

Sensors



Air-mass, lambda, pressure, rotational-speed,
structure-borne sound, temperature

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Hall speed sensor

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Inductive speed sensor

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PFM pressure-based flow meter

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Absolute pressure sensor

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2.1 Lambda sensors

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General remark: Please note that this catalogue is for information only. The listed products do not constitute binding purchase offers. We reserve the right to update the products and the information given herein. Please feel free to contact our sales department in case of any questions, or if you would like to receive an individual offer."

0 General Information

Sensor IP degrees



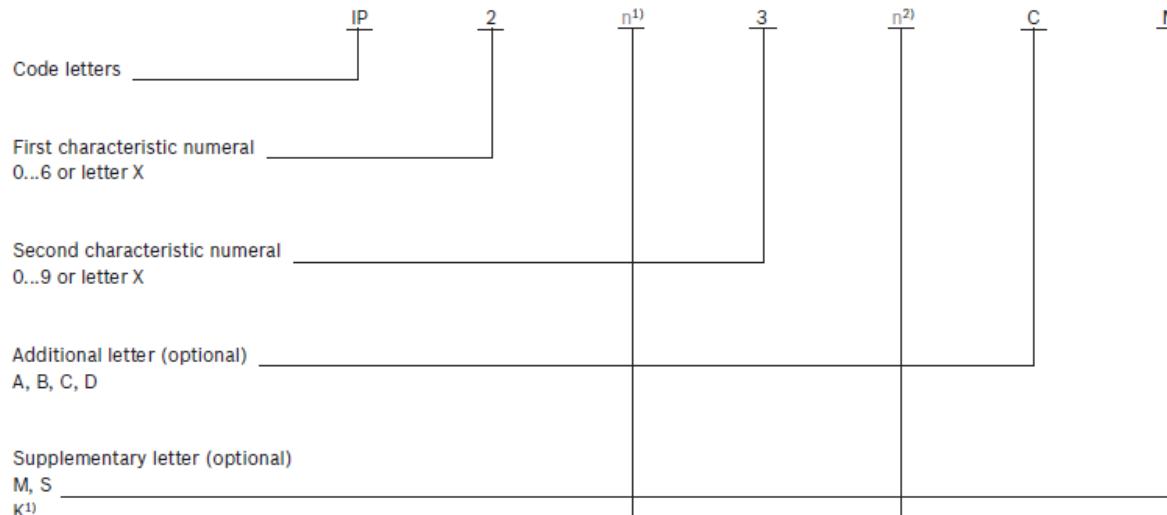
BOSCH

IP degrees of protection

Valid for the electrical equipment of road vehicles as per DIN 40 050 (Part 9).

- ▶ Protection of the electrical equipment inside the enclosure against the effects of solid foreign objects including dust.
- ▶ Protection of the electrical equipment inside the enclosure against the ingress of water.
- ▶ Protection of persons against contact with dangerous parts, and rotating parts, inside the enclosure.

Structure of the IP code



If a characteristic numeral is not given, it must be superseded by the letter "X" (i. e. "XX" if both characteristic numerals are not given). The supplementary and/or additional letters can be omitted at will, and need not be superseded by other letters.

¹⁾ The supplementary letter "K" is located either directly after the first characteristic numerals 5 and 6, or directly after the second characteristic numerals 4, 6 and 9.

²⁾ During the water test. Example: IP16KB protection against the ingress of solid foreign bodies with diameter ≥ 50 mm, protection against high-pressure hose water, protection against access with a finger.

0 General Information

Sensor IP codes



1st characteristic numeral and supplementary letter K	Protection of electrical equipment against ingress of solid foreign objects	Persons	2nd characteristic numeral and supplementary letter K	Protection of electrical equipment against the ingress of water	Additional letter (optional)	Protection of persons against contact with hazardous parts	Additional letter (optional)
0	Non-protected	Non-protected	0	Non-protected	A	Protection against contact with back of hand	M Movable parts of the equipment are in motion ²⁾
1	Protection against foreign bodies Ø ≥ 50 mm	Protection against contact with back of hand	1	Protection against vertically dripping water	B	Protection against contact with finger	S Movable parts of the equipment are stationary ²⁾
2	Protection against foreign bodies Ø ≥ 12.5 mm	Protection against contact with finger	2	Protection against dripping water (at an angle of 15°)	C	Protection against contact with tool	K For the electrical equipment of road vehicles
3	Protection against foreign bodies Ø ≥ 2.5 mm	Protection against contact with tool	3	Protection against splash water	D	Protection against contact with wire	
4	Protection against foreign bodies Ø ≥ 1.0 mm	Protection against contact with wire	4	Protection against spray water			
5K	Dust-protected	Protection against contact with wire	4K	Protection against high-pressure spray water			
6K	Dust-proof	Protection against contact with wire	5	Protection against jets of water			
			6	Protection against powerful jets of water			
			6K	Protection against high-pressure jets of water			
			7	Protection against temporary immersion			
			9	Protection against continuous immersion			
			9K	Protection against high-pressure/steam-jet cleaners			

▶ Product groups

0 General Information

CE-Identification and manufacturer declaration with EU directive



As under the EU Directive all electrically-powered machines, devices and systems, which are manufactured, imported and sold within the borders of the European Union must have a CE-label attached to them. The EU Directive also includes the following individual guidelines, which are of significance for sensor users.

1. Machine Directive

It is valid for self-contained operational machines or any interlinking of machines to form integral systems. It is not valid for machine components however, such as, for example, electrical control systems or sensors which have no independent function. The entire machine or system must always comply with the Directive.

2. EMC Directive

This Directive is valid for all electrical and electronic devices, installations and systems. However, this Directive is also valid for complex components such as, e.g. sensors, although this only applies were they are openly available for purchase by the public. The sensors listed in this catalogue are solely shipped as supplied parts or replacement parts, and are not subject to § 5 paragraph 5 of the EMC Act regarding a mandatory CE label. The limits for the relaying and the radiation of high-frequency interference are specified in EN 55014 of the EMC Act. Because of the previously-mentioned reasons, Bosch sensors are on no account subject to mandatory CE labeling. We will gladly assist you with information in all matters relating to the acceptance of your application.



0 General Information

Liability disclaimer



For applications listed in the catalogue, prior clarification of the technical suitability is imperative. All listed products are designed for automotive vehicles in its intended use. If you use these products within specification, but outside its intended use, you are responsible for establishing the suitability of our products for your intended purpose, if other than for its approved application (in particular, if subjected to different loads or under different technical conditions) by taking suitable action (especially testing). We would like to point out to you that the responsibility for the overall system also lies solely with you.

If your application cannot be solved with this range of products or in case you need our consultancy, please inform us about your requirements and contact us via e-mail address www.bosch-ibusiness.com/contact/



1.1 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 measure the air mass and temperature of the intake air in motor vehicles with diesel and gasoline applications. The sensor measures the actual air mass flow rate for an optimized air-fuel mixture, supporting an efficient fuel combustion and powerful engine performance.

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 upstream 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	Nominal airflow
$\Delta \dot{m}/\dot{m}$	Relative accuracy
τ_Δ	Time until measurement error $\leq 5\%$
τ_{63}	Time until change in measured value 63%

1.1 Air-mass sensors

HFM with analog interface



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		Measuring range \dot{m} 5 ... 640 kg/h																																						
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1.1 Air-mass sensors

HFM with analog interface



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1.1 Air-mass sensors

HFM with analog interface



Product type

HFM7-R5

Part number

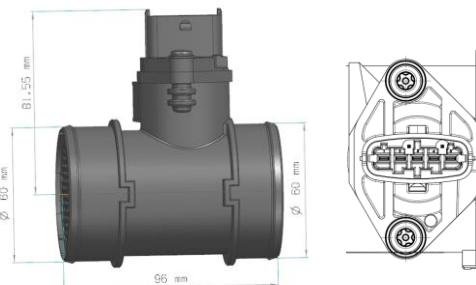
0 280 218 405

(successor of 0 280 217 123)

Picture



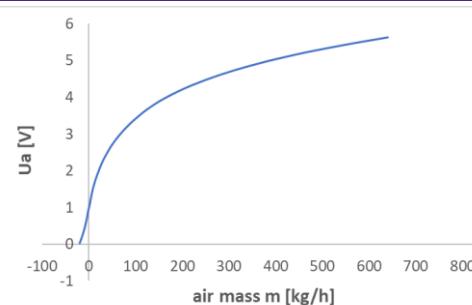
Dimensional drawings



CONNECTIONS:

- 1: NTC
- 2: POWER SUPPLY
- 3: POWER GROUND
- 4: REFERENCE VOLTAGE
- 5: MASS AIR-OUTPUT

Air-mass characteristic curve at ambient temperature



Technical data

Features	With intake air temperature sensor	
Interface	analog	
Nominal airflow	\dot{m}_N	370 kg/h
Measuring range	\dot{m}	-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	$\tau_{63}^{3)}$	≤ 15 ms
Time constant	$\tau^{\Delta} {4)}$	≤ 30 ms

1) for $0,04 \leq \Delta \dot{m} / \dot{m} N \leq 1,3$

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 $|\Delta \dot{m} / \dot{m}| \leq 5\%$.

Accessories

Connector housing	5-pin	1 928 403 836
Contact pins	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
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1.1 Air-mass sensors

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Dummy plug		Tyco 828 922																						

1.1 Air-mass sensors

HFM with analog interface



Product type	Picture	Technical data																																				
HFM-7																																						
Part number	0 280 218 218																																					
Dimensional drawings																																						
Air-mass characteristic curve at ambient temperature																																						
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		► Product groups																																				

1.2 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 measure the air mass and temperature of the intake air in motor vehicles with diesel and gasoline applications. The sensor measures the actual air mass flow rate for an optimized air-fuel mixture, supporting an efficient fuel combustion and powerful engine performance.

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 upstream 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	Nominal airflow
$\Delta \dot{m}/\dot{m}$	Relative accuracy
τ_Δ	Time until measurement error $\leq 5\%$
τ_{63}	Time until change in measured value 63%

1.2 Air-mass sensors

HFM with digital interface



Product type	Picture	Technical data
HFM-7		
Part number		

0 280 218 416

Dimensional drawings	Technical data
<p>CONNECTIONS:</p> <ul style="list-style-type: none"> 1: POWER SUPPLY 2: POWER GROUND 3: NTC 4: MASS AIR-OUTPUT 	<p>Features With intake air temperature sensor</p> <p>Interface FAS (frequency analog signal)</p> <p>Nominal airflow \dot{m}_N 850 kg/h</p> <p>Measuring range \dot{m} -90 ... +1150 kg/h</p> <p>Rated supply voltage U_N 14 V</p> <p>Supply-voltage range U_V 6 ... 17 V</p> <p>Relative accuracy ¹⁾ $\Delta \dot{m} / \dot{m}$ $\pm 5\%$</p> <p>Temperature range ²⁾ °C -40 ... +120</p> <p>Pressure drop at \dot{m}_N Δp < 12 hPa</p> <p>Current input I_V < 0,1 A</p> <p>Time constant $\tau_{63}^{3)}$ ≤ 10 ms</p> <p>Time constant $\tau_{\Delta}^{4)}$ ≤ 30 ms</p>

- 1) for $0,04 \leq \Delta \dot{m} / \dot{m}_N \leq 1,3$
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Air-mass characteristic curve at ambient temperature	Accessories
	<p>Connector housing 4-pin 1 928 404 160</p> <p>Contact pins For Ø 0.5...1.0 mm²; Contents: 100 x 1 928 498 056</p> <p>Contact pins For Ø 1.5...2.5 mm²; Contents: 100 x 1 928 498 057</p> <p>Single-wire seal For Ø 0.35...1.0 mm²; Contents: 10 x 1 928 300 599</p> <p>Single-wire seal For Ø 1.5...2.5 mm²; Contents: 10 x 1 928 300 600</p> <p>Dummy plug 1 928 300 601</p>

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

1.2 Air-mass sensors

HFM with digital interface

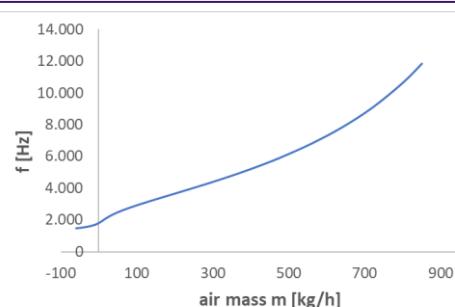


Product type	Picture	Technical data
HFM-7 SF		
Part number		

0 280 218 429

Dimensional drawings	Technical data																																				
<p>CONNECTIONS:</p> <ul style="list-style-type: none"> 1: NTC- 2: POWER GROUND 3: NTC+ 4: POWER SUPPLY 5: MASS AIR-OUTPUT 	<table border="1"> <tbody> <tr> <td>Features</td><td colspan="2">With intake air temperature sensor</td></tr> <tr> <td>Interface</td><td colspan="2">FAS (frequency analog signal)</td></tr> <tr> <td>Nominal airflow</td><td>\dot{m}_N</td><td>640 kg/h</td></tr> <tr> <td>Measuring range</td><td>\dot{m}</td><td>-60 ... +800 kg/h</td></tr> <tr> <td>Rated supply voltage</td><td>U_N</td><td>14 V</td></tr> <tr> <td>Supply-voltage range</td><td>U_V</td><td>6 ... 17 V</td></tr> <tr> <td>Relative accuracy ¹⁾</td><td>$\Delta \dot{m} / \dot{m}$</td><td>$\pm 2 \%$</td></tr> <tr> <td>Temperature range ²⁾</td><td>$^{\circ}\text{C}$</td><td>-40 ... +120</td></tr> <tr> <td>Pressure drop at \dot{m}_N</td><td>Δp</td><td>depending on size and design of cross section area</td></tr> <tr> <td>Current input</td><td>I_V</td><td>< 0,1 A</td></tr> <tr> <td>Time constant</td><td>$\tau_{63}^{3)}$</td><td>$\leq 25 \text{ ms}$</td></tr> <tr> <td>Time constant</td><td>$\tau_{\Delta}^{4)}$</td><td>$\leq 80 \text{ ms}$</td></tr> </tbody> </table> <p> <small> 1) for $0,04 \leq \Delta \dot{m} / \dot{m}_N \leq 1,3$ 2) short-time ($\leq 3 \text{ min.}$) to $130 \text{ }^{\circ}\text{C}$ 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 $\Delta \dot{m} / \dot{m} \leq 5 \%$. </small> </p>	Features	With intake air temperature sensor		Interface	FAS (frequency analog signal)		Nominal airflow	\dot{m}_N	640 kg/h	Measuring range	\dot{m}	-60 ... +800 kg/h	Rated supply voltage	U_N	14 V	Supply-voltage range	U_V	6 ... 17 V	Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	$\pm 2 \%$	Temperature range ²⁾	$^{\circ}\text{C}$	-40 ... +120	Pressure drop at \dot{m}_N	Δp	depending on size and design of cross section area	Current input	I_V	< 0,1 A	Time constant	$\tau_{63}^{3)}$	$\leq 25 \text{ ms}$	Time constant	$\tau_{\Delta}^{4)}$	$\leq 80 \text{ ms}$
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Air-mass characteristic curve at ambient temperature



Accessories

Connector housing	5-pin	1 928 405 138
Contact pins	For Ø 0.35...0.5 mm ² ; Contents: 100 x	1 928 498 143
Contact pins	For Ø 0.75...1.0 mm ² ; Contents: 100 x	1 928 498 144
Single-wire seal	For Ø 1.2...1.6 mm ² ; Contents: 10 x	1 928 300 934
Single-wire seal	For Ø 1.7...2.1 mm ² ; Contents: 10 x	1 928 300 936
Dummy plug		1 928 300 935

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

1.2 Air-mass sensors

HFM with digital interface



Product type	Picture	Technical data																																				
HFM-7																																						
Part number																																						
0 281 002 956																																						
Dimensional drawings	<p>CONNECTIONS:</p> <ul style="list-style-type: none">1: POWER SUPPLY2: POWER GROUND3: REFERENCE_FREQUENCY4: MASS AIR-OUTPUT																																					
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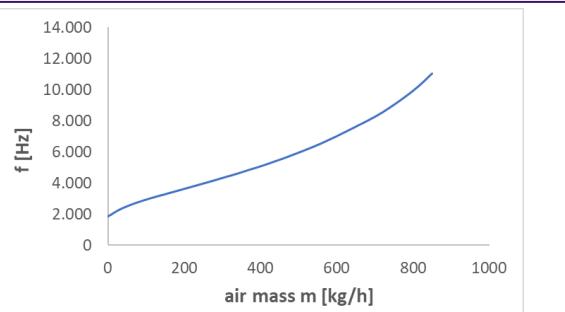
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4) Delay on switch-on and after any change in flow rate until the output voltage has attained the relative measurement deviation $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Air-mass characteristic curve at ambient temperature



8.2 Air-mass sensors

HFM with digital interface



Product type

HFM-8-PTH SF

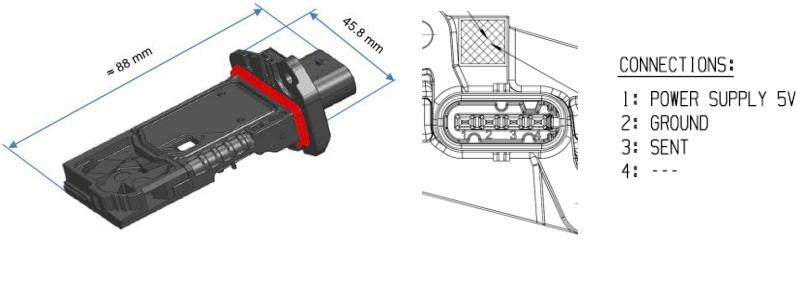
Part number

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(successor of 0 280 218 00W)

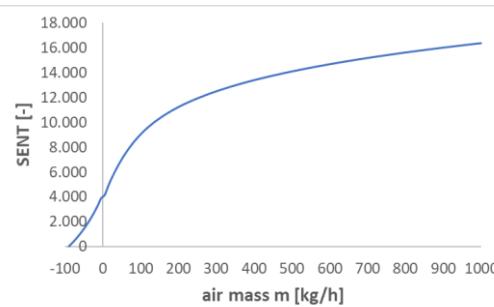
Picture



Dimensional drawing



Air-mass characteristic curve at ambient temperature



Technical data

Features	With integrated pressure, humidity and intake air temperature sensor	
Interface	SENT	
Nominal airflow	\dot{m}_N	640 kg/h
Measuring range airflow	\dot{m}	-90 ... +1000 kg/h
Measuring range pressure	kPa	10 ... 120
Measuring range humidity	%rH	0 ... 100
Rated supply voltage	U_N	5 V
Supply-voltage range	U_V	4,85 ... 5,15 V
Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	± 1.5 %
Temperature range ²⁾	°C	-40 ... +130
Pressure drop at \dot{m}_N	Δp	depending on size and design of cross section area
Current input	I_V	< 0,03 A
Time constant	$\tau_{63}^{3)}$	≤ 10 ms
Time constant	$\tau\Delta^{4)}$	≤ 30 ms

1) for $0,025 \leq \Delta \dot{m} / \dot{m} N \leq 1,0$

2) short-time (≤ 3 min.) to 140 °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 $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Accessories

Connector	4-pin	Hirschmann 872-975-...02
	Option 1, Spec. 2, Code A	

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

8.2 Air-mass sensors

HFM with digital interface



Product type	Picture	Technical data																						
HFM-8-PTH 4.7																								
Part number																								
0 280 218 07T																								
Dimensional drawing	<p>CONNECTIONS:</p> <ul style="list-style-type: none"> 1: POWER SUPPLY 5V 2: GROUND 3: SENT 4: --- 																							
Air-mass characteristic curve at ambient temperature	<table border="1"> <caption>Data points estimated from the graph</caption> <thead> <tr> <th>air mass m [kg/h]</th> <th>SENT [-]</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>50</td><td>10000</td></tr> <tr><td>100</td><td>12000</td></tr> <tr><td>200</td><td>13500</td></tr> <tr><td>300</td><td>14200</td></tr> <tr><td>400</td><td>14800</td></tr> <tr><td>500</td><td>15300</td></tr> <tr><td>600</td><td>15800</td></tr> <tr><td>700</td><td>16200</td></tr> <tr><td>800</td><td>16600</td></tr> </tbody> </table>	air mass m [kg/h]	SENT [-]	0	0	50	10000	100	12000	200	13500	300	14200	400	14800	500	15300	600	15800	700	16200	800	16600	
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		<p>▶ Product groups</p>																						
		<p>19</p>																						

