

Equipment for High Performance Vehicles



Motorsport



BOSCH

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High Pressure Injection Components

HPI Box

In combination with a Bosch Motorsport ECU the HPI box enables the running of high pressure injection valves. The injector current is realised by a switched current regulation with a pre-magnetisation phase, booster period, pick-up period, holding period and recharging period.



HPI 2.5

Mechanical data	
Max. number of cylinders	6
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Rail pressure regulation	
Size with connectors	165 x 132 x 51 mm
Weight	2070 g
Booster	internal
Communication interfaces	2 CAN, K-line
Lambda measurement	2 LSU 4.9

Conditions for use	
Operating temperature	-40 ... 85°C
Min. voltage	10 V
Max. vibration	30g sinus at 20 ... 2000 Hz for t<5h

Electronic data	
Optimised for Bosch injection valves HDEV 1.2	
Max. rpm	10000 at I=16 A (peak current) 8500 at I=18 A (peak current) 7000 at I=20 A (peak current)

Order number
on request

PSU 2.12

Mechanical data	
Max. number of cylinders	12
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Rail pressure regulation 2 banks	
Size with connectors	165 x 132 x 51 mm
Weight	2070 g
Booster	internal
Communication interfaces	2 CAN, K-line
Lambda measurement	2 LSU 4.9

Conditions for use	
Operating temperature	-40 ... 85°C
Min. voltage	10 V
Max. vibration	30g sinus at 20 ... 2000 Hz for t<5h

Electronic data	
Optimised for Bosch injection valves HDEV 1.2	
Max. rpm	10000 at I=16 A (peak current) 8500 at I=18 A (peak current) 7000 at I=20 A (peak current)

Order number
on request

HPI Fuel Pump HDP 1

The HDP 1 is a high pressure radial pump with three pistons. Designing it we set great value on a big delivery volume, as needed in motorsport applications. Variations in bore and stroke affect different deliveries.

This type of pump was used by different 24h-Le Mans winners.



Mechanical data	
Fuel delivery	0,66 ccm/0,80 ccm per rotation
Length	76,8 mm
Enveloping circle	121,4 mm
Supply pressure	4 ... 6 bar
Output pressure	120 bar permanent 200 bar short time
Max. operating temperature	80°C
Max. temperature of location	130°C
Max. rotation per minute	9000

Connections	
Intake side	e.g. thread hole M10 x 1
Pressure side	e.g. thread hole M10 x 1

Order numbers	
Fuel delivery 0,66 ccm	B 438 172 058
Fuel delivery 0,80 ccm	B 438 172 061

HPI Valve HDEV 1.2

The HDEV 1.2 can be used in combination with direct injection systems as well as in high pressure manifold injection systems.

Its most remarkable features are the small size and weight and the freedom in defining both spray and jet. Every jet is free definable in terms of position, flow rate and penetration. Moreover, asymmetric sprays are possible.



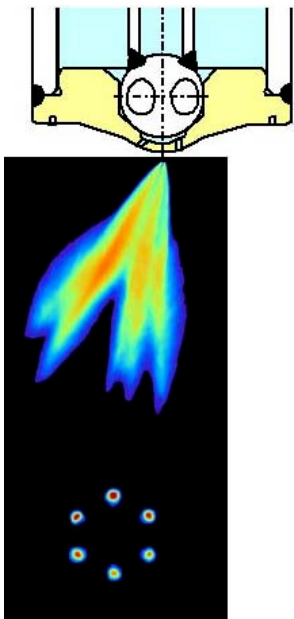
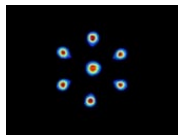
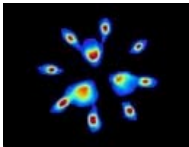
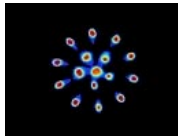
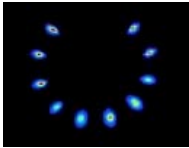
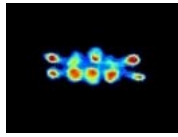
Mechanical data	
System pressure	max. 200 bar
Flow rate	e.g. 30 ccm/sec at 100 bar
Weight	78 g

Electrical data	
Resistance	0,9 Ω
Voltage	90 V
Peak current	20 A

Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-30 ... 120°C
Permissible fuel temperatures	< 80°C
Installation lengths	86 mm

Order number
on request

Examples of variations, further variations on request

	 Jets on a circle	 Jets on a circle and a middle jet
	 Jets on two circles	 Jets on two circles and a middle jet
	 Jet configuration regarding the spark plug position	 Flat jet configuration

HPI Control Valve DSV

The DSV is especially designed for regulation of pressure in the common rail of high pressure injection systems.



Mechanical data	
Pressure range	4 ... 120 bar
Back pressure	4 bar
Flow quantity	max. 100 l/h
Weight	135 g
Size	32 x 54 x 56 mm
Operating temperature	-20 ... 130°C
Max. temperature of location	140°C (max. 5 min)

Electrical data	
Operation voltage	6,5 ... 18 V
Operation current	$I_{\max} = 1,8 \text{ A}$

Order number	
	B 261 209 568

Absolute Pressure Sensor PSM

Pressure range: 0 ... 2 / 12 / 250 bar nominal

A miniature M10 x 1 absolute pressure sensor for universal precision pressure measurement. It is manufactured in a DR-25 sleeve, various connector options are available. Detailed calibration sheet included.



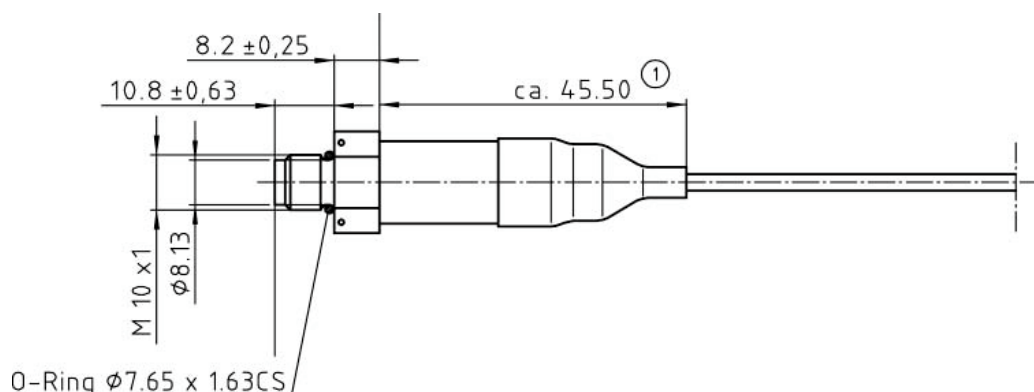
Mechanical data	
Max. pressure	2 x nominal
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	16 mm
Weight	55 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-20 ... 125°C
Vibration	80 g/5 Hz ... 2,5 kHz

Characteristic	
Sensitivity and offset will be delivered with each sensor.	

