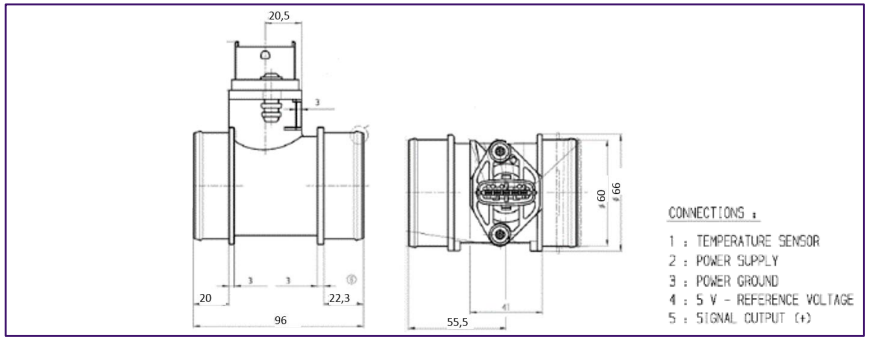
Picture

Technical data

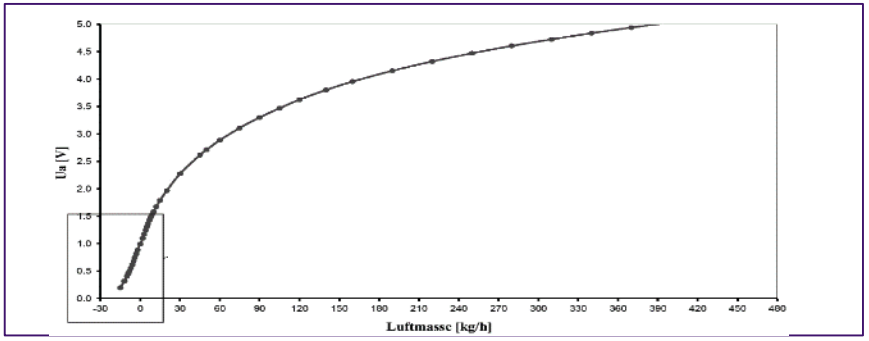
Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	370 kg/h
Measuring range	$\dot{m}_N$	-15 ... 480 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	8 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 15 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 15 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation | $\Delta \dot{m} / \dot{m}$ | ≤ 5 %.

Dimensional drawings



Air-mass characteristic curve at ambient temperature



Accessories

Compact connector	5-pin	1 928 403 836
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

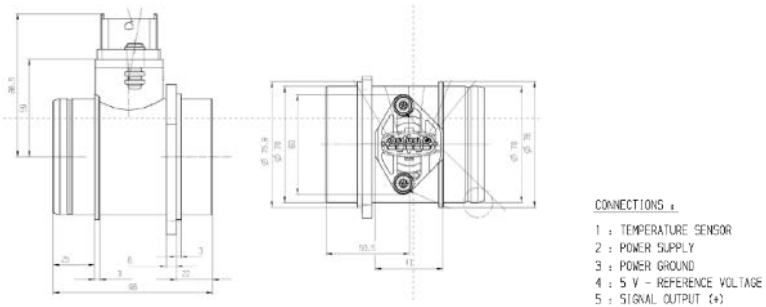
HFM-5

Part number

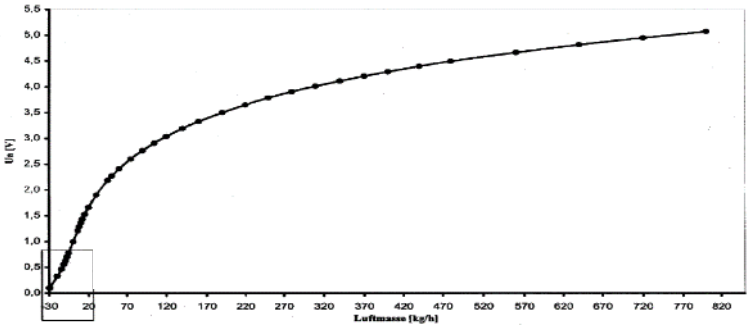
0 280 218 037

Picture

Dimensional drawings



Air-mass characteristic curve at ambient temperature



Technical data

Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	480 kg/h
Measuring range	$\dot{m}_N$	5 ... 480 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	8 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 15 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 15 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation $| \Delta \dot{m} / \dot{m} | \le 5$ %.