8.2 Air-mass sensors

HFM with digital interface



Product type

HFM-8-PTH 6.4

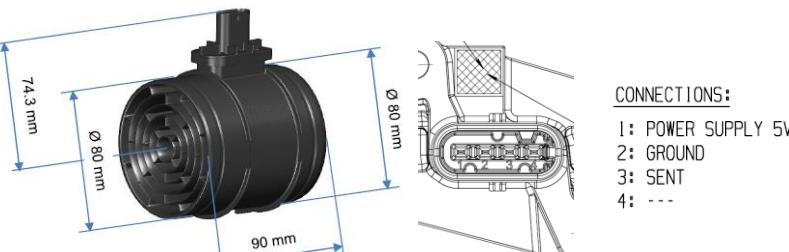
Part number

0 280 218 07U

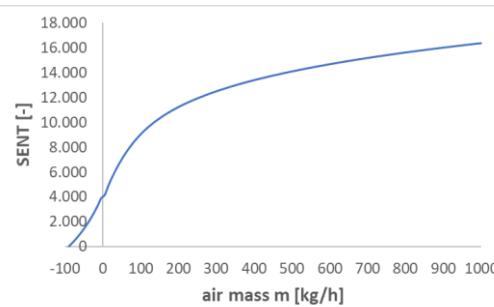
Picture



Dimensional drawing



Air-mass characteristic curve at ambient temperature



Technical data

Features	With integrated pressure, humidity and intake air temperature sensor	
Interface	SENT	
Nominal airflow	\dot{m}_N	640 kg/h
Measuring range airflow	\dot{m}	-90 ... +1000 kg/h
Measuring range pressure	kPa	10 ... 120
Measuring range humidity	%rH	0 ... 100
Rated supply voltage	U_N	5 V
Supply-voltage range	U_V	4,85 ... 5,15 V
Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	$\pm 1.5 \%$
Temperature range ²⁾	°C	-40 ... +130
Pressure drop at \dot{m}_N	Δp	$\leq 5 \text{ hPa}$
Current input	I_V	$< 0,03 \text{ A}$
Time constant	$\tau_{63}^{3)}$	$\leq 10 \text{ ms}$
Time constant	$\tau\Delta^{4)}$	$\leq 30 \text{ ms}$

1) for $0,025 \leq \Delta \dot{m} / \dot{m}_N \leq 1,0$

2) short-time ($\leq 3 \text{ min.}$) to $140 \text{ }^\circ\text{C}$

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 $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Accessories

Connector	4-pin	Hirschmann 872-975-...02
	Option 1, Spec. 2, Code A	

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

8.2 Air-mass sensors

HFM with digital interface



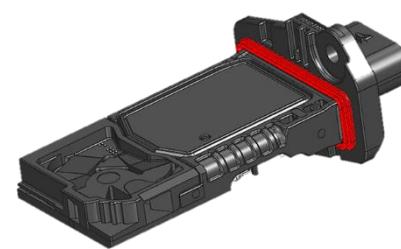
Product type

HFM-8-T SF

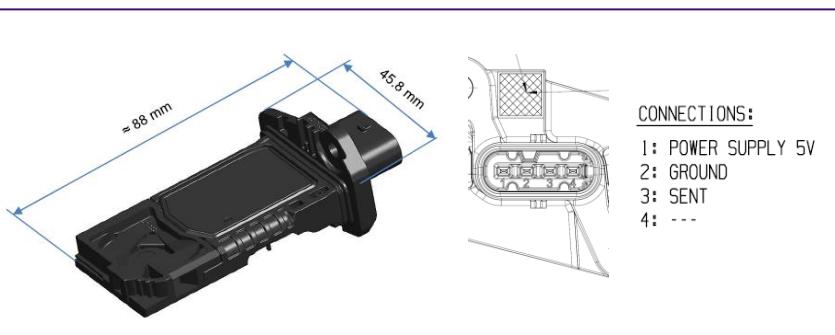
Part number

0 281 006 597

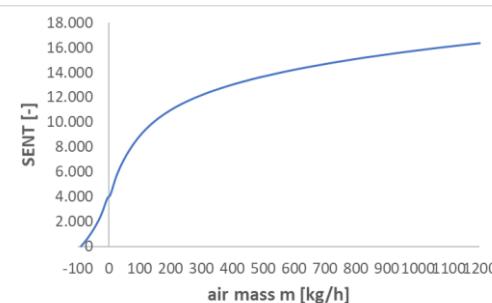
Picture



Dimensional drawing



Air-mass characteristic curve at ambient temperature



Technical data

Features	With intake air temperature sensor	
Interface	SENT	
Nominal airflow	\dot{m}_N	640 kg/h
Measuring range airflow	\dot{m}	-60 ... +1200 kg/h
Rated supply voltage	U_N	5 V
Supply-voltage range	U_V	4,85 ... 5,15 V
Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	$\pm 2.0 \%$
Temperature range ²⁾	$^{\circ}\text{C}$	-40 ... +130
Pressure drop at \dot{m}_N	Δp	depending on size and design of cross section area
Current input	I_V	< 0,02 A
Time constant	τ_{63} ³⁾	$\leq 10 \text{ ms}$
Time constant	$\tau\Delta$ ⁴⁾	$\leq 30 \text{ ms}$

1) for $0,01 \leq \Delta \dot{m} / \dot{m} N \leq 1,7$

2) short-time ($\leq 3 \text{ min.}$) to $140 \text{ }^{\circ}\text{C}$

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 $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Accessories

Connector	4-pin	Hirschmann 872-975-...02
		Option 1, Spec. 2, Code C

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

8.2 Air-mass sensors

HFM with digital interface



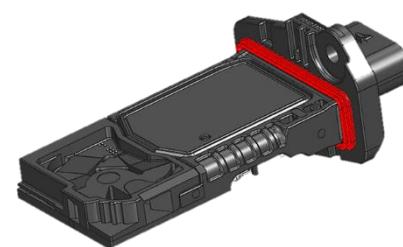
Product type

HFM-8-T SF

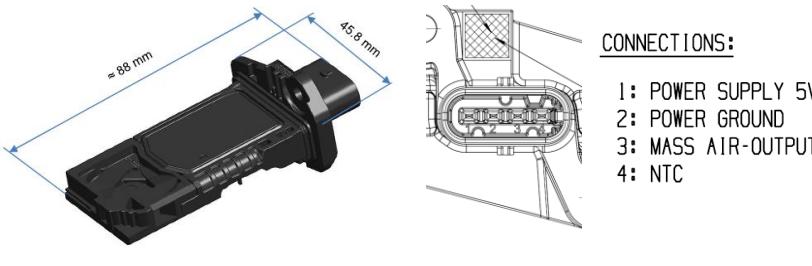
Part number

0 280 218 07K

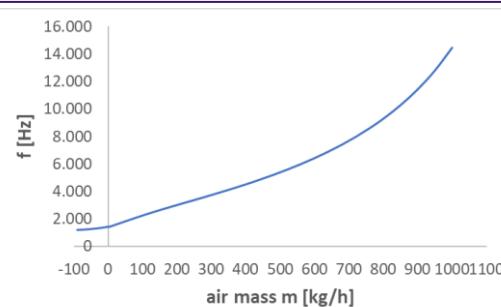
Picture



Dimensional drawing



Air-mass characteristic curve at ambient temperature



Technical data

Features	With intake air temperature sensor	
Interface	FAS (frequency analog signal)	
Nominal airflow	\dot{m}_N	640 kg/h
Measuring range airflow	\dot{m}	-90 ... +1000 kg/h
Rated supply voltage	U_N	5 V
Supply-voltage range	U_V	4,85 ... 5,15 V
Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	$\pm 2.0 \%$
Temperature range ²⁾	$^{\circ}\text{C}$	-40 ... +130
Pressure drop at \dot{m}_N	Δp	depending on size and design of cross section area
Current input	I_V	< 0,02 A
Time constant	τ_{63} ³⁾	$\leq 10 \text{ ms}$
Time constant	$\tau\Delta$ ⁴⁾	$\leq 30 \text{ ms}$

1) for $0,025 \leq \Delta \dot{m} / \dot{m} N \leq 1,0$

2) short-time ($\leq 3 \text{ min.}$) to $140 \text{ }^{\circ}\text{C}$

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 $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Accessories

Connector	4-pin	Hirschmann 872-975-...02
		Option 1, Spec. 2, Code A

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

8.2 Air-mass sensors

HFM with digital interface



Product type

HFM-8-TH SF

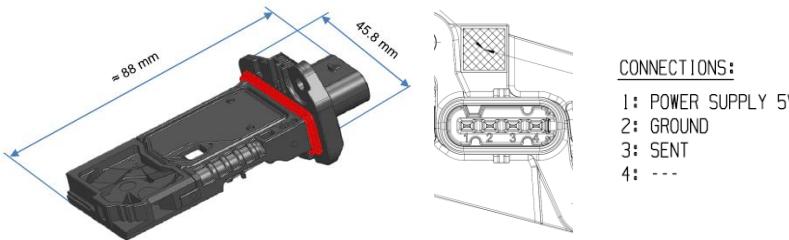
Part number

0 281 006 812

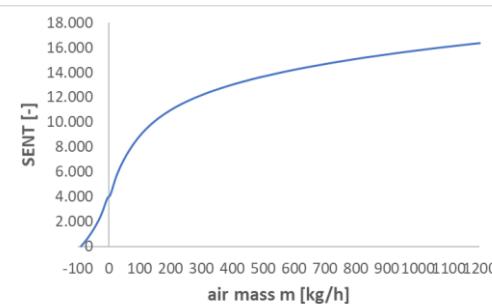
Picture



Dimensional drawing



Air-mass characteristic curve at ambient temperature



Technical data

Features	With integrated humidity and intake air temperature sensor	
Interface	SENT	
Nominal airflow	\dot{m}_N	640 kg/h
Measuring range airflow	\dot{m}	-60 ... +1200 kg/h
Measuring range humidity	%rH	0 ... 100
Rated supply voltage	U_N	5 V
Supply-voltage range	U_V	4,85 ... 5,15 V
Relative accuracy ¹⁾	$\Delta \dot{m} / \dot{m}$	$\pm 2.0 \%$
Temperature range ²⁾	$^{\circ}\text{C}$	-40 ... +130
Pressure drop at \dot{m}_N	Δp	depending on size and design of cross section area
Current input	I_V	< 0,02 A
Time constant	$\tau_{63}^{3)}$	$\leq 10 \text{ ms}$
Time constant	$\tau\Delta^{4)}$	$\leq 30 \text{ ms}$

1) for $0,01 \leq \Delta \dot{m} / \dot{m} N \leq 1,7$

2) short-time ($\leq 3 \text{ min.}$) to $140 \text{ }^{\circ}\text{C}$

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 $|\Delta \dot{m} / \dot{m}| \leq 5 \%$.

Accessories

Connector	4-pin	Hirschmann 872-975-...02
		Option 1, Spec. 2, Code D

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

1.3 Air-mass sensors

PFM pressure based flow meter



- ▶ Pressure range up to 4,5 bar
- ▶ Digital interface (SENT, 2 channels)
- ▶ Compact design
- ▶ Low weight
- ▶ Fast response time
- ▶ Efficient, robust & dynamic mass flow measurement
- ▶ High level of robustness & accuracy



Application

The pressure based air mass flow meter PFM is a sensor to measure the fresh air mass (without exhaust gas recirculation) within air ducts of CV-engines. It is usually mounted downstream of the charge air intercooler.

With the air mass flow measurement the fuel injection quantities can be optimized, which helps to minimize the exhaust gas emissions. The PFM detects the single values, which are used for the air mass flow calculation.

The single values are:

- Differential pressure (difference of total pressure and static pressure)
- Absolute pressure (static pressure)
- Temperature

Design and operation

The PFM measurement technique is based on the pitot-static tube concept, whereby two pressure sensors and one temperature sensor are installed in the sensor for the determination of the air mass flow. The differential pressure sensor is placed in the lower part of the sensor housing and its pressure taps are exposed to the air flow. Similarly, the temperature sensor is placed in the lower housing part to be directly immersed in the flow. The absolute pressure sensor is positioned in the upper part of the sensor housing, since its membrane does not have to be exposed to the flow.

The PFM is designed as a plug-in sensor, which is mounted in a measuring tube with three main parts: a nozzle, a measurement section and a diffusor. The design of the measurement tube uses engine specific data and conditions the flow for an optimal air mass flow measurement with the PFM.

The two analog pressure sensor signals are AD converted, the signal of the temperature sensor is digitized via the absolute pressure sensor. Finally, the sensor signals are transmitted to the ECU via the SENT communication protocol.

The sensor signals of
- the differential pressure sensor
- the absolute pressure sensor
- the temperature sensor
are the input for the air mass flow calculation on the ECU.

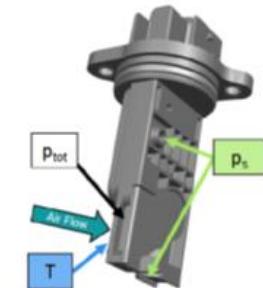
The PFM is mounted downstream of the charge air intercooler and upstream of the throttle valve. Thereby, the PFM static pressure measurement can be used as boost pressure signal at this position.

The temperature signal of the PFM can not only be used for the calculation of the air mass flow, but also as an additional temperature signal at the PFM position between the charge air intercooler and the throttle valve.

Explanation of characteristic data

$$\dot{m} = \sqrt{\frac{2 \cdot p_{diff} \cdot p_s}{R_s \cdot T} \cdot A_{eff}}$$

\dot{m}	= Air mass flow
p_{diff}	= Differential pressure ($p_{diff} = p_{tot} - p_s$)
p_s	= Static pressure
T	= Temperature
R_s	= gas-constant for air
A_{eff}	= Effective area at mounting position



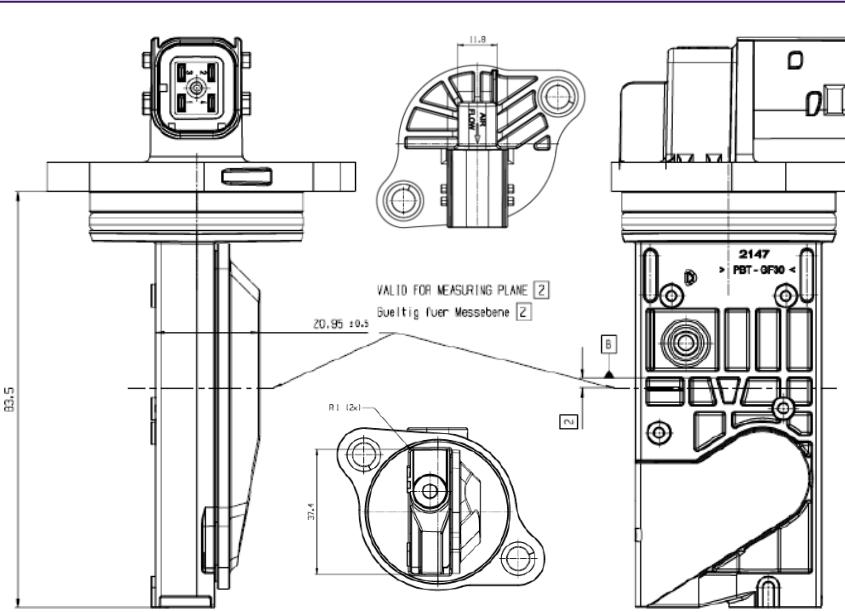
1.3 Air-mass sensors

PFM pressure based flow meter

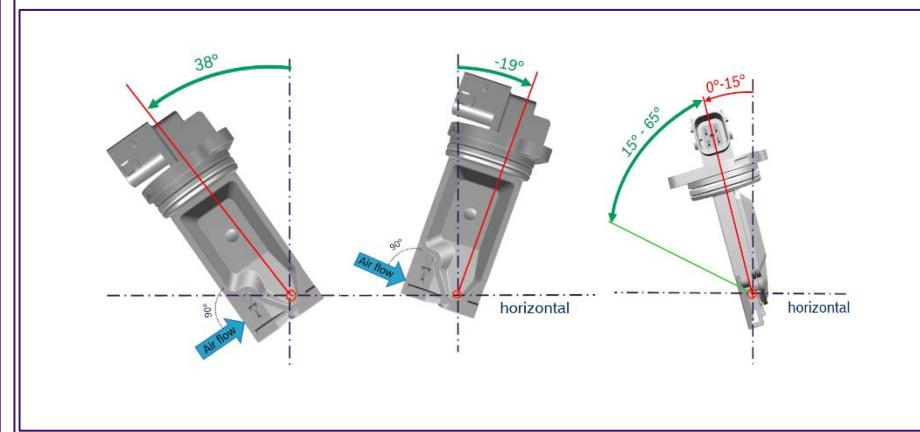
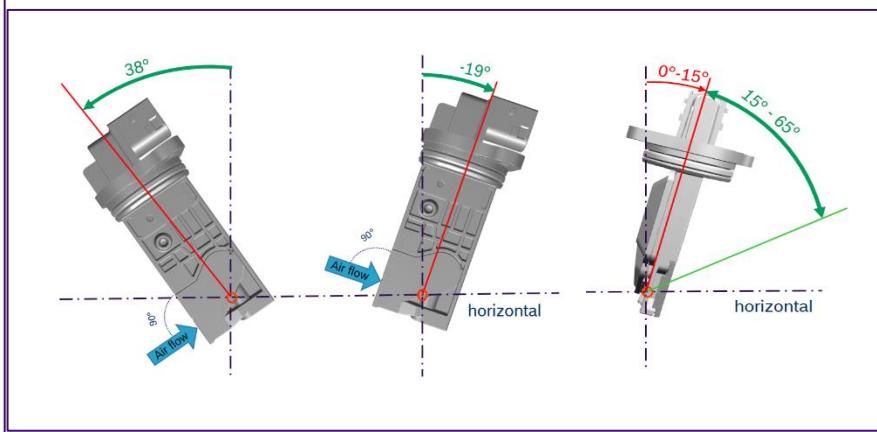
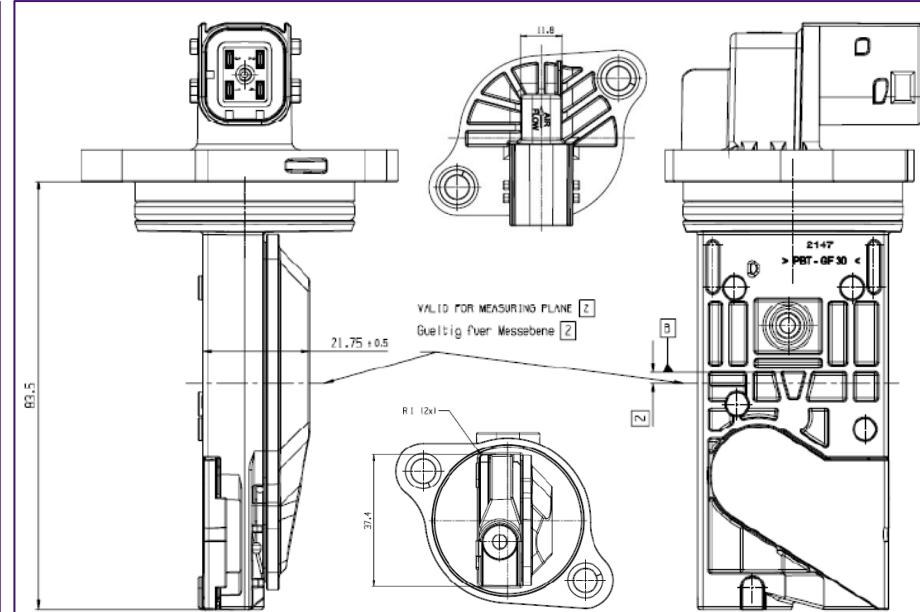


BOSCH

Dimensional drawings for VarA with positioning angles



Dimensional drawings for VarB with positioning angles



1.3 Air-mass sensors

PFM with digital interface



Product type	Picture	Technical data
PFM VarA		
Part number		
0 280 218 902		
Dimensional drawings		
		<p>Features With integrated ambient-temperature sensor.</p> <p>Interface SENT</p> <p>Measuring range differential pressure p_{diff} -16 ... 2 kPa</p> <p>Measuring range absolute pressure p_{abs} 50 ... 450 kPa</p> <p>Rated supply voltage U_N 5 V</p> <p>Supply-voltage range U_V 4,85 ... 5,15 V</p> <p>accuracy $\Delta \dot{m} / \dot{m}$ approx. 2 ... 4 % calculation for each engine</p> <p>Temperature range °C -40 ... +130</p> <p>Pressure drop at \dot{m}_N Δp depending on size and design of cross section area</p> <p>Current input I_{DD} 0,018 A ... 0,045 A</p> <p>Time constant $\tau_{IDD}^1)$ ≤ 7 ms</p> <p>Time constant $\tau_{up,p,SENT}^2)$ ≤ 5 ms</p>
		<p>1) Transient time until supply current settled 2) Time until 1st valid pressure value transfer</p>
pressure characteristic curves at ambient temperature		
Accessories		
Connector	4-pin	Tyco HDSCS Code A
Accessories are not included in the scope of delivery of the sensor and therefore to be ordered separately as required.		
▶ Product groups		26

1.3 Air-mass sensors

PFM with digital interface



Product type	Picture	Technical data				
PFM VarB						
Part number						
0 280 218 900						
Dimensional drawings	<table border="1"> <tr> <td>1: VOD 15V SOURCE/Spannung Versorgung</td> </tr> <tr> <td>2: SENT 1 DYNAMIC PRESSURE p_{diff} / Dynamischer Druck p_{diff}</td> </tr> <tr> <td>3: GND Ground/Basis</td> </tr> <tr> <td>4: SENT 2 ABSOLUTE PRESSURE p_{abs} & AIR TEMPERATURE T_a / Absolutdruck p_{abs} & Lufttemperatur T_a</td> </tr> </table>	1: VOD 15V SOURCE/Spannung Versorgung	2: SENT 1 DYNAMIC PRESSURE p_{diff} / Dynamischer Druck p_{diff}	3: GND Ground/Basis	4: SENT 2 ABSOLUTE PRESSURE p_{abs} & AIR TEMPERATURE T_a / Absolutdruck p_{abs} & Lufttemperatur T_a	
1: VOD 15V SOURCE/Spannung Versorgung						
2: SENT 1 DYNAMIC PRESSURE p_{diff} / Dynamischer Druck p_{diff}						
3: GND Ground/Basis						
4: SENT 2 ABSOLUTE PRESSURE p_{abs} & AIR TEMPERATURE T_a / Absolutdruck p_{abs} & Lufttemperatur T_a						
pressure characteristic curves at ambient temperature	 					
Accessories						
Connector	4-pin	Tyco HDSCS Code B				
Accessories are not included in the scope of delivery of the sensor and therefore to be ordered separately as required.						