Electronic data	
Power supply	8 ... 16 V
Compensated range	20 ... 80°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0 ... 5 V

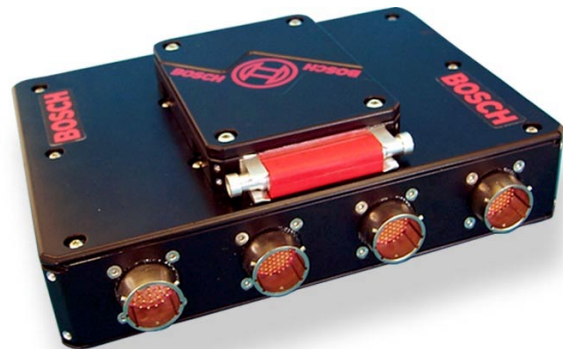
Order numbers	
ASL 6-06-05PC-HE	
2 bar	B 261 209 335
Offer drawing	A 261 209 330
12 bar	B 261 209 331
Offer drawing	A 261 209 331
250 bar	B 261 209 332
Offer drawing	A 261 209 332



Engine Control Units

Motronic MS 2.9

The MS 2.9 engine management system contains 12 ignition power stages and 24 independent injection power stages. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged in the integrated flash card memory. Eight vibration sensor inputs allow knock detection and knock control. Four independent wide range lambda circuits allow lambda closed loop engine control.



Functionality	
Injection timing	
Ignition timing	
Lambda control	
Boost control (option)	
Knock control	
Data acquisition	
Telemetry	

Mechanical data	
Dust and waterproof aluminium housing	
Connectors in military technology	
Each pin individually filtered	
Vibration damped circuit boards	
Flexible housing fixation points	
Size	194 x 245x 71 mm
Weight	2280 g

Conditions for use	
ECU temperature	-40 ... 75°C
Max. power consumption	18 W at 14 V
Max. vibration	15 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electronic data	
In general	
9 microcontrollers with 16 bit organisation, calculator capacity 70 MIPS	
Real time clock	

Inputs	
4 inputs for Ni-Cr-Ni exhaust gas temperature sensors	
4 lambda LSM 11 interfaces	
4 inputs for inductive wheel speed sensors (Hall optional)	
42 universal inputs 0 ... 5 V	
6 differential inputs ± 5 V	
1 input for inductive or Hall crankshaft sensor	
1 input for inductive or Hall camshaft sensor	
8 knock sensor inputs	
Outputs	
All power stages short circuit protected	
12 peak and hold injection power stages with diagnosis interface	
12 switched injection power stages with diagnosis interface	
12 ignition power stages with diagnosis interface	
3 high current power stages (12 A)	
12 high speed power stages (2 A)	
3 sensor supply 5 V/100 mA	
3 sensor supply 10 V/200 mA	
Communication interfaces	
2 RS232 interface for telemetry and laptrigger	
1 2-Mbaud interface for memory and data read out or high speed telemetry	
3 CAN interfaces	
Memory	
Compact Flash Card memory for data acquisition	

Motronic MS 2.9.1

The MS 2.9.1 engine management system contains 12 ignition power stages and 12 independent injection power stages. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged in the integrated flash card memory. Eight vibration sensor inputs allow knock detection and knock control. Four independent wide range lambda circuits allow lambda closed loop engine control.



Functionality

Injection timing
Ignition timing
Lambda control
Boost control (option)
Knock control
Data acquisition
Telemetry

Mechanical data

Dust and waterproof aluminium housing
Connectors in military technology
Each pin individually filtered
Vibration damped circuit boards
Flexible housing fixation points
Size 194 x 245 x 71 mm
Weight 2280 g

Conditions for use

ECU temperature -40 ... 75°C
Max. power consumption 18 W at 14 V
Max. vibration 15 g sinus
at 20 Hz ... 2 kHz for t < 5 h

Electronic data

In general

8 microcontrollers with 16 bit organisation,
calculator capacity 50 MIPS
Real time clock

Inputs

4 inputs for Ni-Cr-Ni exhaust gas temperature sensors
4 lambda LSM 11 interfaces
4 inputs for inductive wheel speed sensors (Hall optional)
42 universal inputs 0 ... 5 V
6 differential inputs ± 5 V
1 input for inductive or Hall crankshaft sensor
1 input for inductive or Hall camshaft sensor
8 knock sensor inputs

Outputs

All power stages short circuit protected
12 peak and hold injection power stages with diagnosis interface
12 ignition power stages with diagnoses interface
3 high current power stages (12 A)
12 high speed power stages (2 A)
3 sensor supply 5 V/100 mA
3 sensor supply 10 V/200 mA

Communication interfaces

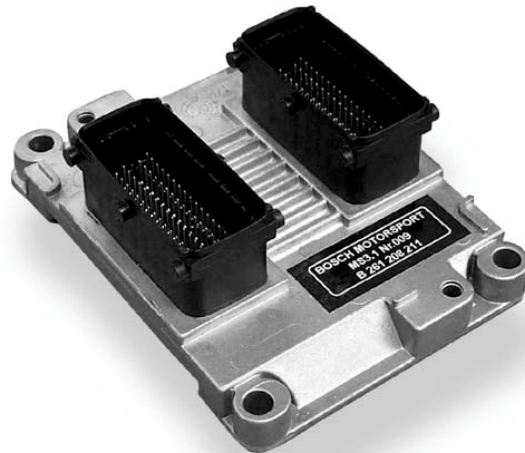
2 RS232 interface for telemetry and laptrigger
1 2-Mbaud interface for memory and data read out or high speed telemetry
3 CAN interfaces