Accessories

Connector housing	5-pin	1 928 403 738
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²; Contents: 10 x	1 928 300 600
Dummy plug		1 928 300 601

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

HFM-5

Part number

0 280 218 089

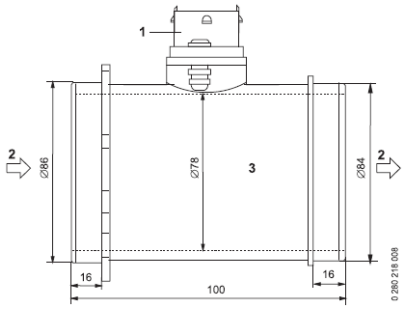
Picture

Technical data

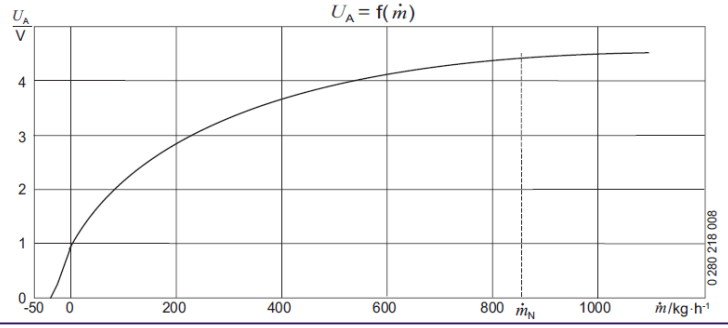
Features		Without ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	850 kg/h
Measuring range	$\dot{m}_N$	-50 ... +1100 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	8 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 15 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 15 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation | $\Delta \dot{m} / \dot{m}$ | ≤ 5 %.

Dimensional drawings



Air-mass characteristic curve at ambient temperature



Accessories

Compact connector	5-pin	1 928 403 836
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

HFM-5

Part number

0 280 218 116

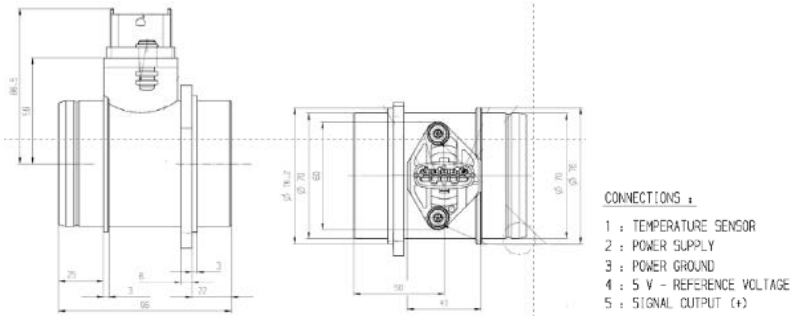
Picture

Technical data

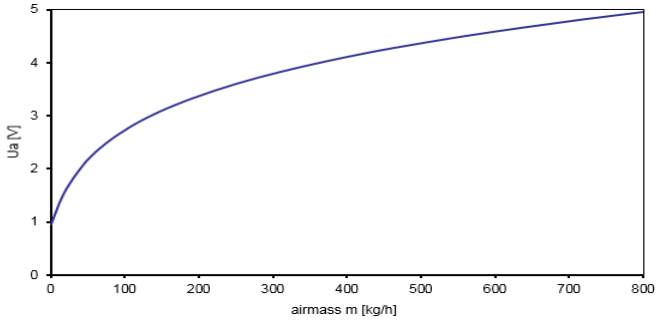
Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	480 kg/h
Measuring range	$\dot{m}_N$	-40 ... +640 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	8 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 15 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 15 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation $|\Delta \dot{m} / \dot{m}| \le 5$ %.

Dimensional drawings



Air-mass characteristic curve at ambient temperature



Accessories

Connector housing	5-pin	1 928 403 738
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²; Contents: 10 x	1 928 300 600
Dummy plug		1 928 300 601