2.1 Lambda sensors

Type LSF-4.2 (Switching type)



► compared to the wideband lambda sensor LSU4.9 the switching type LSF4.2 type is limited to applications in the near operation vicinity of $\lambda=1$



Application

Engine management

- Gas engines
- Combined heat and thermal power units (CHP)
- Gasoline engines

Industrial processes

- Tempering furnaces
- Chemical industry
- Packaging equipment
- Process engineering
- Drying plants
- Metallurgy

Measurement and analysis processes

- Flue gas measurement
- Gas analysis
- Determination of Wobbe index

Design and application

The LSF4.2 lambda sensor operates according to the principle of a galvanic oxygen concentration cell with solid electrolyte. The sensor element is in the form of a long wafer with rectangular cross section. The measuring cell and the heater are integrated in this planar ceramic. The measuring cell's surfaces are coated with microporous layers of noble metal. On the one side, due to their catalytic activity, these layers define the sensor's characteristic curve, while on the other they serve as contact elements. On the surface of the ceramic exposed to the exhaust gas, the noble-metal electrode is protected by a porous ceramic layer which, across the whole operating-temperature range, prevents erosion damage due to the deposits in the exhaust gas. This protective layer is applied using sintering techniques and, due among other things to its perfect adhesion and structure, it guarantees a long service life and compliance with the high functional demands made upon the sensor.

The heater is a wave-shaped element and contains noble metals. It is insulated, and integrated in the ceramic wafer. Even at low heater inputs it ensures that the sensor heats up quickly. The Lambda sensor operates as a reference-gas sensor, and compares the residual oxygen in the exhaust gas with the oxygen in the reference atmosphere (air circulating inside the sensor).

In the stoichiometric region of the air/fuel mixture ($\lambda = 1$), there is a sudden jump in the sensor output voltage. The system is closed-loop controlled to $\lambda = 1$ (two-state controller), and this voltage jump is evaluated in the 450...500 mV area of the system's characteristic curve.

The following approximate values apply as guidelines for sensor voltage:

- rich mixture ($\lambda < 1$) 800...1000 mV,
- lean mixture ($\lambda > 1$)
- in the area around 100 mV.

A prerequisite for efficient and reliable functioning is that the active sensor ceramic has a temperature of 350 °C. The integrated heater ensures that the sensor functions at exhaust-gas temperatures.

In addition, the direct sensor heating ensures that the sensor element heats up so rapidly that lambda closed loop control can come into operation within 10 secs. after engine start.

These advantages make an important contribution towards achieving low, stable exhaust-gas emission values. There are product variants with an additional "Thermal Shock Protection" (TSP). TSP increases robustness, especially against cold water droplets in cold start case of motor engines. An additional ceramic layer reduces the heat transition by distributing the drops to a larger area in case a water droplet hits the already heated sensor

Characteristics

- Field-proven,
- robust and compact,
- reliable,
- high-temperature-resistant up to 1000 °C exhaust-gas temperature
- resistant to stone impact,
- resistant to corrosion,
- isolated ground sensor signal circuit,
- low heater rating,
- stable control characteristic,
- short switch-on time.

2.1 Lambda sensors

Type LSF-4.2 (Switching type)



Product type

LSF-4.2

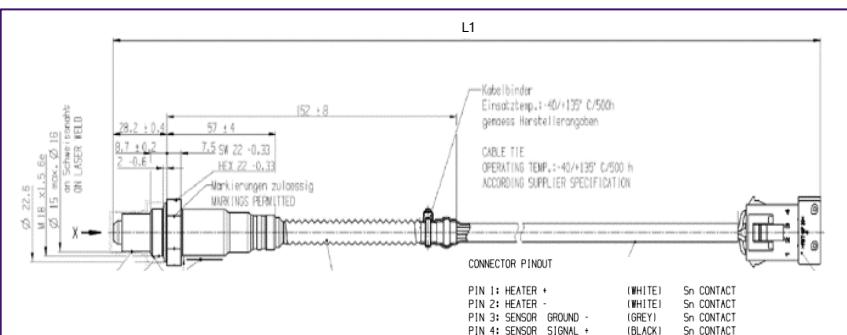
Part number

Several available

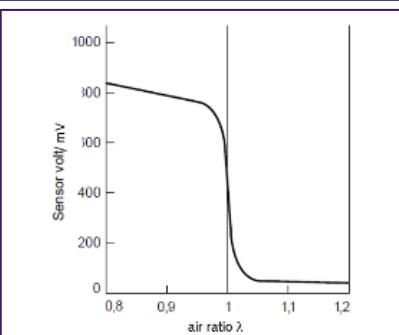
Picture



Dimensional drawing



Characteristic curve



Technical data

Measuring range of lambda	0,97 ... 1,10
Sensor voltage at lambda = 0,97	800 ± 55 mV
Sensor voltage at lambda = 1,10	50 ± 30 mV
Internal resistance	≤ 0,5 kΩ
Response time (600mV ... 300mV)	< 125 ms
Response time (300mV ... 600mV)	< 60 ms
Heater current	0,48 ± 0,1 A
Heater power (with 13V heater voltage)	7 W
Heater nominal voltage supply	12 V
Exhaust gas temperature	350°C 930°C

Part number	TSP	Voltage	Cable length L1
0258 006 956	No	12 V	460 mm
0258 986 784	Yes	12 V	1135 mm

Accessories

Connector housing	4-pin	Tyco 185 001-61
Contact pins	Sn	Tyco 1-962915-1
Single-wire seal		Tyco 828 904-1
Single-wire seal		Tyco 1 251 039 001

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

2.2 Lambda sensors

Type LSU-4.9 (wideband)



- The wideband Lambda sensor LSU is a planar ZrO_2 dual-cell limit current sensor with integrated heater.
- It is used for measuring the oxygen content and the λ value of exhaust gases in vehicle engines.
- Thanks to a steady characteristic curve in the range $\lambda = 0.65$ to air, it is universally applicable for $\lambda = 1$ and for other λ ranges.



Application

Engine management

- Gas engines
- Combined heat and thermal power units (CHP)
- Diesel engines
- Gasoline engines
- Lean combustion engines

Industrial processes

- Tempering furnaces
- Chemical industry
- Packaging equipment
- Process engineering
- Drying plants
- Metallurgy

Measurement and analysis processes

- Flue gas measurement
- Gas analysis
- Determination of Wobbe index
- Incineration plants
- Wood
- Biomass

Design and operation

The LSU broadband Lambda sensor is a planar ZrO_2 dual-cell limit current sensor with integrated heater. It is suitable for measuring the oxygen content and the λ value of exhaust gases in vehicle engines (gasoline and diesel). A constant characteristic curve in the range from $\lambda = 0.65$ to air makes it suitable for universal use for $\lambda = 1$ and for other λ ranges. The connector module includes a trimming resistor, which determines the characteristics of the sensor and is necessary for the sensor to function. To function, the LSU requires special operating electronics (e.g. ETAS LA4 or IC CJ125 evaluation circuit) and may only be operated in conjunction with these. The Lambda sensor consists of two cells. It is made up of a Nernst type potentiometric oxygen concentration cell and an amperometric oxygen pump cell. Nernst cells have the property that oxygen ions diffuse through their ceramic at high temperatures, as soon as there are differences in the partial oxygen pressure at both ends of the ceramic. The transport of ions results in an electrical

voltage between them, which is measured using electrodes. The components of the exhaust gas diffuse through the diffusion duct to the electrodes for the pump and Nernst cell, where they are brought to thermodynamic equilibrium. Control electronics record the Nernst voltage U_N , the concentration cell and supply the pump cell with a variable pump voltage U_P . If U_N takes on a value of less than 450 mV, the exhaust gas is lean and the pump cell is supplied with a current that causes oxygen to be pumped out of the duct. By contrast, if the exhaust gas is rich, $U_N > 450$ mV and the flow direction is reversed, causing the cell to pump oxygen into the duct. An integrated module (CJ125) can be used for signal evaluation. As well as the controller for the pump flow and the controller that keeps the Nernst cell at 450 mV, this module includes an amplifier. The sensor element is manufactured using thick-film techniques, which results in production distribution. This means that the characteristic curves for different sensors will vary. At an oxygen concentration of 0%, the output voltage is a uniform 0 V, as when using the evaluation circuit. However, at air the voltage scatters between approx. 6 and 8 V. This means that each sensor has to be individually calibrated so that a clear relationship between the measured oxygen concentration and the output voltage can be created. Calibration can be carried out on air in which the oxygen content is 20.9%. Calibration is recommended at each maintenance. There are product variants with an additional "Thermal Shock Protection" (TSP). TSP increases robustness, especially against cold water droplets in cold start case of motor engines. An additional ceramic layer

reduces the heat transition by distributing the drops to a larger area in case a water droplet hits the already heated sensor. This allows an earlier signal readiness in the vehicle since it is possible to heat sensor already with engine start.

Installation instructions

- Installation in exhaust gas pipes at a location exhibiting a representative exhaust gas composition given compliance with the specified temperature limits.
- The ceramic sensor element warms up rapidly after switching on the sensor heating. Once the ceramic element has warmed up, the occurrence of condensate, which could damage the hot ceramic sensor element, must be avoided.
- If possible, the installation position should be vertically upwards, however at least at an angle of 10 ° with respect to the horizontal. This prevents the accumulation of liquid between the sensor housing and sensor element. An angle of 90 ° is desirable, however no greater than 90 ° + 15 ° gas inlet hole with respect to the exhaust gas flow or 90 ° - 30 °. Other angular positions are to be assessed separately if applicable.
- Tightening torque: 40 - 60 Nm, the material properties and strength of the thread must be designed accordingly.

Explanation of characteristics quantities

- λ Air fuel ratio
- U_N Nernst voltage
- U_P Variable pump voltage

2.2 Lambda sensors

Type LSU-4.9 (wideband)



Product type	Picture	Technical data		
LSU-4.9		Measuring range of lambda	0,65 ... ∞	
		Heater power (with 7,5V heater voltage)	7,5 W	
		Heater nominal voltage supply	7,5 V	
		Exhaust gas temperature	≤ 930°C	
Part number	Several available	Part number	TSP	Voltage
		0281 004 805	Yes	12 V ²⁾
		0281 004 107	No	24 V ¹⁾
		0258 017 025	No	12 V ²⁾
Dimensional drawings	L1	Cable length L1		
	97	1000 mm		
Characteristic curve	Characteristic curve	Accessories		
		Mating connector parts set	Connector housing, contacts, grommet	1 987 280 016

I_p = Pump current
 λ = Air ratio

► Product groups

2.3 Lambda sensors

Type LSU-5.2 (wideband)



- The wideband Lambda sensor LSU is a planar ZrO_2 dual-cell limit current sensor with integrated heater.
- It is used for measuring the oxygen content and the λ value of exhaust gases in vehicle engines.
- Thanks to a steady characteristic curve in the range $\lambda = 0.65$ to air, it is universally applicable for $\lambda = 1$ and for other λ ranges.



Application

Engine management

- Gas engines
- Gasoline engines
- Lean combustion engines

Industrial processes

- Tempering furnaces
- Chemical industry
- Packaging equipment
- Process engineering
- Drying plants
- Metallurgy
- Baking oven application

Measurement and analysis processes

- Flue gas measurement
- Gas analysis
- Determination of Wobbe index
- Incineration plants

Design and operation

The LSU broadband Lambda sensor is a planar ZrO_2 dual-cell limit current sensor with integrated heater. It is suitable for measuring the oxygen content and the λ value of exhaust gases in vehicle engines (gasoline). A constant characteristic curve in the range from $\lambda = 0.65$ to air makes it suitable for universal use for $\lambda = 1$ and for other λ ranges. The connector module includes a trimming resistor, which determines the characteristics of the sensor and is necessary for the sensor to function. To function, the LSU requires special operating electronics (e.g. ETAS LA4 or IC CJ125 evaluation circuit) and may only be operated in conjunction with these.

The Lambda sensor consists of two cells. It is made up of a Nernst type potentiometric oxygen concentration cell and an amperometric oxygen pump cell. Nernst cells have the property that oxygen ions diffuse through their ceramic at high temperatures, as soon as there are differences in the partial oxygen pressure at both ends of the ceramic. The transport of ions results in an electrical

voltage between them, which is measured using electrodes. The components of the exhaust gas diffuse through the diffusion duct to the electrodes for the pump and Nernst cell, where they are brought to thermodynamic equilibrium. Control electronics record the Nernst voltage U_N at the concentration cell and supply the pump cell with a variable pump voltage U_P . If U_N takes on a value of less than 450 mV, the exhaust gas is lean and the pump cell is supplied with a current that causes oxygen to be pumped out of the duct. By contrast, if the exhaust gas is rich, $U_N > 450$ mV and the flow direction is reversed, causing the cell to pump oxygen into the duct. An integrated module (CJ125) can be used for signal evaluation. As well as the controller for the pump flow and the controller that keeps the Nernst cell at 450 mV, this module includes an amplifier. The sensor element is manufactured using thick-film techniques, which results in production distribution. This means that the characteristic curves for different sensors will vary. At an oxygen concentration of 0%, the output signal is 0, as when using the evaluation circuit. However, at air the signal scatters $\pm 12\%$. This means that each sensor has to be individually calibrated so that a clear relationship between the measured oxygen concentration and the output voltage can be created. Calibration can be carried out on air in which the oxygen content is 20.9%. Calibration is recommended at each maintenance. The LSU5.2 has a "Thermal Shock Protection" (TSP). TSP increases robustness, especially against cold water droplets in cold start case of motor engines. An additional ceramic layer

reduces the heat transition by distributing the drops to a larger area in case a water droplet hits the already heated sensor. This allows an earlier signal readiness in the vehicle since it is possible to heat sensor already with engine start.

Installation instructions

- Installation in exhaust gas pipes at a location exhibiting a representative exhaust gas composition given compliance with the specified temperature limits.
- The ceramic sensor element warms up rapidly after switching on the sensor heating. Once the ceramic element has warmed up, the occurrence of condensate, which could damage the hot ceramic sensor element, should be limited (max. 60 μ l droplet size and max. 25 μ l/sec liquid flow)
- If possible, the installation position should be vertically upwards, however at least at an angle of 10° with respect to the horizontal. This prevents the accumulation of liquid between the sensor housing and sensor element. An angle of 90° is desirable, however no greater than 90° + 15° gas inlet hole with respect to the exhaust gas flow or 90° - 30°. Other angular positions are to be assessed separately if applicable.
- Tightening torque: 40 - 60 Nm, the material properties and strength of the thread must be designed accordingly.

Explanation of characteristics quantities

- λ Air fuel ratio
- U_N Nernst voltage
- U_P Variable pump voltage

2.3 Lambda sensors

Type LSU-5.2 (wideband)



Product type	Picture	Technical data
LSU-5.2		
Part number		
Several available		
Dimensional drawings		
Characteristic curve		
Characteristic curve		
Accessories		
Mating connector parts set	Connector housing, contacts, grommet	1 986 280 016

I_p = Pump current
 λ = Air fuel ratio

► Product groups

3.1 Pressure sensors

Differential pressure sensor



- ▶ Pressure range -100 to 500 kPa
- ▶ High level of accuracy
- ▶ With temperature compensation



Application

This sensor is used for either measurement of the differential pressure at the diesel particulate filter to determine its load condition, or fuel tank vapor pressure.

Design and operation

The piezo-resistive pressure sensor element and a suitable circuitry for signal amplification and temperature compensation are integrated on a silicon chip. The pressure measured operates to the back side of the silicon diaphragm, which is resistant to corrosive media and protected by a gel film against diaphragm cracks. The reference pressure operates from above to the active side of the silicon diaphragm. The upper chip surface and the wire-bonding onto the ceramic substrate are protected from corrosion by a anti-corrosive gel.

Explanation of characteristic data

p_e	Differential pressure
U_A	Output voltage (signal voltage)
U_V	Supply voltage
k	Tolerance multiplier
D	After endurance test
N	As-new condition

Installation instructions

The sensor is designed for attachment to the bodywork or to the engine of motor vehicles. The sensor should be installed to avoid condensate accumulating in the pressure cell or the reference opening (pressure sampling point at top of intake manifold, pressure connection angled downwards etc.). As a general rule, the installation position should ensure that liquids cannot accumulate in the sensor and pressure hose. If it freezes, water in the sensor can lead to malfunction.

3.1 Pressure sensors

Differential pressure sensor



Product type

DS-T3

Part number

0 261 230 161

Picture



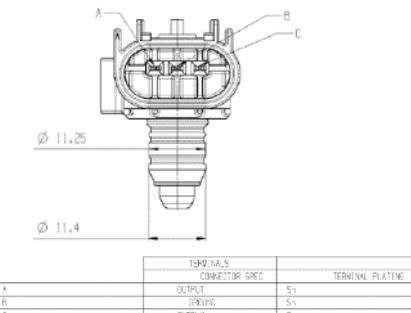
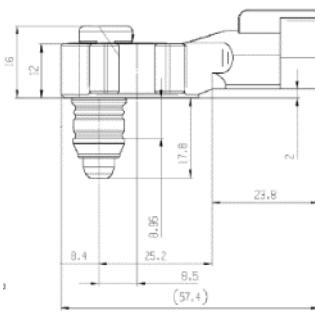
Technical data

		min.	type	Max.
Pressure range ($p_1 \dots p_2$)	kPa	-3,75		+1,25
Supply voltage U_V	V	4,75	5	5,25
Load current I_L at output	mA	-1,0		0,5
Response time $\tau_{10/90}$	ms			5,0
Operating temperature	°C	0		+80

Limit data	
Operating temperature	°C

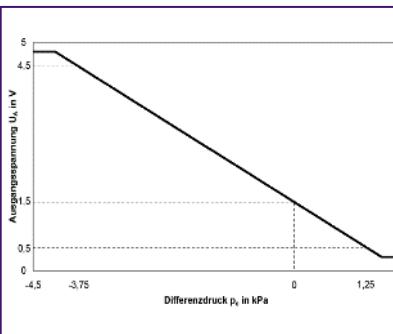
Operating temperature	°C	-50	+90
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Dimensional drawings



TERMINAL BLOCK CONNECTOR SPEC.		TERMINAL PLATING
A	OUTPUT	Sn
B	SIGNAL	Sn
C	SUPPLY	Sn

Characteristic curve



▶ Product groups

3.2 Pressure sensors

Absolute pressure sensors



- ▶ Pressure range 0 – 1000 kPa
- ▶ High level of accuracy
- ▶ EMC protection better than 100 V m^{-1}
- ▶ With temperature compensation
- ▶ Version with additional integrated temperature sensor



Application

The sensor is used to measure the absolute intake-manifold or boost pressure. Some variants can be used to measure the absolute fuel or oil pressure. The version with integrated temperature sensor additionally measures the temperature of the detected medium.

Design and operation

The piezo-resistive pressure sensor element and a suitable circuitry for signal amplification and temperature compensation are integrated on a silicon chip. The measured pressure operates from above to the active side of the silicon diaphragm. Between the backside and a glass socket a reference vacuum is enclosed. The temperature sensor element is an NTC-resistor. By a suitable coating process the pressure and temperature sensor are protected against vapors and fluids existing in the intake-manifold, exhaust gas or exhaust gas condensate, however, may affect the sensor lifetime.