Memory

Compact Flash Card memory for data acquisition

Motronic MS 3.1

The MS 3.1 is the first Bosch engine management system in full hybrid technique and for engines up to 6 cylinders. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality	
Engine management system for 4- and 6-cylinder engines	
Sequential fuel injection	
Ignition timing	
Lambda control	
Knock control	
Fuel cut off	
Component diagnosis	

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock and vibration proof hybrid technology	
Four housing fixation points	
Size	120 x 90 x 40 mm
Weight	250 g

Conditions for use	
ECU temperature	-40 ... 125°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electronic data	
In general	
2 microcontrollers with 16 bit organisation calculation capacity 20 MIPS	
Inputs	
2 lambda LSU4 interfaces	
3 analogous inputs 0 ... 5 V for water temperature, oil temperature, intake air temperature	
3 analogous inputs 0 ... 5 V for oil pressure, fuel pressure, ambient pressure	
1 analogous input 0 ... 5 V for throttle position sensor	
1 digital input for lap trigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for hall camshaft sensor	
2 knock sensor interfaces	
Outputs	
6 injection power stages with diagnosis interface	
2 high current power stages (8 A) with diagnosis interface for LSU heating	
6 ignition power stages	
Sensors supply output	5 V/100 mA
Separate supply output for throttle position sensor	5 V/100 mA
2 power stages (1 A) for main relay and fuel pump relay control	

Communication interfaces

- 1 CAN interface
- 1 K-Line interface

Necessary equipment

- | | |
|--|----------------------|
| KIC2-standard connector | B 261 206 859 |
| KIC2-diagnosis connector with ignition bridge | B 261 206 866 |
| KIC2-diagnosis connector without ignition bridge | B 261 206 867 |

Cable harness connectors

- | | |
|----------------|----------------------|
| Order numbers: | D 261 205 139 |
| | D 261 205 140 |

Order numbers

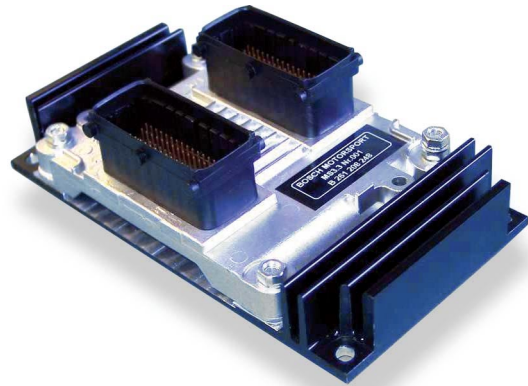
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|---------------------------------|----------------------|
| MS 3.1 incl. INCA light | B 261 208 211 |
| MS 3.1 incl. INCA expert | B 261 208 273 |
| MS 3.1 incl. Modas for notebook | B 261 208 245 |

Options

- | | |
|-----------------------------------|----------------------|
| Upgrade INCA light to INCA Expert | B 261 206 425 |
|-----------------------------------|----------------------|

Motronic MS 3.3

The MS 3.3 is an engine management system in full hybrid technique and for engines up to 8 cylinders. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality	
Engine management system for 8-cylinder engines	
Sequential fuel injection	
Ignition timing	
Lambda control	
Knock control	
Fuel cut off	
Component diagnosis	

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock and vibration proof hybrid technology	
Four housing fixation points	
Size	162 x 90 x 44 mm
Weight	450 g

Conditions for use	
ECU temperature	-40 ... 75°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electronic data	
In general	
2 microcontrollers with 16 bit organisation calculation capacity 20 MIPS	
Inputs	
2 lambda LSU4 interfaces	
3 analogous inputs 0 ... 5 V for water temperature, oil temperature, intake air temperature	
3 analogous inputs 0 ... 5 V for oil pressure, fuel pressure, ambient pressure	
1 analogous input 0 ... 5 V for throttle position sensor	
1 digital input for lap trigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for hall camshaft sensor	
2 knock sensor interfaces	
Outputs	
8 injection power stages with diagnosis interface	
2 high current power stages (8 A) with diagnosis interface for LSU heating	
4 ignition power stages	
Sensors supply output	5 V/100 mA
Separate supply output for throttle position sensor	5 V/100 mA
2 power stages (1 A) for main relay and fuel pump relay control	

Communication interfaces

1 CAN interface
1 K-Line interface

Cable harness connectors

Order numbers:	D 261 205 139
	D 261 205 140

Necessary equipment

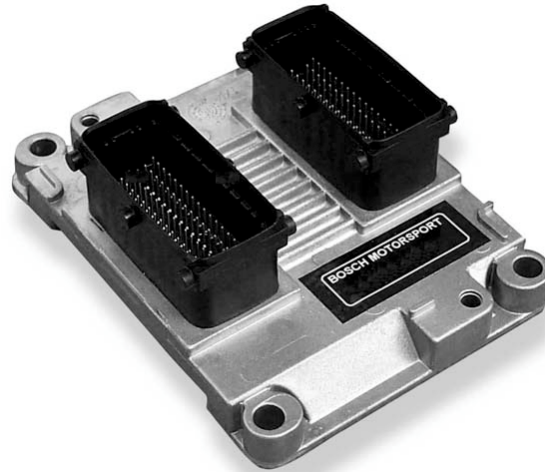
KIC2-standard connector	B 261 206 859
KIC2-diagnosis connector with ignition bridge	B 261 206 866
KIC2-diagnosis connector without ignition bridge	B 261 206 867

Order numbers

MS 3.3	B 261 208 248
MS 3.3 incl. INCA expert	B 261 208 249
MS 3.3 incl. Modas for notebook	B 261 208 250

Motronic MS 3.4

The MS 3.4 is an engine management system in full hybrid technique and specially adapted for motorbikes. It allows engine speeds up to 20.000 rpm. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality	
Engine management system for 4-cylinder engines	
Sequential fuel injection	
Ignition timing	
Lambda control	
Knock control	
Fuel cut off	
Component diagnosis	
Engine speed up to 20.000 rpm	
Variable firing order	

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock vibration proof hybrid technology	
Four housing fixation points	
Size	120 x 90 x 40 mm
Weight	250 g