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

HFM-5

Part number

0 280 218 119

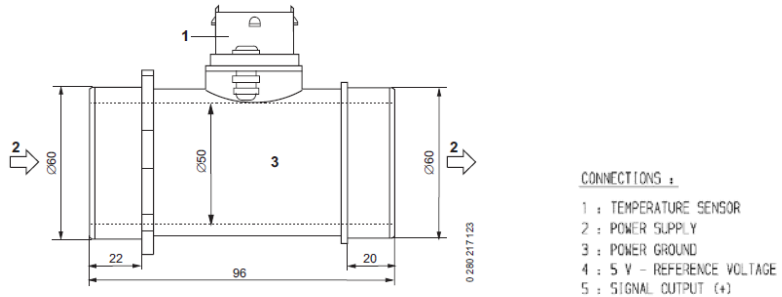
Picture

Technical data

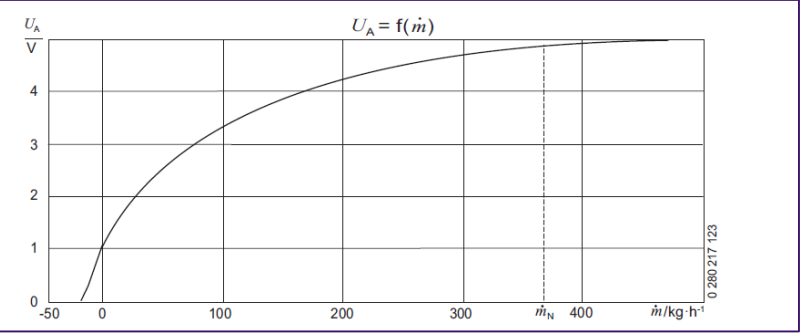
Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	370 kg/h
Measuring range	$\dot{m}_N$	-15 ... +480 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	6 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 15 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 15 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation | $\Delta \dot{m} / \dot{m}$ | ≤ 5 %.

Dimensional drawings



Air-mass characteristic curve at ambient temperature



Accessories

Compact connector	5-pin	1 928 403 836
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seals	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599

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

► Product groups

8.1 Air-mass sensors
HFM with analog interface

Product type
HFM-5

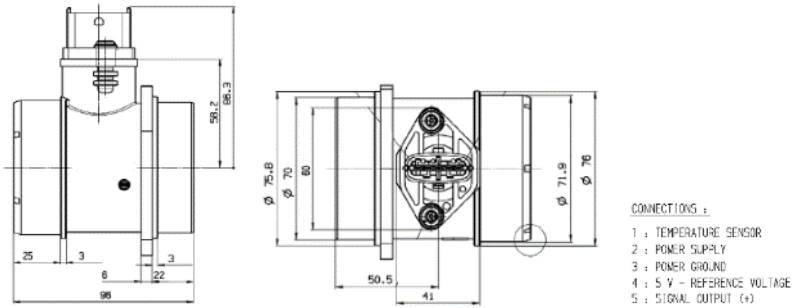
Part number
0 281 002 571

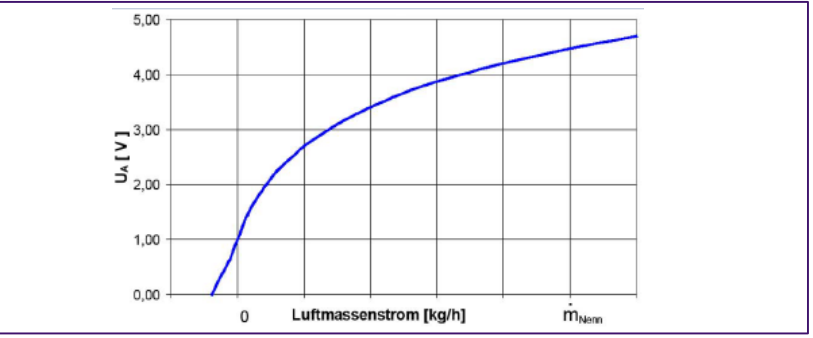
Picture


Technical data

Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	480 kg/h
Measuring range	$\dot{m}_N$	+8 ... 480 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	6 ... 17 V
Relative accuracy [1)]	$\Delta \dot{m} / \dot{m}$	± 3 %
Temperature range [2)]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 18 hPa
Current input	I_V	< 0,1 A
Time constant	τ_{63} [3)]	≤ 10 ms
Time constant	$\tau\Delta$ [4)]	≤ 30 ms

1) for 0,04 ≤ $\Delta \dot{m} / \dot{m}N$ ≤ 1,3
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation | $\Delta \dot{m} / \dot{m}$ | ≤ 5 %.