Explanation of characteristic data

U_A	Output voltage
U_V	Supply voltage
k	Tolerance multiplier
D	After endurance test
N	As-new condition

Installation instruction

The sensor is designed for attachment to a flat surface at the intake manifold of motor vehicles. The pressure connection and the temperature sensor jointly project into the intake manifold and are sealed off from the atmosphere by an O-ring. The sensor should be installed to avoid condensate accumulating in the pressure cell (pressure sampling point at top of intake manifold, pressure connection angled downwards etc.).

3.2 Pressure sensors

Absolute pressure sensors

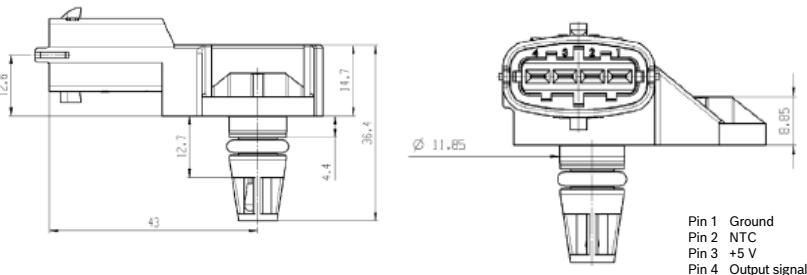
Attention: product will be discontinued, successor product in development. Please approach us via contact page.



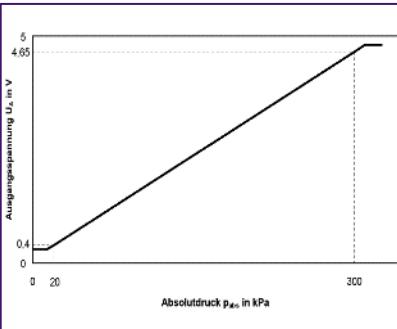
BOSCH

Product type	Picture	Technical data				
DS-S2-TF		Parameter	min.	type		
		Features	Integrated temperature sensor			
		Pressure range ($p_1 \dots p_2$)	kPa	20	300	
		Supply voltage U_V	V	4,75	5	5,25
		Load current I_L at output	mA	-1	0,5	
		Response time $\tau_{10/90}$	ms	1		
		Operating temperature	°C	-40	+130	
Limit data						
Operating temperature						

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
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 seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

3.2 Pressure sensors

Absolute pressure sensors

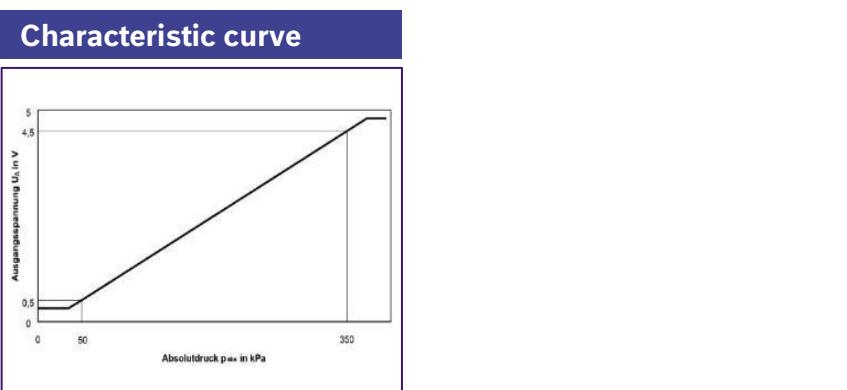
Attention: product will be discontinued, successor product in development. Please approach us via contact page.



BOSCH

Product type	Picture
DS-S2-TF	
Part number	
0 281 002 456	

Dimensional drawings
<p>The technical drawings include a front view showing dimensions of 12.6, 14.7, 12.7, 36.4, and Ø 11.05; a side view showing height 43 and diameter Ø 11.05; and a pinout diagram for a 4-pin connector with pins labeled 1, 2, 3, and 4. Below the pinout diagram is a legend: Pin 1 Ground, Pin 2 NTC thermistor, Pin 3 +5 V, Pin 4 Output signal.</p>



Technical data	Parameter	min.	type	Max.
Features	Integrated temperature sensor			
Pressure range ($p_1 \dots p_2$)	kPa	50		350
Supply voltage U_V	V	4,5	5	5,5
Load current I_L at output	mA	-1		0,5
Response time $\tau_{10/90}$	ms			1
Operating temperature	°C	-40		+130
Limit data				
Operating temperature	°C	-40		+130
Temperature sensor				
Measuring range	°C	-40		+130
Measurement current ¹⁾	mA			1
Rated resistance at +20°C	kΩ			2,5 ± 5 %
Temperature/time constant $\tau_{63}^{2)}$	s			10

¹⁾ Operation with 1 kΩ series resistance.

²⁾ In air with flow velocity 6 m/s.

Accessories		
Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ² ; Contents:	1 928 498 060
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ² ; Contents:	1 928 498 061
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents:	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; Contents:	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.

3.2 Pressure sensors

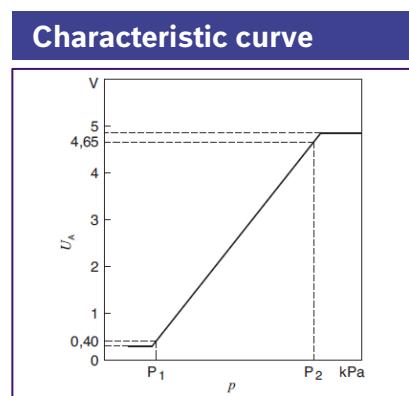
Absolute pressure sensors

Attention: product will be discontinued, successor product in development. Please approach us via contact page.



BOSCH

Product type	Picture	Technical data			
DS-S2		Parameter	min.	type	max.
		Pressure range kPa ($p_1 \dots p_2$)	20		250
		Operating temperature ϑ_B °C	-40		+130
		Supply voltage U_V V	4,75	5	5,25
		Load resistance to U_V or ground $R_{\text{pull-up}}$ kΩ	5		
		Load resistance to U_V or ground $R_{\text{pull-down}}$ kΩ	10		
		Response time $\tau_{10/90}$ ms			1
Limit data					
		Storage temperature ϑ_L °C	-40		+130



Accessories

Connector housing	Quantity required: 1 x	1 928 403 966
Contact pins	Quantity required: 3 x; Contents: 100 x	1 928 498 060
Individual seals	Quantity required: 3 x; 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

3.2 Pressure sensors

Absolute pressure sensors



Product type

DS-S3-TF

Part number

0 261 230 217

(successor of 0 261 230 099)

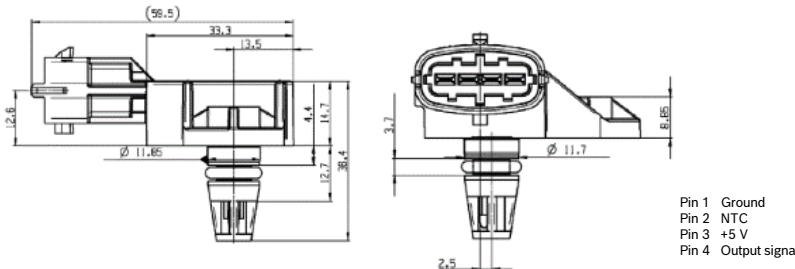
Picture



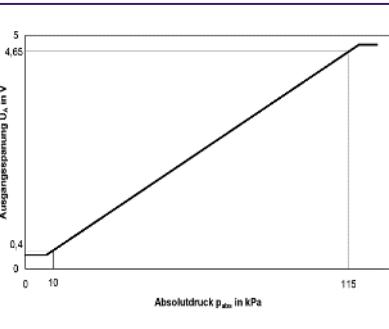
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	10	115
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Limit data			
Operating temperature	°C	-40	+130

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
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 seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 245
(successor of 0 261 230 030)

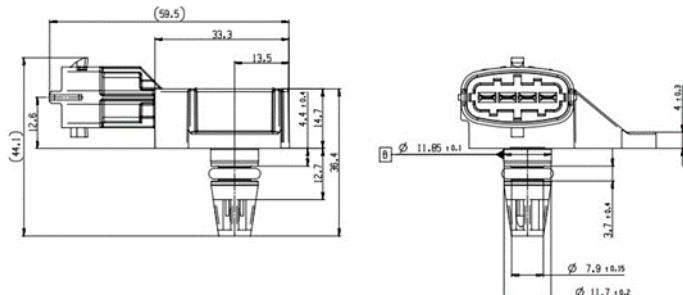
Picture



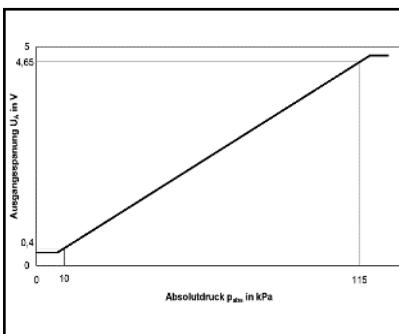
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	10	115
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1.0
Operating temperature	°C	-40	+130
Load resistance to Us or ground R pull up	kΩ	5	68
Load resistance to Us or ground R pull down	kΩ	10	100
Lower limit at US = 5 V	V	0,25	0,3
Upper limit at US = 5 V		4,65	4,7
			0,35
			4,75

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 404 745
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 247

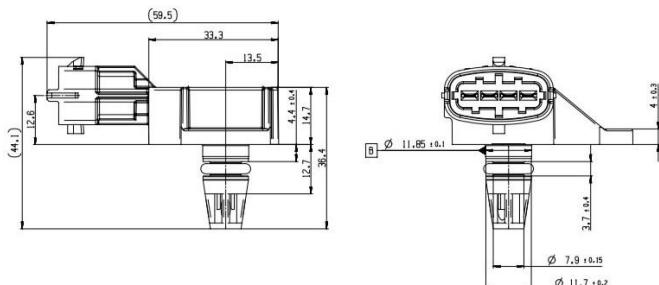
Picture



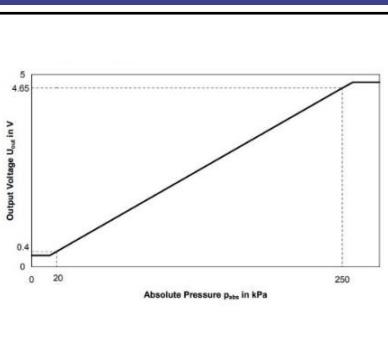
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	250
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Lower limit at US = 5 V	V	0,25	0,35
Upper limit at US = 5 V		4,65	4,75

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 404 745
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 280

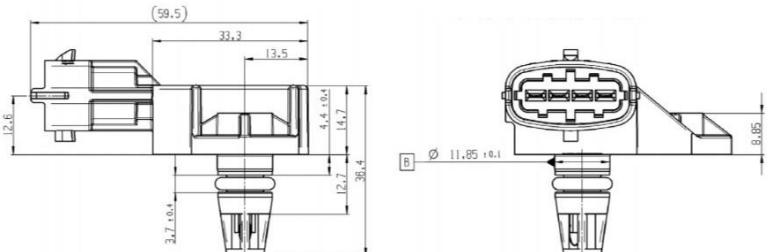
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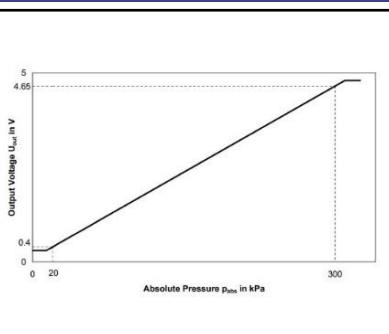
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	300
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Lower limit at US = 5 V	V	0,25	0,35
Upper limit at US = 5 V		4,65	4,7

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 404 745
Contact pins (tin-plated)	For Ø 0,5...1,0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1,5...2,5 mm ²	1 928 498 057
Single-wire seal	For Ø 0,35...1,0 mm ²	1 928 300 599
Single-wire seal	For Ø 1,5...2,5 mm ²	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.

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 283

(successor of 0 281 002 514)

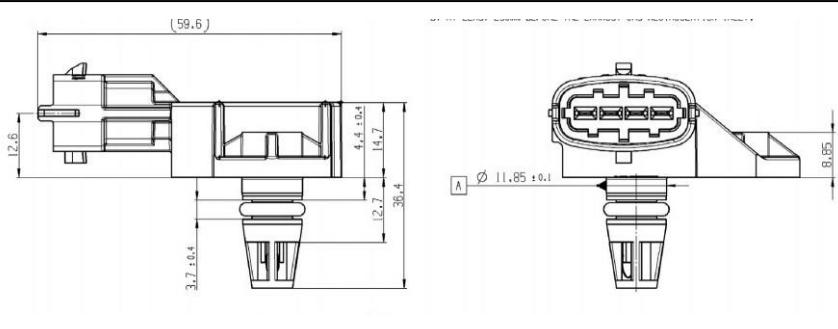
Picture



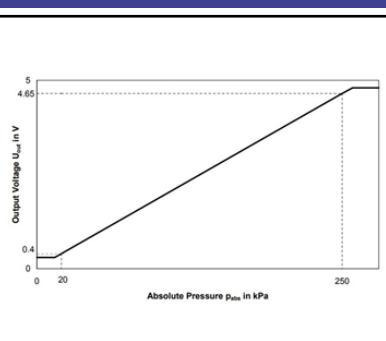
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	250
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Lower limit at US = 5 V	V	0,25	0,35
Upper limit at US = 5 V		4,65	4,75

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 302
(successor of 0 261 230 042)

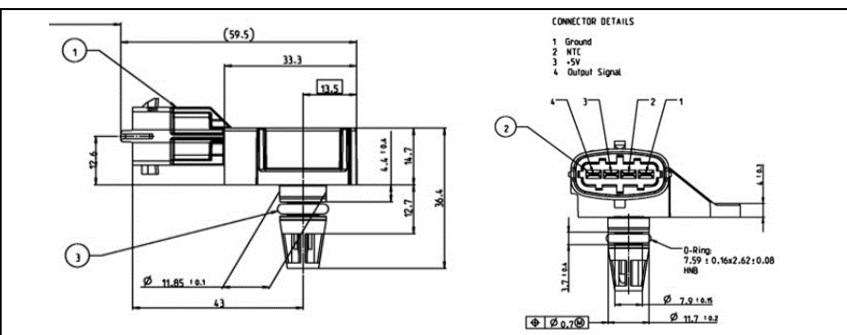
Picture



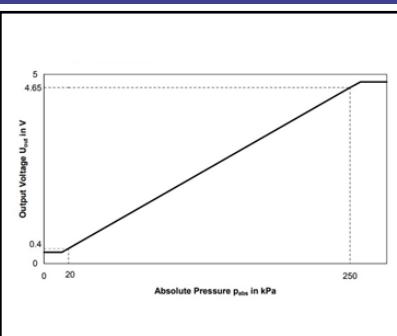
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	250
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Lower limit at US = 5 V	V	0,25	0,35
Upper limit at US = 5 V		4,65	4,7

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 404 745
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.2 Pressure sensors

Absolute pressure sensor



Product type

DS-S3-TF

Part number

0 261 230 310

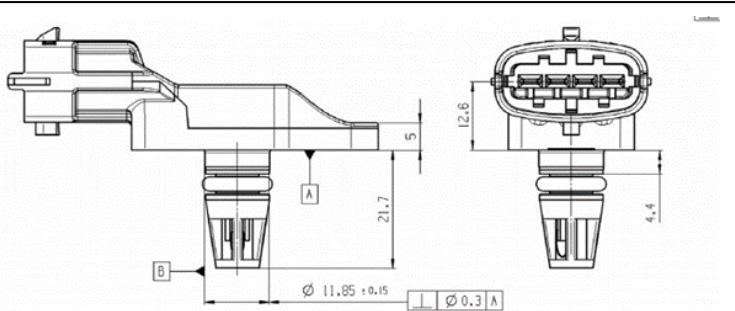
Picture



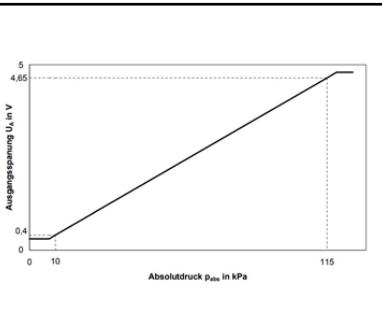
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	10	115
Supply voltage U_V	V	4,75	5 5,25
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Load current I_L at output	mA	-1	0,5
Operating temperature	°C	-40	+130
Lower limit at US = 5 V	V	0.25	0,35
Upper limit at US = 5 V		4.65	4,7

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 404 745
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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

3.2 Pressure sensors

Absolute pressure sensors



Product type

DS-S3-TF

Part number

0 261 230 416

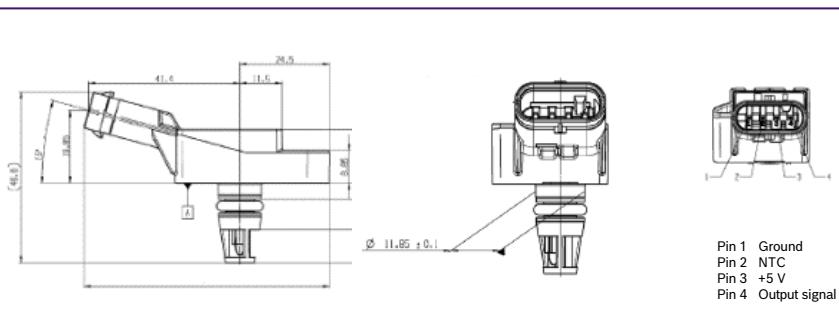
Picture



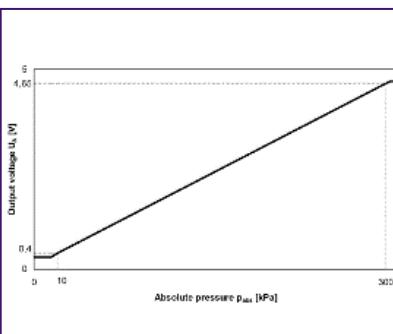
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	10	300
Supply voltage U_V	V	4,75	5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Limit data			
Operating temperature	°C	-40	+130

Dimensional drawings



Characteristic curve



3.2 Pressure sensors

Absolute pressure sensors



Product type

DS-S3-TF

Part number

0 281 006 028

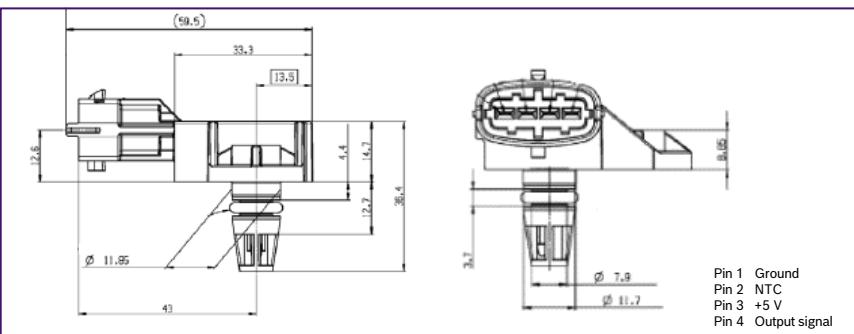
Picture



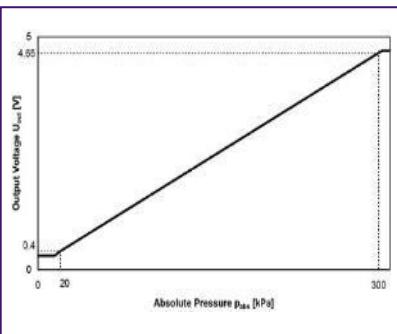
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	300
Supply voltage U_V	V	4,75	5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Limit data			
Operating temperature	°C	-40	+130

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
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 seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

3.2 Pressure sensors

Absolute pressure sensors



Product type

DS-S3-TF

Part number

0 281 006 076

(successor of 0 281 002 437)

Picture



Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	20	300
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130

Limit data

Operating temperature	°C	-40	+130
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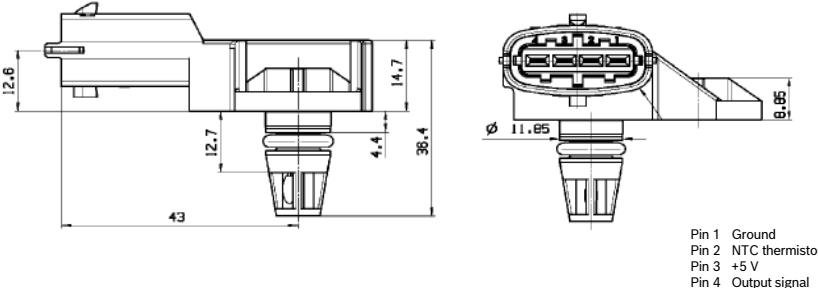
Temperature sensor

Measuring range	°C	-40	+130
Measurement current ¹⁾	mA		1
Rated resistance at +20°C	kΩ	2,5 ± 5 %	
Temperature/time constant τ_{63}^2	s		10

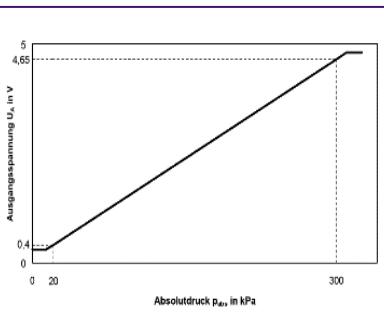
¹⁾ Operation with 1 kΩ series resistance.