Conditions for use	
ECU temperature	-40 ... 125°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electronic data	
In general	
2 microcontrollers with 16 bit organisation, calculation capacity 20 MIPS	
Inputs	
2 lambda LSU4 interfaces	
3 analogous inputs 0 ... 5 V for water temperature, oil temperature, intake air temperature	
3 analogous inputs 0 ... 5 V for oil pressure, fuel pressure, ambient pressure	
1 analogous input 0 ... 5 V for throttle position sensor	
1 digital input for lap trigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for hall camshaft sensor	
2 knock sensor interfaces	
Outputs	
4 injection power stages with diagnosis interface	
2 high current power stages (8 A) with diagnosis interface for LSU heating	
4 ignition power stages	
Sensors supply output 5 V/100 mA	
Separate supply output for throttle position sensor 5 V/100 mA	
2 power stages (1 A) for main relay and fuel pump relay control	

Communication interfaces

1 CAN interface
1 K-Line interface

Cable harness connectors

Order numbers:	D 261 205 139
	D 261 205 140

Necessary equipment

KIC2-standard connector	B 261 206 859
KIC2-diagnosis connector with ignition bridge	B 261 206 866
KIC2-diagnosis connector without ignition bridge	B 261 206 867

Order numbers

MS 3.4 incl. INCA light	B 261 208 274
MS 3.4 incl. INCA expert	B 261 208 275
MS 3.4 incl. Modas	B 261 208 276

Motronic MS 4.0

The MS 4.0 is a highly sophisticated engine management system for high performance engines. The system contains 8 ignition drivers for external power stages and 8 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.



Mechanical data	
Sheet-metal housing	
Each connector pin individually filtered	
Vibration damped circuit boards	
Size	180 x 162 x 46 mm
Weight	430 g

Functionality	
Injection timing	
Ignition timing	
Lambda control	
Knock control	
Data acquisition	
Telemetry	
Traction control	
Turbo functionality	

Conditions for use	
Temperature range	-40 ... 75°C
Max. power consumption	30 W at 14 V
Max. vibration	15 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electronic design	
Inputs	
2 inputs for exhaust gas temperature sensors	
2 lambda interfaces LSU	
4 inputs for Hall effect wheel speed sensors	
1 input for inductive or Hall effect crankshaft sensor	
16 universal inputs 0 ... 5 V	
2 inputs for vibration knock sensors	
7 digital inputs	
Outputs	
8 injection power stages	
8 ignition drivers	
20 power stages (2,7 A/0,6 A; low side; PWM)	
2 power stages for lambda heater	
1 H-bridge (5 A)	
2 sensor supply 5 V/100 mA	
Communication interfaces	
1 K-line serial interfaces	
2 CAN interfaces for external communication	

Motronic MS 4.1

The MS 4.1 is a highly sophisticated engine management system for high performance engines. The system contains 8 ignition drivers for external power stages and 16 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels and logged on the internal data logger. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.



Mechanical data

Dust and waterproof aluminium housing	
3 connectors in military technology with high pin density	
165 pins, each pin individually filtered	
Vibration damped circuit boards	
8 flexible housing fixation points	
Size	180 x 162 x 46 mm
Weight	1170 g

Conditions for use

Temperature range	-40 ... 75°C
Max. power consumption	30 W at 14 V
Max. vibration	15 g sinus at 20 Hz ... 2 kHz for t<5 h

Functionality

Injection timing
Ignition timing
Lambda control
Knock control
Data acquisition
Telemetry
Traction control
Turbo functionality

Electronic design

Inputs

2 inputs for exhaust gas temperature sensors
2 lambda interfaces LSU
4 inputs for Hall effect wheel speed sensors
1 input for inductive or Hall effect crankshaft sensor
31 universal inputs 0 ... 5 V
2 inputs for vibration knock sensors
7 digital inputs

Outputs

16 injection power stages
8 ignition drivers
26 power stages (2,7 A/0,6 A; low side; PWM)
2 power stages for lambda heater
1 H-bridge (5 A)
2 sensor supply 5 V/100 mA

Communication interfaces

1 RS232 serial interface
2 K-line serial interfaces
2 CAN interfaces for external communication
1 SPI

Memory

Internal memory up to 48 MB for data acquisition
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Motronic MS 4.2

The MS 4.2 is a highly sophisticated engine management system for high performance engines. The system contains 8 ignition drivers for external power stages and 16 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels and logged on the compact flash card data logger. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.



Mechanical data	
Dust and waterproof aluminium housing	
3 connectors in military technology with high pin density	
165 pins, each pin individually filtered	
Vibration damped circuit boards	
8 flexible housing fixation points	
Size	192 x 162 x 52 mm
Weight	1240 g

Conditions for use	
Temperature range	-40 ... 75°C
Max. power consumption	30 W at 14 V
Max. vibration	15 g sinus at 20 Hz ... 2 kHz for t<5 h

Functionality	
Injection timing	
Ignition timing	
Lambda control	
Knock control	
Data acquisition	
Telemetry	
Traction control	
Turbo functionality	

Electronic design	
Inputs	
2 inputs for exhaust gas temperature sensors	
2 lambda interfaces LSU	
4 inputs for Hall effect wheel speed sensors	
1 input for inductive or Hall effect crankshaft sensor	
31 universal inputs 0 ... 5 V	
2 inputs for vibration knock sensors	
7 digital inputs	
Outputs	
16 injection power stages	
8 ignition drivers	
26 power stages (2,7 A/0,6 A; low side; PWM)	
2 power stages for lambda heater	
1 H-bridge (5 A)	
2 sensor supply 5 V/100 mA	
Communication interfaces	
1 RS232 serial interface	
2 K-line serial interfaces	
2 CAN interfaces for external communication	
1 SPI	
Memory	
Compact Flash Card memory for data acquisition	



Sensors

Pressure Sensors Air

Absolute Pressure Sensor PS-10

Pressure range: 10 x 0,1 ... 2,5 bar nominal

The pressure box is designed for measuring air pressure and specially modified for motorsport use. With its 10 analogous outputs it can take 10 measurements simultaneously.