Dimensional drawings


Air-mass characteristic curve at ambient temperature


Accessories

Connector housing	5-pin	1 928 403 738
Contact pins	For Ø 0.5...1.0 mm²; Contents: 100 x	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm²; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm²; Contents: 10 x	1 928 300 600
Dummy plug		1 928 300 601

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

► Product groups

8.1 Air-mass sensors

HFM with analog interface

Product type

HFM-7 (analog)

Part number

0 280 218 218

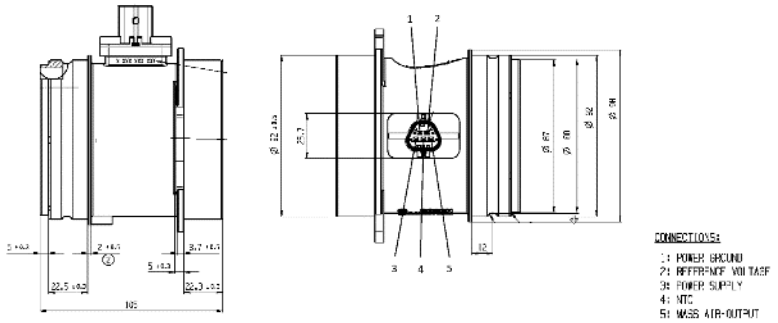
Picture

Technical data

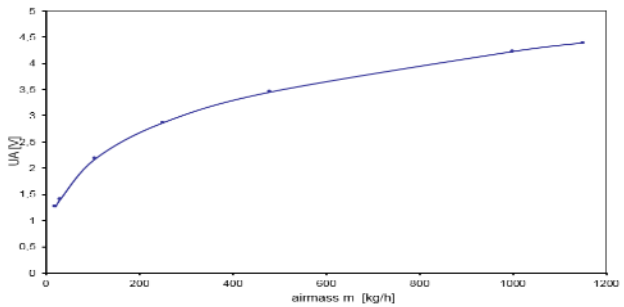
Features		With ambient-temperature sensor.
Nominal airflow	$\dot{m}_N$	1050 kg/h
Measuring range	$\dot{m}_N$	-90 ... 1150 kg/h
Rated supply voltage	U_N	14 V
Supply-voltage range	U_V	6 ... 17 V
Relative accuracy [1]	$\Delta \dot{m} / \dot{m}$	± 2 %
Temperature range [2]	°C	-40 ... +120
Pressure drop at $\dot{m}_N$	Δp	< 10 hPa
Current input	I_V	< 0,06 A
Time constant	τ_{63} [3]	≤ 10 ms
Time constant	$\tau\Delta$ [4]	≤ 30 ms

1) for $0{,}04 \le \Delta \dot{m} / \dot{m}N \le 1{,}3$
2) short-time (≤ 3 min.) to 130 °C
3) Time required for step response of output voltage to 63 % of final value given an abrupt change in air mass from 10 kg/h to 310 kg/h
4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation | $\Delta \dot{m} / \dot{m}$ | ≤ 5 %.

Dimensional drawings



Air-mass characteristic curve at ambient temperature



► Product groups

8.2 Air-mass sensors

HFM with digital interface

- ► Nominal air-flow up to 2.300 kg/h
- ► Digital interface (frequency/SENT)
- ► Compact design
- ► Low weight
- ► Fast response time
- ► Low power input
- ► Pulsation flow detection

Application

The air-mass sensor (HFM) is designed to meter the mass air and temperature of the intake air in motor vehicles with diesel and gasoline applications. The sensor is used to measure the air-mass flow for precise adaption of the injected fuel quantity to the current power requirement, atmospheric pressure and air temperatures

Design and operation

The standard HFM consists of a plug-in sensor and cylinder housing. The electronic module, with the evaluation circuit and the sensor element, is located in the plug-in sensor. The sensor element is positioned on the electronic module and extends into the metering duct (bypass channel) of the connector housing. The location of the temperature sensor (NTC) is on the backside of the connector housing.

The HFM is a thermal flowmeter. From the intake air flow within the cylinder housing, a portion of the total mass air flow will pass across the sensor element in the bypass channel. In the center exists a heating zone which is controlled to a certain temperature, depending on the temperature of the intake air. Without air flow, the temperature from the heating zone to the edges decreases linearly, and the temperature sensors up- and downstream of the heating zone indicate the same value. With air flow, the sensor area upstream will be cooled by the heat transfer in the boundary layer.

The downstream temperature sensor will keep its temperature because the air is heated as it passes over the heating zone. The temperature sensors show a temperature difference which depends on amount and direction of the air flow. The difference between the signals of the temperature sensors is evaluated in a bridge circuit.

Explanation of characteristic data

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