²⁾ In air with flow velocity 6 m/s.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
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.

3.2 Pressure sensors

Absolute pressure sensors



Product type

DS-S3-TF

Part number

0 281 006 102

(successor of 0 281 002 576)

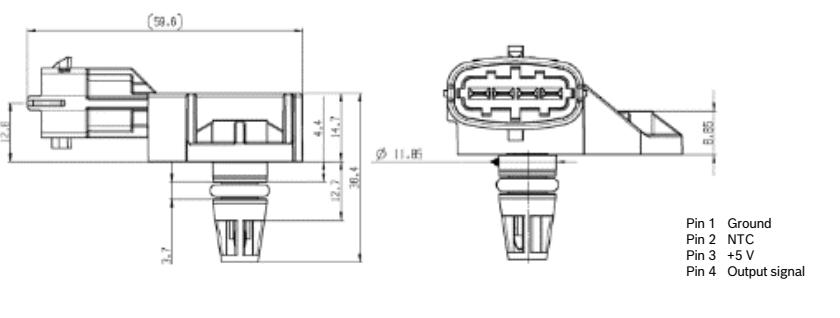
Picture



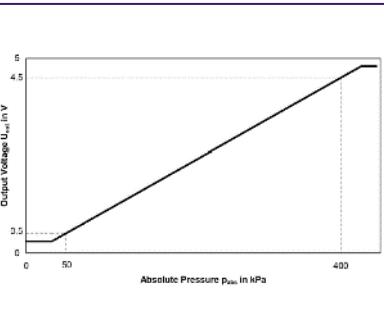
Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Pressure range ($p_1 \dots p_2$)	kPa	50	400
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
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	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 seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

3.3 Pressure sensors

Pressure sensors for CNG



- ▶ Pressure range 20 – 1000 kPa
- ▶ High level of accuracy
- ▶ EMC protection up to 100 Vm⁻¹
- ▶ With temperature compensation
- ▶ Ratiometric output signal
- ▶ All sensors and sensor cells are resistant against natural gas (CNG)



Application

The sensor is used to measure and regulate the absolute pressure and the temperature in the fuel rail pipe of natural-gas systems that are operated with CNG. The fuel pressure sensor is resistant against natural gas (CNG).

Design and operation

The piezo-resistive pressure sensor element and a suitable circuitry for signal amplification and temperature compensation are integrated on a silicon chip. The measured pressure operates from above to the active side of the silicon diaphragm. The temperature sensor element is an NTC-resistor.

Explanation of characteristic data

U_A	Output voltage
U_V	Supply voltage
k	Tolerance multiplier
D	After endurance test
N	As-new condition

Installation instructions

The sensor has been designed for attachment to a flat surface. Both pressure port piece and temperature sensor project into the line, and sealing from the atmosphere is by means of an O-ring. The hole on the customer side for holding and fastening the sensor in place shall be such that a permanently tight sit at the pressure port as well as stability towards the measuring medium will be assured. The installed position in the vehicle shall be only on the side of medium purity. Neither substances that can freeze nor any condensates at the pressure port are allowed, and neither shall be introduced during transportation of assembly.

3.3 Pressure sensors

Pressure sensors for CNG



BOSCH

Product type

DS-G3-TF

Part number

0 261 230 373

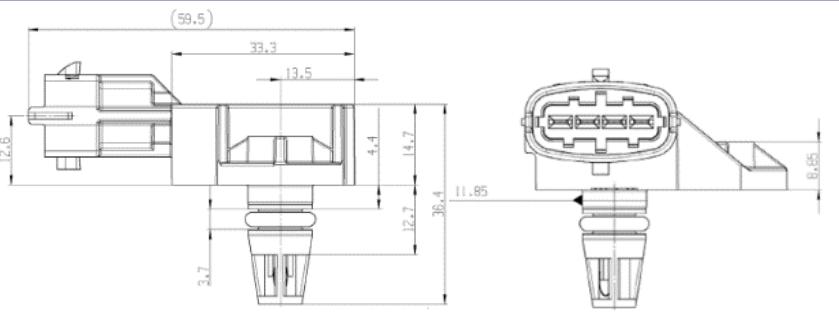
Picture



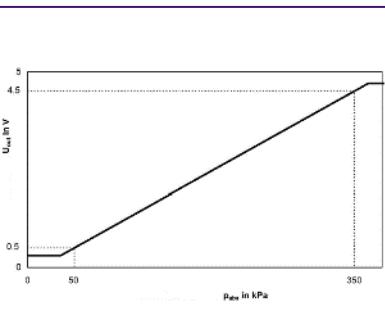
Technical data

Parameter	min.	type	Max.
Features	integrated temperature sensor		
Application/medium	approved for CNG		
Pressure range ($p_1 \dots p_2$)	kPa	50	350
Supply voltage U_V	V	4,75	5
Current input I_V at $U_V = 5$ V	mA	6	9
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
Upper limit at $U_V = 5$ V	V	4,65	4,7
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	120

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0,5...1,0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1,5...2,5 mm ²	1 928 498 057
Single-wire seal	For Ø 0,5...1,0 mm ²	1 928 300 599
Single-wire seal	For Ø 1,5...2,5 mm ²	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.

3.3 Pressure sensors

Pressure sensors for CNG



Product type

DS-G3-TF

Part number

0 261 230 499

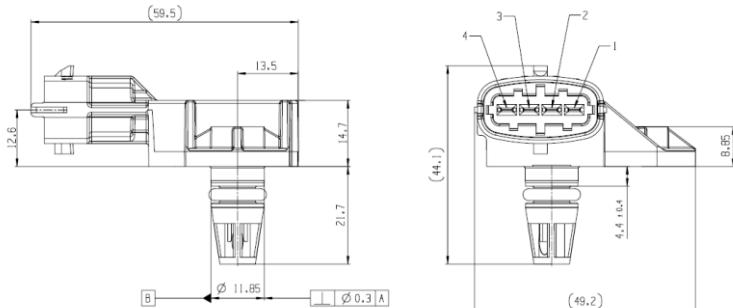
Picture



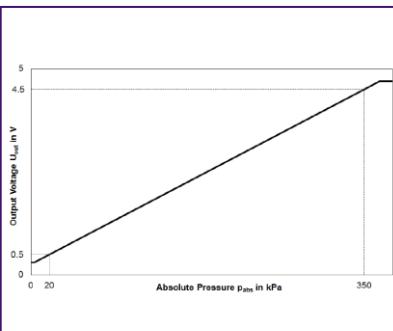
Technical data

Parameter	min.	type	Max.
Features	integrated temperature sensor		
Application/medium	approved for CNG		
Pressure range ($p_1 \dots p_2$)	kPa	20	350
Supply voltage U_V	V	4,75	5
Current input I_V at $U_V = 5$ V	mA	6	9
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
Upper limit at $U_V = 5$ V	V	4,65	4,7
Output resistance to ground, U_V open	kΩ	1	1,6
Output resistance to U_V , ground open	kΩ	1	1,6
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	120

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0,5...1,0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1,5...2,5 mm ²	1 928 498 057
Single-wire seal	For Ø 0,5...1,0 mm ²	1 928 300 599
Single-wire seal	For Ø 1,5...2,5 mm ²	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.

3.3 Pressure sensors

Pressure sensors for CNG



Product type

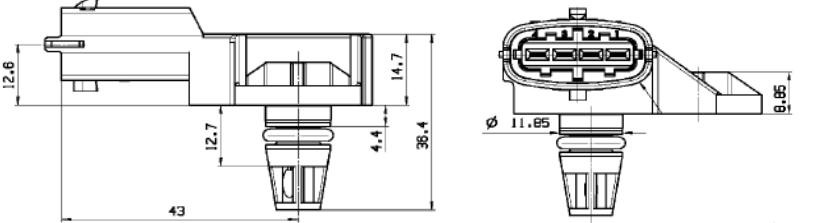
DS-G3-TF

Part number

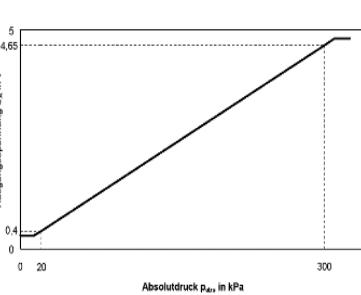
0 261 230 01F

(successor of 0 281 002 437
for usage with CNG)

Dimensional drawings



Characteristic curve



Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Application/medium	approved for CNG		
Pressure range ($p_1 \dots p_2$)	kPa	20	300
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Limit data			
Operating temperature	°C	-40	+130
Temperature sensor			
Measuring range	°C	-40	+130
Measurement current ¹⁾	mA		1
Rated resistance at +20°C	kΩ	$2,5 \pm 5\%$	
Temperature/time constant $\tau_{63}^2)$	s	10	

¹⁾ Operation with 1 kΩ series resistance.

²⁾ In air with flow velocity 6 m/s.

Accessories

Connector housing	4-pin	1 928 403 736
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 seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

3.3 Pressure sensors

Pressure sensors for CNG



Product type

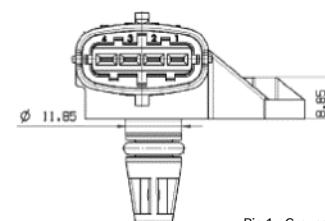
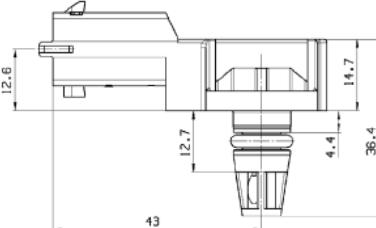
DS-G3-TF

Part number

0 261 230 01G

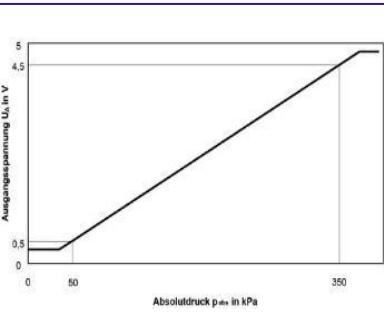
(successor of 0 281 002 576
for usage with CNG)

Dimensional drawings



Pin 1 Ground
Pin 2 NTC thermistor
Pin 3 +5 V
Pin 4 Output signal

Characteristic curve



Technical data

Parameter	min.	type	Max.
Features	Integrated temperature sensor		
Application/medium	approved for CNG		
Pressure range ($p_1 \dots p_2$)	kPa	50	400
Supply voltage U_V	V	4,75	5
Load current I_L at output	mA	-1	0,5
Response time $\tau_{10/90}$	ms		1
Operating temperature	°C	-40	+130
Limit data			
Operating temperature	°C	-40	+130
Temperature sensor			
Measuring range	°C	-40	+130
Measurement current ¹⁾	mA		1
Rated resistance at +20°C	kΩ	$2,5 \pm 5\%$	
Temperature/time constant $\tau_{63}^2)$	s	10	

¹⁾ Operation with 1 kΩ series resistance.

²⁾ In air with flow velocity 6 m/s.

Accessories

Connector housing	4-pin	1 928 403 736
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ² ; Contents:	1 928 498 060
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ² ; Contents:	1 928 498 061
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents:	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; Contents:	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.

3.4 Pressure sensors

High pressure sensors



- ▶ Pressure range 5 – 340 MPa
- ▶ Ratiometric signal evaluation (relative to supply voltage)
- ▶ Self-monitoring offset and sensitivity.
- ▶ Excellent media resistance (stainless steel)
- ▶ Resistant to brake fluids, mineral oils, fuel, water and air
- ▶ Protection against reverse polarity, overvoltage and short circuit of the output to supply voltage or ground



Application

High pressure sensors are used in motor vehicles to measure the pressure in the fuel rail of direct-injection gasoline and common-rail diesel engines or further hydraulic applications.

Design and operation

Use is made of polysilicon metal thin-film strain gauge elements. These are connected to form a Wheatstone bridge. This permits good signal utilization and temperature compensation. The measurement signal is amplified in an evaluation IC and corrected with regard to offset and sensitivity. Further temperature compensation is then implemented, so that the calibrated measurement cell and ASIC unit exhibits only a low degree of dependence on temperature. The evaluation IC also incorporates a diagnosis function for detection of the following possible faults:

- Break in bonding wire to measurement cell.
- Break in any signal wire at any point.
- Break in supply and ground wire at any point.

Explanation of characteristic data

U_A	Output voltage
U_V	Supply voltage
bar	Pressure
U_S	Input voltage
p	Pressure [MPa]
C_O	0.1
C_1	$0.8 \cdot p / P_N$
P_N	Rated pressure [MPa]

Installation instruction

The pressure sensor is designed for different use cases, which have different sealing concepts. Water must not be allowed to collect on the membrane.

The pressure sensor consists of a pressure port of metal and a housing of plastic. The pressure port has a sealing surface and a hexagon. The housing must not be twisted against the pressure port during installation. The pressure sensor has to be handled during screwing-in only at the hexagon. Tools for installation, e. g. socket wrench, must be applied only at the hexagon. After the pressure sensor has been correctly tightened to its installation position, a gap remains between the hexagon of the pressure sensor and the fuel rail or similar interface.

3.4 Pressure sensors

High pressure sensor (hydraulic applications)



Product type

PS-HPS4-MA

Part number

0 261 546 00M

Picture



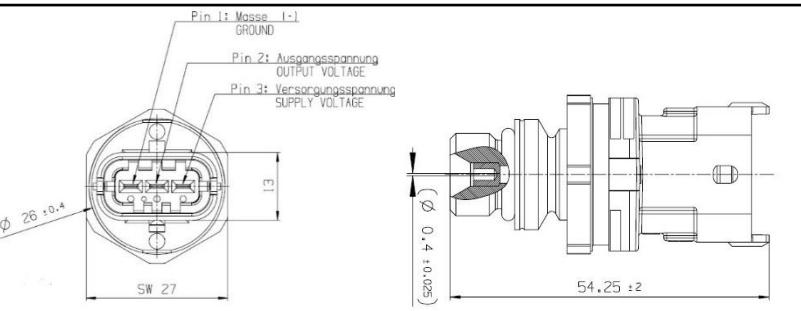
Technical data

Pressure range	P_N	bar (Mpa)	600 (60)
Thread			7/16-20
Connector			Compact 1.1
Application/medium			Hydraulic applications with oil or hydraulic fluids
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	$5 \pm 0,25$
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	- 40 ... + 150
Max. overpressure	p_{\max}	bar	840
Rupture pressure	p_{\max}	bar	4500
Response time	$\tau_{10/90}$	ms	0,2...0,8

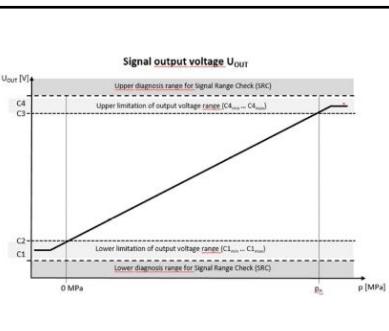
¹⁾ FS = Full Scale

Attention: product also available with other pressure ranges, such as 280 or 420 bar. For details, please approach us via contact page.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.4 Pressure sensors

High pressure sensor (hydraulic applications)



Product type

PS-HPS4

Part number

0 261 546 00A

Picture



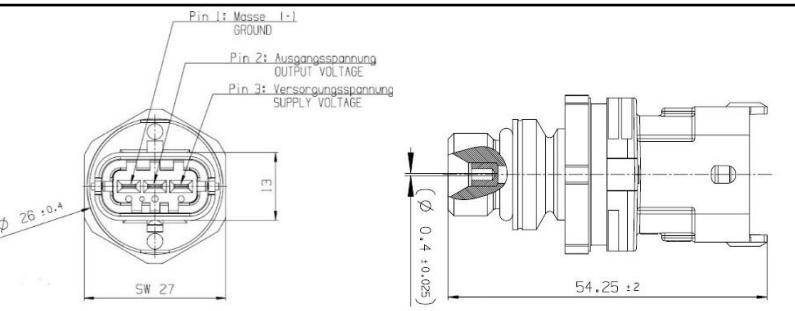
Technical data

Pressure range	P_N	bar (Mpa)	400 (40)
Thread			M 14 x 1,5
Connector			Compact 1.1
Application/medium			Hydraulic applications with oil or hydraulic fluids
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	5 ± 0,25
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	- 40 ... + 130
Max. overpressure	p_{max}	bar	840
Rupture pressure	p_{max}	bar	4500
Response time	$\tau_{10/90}$	ms	0,2...0,8

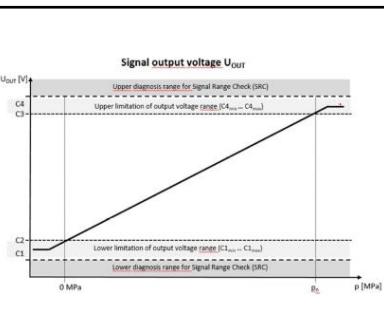
¹⁾ FS = Full Scale

Attention: product also available with other pressure ranges, such as 600 bar. For details, please approach us via contact page.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.4 Pressure sensors

High pressure sensor (hydraulic applications)



Product type

PS-HPS4-MA

Part number

0 261 546 00W

Picture



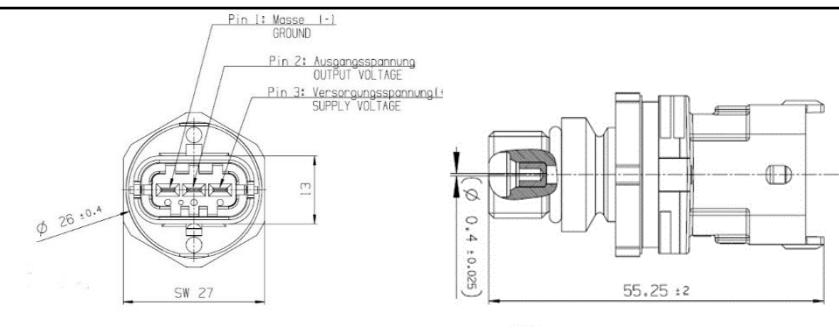
Technical data

Pressure range	P_N	bar (Mpa)	280 (28)
Thread		9/16-18	
Connector		Compact 1.1	
Application/medium		Hydraulic applications with oil or hydraulic fluids	
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	$5 \pm 0,25$
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	-40 ... +150
Max. overpressure	p_{\max}	bar	400
Rupture pressure	p_{\max}	bar	2500
Response time	$\tau_{10/90}$	ms	0,2...0,8

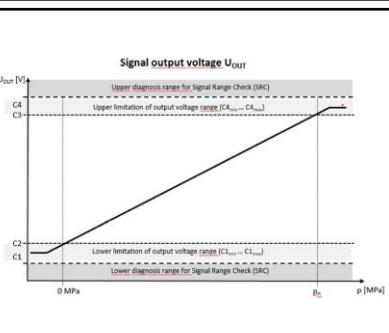
¹⁾ FS = Full Scale

Attention: product also available with other pressure ranges, such as 420 or 600 bar. For details, please approach us via contact page.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.4 Pressure sensors

High pressure sensor (hydraulic applications)



Product type

PS-HPS4-MA

Part number

0 261 546 001

Picture



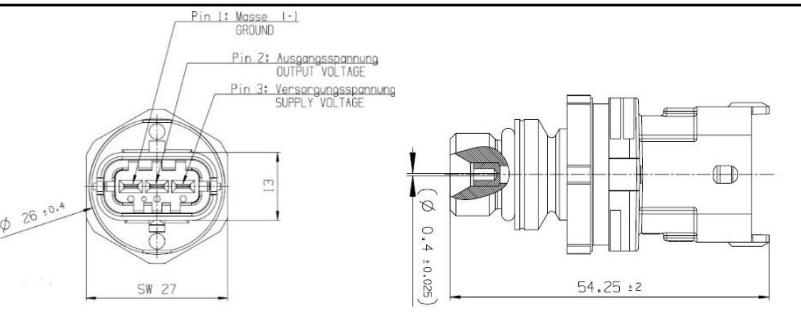
Technical data

Pressure range	P_N	bar (Mpa)	420 (42)
Thread			G1/4 A
Connector			Compact 1.1
Application/medium			Hydraulic applications with oil or hydraulic fluids
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	5 ± 0,25
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	- 40 ... + 150
Max. overpressure	p_{max}	bar	560
Rupture pressure	p_{max}	bar	3750
Response time	$\tau_{10/90}$	ms	0,2...0,8

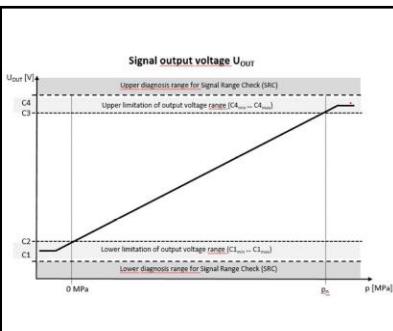
¹⁾ FS = Full Scale

Attention: product also available with other pressure ranges, such as 50 or 420 bar. For details, please approach us via contact page.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.4 Pressure sensors

High pressure sensor (hydraulic applications)



BOSCH

Hydraulic sensor program



Nominal Pressure	series number	electrical Interface	mechanical interface
600 bar	0261 546 000	analog	M14x1,5 acc. ISO 6149-1 w. O-Ring
420 bar	0261 546 001	analog	G1/4 acc. ISO1179-1 w. form gasket
400 bar	0261546 00A	analog	M14x1,5 acc. ISO 6149-1 w. O-Ring
280 bar	0261 546 002	analog	G1/4 acc. ISO1179-1 w. form gasket
100 bar	0261546 00B	analog	G1/4 acc. ISO1179-1 w. form gasket
50 bar	0261 546 003	analog	G1/4 acc. ISO1179-1 w. form gasket
600 bar	0261 546 004	digital (SENT)	M14x1,5 acc. ISO 6149-1 w. O-Ring
420 bar	0261 546 005	digital (SENT)	G1/4 acc. ISO1179-1 w. form gasket
280 bar	0261 546 006	digital (SENT)	G1/4 acc. ISO1179-1 w. form gasket
50 bar	0261 546 007	digital (SENT)	G1/4 acc. ISO1179-1 w. form gasket

Attention: program is regularly adjusted based on market requirements.