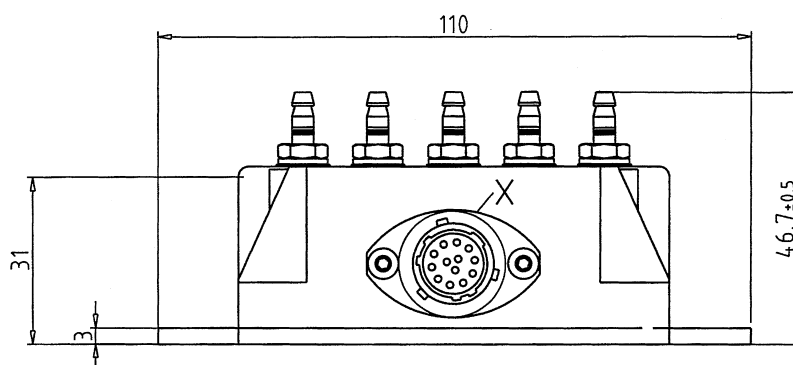
Mechanical data	
Measurement transducer	piezoresistive
Pressure range	10 x 0,1 ... 2,5 bar nominal
Max. pressure	10 bar nominal
Weight	185 g
Dimensions	110 x 87 x 47 mm
Sensor connector	3 mm

Conditions for use	
Temperature range	-40 ... 125°C
Max. vibration	15 g /30 ... 200 Hz

Characteristic	
Sensitivity and offset will be delivered with each sensor	

Electronic data	
Power supply	12 V
Compensated range	20 ... 85°C
Non linearity	1,00 %
Therm. zero point drift	< 1,00 %
Therm. sensitivity drift	< 1,00 %
Long time drift	< 1,00 %
Full scale output	0,5 ... 4,5 V
Time of reaction	1 ms (90 %)

Order number	
AS 0-10-35PN	B 261 206 865
Offer drawing	A 261 206 865



Absolute Pressure Sensor PSA

Pressure range: 0,2 ... 1,05 / 2,5 bar nominal

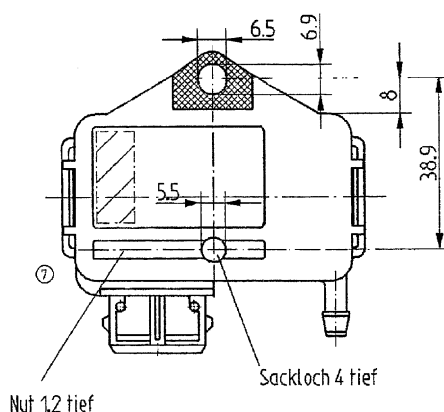
A piezoresistive pressure sensor for ambient air pressure measurement.



Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	5 bar
Thread	M6
Weight	60 g

Conditions for use	
Temperature range	-40 ... 120°C
Max. temp. of location	130°C
Max. vibration	15 g / 30 ... 200 Hz

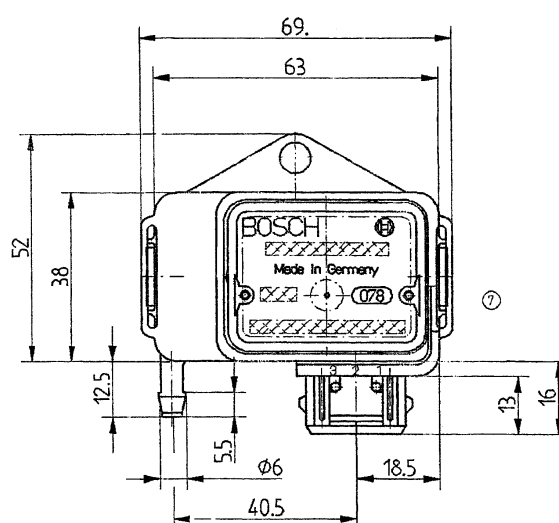
Characteristic	
0,2 ... 1,05 bar:	
Sensitivity	5000 mV/bar
Offset	-600 mV
0,2 ... 2,5 bar:	
Sensitivity	1847 mV/bar
Offset	30 mV



Electronic data	
Power supply	4,75 ... 5,25 V
Full scale output	0,4 ... 4,65 V
Time of reaction	10 ms (90 %)
Max. current	< 10 mA
Resistance	> 50 kΩ

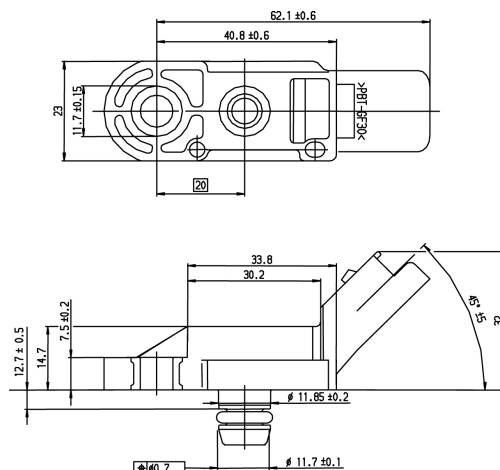
Connector	
Cable harness connector	1 237 000 039

Order numbers	
0,2 ... 1,05 bar	0 261 230 004
Offer drawing	A 261 260 041
0,2 ... 2,5 bar	0 281 002 119
Offer drawing	A 261 260 047



Pressure range: 0,1 ... 1,15 / 0,2 ... 2,5 bar nominal

Characteristic	
0,1 ... 1,15 bar:	
Sensitivity	4040 mV/bar
Offset	-4,8 mV
0,2 ... 2,5 bar:	
Sensitivity	1848 mV/bar
Offset	30,4 mV

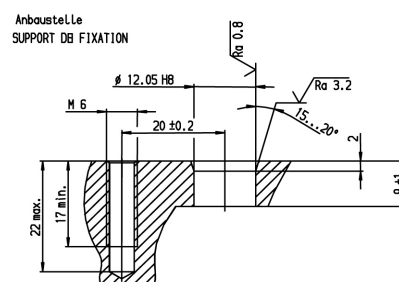


Pressure range: 0,1 ... 2 bar nominal

Order number	
ASL 6-06-05PC-HE	B 261 209 337
Offer drawing	A 261 260 123

Technical drawing of the front view of a mechanical component. The drawing shows a symmetrical part with a central circular feature and two side flanges. Dimensions are indicated as follows:

- Overall width: 62.1 ± 0.6
- Distance from the central axis to the center of the side flange: 40.8 ± 0.6
- Overall height: 23
- Distance from the bottom edge to the center of the side flange: 11.7 ± 0.15
- Material specification: PBT GF-30K
- Part number: 20



Absolute Pressure Sensor PSB-4

Pressure range: 0,5 ... 4 bar nominal

An absolute pressure sensor modified for precision air pressure measurement, especially boost pressure. It is manufactured in a DR-25 sleeve, various connector options are available.