3.4 Pressure sensors

High pressure sensor (gasoline)



Product type

PS-HPS4

Part number

0 261 545 188

Picture

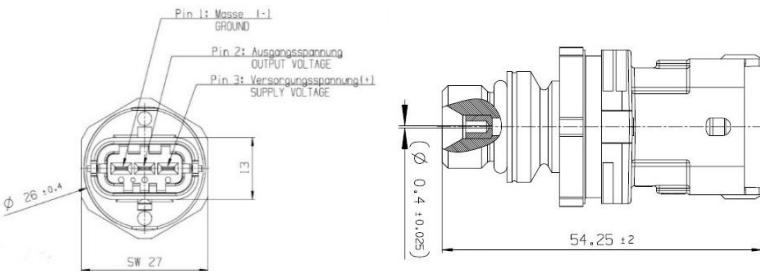


Technical data

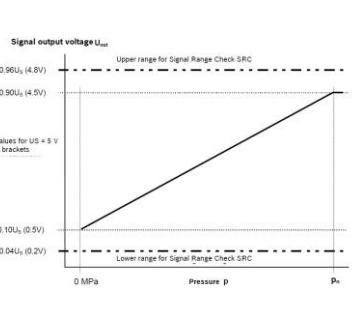
Pressure range	P_N	bar (Mpa)	260 (26)
Thread			M10 x1
Connector			Compact 1.1
Application/medium			CNG
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	5 ± 0,25
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	- 40 ...+ 140
Max. overpressure	p_{max}	bar	400
Rupture pressure	p_{max}	bar	2500
Response time	$\tau_{10/90}$	ms	1.0

¹⁾ FS = Full Scale

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

3.4 Pressure sensors

High pressure sensor (gasoline)



Product type

PS-HPS4-TF

Part number

0 261 545 161

Picture



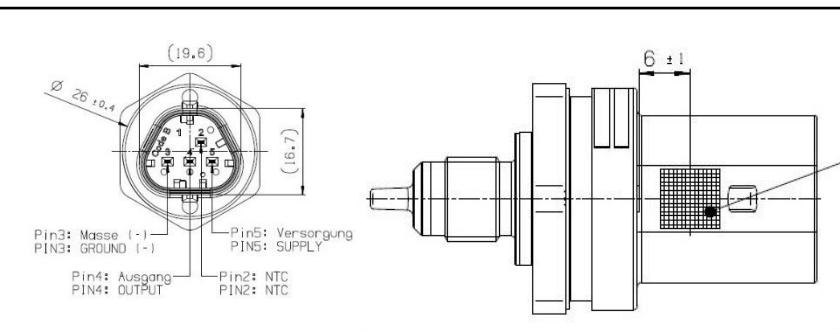
Technical data

Pressure range	P_N	bar (Mpa)	260 (26)
Thread			M10x1
Connector			Compact 1.1
Application/medium			gasoline direct injection systems with approved fuels
Max. feed voltage	U_s	V	18
Supply voltage	U_V	V	5 ± 0,25
Supply current	I_s	mA	15
Load capacitance to ground		nF	13
Temperature range		°C	- 40 ... + 140
Max. overpressure	p_{max}	bar	2500
Rupture pressure	p_{max}	bar	>7000
Response time	$\tau_{10/90}$	ms	0,2...0,8

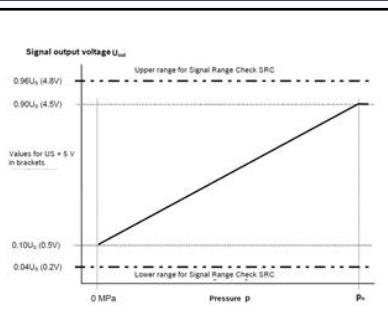
¹⁾ FS = Full Scale

Attention: product also available with other pressure ranges, such as 140 or 280 bar. For details, please approach us via contact page.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	4-pin	1 928 405 159
Matrix-Hv Terminal	For Ø 0.35...0.5 mm ² ; Contents: 4 x	1 928 498 810
Mating single wire seal	For Ø 0.35...0.5 mm ² ; Contents: 4 x	1 928 300 934
Cavity Plug	For Ø 0.35 ... 0.5 mm ² ; Contents: 1 x	1 928 300 935

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

3.4 Pressure sensors

High pressure sensor (diesel)



Product type	Picture	Technical data				
DS-HD-RDS4.2		Pressure range	P_N	bar (MPa) 2000 (200)		
		Max. feed voltage	U_s	V 16		
		Supply voltage	U_V	V $5 \pm 0,25$		
		Load capacitance to ground		nF 13		
		Thread		M 18 x 1,5		
		Application/medium		Diesel or biodiesel*		
		Temperature range	$^{\circ}\text{C}$	- 40 ... + 130		
		Max. overpressure	p_{\max}	bar 2300		
		Rupture pressure	p_{berst}	bar 4000		
		Response time	τ_{ini}	ms 2		
 *RME rapeseed methyl ester.						
Attention: product also available with other pressure ranges, such as 1500 or 1800 bar. For details, please approach us via contact page.						
Dimensional drawings						
Characteristic curve						
Accessories						
Connector housing	3-pin	1 928 403 966				
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054				
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055				
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599				
Single-wire seal	For Ø 1.5...2.5 mm ²	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				64		

3.4 Pressure sensors

High pressure sensor (diesel)



Product type

PS-RPS4-22

Part number

0 281 008 003

Picture

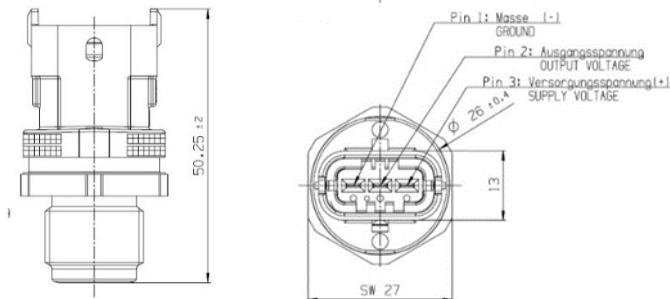


Technical data

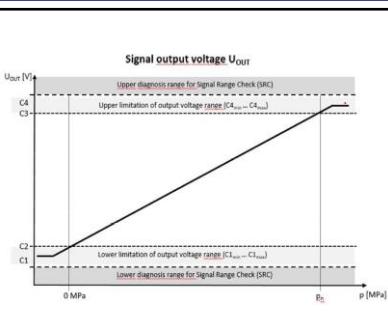
Pressure range	P_N	bar (MPa)	2400 (240)
Max. feed voltage	U_s	V	16
Supply voltage	U_V	V	5 ± 0,25
Load capacitance to ground		nF	13
Thread		M 18 x 1,5	
Application/medium		Diesel or biodiesel*	
Temperature range		°C	- 40 ... + 130
Max. overpressure	p_{\max}	bar	2150
Rupture pressure	p_{berst}	bar	>7000
Response time	τ_{ini}	ms	0,2...0,8

*RME rapeseed methyl ester.

Dimensional drawings



Characteristic curve



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	1 928 498 054
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	1 928 498 055
Single-wire seal	For Ø 0.35...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

4.1 Rotational-speed sensors

Hall speed sensor



- ▶ Precise and reliable digital measurement of speeds and angles
- ▶ Non-contacting measurement
- ▶ Hall IC in sensor with open collector output
- ▶ Not susceptible to dirt
- ▶ Resistant to mineral oil products (fuel, engine oil)
- ▶ Transmission of information on sensor signal quality



Application

Hall speed sensors are suitable for non-contacting and thus wear-free speed measurement of crank speed, cam speed or similar.

Design and operation

Hall sensors consist of a semiconductor chip with integrated driver circuits (e.g. Schmitt trigger) for signal conditioning and a transistor as output driver as well as a permanent magnet. These are hermetically sealed into a plastic connector housing. With an active speed sensor, magnets assume the function of the sensor ring teeth. The magnets are integrated for example into a multi-pole ring and are arranged with alternating polarity around its circumference. The measurement cell of the active speed sensor is exposed to the constantly changing magnetic field of these magnets. There is thus a constant change in the magnetic flux through the measurement cell as the multi-pole ring rotates.

The principal sensor components are either Hall elements or magneto resistive elements. Both elements generate a voltage which is governed

by the magnetic flux through the measuring element. The voltage is conditioned in the active speed range. In contrast to an inductive sensor, the voltage to be evaluated is not a function of wheel speed. The wheel speed can thus be measured almost down to zero. A typical feature of the active speed sensor is the local amplifier. This is integrated into the sensor housing together with the measurement cell. A two-core cable forms the connection to the control unit. The speed information is transmitted in the form of a load-independent current. As with an inductive speed sensor, the frequency of the current is proportional to the wheel speed. This form of transmission employing conditioned digital signals is not susceptible to inductive disturbance voltages as is the case with the type of transmission with inductive speed sensors.

Explanation of characteristic data

$n_{\min.}=0$	Static operation possible.
$n_{\min.}>0$	Dynamic operation only.
U_S	Max. output voltage at LOW with output current = 20 mA.
I_A	Supply current for Hall sensor.
t_f	Fall time (trailing signal edge).
T_r	Rise time (leading signal edge).

Installation instructions

- Standard installation conditions guarantee full sensor functioning.
- Route the connecting cables in parallel to minimize interference.
- Protect the sensor against the destructive action of static discharge (CMOS components).

4.1 Rotational-speed sensors

Hall speed sensor



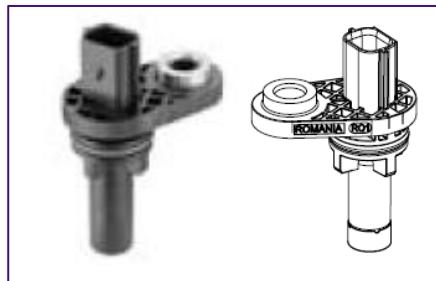
Product type

DG-23

Part number

0 261 210 303

Picture



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed	$n_{\max.}$	8000 min. ⁻¹
Maximum working air gap		1,5 mm
Minimum working air gap		0,3 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5 ...18V
Supply current	I_V	Typically 6.7 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	$\leq 1,3$ μ s
Switching time	$t_f^2)$	≤ 20 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

μA) At ambient temperature 23 ± 5 °C.

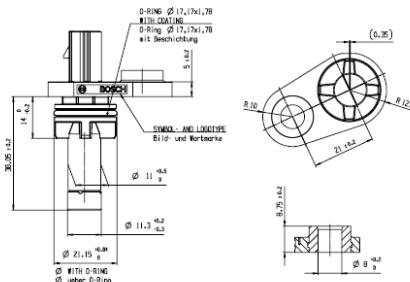
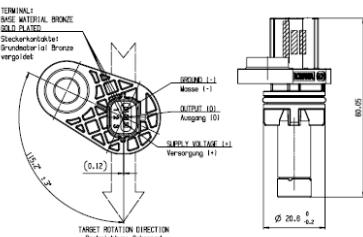
1) Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

2) Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

Dimensional drawings



4.1 Rotational-speed sensors

Hall speed sensor



Product type

DG-23-I

Part number

0 261 210 30E

Picture



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed, forwards	$n_{\max.}$	8000 1/min
Maximum trigger-wheel speed, reverse	$n_{\max.}$	4000 1/min
Maximum working air gap		1,5 mm
Minimum working air gap		0,5 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5...5,5 V
Supply current	I_V	Typically 5.0 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	$\leq 1,3$ μ s
Switching time	$t_f^2)$	≤ 17 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

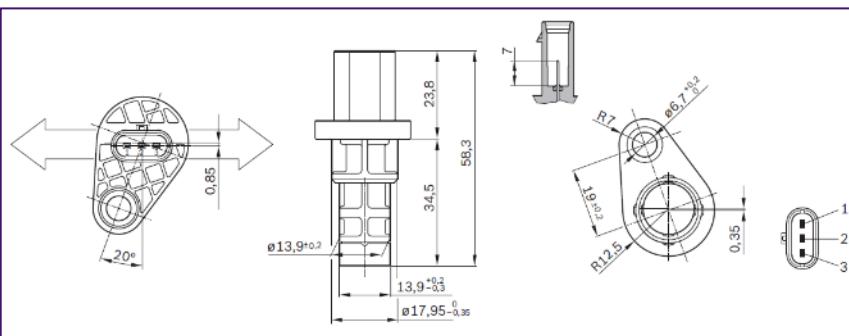
¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

³⁾ -40...+150 °C permissible for brief period.

⁴⁾ -40...+130 °C permissible for brief period.

Dimensional drawings



4.1 Rotational-speed sensors

Hall speed sensor



Product type	Picture	Technical data																																							
DG-23-I																																									
Part number	0 261 210 383																																								
Dimensional drawings																																									
		<table border="1"><tr><td>Minimum trigger-wheel speed</td><td>$n_{\min.}$</td><td>0 min.⁻¹</td></tr><tr><td>Maximum trigger-wheel speed</td><td>$n_{\max.}$</td><td>5000 min.⁻¹</td></tr><tr><td>Maximum working air gap</td><td></td><td>1,8 mm</td></tr><tr><td>Minimum working air gap</td><td></td><td>0,2 mm</td></tr><tr><td>Rated supply voltage</td><td>U_N</td><td>5 V</td></tr><tr><td>Supply voltage range</td><td>U_V</td><td>4,5...18 V</td></tr><tr><td>Supply current</td><td>I_V</td><td>Typically 10 mA</td></tr><tr><td>Output current</td><td>I_A</td><td>0 ... 20 mA</td></tr><tr><td>Output saturation voltage</td><td>U_s</td><td>$\leq 0,5$ V</td></tr><tr><td>Switching time</td><td>$t_f^1)$</td><td>$\leq 1,3$ μs</td></tr><tr><td>Switching time</td><td>$t_f^2)$</td><td>≤ 17 μs</td></tr><tr><td>Steady-state temperature in sensor and transition zone</td><td></td><td>-40°C...+150°C</td></tr><tr><td>Steady-state temperature in connector zone</td><td></td><td>-40°C...+130°C</td></tr></table>	Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹	Maximum trigger-wheel speed	$n_{\max.}$	5000 min. ⁻¹	Maximum working air gap		1,8 mm	Minimum working air gap		0,2 mm	Rated supply voltage	U_N	5 V	Supply voltage range	U_V	4,5...18 V	Supply current	I_V	Typically 10 mA	Output current	I_A	0 ... 20 mA	Output saturation voltage	U_s	$\leq 0,5$ V	Switching time	$t_f^1)$	$\leq 1,3$ μ s	Switching time	$t_f^2)$	≤ 17 μ s	Steady-state temperature in sensor and transition zone		-40°C...+150°C	Steady-state temperature in connector zone		-40°C...+130°C
Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹																																							
Maximum trigger-wheel speed	$n_{\max.}$	5000 min. ⁻¹																																							
Maximum working air gap		1,8 mm																																							
Minimum working air gap		0,2 mm																																							
Rated supply voltage	U_N	5 V																																							
Supply voltage range	U_V	4,5...18 V																																							
Supply current	I_V	Typically 10 mA																																							
Output current	I_A	0 ... 20 mA																																							
Output saturation voltage	U_s	$\leq 0,5$ V																																							
Switching time	$t_f^1)$	$\leq 1,3$ μ s																																							
Switching time	$t_f^2)$	≤ 17 μ s																																							
Steady-state temperature in sensor and transition zone		-40°C...+150°C																																							
Steady-state temperature in connector zone		-40°C...+130°C																																							

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

³⁾ -40...+150 °C permissible for brief period.

⁴⁾ -40...+130 °C permissible for brief period.

4.1 Rotational-speed sensors

Hall speed sensor



Product type

RSC-D5

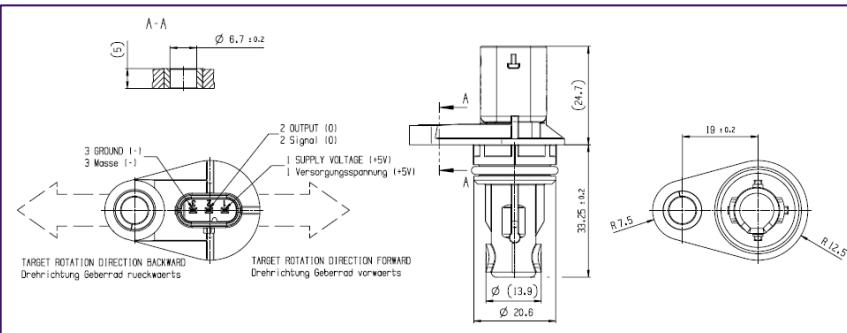
Part number

0 261 210 399

Picture



Dimensional drawings



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed, forward	$n_{\max.}$	10 000 min. ⁻¹
Maximum trigger-wheel speed, reverse	$n_{\max.}$	4 000 min. ⁻¹
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5...5,5 V
Supply current	I_V	Typically 13 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	≤ 0,55 V
Switching time	$t_f^2)$	≤ 4,25 µs
Switching time	$t_f^3)$	≤ 10 µs
Steady-state temperature in sensor and transition zone		-40°C...+160°C
Steady-state temperature in connector zone		-40°C...+150°C

2) Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

3) Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

Accessories

Connector housing	3-pin	Hirschmann 872-978-...00
Contact pins (gold plated)		

4.1 Rotational-speed sensors

Hall speed sensor



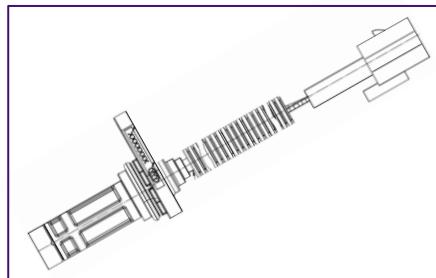
Product type

DG-23-I

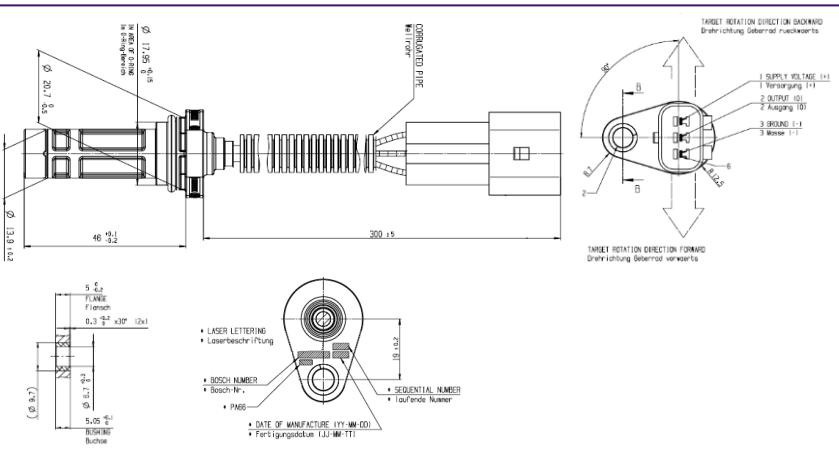
Part number

0 261 210 404

Picture



Dimensional drawings



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed, forwards	$n_{\max.}$	8000 1/min
Maximum trigger-wheel speed, reverse	$n_{\max.}$	4000 1/min
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5...18 V
Supply current	I_V	Typically 10 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	$\leq 1,3$ μ s
Switching time	$t_f^2)$	≤ 17 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

1) Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

2) Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

4.1 Rotational-speed sensors

Hall speed sensor



Product group

PG-3-8

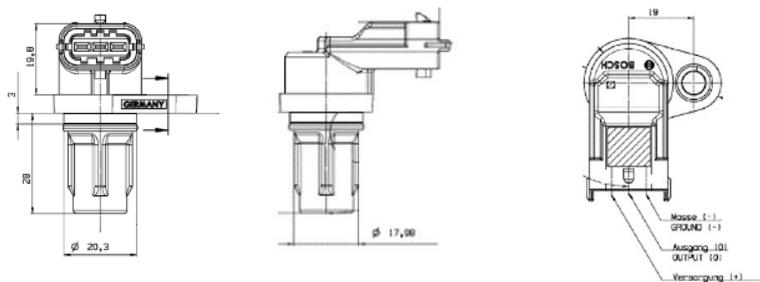
Part number

0 232 103 048

Picture



Dimensional drawings



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed	$n_{\max.}$	4500 min. ⁻¹
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5 ... 16V
Supply current	I_V	Typically 5.6 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	≤ 1 μ s
Switching time	$t_f^2)$	≤ 15 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 054
Contact pins (gold plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 055
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product group	Picture	Technical data			
PG-3-8	A black cylindrical Hall speed sensor with a grey plastic housing and a black metal connector. It has a green ring around the base.				
Part number	0 232 103 063				
Dimensional drawings	Three technical drawings showing the dimensions of the sensor. 1) Top view: height 19.8, width 24, thickness 1.5, and pin diameter Ø 20.3. 2) Side view: height 19.8, width 24, and pin diameter Ø 20.3. 3) Bottom view: height 19.8, width 24, and pin diameter Ø 20.3. A callout shows the mounting hole diameter Ø 17.00 and distance 31.5. A legend at the bottom right lists: Modell 103-101, Ausgang 101, DUTPUT 101, Versorgung 1+1, SUPPLY VOLTAGE 1+1.				
		Minimum trigger-wheel speed	$n_{\min.}$ 0 min. ⁻¹		
		Maximum trigger-wheel speed	$n_{\max.}$ 4500 min. ⁻¹		
		Maximum working air gap	1.8 mm		
		Minimum working air gap	0.2 mm		
		Rated supply voltage	U_N 5 V		
		Supply voltage range	U_V 4.5 ... 16 V		
		Supply current	I_V Typically 5.6 mA		
		Output current	I_A 0 ... 20 mA		
		Output saturation voltage	U_s ≤ 0.5 V		
		Switching time	$t_s^1)$ ≤ 1 µs		
		Switching time	$t_s^2)$ ≤ 15 µs		
		Steady-state temperature in sensor and transition zone	-40°C...+150°C		
		Steady-state temperature in connector zone	-40°C...+130°C		

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

³⁾ -40...+150 °C permissible for brief period.

⁴⁾ -40...+130 °C permissible for brief period.

Accessories		
Connector housing	3-pin	1 928 403 966
Contact pins (tin plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins (tin plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product group

PG-3-8

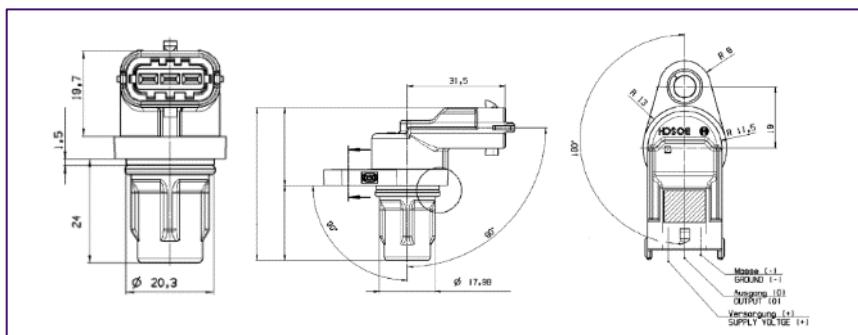
Picture



Part number

0 232 103 067

Dimensional drawings



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed	$n_{\max.}$	4500 min. ⁻¹
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,5 ...16V
Supply current	I_V	Typically 5.6 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	≤ 1 μ s
Switching time	$t_f^2)$	≤ 15 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (tin plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins (tin plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product group	Picture	Technical data																																							
PG-3-8																																									
Part number																																									
0 232 103 097																																									
Dimensional drawings		<table border="1"> <tr> <td>Minimum trigger-wheel speed</td><td>$n_{\min.}$</td><td>0 min.⁻¹</td></tr> <tr> <td>Maximum trigger-wheel speed</td><td>$n_{\max.}$</td><td>4500 min.⁻¹</td></tr> <tr> <td>Maximum working air gap</td><td></td><td>1,8 mm</td></tr> <tr> <td>Minimum working air gap</td><td></td><td>0,2 mm</td></tr> <tr> <td>Rated supply voltage</td><td>U_N</td><td>5 V</td></tr> <tr> <td>Supply voltage range</td><td>U_V</td><td>4,5 ...16V</td></tr> <tr> <td>Supply current</td><td>I_V</td><td>Typically 5.6 mA</td></tr> <tr> <td>Output current</td><td>I_A</td><td>0 ... 20 mA</td></tr> <tr> <td>Output saturation voltage</td><td>U_s</td><td>$\leq 0,5$ V</td></tr> <tr> <td>Switching time</td><td>$t_f^1)$</td><td>≤ 1 μs</td></tr> <tr> <td>Switching time</td><td>$t_f^2)$</td><td>≤ 15 μs</td></tr> <tr> <td>Steady-state temperature in sensor and transition zone</td><td></td><td>-40°C...+150°C</td></tr> <tr> <td>Steady-state temperature in connector zone</td><td></td><td>-40°C...+130°C</td></tr> </table>	Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹	Maximum trigger-wheel speed	$n_{\max.}$	4500 min. ⁻¹	Maximum working air gap		1,8 mm	Minimum working air gap		0,2 mm	Rated supply voltage	U_N	5 V	Supply voltage range	U_V	4,5 ...16V	Supply current	I_V	Typically 5.6 mA	Output current	I_A	0 ... 20 mA	Output saturation voltage	U_s	$\leq 0,5$ V	Switching time	$t_f^1)$	≤ 1 μ s	Switching time	$t_f^2)$	≤ 15 μ s	Steady-state temperature in sensor and transition zone		-40°C...+150°C	Steady-state temperature in connector zone		-40°C...+130°C
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Steady-state temperature in connector zone		-40°C...+130°C																																							

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (gold plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 054
Contact pins (gold plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 055
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product group	Picture	Technical data
CPS-4		
Part number		
0 232 103 502		
Dimensional drawings		
		Minimum trigger-wheel speed $n_{\min.}$ 0 min. ⁻¹
		Maximum trigger-wheel speed $n_{\max.}$ 5000 min. ⁻¹
		Maximum working air gap 1,8 mm
		Minimum working air gap 0,2 mm
		Rated supply voltage U_N 5 V / 12V
		Supply voltage range U_V 4,5 ... 5,5V / 4,75 ... 16 V
		Supply current I_V Typically 5,6 mA
		Output current I_A 0 ... 20 mA
		Output saturation voltage U_s ≤ 0,5 V
		Switching time $t_f^1)$ ≤ 3,5 µs
		Switching time $t_f^2)$ ≤ 20,5 µs
		Steady-state temperature in sensor and transition zone -40°C...+160°C
		Steady-state temperature in connector zone -40°C...+150°C

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

Accessories

Connector housing	3-pin	Hirschmann 872-978-...00
		Coding B, Silver plated

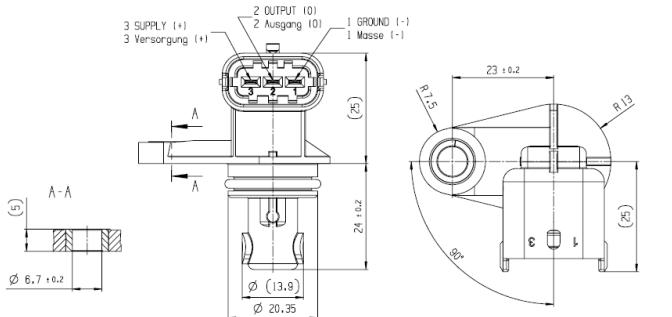
Accessories are not included in the scope of delivery of the sensor and therefore to be ordered separately as required.

4.1 Rotational-speed sensors

Hall speed sensor



BOSCH

Product type	Picture	Technical data	
CPS-4			
Part number			
0 232 103 506	 (generic photo)		
Dimensional drawings			
		Minimum trigger-wheel speed	$n_{\min.}$ 0 min. ⁻¹
		Maximum trigger-wheel speed	$n_{\max.}$ 5000 min. ⁻¹
		Maximum working air gap	1,8 mm
		Minimum working air gap	0,2 mm
		Rated supply voltage	U_N 5 V / 12 V
		Supply voltage range	U_V 4,5 ...5,5V / 4,75 ...16 V
		Supply current	I_V Typically 5,6 mA
		Output current	I_A 0 ... 20 mA
		Output saturation voltage	U_s ≤ 0,5 V
		Switching time	$t_f^1)$ ≤ 3.5 µs
		Switching time	$t_f^2)$ ≤ 20.5 µs
		Steady-state temperature in sensor and transition zone	-40°C...+160°C
		Steady-state temperature in connector zone	-40°C...+150°C

¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

Accessories		
Connector housing	3-pin	1 928 405 524
Contact pins (tin plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins (tin plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product type

PG-3-8

Part number

0 281 002 667

Picture



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed	$n_{\max.}$	4500 min. ⁻¹
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,75 ... 18V
Supply current	I_V	Typically 5.0 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,5$ V
Switching time	$t_f^1)$	≤ 1 μ s
Switching time	$t_f^2)$	≤ 15 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

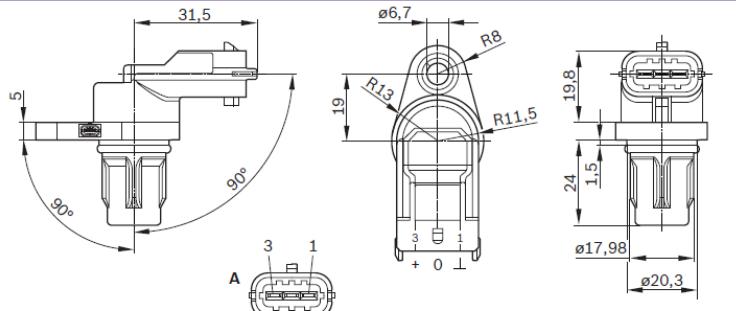
¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

³⁾ -40...+150 °C permissible for brief period.

⁴⁾ -40...+130 °C permissible for brief period.

Dimensional drawings



Accessories

Connector housing	3-pin	1 928 403 966
Contact pins (tin plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins (tin plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.1 Rotational-speed sensors

Hall speed sensor



Product group	Picture	Technical data
PG-3-9		
Part number		
0 232 103 099		
Dimensional drawings		
		<p>Minimum trigger-wheel speed $n_{\min.}$ 0 min.⁻¹</p> <p>Maximum trigger-wheel speed $n_{\max.}$ 4500 min.⁻¹</p> <p>Maximum working air gap 1,8 mm</p> <p>Minimum working air gap 0,2 mm</p> <p>Rated supply voltage U_N 5 V</p> <p>Supply voltage range U_V 4,75 ... 18V</p> <p>Supply current I_V Typically 5,6 mA</p> <p>Output current I_A 0 ... 20 mA</p> <p>Output saturation voltage U_s \leq 0,52 V</p> <p>Switching time $t_f^1)$ \leq 1 μs</p> <p>Switching time $t_f^2)$ \leq 17 μs</p> <p>Steady-state temperature in sensor and transition zone -40°C...+150°C</p> <p>Steady-state temperature in connector zone -40°C...+150°C</p>
		<p>μA) At ambient temperature 23 \pm 5 °C.</p> <p>¹⁾ Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.</p> <p>²⁾ Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.</p> <p>³⁾ -40...+150 °C permissible for brief period.</p> <p>⁴⁾ -40...+130 °C permissible for brief period.</p>

4.1 Rotational-speed sensors

Hall speed sensor



Product group

PG-3-9

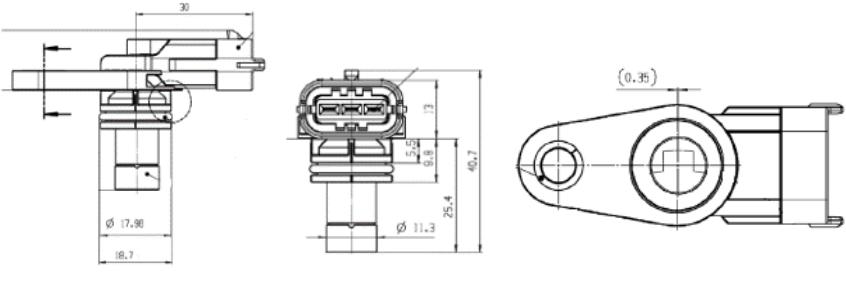
Part number

0 232 103 122

Picture



Dimensional drawings



Technical data

Minimum trigger-wheel speed	$n_{\min.}$	0 min. ⁻¹
Maximum trigger-wheel speed	$n_{\max.}$	4500 min. ⁻¹
Maximum working air gap		1,8 mm
Minimum working air gap		0,2 mm
Rated supply voltage	U_N	5 V
Supply voltage range	U_V	4,75 ... 18V
Supply current	I_V	Typically 5,6 mA
Output current	I_A	0 ... 20 mA
Output saturation voltage	U_s	$\leq 0,52$ V
Switching time	$t_f^1)$	≤ 1 μ s
Switching time	$t_f^2)$	≤ 17 μ s
Steady-state temperature in sensor and transition zone		-40°C...+150°C
Steady-state temperature in connector zone		-40°C...+130°C

μA) At ambient temperature 23 ± 5 °C.

1) Time from HIGH to LOW, measured between connections (0) and (-) from 90% to 10%.

2) Time from LOW to HIGH, measured between connections (0) and (-) from 10% to 90%.

3) -40...+150 °C permissible for brief period.

4) -40...+130 °C permissible for brief period.

Accessories

Connector housing	3-pin	1 928 403 968
Contact pins (silver plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 058
Contact pins (silver plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 059
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.2 Rotational-speed sensors

Inductive speed sensor



- ▶ Precise and reliable measurement of speeds
- ▶ Non-contacting measurement
- ▶ Not susceptible to dirt
- ▶ Resistant to mineral oil products (fuel, engine oil)



Application

Inductive speed sensors of this type are suitable for a variety of speed recording applications. Depending on design, they use completely non-contacting and wear-free methods to measure engine speeds (cam or crank) and convert these speeds into electrical signals.

Design and operation

The soft iron core of the speed sensor, surrounded by a winding, is positioned directly opposite a rotating trigger wheel and only separated from this by a narrow air gap. The soft iron core is connected to a permanent magnet, the magnetic field of which extends into the ferromagnetic trigger wheel, by which it is influenced. A tooth directly opposite the sensor concentrates the magnetic field and thus intensifies the magnetic flux in the coil. A gap on the other hand attenuates the flux in the coil. These two states alternate constantly due to the rotation of the ring gear. The transition from gap to tooth (leading tooth edge) and from tooth to gap (trailing tooth edge) produces changes in the magnetic flux which induce an alternating voltage in the coil in line with Faraday's law. The frequency of this voltage can be used for speed determination.

Per tooth the sensor supplies an output pulse, the magnitude of which is governed by the speed, the size of the air gap, the tooth shape and the rotor materials used. Together with the frequency, the amplitude of the output signal also increases with the speed. A minimum speed is therefore necessary to permit reliable evaluation of even very low voltages. A reference mark on the trigger wheel in the form of a large "tooth gap" permits determination of the position of the trigger wheel in addition to the actual speed measurement. The trigger wheel sensor ring forms part of the speed detection system. Sensor rings must be of a high technical standard to provide reliable speed information. Trigger wheel sensor ring specifications are available on request.

Explanation of characteristic data

U	Output voltage
n	Speed
s	Air gap

Installation instructions

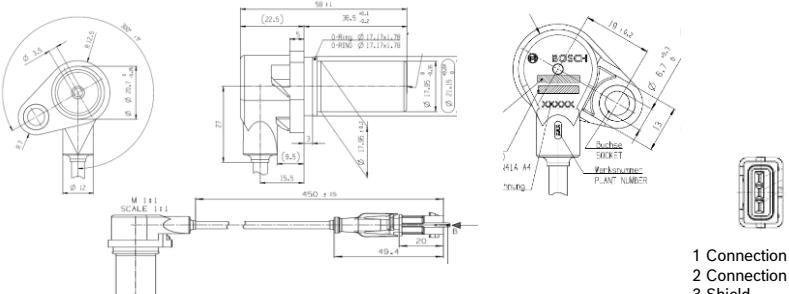
- Standard Installation conditions guarantee full sensor functioning.
- Route the connecting cables in parallel to minimize interference.
- Protect the sensor against the destructive action of static discharge (CMOS components).

4.2 Rotational-speed sensors

Inductive speed sensor



Product group	Picture	Technical data		
DG-6-K		Rotational-speed measuring range ¹⁾ n	min ⁻¹	20 ... 7000
		Sustained ambient temperature/coil zone	°C	- 40 ... + 130
		Sustained ambient temperature/cable zone	°C	- 40 ... + 130
		Max. vibration	m/s ²	300
		Number of turns		4300 turns/windings
		Winding resistance at 20 °C ²⁾ U _A	Ω	860 ±10%
		Inductance at 1 kHz	mH	370 ±60
		Degree of protection	IP	IPx9K
		Output voltage ²⁾ U _A	V/mV	210 V (0.3mm air-gap, 7000 RPM) 170 mV (1.5mm air-gap, 50 RPM)
		Signal frequency	Hz	7000 (for 60-2 type wheel)



Accessories

Connector housing	3-pin	1 928 403 734
Contact pins (tin plated)	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 056
Contact pins (tin plated)	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ² ; 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.

4.2 Rotational-speed sensors

Inductive speed sensor



BOSCH

Product group

DG-6-K

Part number

0 281 002 629

Picture



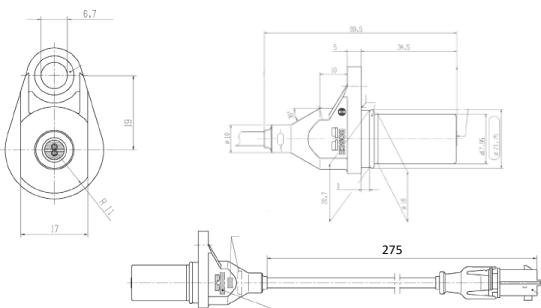
Technical data

Rotational-speed measuring range ¹⁾ n	min^{-1}	20 ... 7000
Sustained ambient temperature/coil zone	$^{\circ}\text{C}$	- 40 ... + 150
Sustained ambient temperature/cable zone	$^{\circ}\text{C}$	- 40 ... + 130
Max. vibration	m/s^2	300
Number of turns		4300 turns/windings
Winding resistance at 20 $^{\circ}\text{C}$ ²⁾ U_A	Ω	860 \pm 10%
Inductance at 1 kHz	mH	370 \pm 60
Degree of protection	IP	IPx9K
Output voltage ²⁾ U_A	V/mV	210 V (0.3mm air-gap, 7000 RPM) 170 mV (1.5mm air-gap, 50 RPM)
Signal frequency	Hz	7000 (for 60-2 type wheel)

¹⁾ Referenced to corresponding trigger wheel.

²⁾ Change factor $k = 1 + 0.004 (v_w - 20^{\circ}\text{C})$; v_w Winding temperature.

Dimensional drawings



1 Connection A
2 Connection B
3 Shield

Accessories

Connector housing	3-pin	1 928 404 073
Contact pins	For $\varnothing 0.5 \dots 1.0 \text{ mm}^2$	1 928 498 056
Contact pins	For $\varnothing 1.5 \dots 2.5 \text{ mm}^2$	1 928 498 057
Single-wire seal	For $\varnothing 0.5 \dots 1.0 \text{ mm}^2$	1 928 300 599
Single-wire seal	For $\varnothing 1.5 \dots 2.5 \text{ mm}^2$	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.