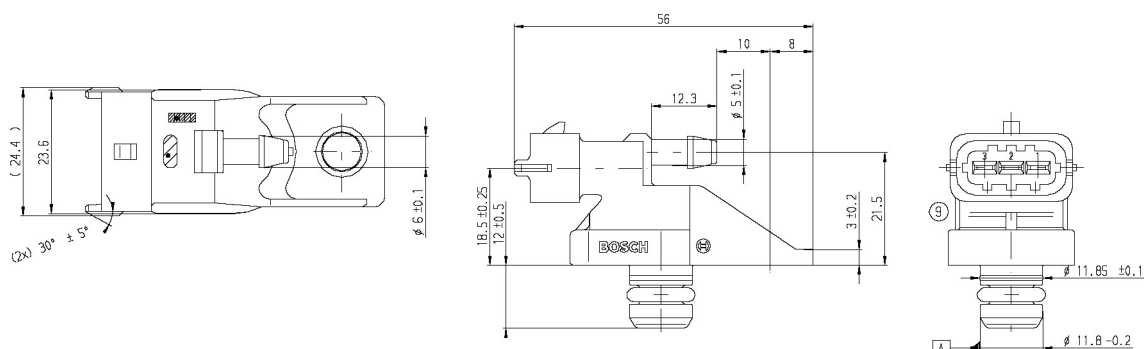
Mechanical data	
Max. pressure	4,5 bar
Fitting	11,85 mm
Weight	45 g
Sealing	O-ring 7,59 x 2,62

Conditions for use	
Temperature range	-40 ... 80°C
Max. temp. of location	130°C
Max. vibration	8 g /10 ... 1000 Hz

Characteristic	
Sensitivity and offset will be delivered with each sensor.	

Electronic data	
Power supply	5 V
Compensated range	-40 ... 80°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,5 ... 4,5 V

Order number	
ASL 6-06-05PC-HE	B 261 209 338
Offer drawing	A 261 260 302



Absolute Pressure Sensor PSP

Pressure range: 0,2 ... 3 bar nominal

An absolute pressure sensor modified for precision air pressure measurement.



Mechanical data

Max. pressure	5 bar
Characteristic	20°C/2,5 kΩ
Fitting	Ø 11,8 mm
Weight	17 g
Sealing	O-ring

Conditions for use

Temperature range	-40 ... 130°C
Max. vibration	4 g/20 ... 71 Hz
Max. temp. of location	130 °C

Characteristic

Sensitivity	1517 mV/bar
Offset	96 mV

Electronic data

Power supply	5 V
Compensated range	-40 ... 125°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,4 ... 4,65 V

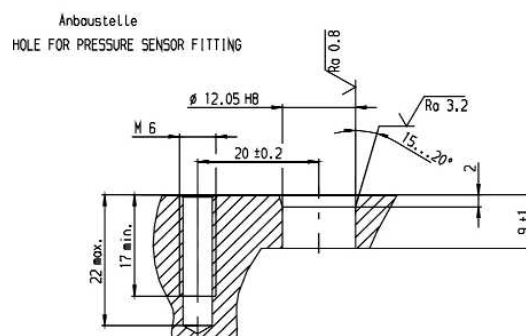
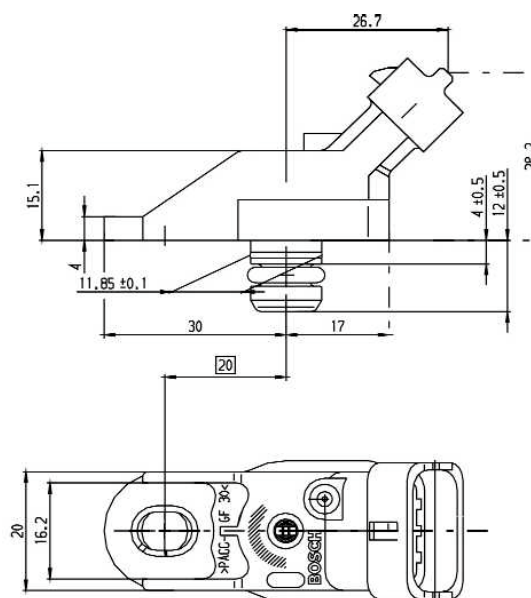
Connector

Cable harness connector	1 928 402 868
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Order number

ASL 6-06-05PC-HE **B 261 209 690**

Offer drawing **A 261 260 139**



Absolute Pressure Sensor PST

Pressure range: 0,1 ... 1,15 bar nominal

An absolute pressure sensor with integrated temperature sensor for ambient air and various fluid pressure measurements.



Mechanical data	
Max. pressure	2,3 bar
Characteristic	20°C/2,5 kΩ
Fitting	Ø 17,6 mm
Weight	35 g
Sealing	O-ring 7,65 x 1,63

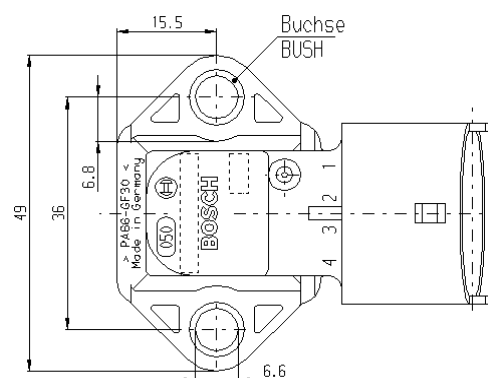
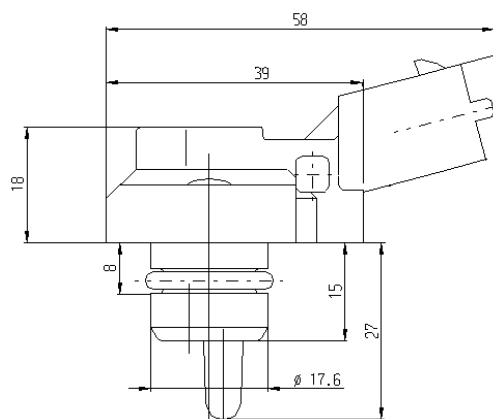
Conditions for use	
Temperature range	-40 ... 125°C
Vibration	250 g/200 ... 500 Hz
Max. temp. of location	130°C

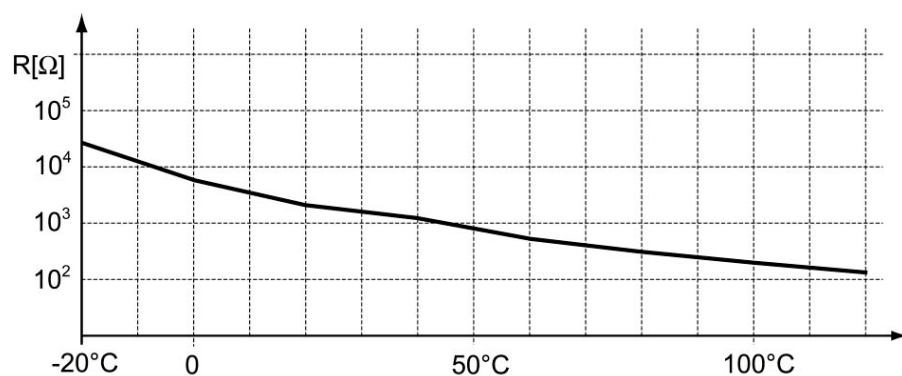
Characteristic	
Sensitivity	4048 mV/bar
Offset	-4,76 mV

Electronic data	
Power supply	5 V
Compensated range	-40 ... 125°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,4 ... 4,65 V

Connector	
Cable harness connector	1 928 403 112

Order number	
	0 261 230 022
Offer drawing	A 261 260 253





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Pressure Sensors Fluid

Absolute Pressure Sensor PSC-10

Pressure range: 0 ... 10 bar nominal

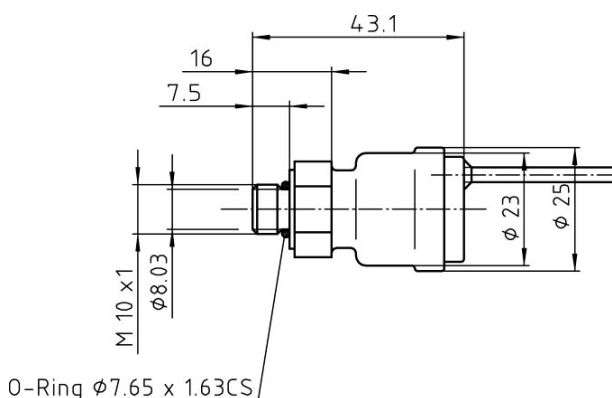
A M10 x 1 sensor for various fluid pressure measurement. The sensor range covers pressure measurement up to 10 bar. It is manufactured in a DR-25 sleeve, various connector options are available. Gauge and absolute pressure sensors are available.



Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	20 bar
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	70 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-40 ... 125°C
Max. vibration	15 g/30 ... 200 Hz

Characteristic	
Sensitivity	400 mV/bar
Offset	100 mV



Electronic data	
Power supply	5 ... 6 V/8 ... 16 V
Compensated range	25 ... 85 °C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 ... 4,5 V
Time of reaction	1 ms (90 %)

Order numbers	
5 ... 6 V supply	
KPTA 6E6-4P-C-DN	B 261 209 342
Offer drawing	A 261 209 342
8 ... 16 V supply	
KPTC 6E8-4P-C-DN	B 261 209 063
Offer drawing	A 261 209 063
ASL 6-06-05PN	B 261 209 068
Offer drawing	A 261 209 068
KPTA 6E6-4P-C-DN	B 261 209 069
Offer drawing	A 261 209 069
ASL 6-08-98PN	B 261 209 077
Offer drawing	A 261 209 077
ASL 6-06-05PC-HE	B 261 209 079
Offer drawing	A 261 209 079

Absolute Pressure Sensor PSC-250

Pressure range: 0 ... 250 bar nominal

A M10 x 1 sensor for various fluid pressure measurement. The sensor range covers pressure measurement from 0 to 250 bar. It is manufactured in a DR-25 sleeve, various connector options are available. Gauge and absolute pressure sensors are available.



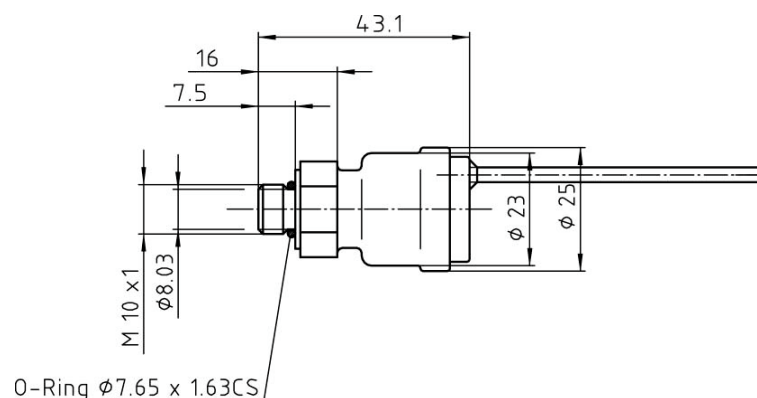
Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	500 bar
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	70 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-40 ... 125°
Max. vibration	15 g/30 ... 200 Hz

Characteristic	
Sensitivity	16 mV/bar
Offset	500 mV

Electronic data	
Power supply	8 ... 16 V
Compensated range	25 ... 85°C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 ... 4,5 V
Time of reaction	1 ms (90 %)

Order numbers	
KPTC 6E8-4P-C-DN	B 261 209 066
Offer drawing	A 261 209 066
KPTA 6E6-4P-C-DN	B 261 209 076
Offer drawing	A 261 209 076
ASL 6-08-98PN	B 261 209 078
Offer drawing	A 261 209 078



Absolute Pressure Sensor PSM

Pressure range: 0 ... 2 / 12 / 250 bar nominal

A miniature M10 x 1 absolute pressure sensor for universal precision pressure measurement. It is manufactured in a DR-25 sleeve, various connector options are available. Detailed calibration sheet included.