4.2 Rotational-speed sensors

Inductive speed sensor



Product group	Picture	Technical data		
DG-6-S		Rotational-speed measuring range ¹⁾ n	min ⁻¹	20 ... 7000
		Sustained ambient temperature/coil zone	°C	- 40 ... + 150
		Sustained ambient temperature/cable zone	°C	- 40 ... + 130
		Max. vibration	m/s ²	300
		Number of turns		4300 turns/windings
		Winding resistance at 20 °C ²⁾ U _A	Ω	860 ±10%
		Inductance at 1 kHz	mH	370 ±60
		Degree of protection	IP	IPx9K
		Output voltage ²⁾ U _A	V/mV	210 V (0.3mm air-gap, 7000 RPM) 170 mV (1.5mm air-gap, 50 RPM)
		Signal frequency	Hz	7000 (for 60-2 type wheel)

Accessories

Connector housing	2-pin	1 928 404 072
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	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

5 Structure-borne sound Piezoelectric vibration sensor



- Reliable detection of structure-borne sound to protect machines and motors
- Piezo-ceramic element with high measurement sensitivity
- Sturdy compact design



Application

Vibration sensors of this type are suitable for detecting structure-borne vibration occurring for example in motor-vehicle engines due to irregular combustion and in machines. Thanks to their robust design, these vibration sensors can withstand even the most severe operating conditions.

Areas of application

- Knock control for internal-combustion engines
- Machine-tool protection
- Cavitation detection
- Monitoring of pivot bearings
- Anti-theft systems

Design and operation

On account of its inertia, a mass exerts compressive forces on an annular piezo-ceramic element in the same rhythm as the vibrations causing them. As a result of these forces, charge transfer occurs within the ceramic element and a voltage is generated between the upper and lower sides of the ceramic element. The voltage is tapped via contact washers - often filtered and integrated - and is available for use as a measurement signal. Vibration sensors are bolted to the object to be measured so as to relay the vibrations at the measurement location directly to the sensors.

Explanation of characteristic data

- E* Sensitivity
F Frequency
g Acceleration due to gravity

Measurement sensitivity

Each vibration sensor has individual transmission characteristics closely related to the measuring sensitivity. The sensitivity is defined as the output voltage per unit of acceleration due to gravity (refer to characteristic curve). The production-related sensitivity scatter is acceptable for applications in which the main emphasis is on recording the occurrence of vibrations rather than on their amplitude. The low voltages supplied by the sensor can be evaluated using a high-impedance AC voltage amplifier.

Installation instructions

The sensors must rest directly on their metal surfaces. Use must not be made of packing plates, spring or toothed lock washers for support. The contact surface of the mounting hole must be of high quality to ensure low-resonance coupling of the sensors to the measurement location. The sensor cable is to be laid such that no resonance vibration can occur. The sensor must not be allowed to have contact with liquids for lengthy periods.

5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type

KS-4-K

Picture



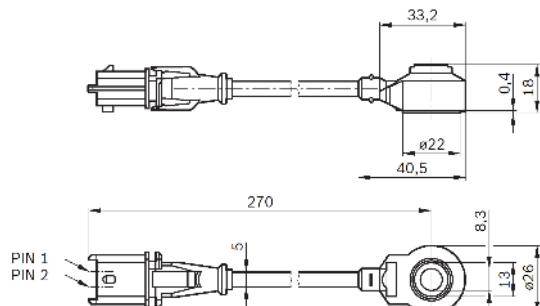
Part number

0 261 231 196

Technical data

Vibration sensors	2-pole, with cable
Frequency range	0 ... 24 kHz
Self-impedance	> 1 MΩ
Operating temperature range	- 40 ... + 130 °C (sensor head +150 °C)
Permissible sustained vibration	≤ 80 g
Pin coating	Gold-plated

Dimensional drawings



Accessories

Connector housing	2-pin RB compact connector code-1, tin plated terminals	1 928 403 874
Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm ² ; Contents: 100 x	1 928 498 054
Contact pins	For Ø 1.5...2.5 mm ² ; Contents: 100 x	1 928 498 055
Individual seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Individual seal	For Ø 1.5...2.5 mm ² ; Contents: 10 x	1 928 300 600
Dummy plug		1 928 300 601

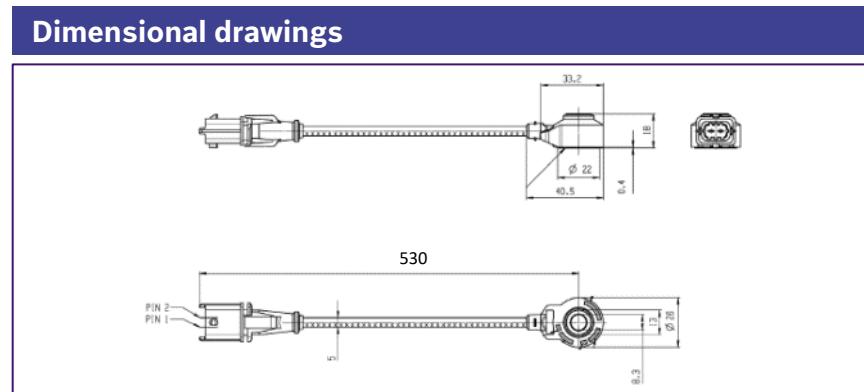
Accessories are not included in the scope of delivery of the sensor and therefore to be ordered separately as required.

5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type	Picture	Technical data
KS-4-K		<p>Vibration sensors 2-pole, with cable</p> <p>Frequency range 0 ... 24 kHz</p> <p>Self-impedance > 1 MΩ</p> <p>Operating temperature range - 40 ... + 130 °C (sensor head 150 °C)</p> <p>Permissible sustained vibration ≤ 80 g</p> <p>Pin coating Gold-plated</p>



Accessories	
Connector housing	2-pin RB compact connector code-1, gold plated terminals
Connector housing	2-pin

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

5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type	Picture	Technical data
KS-4-S		
Part number		
0 261 231 173		
Dimensional drawings		

Accessories

Connector housing	2-pin RB compact connector code-1, gold plated terminals	
Connector housing	2-pin	1 928 403 874
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
Individual seal	For Ø 0.5...1.0 mm ² ; Contents: 10 x	1 928 300 599
Individual seal	For Ø 1.5...2.5 mm ² ; 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.

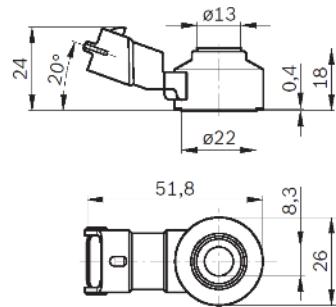
5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type	Picture	Technical data
KS-4-S		<p>Vibration sensors 2-pole, without cable</p> <p>Frequency range 3 ... 22 kHz</p> <p>Self-impedance > 1 MΩ</p> <p>Operating temperature range - 40 ... + 130 °C</p> <p>Permissible sustained vibration ≤ 50 g</p> <p>Pin coating Tin-plated</p>
Part number		
0 261 231 176		

Dimensional drawings



Accessories

Connector housing	2-pin RB compact connector code-1, gold plated terminals	
Connector housing	2-pin	1 928 403 874
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
Individual seal	For Ø 0.5...1.0 mm²; Contents: 10 x	1 928 300 599
Individual 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.

5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type

KS-4-S

Picture



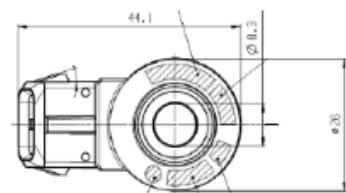
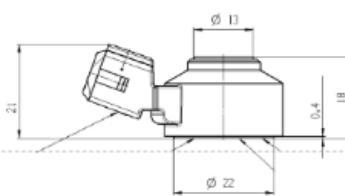
Part number

0 261 231 208

Technical data

Vibration sensors	2-pole, without cable
Frequency range	0 ... 24 kHz
Self-impedance	> 1 MΩ
Operating temperature range	- 40 ... + 130 °C
Permissible sustained vibration	≤ 80 g
Pin coating	Tin-plated

Dimensional drawings



Accessories

Connector housing	2-pin Jetronics connector, gold plated terminals
Connector housing	2-pin

1 284 485 070

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

5 Structure-borne sound Piezoelectric vibration sensor



BOSCH

Product type

KS-4-S

Picture



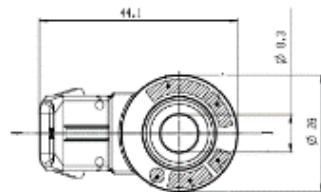
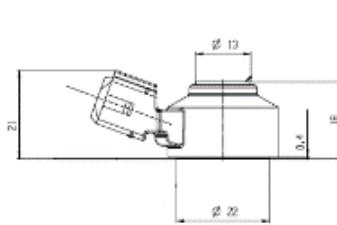
Part number

0 261 231 300

Technical data

Vibration sensors	2-pole, without cable
Frequency range	0 ... 24 kHz
Self-impedance	> 1 MΩ
Operating temperature range	- 40 ... + 150 °C
Permissible sustained vibration	≤ 80 g
Pin coating	Gold-plated

Dimensional drawings



Accessories

Connector housing	2-pin	1 928 402 070

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

6 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. Available for air, coolant, fuel and oil temperature measurement.

In motor vehicles they are used to measure the temperature of the intake air in the range -40...130 °C.

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.

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 fluid flow.

6 Temperature sensors

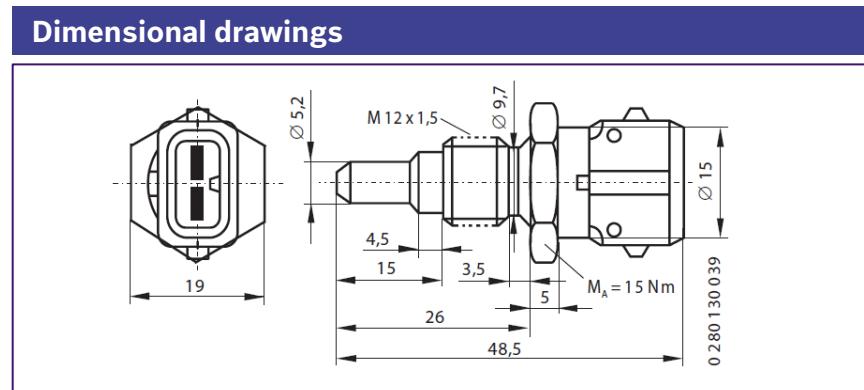
Measurement of air/liquid temperatures



BOSCH

Product type	Picture	Technical data	
TF-L		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 8,727 ... 10,067
		Resistance at +20 °C	kΩ 2,375 ... 2,625
		Resistance at +80 °C	kΩ 0,296 ... 0,349
		Nominal voltage	V 5 ± 0,15
		Max. measurement current	mA 1
		Self-heating with max. perm. Power loss of $P = 2 \text{ mW}$ and still air (23 °C)	K ≤ 2
		Temperature/time constant $\tau_{63}^{1)}$	s ≤ 45
		Approximate value for permissible Vibration acceleration a_{\sin} (sinusoidal vibration)	m/s ² 300
		Corrosion-tested as per	DIN 50 018
		Degree of protection	IP6K9K
		Tightening torque	Nm 15 ± 2
		Thread	M12 x 1.5

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 75°C; flow velocity of air 6 m/s.



Accessories		
Connector housing	2-pin Jetronics connector, tin plated terminals	1 928 402 078
Connector housing	2-pin	1 928 402 078
Protective cap	Temperature-resistant	1 280 703 031
Contact pins	For Ø 0.5...1.0 mm ²	AMP 929 939-3
Contact pins	For Ø 1.5...2.5 mm ²	AMP 929 937-3
Individual seal	For Ø 0.5...1.0 mm ²	1 987 280 106
Individual seal	For Ø 1.5...2.5 mm ²	1 987 280 107

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

6 Temperature sensors

Measurement of air/liquid temperatures



Product type

TF-W

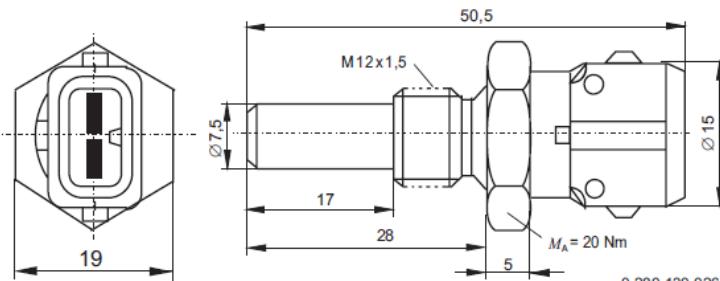
Part number

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 20 °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	0,296 ... 0,349
Temperature/time constant $\tau_{63}^{(1)}$	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	20 ± 5
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 mm ²	AMP 929 939-3
Contact pins	For Ø 1.5...2.5 mm ²	AMP 929 937-3
Individual seal	For Ø 0.5...1.0 mm ²	1 987 280 106
Individual seal	For Ø 1.5...2.5 mm ²	1 987 280 107

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

6 Temperature sensors

Measurement of air/liquid temperatures



Product type	Picture	Technical data	
TF-W			
Part number	0 280 130 093		
Dimensional drawings			
		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 20 °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 0,296 ... 0,349
		Temperature/time constant $\tau_{63}^{1)}$	s = 15 s
		Degree of protection ¹⁾	IP 6K 9K
		Thread	M12 x 1,5
		Corrosion-tested as per	DIN EN 60068-2-11
		Tightening torque	Nm 20 ± 5
		Rated voltage	V 5 ± 0,15

Accessories

Connector housing	2-pin RB compact connector code-1, tin plated terminals	1 928 403 137
Connector housing	2-pin	1 928 403 137
Contact pins (tin-plated)	For Ø 0.5...1.0 mm ²	AMP 929 939-3
Contact pins (tin-plated)	For Ø 1.5...2.5 mm ²	AMP 929 937-3
Single-wire seal	For Ø 0.5...1.0 mm ²	AMP 828 904
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

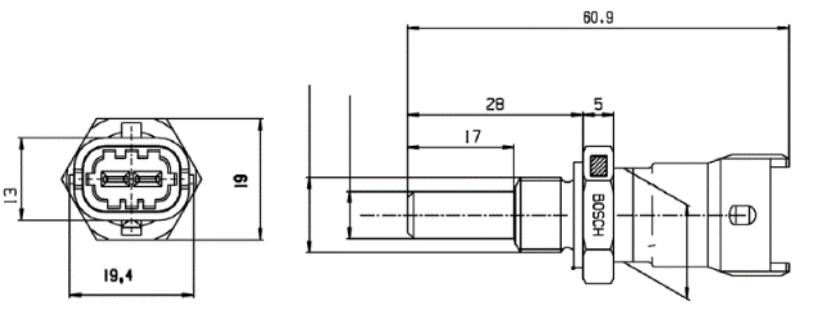
6 Temperature sensors

Measurement of air/liquid temperatures

**BOSCH**

Product type	Picture	Technical data	
TF-W		Temperature range	°C -40 ... +150
Part number	0 281 002 170	Features	Sensor in brass housing.
		Application/medium	Oil/water
		Rated resistance at 100 °C	kΩ 0,1866 ± 2 %
		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 $\tau_{63}^{(1)}$	s ≤ 15
		Degree of protection ⁽¹⁾	IP 6K 9K
		Thread	M 12 x 1,5
		Corrosion-tested as per	DIN EN 60068-2-11
		Tightening torque	Nm 20 ± 5
		Rated voltage	V 5 ± 0,15

Dimensional drawings



⁽¹⁾ With single-wire seal.

Accessories

Connector housing	2-pin RB compact connector code-1, gold plated terminals	1 928 403 137
Connector housing	2-pin	1 928 403 137
Contact pins (gold-plated)	For Ø 0.5...1.0 mm ²	AMP 2 929 939-1
Contact pins (gold-plated)	For Ø 1.5...2.5 mm ²	AMP 2 929 937-1
Single-wire seal	For Ø 0.5...1.0 mm ²	AMP 828 904
Single-wire seal	For Ø 1.5...2.5 mm ²	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.

6 Temperature sensors

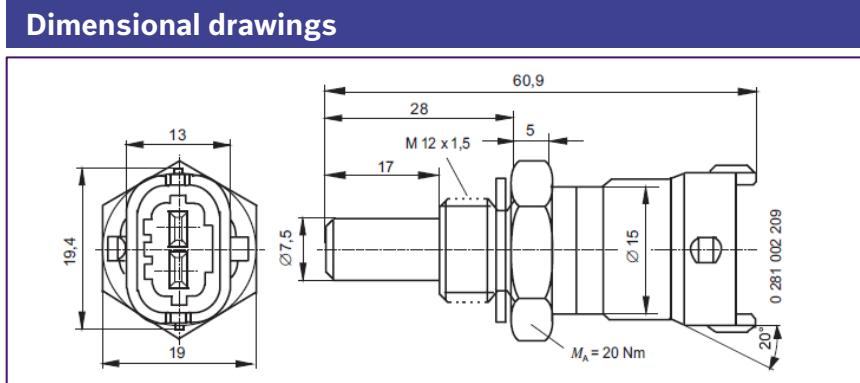
Measurement of air/liquid temperatures



BOSCH

Product type	Picture	Technical data	
TF-W		Temperature range	°C -40 ... +130
Part number	0 281 002 209	Features	Sensor in brass housing.
		Application/medium	Oil/water
		Rated resistance at 100 °C	kΩ 0,1866 ± 2 %
		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 $\tau_{63}^{(1)}$	s ≤ 15
		Degree of protection ⁽¹⁾	IP 6K 9K
		Thread	M 12 x 1,5
		Corrosion-tested as per	DIN EN 60068-2-11
		Tightening torque	Nm 20 ± 5
		Rated voltage	V 5 ± 0,15

⁽¹⁾ With single-wire seal.



Accessories		
Connector housing	2-pin RB compact connector code-1, Tin plated terminals	
Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	1 928 300 600

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

6 Temperature sensors

Measurement of air/liquid temperatures

**BOSCH**

Product type

TF-W Alu

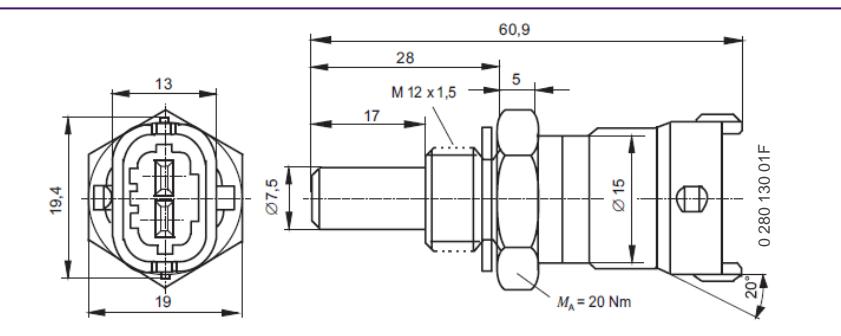
Part number

0 280 130 01F

Picture



Dimensional drawings



Technical data

Temperature range	°C	-40 ... + 140
Features		Sensor with aluminum (Al-6082) housing.
Application/medium		Oil/water/fuel
Rated resistance at 100 °C	kΩ	0,1866 ± 2 %
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 $\tau_{63}^{(1)}$	s	≤ 15
Degree of protection ⁽¹⁾		IP 6K 9K
Thread		M 12 x 1,5
Corrosion-tested as per		DIN EN 60068-2-11
Tightening torque	Nm	20 ± 5
Rated voltage	V	5 ± 0,15

⁽¹⁾ With single-wire seal.

Accessories

Connector housing	2-pin RB compact connector code-1, Tin plated terminals	
Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	1 928 300 600

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

6 Temperature sensors

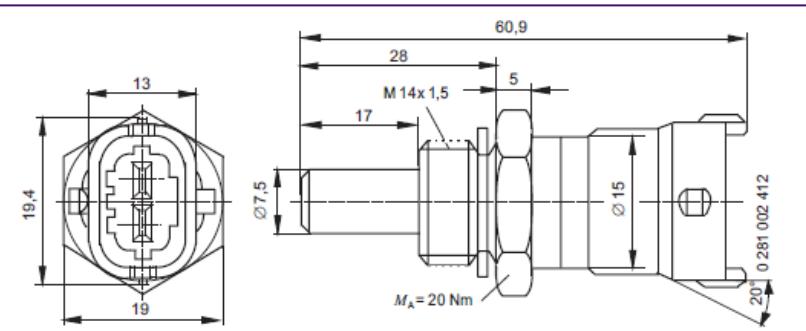
Measurement of air/liquid temperatures



BOSCH

Product type	Picture	Technical data		
TF-W		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 $\tau_{63}^{1)}$	s	≤ 15
		Degree of protection ¹⁾	IP 6K 9K	
		Thread	M 14 x 1,5	
		Corrosion-tested as per	DIN EN 60068-2-11	
		Tightening torque	Nm	20 ± 5
		Rated voltage	V	5 ± 0,15

¹⁾ With single-wire seal.

Dimensional drawings		
		

Accessories		
Connector housing	2-pin RB compact connector code-1, tin plated terminals	
Connector housing	2-pin	1 928 403 874
Contact pins	For Ø 0.5...1.0 mm ²	1 928 498 056
Contact pins	For Ø 1.5...2.5 mm ²	1 928 498 057
Single-wire seal	For Ø 0.5...1.0 mm ²	1 928 300 599
Single-wire seal	For Ø 1.5...2.5 mm ²	1 928 300 600

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

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BOSCH

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