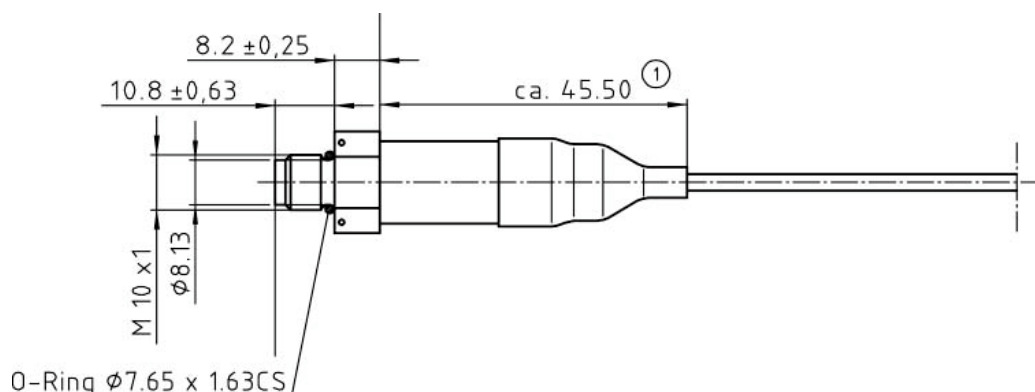
Mechanical data	
Max. pressure	2 x nominal
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	16 mm
Weight	55 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-20 ... 125°C
Vibration	80 g/5 Hz ... 2,5 kHz

Characteristic	
Sensitivity and offset will be delivered with each sensor.	

Electronic data	
Power supply	8 ... 16 V
Compensated range	20 ... 80°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0 ... 5 V

Order numbers	
ASL 6-06-05PC-HE	
2 bar	B 261 209 335
Offer drawing	A 261 209 330
12 bar	B 261 209 331
Offer drawing	A 261 209 331
250 bar	B 261 209 332
Offer drawing	A 261 209 332



Absolute Pressure Sensor PSS

Pressure range: 0 ... 10 / 100 / 250 bar nominal

A M10 x 1 pressure sensor for measuring various fluid pressure. Gauge and absolute pressure sensors are available.



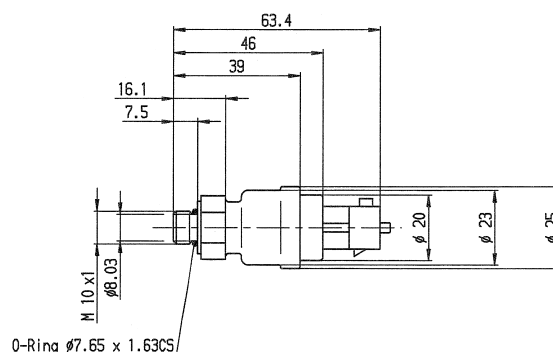
Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	2 x nominal
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	65 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-40 ... 125°C
Vibration	15 g/30 ... 200 Hz

Characteristic	
Sensitivity	
10 bar	400mV/bar
100 bar	40 mV/bar
250bar	16 mV/bar
Offset	
10 bar	500 mV
100 bar	500 mV
250 bar	500 mV

Electronic data	
Power supply	5 ... 6 V/ 8 ... 16 V
Compensated range	20 ... 85°C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 ... 4,5 V
Time of reaction	1 ms (90%)

Order numbers	
5 ... 6 V supply, 10 bar	B 261 209 341
Offer drawing	A 261 209 341
8 ... 16 V supply, 10 bar	B 261 209 064
Offer drawing	A 261 209 064
5 ... 6 V supply, 100 bar	B 261 209 347
Offer drawing	A 261 209 347
8 ... 16 V supply, 250 bar	B 261 209 067
Offer drawing	A 261 209 067



Pressure Sensors differential

Differential Pressure Sensors DP

Pressure range: 0 ... 100 mbar differential

These miniature differential pressure sensors are used for precision air pressure measurement. They are typically combined with a pitot tube.



Mechanical data

Dimensions	
Type A	37 x 28 x 19 mm
Type B	38 x 28 x 19 mm
Fixing	2 x M3
Tightening torque	2 Nm
Weight	28 g

Conditions for use

Temperature range	-20 ... 70°C
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Characteristic

Sensitivity	40 mV/mbar
Offset	500 mV

Electronic data

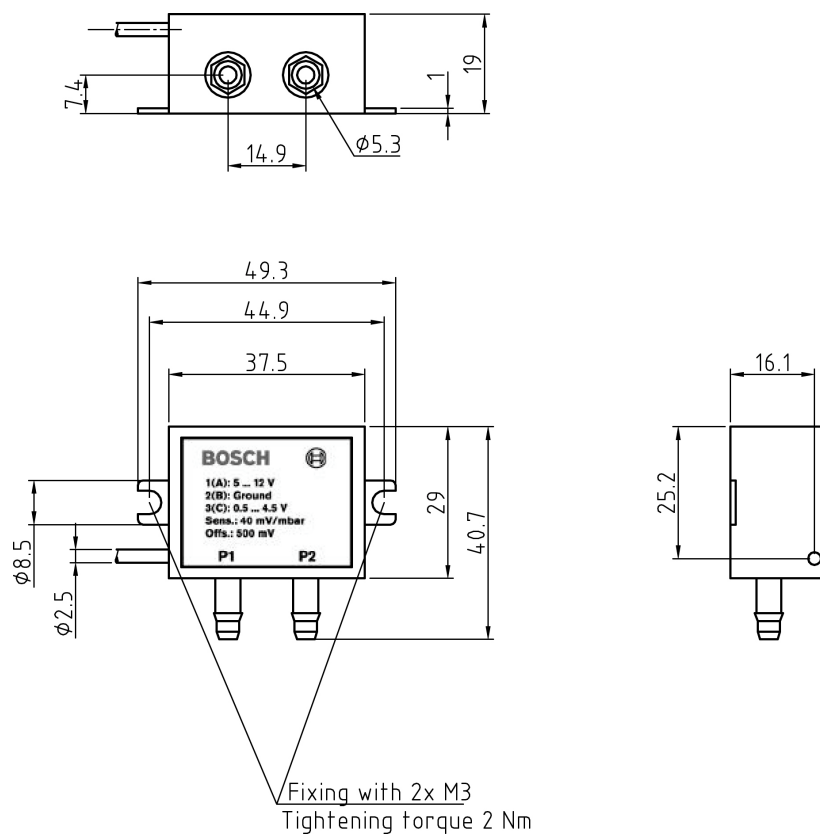
Power supply	4,8 ... 15 V
Output current	10 mA
Compensated range	0 ... 50°C
Non linearity	0,5 %/FSO
Therm. zero point drift	0,05 %/FSO/°C
Therm. sensitivity drift	0,05 %/FSO/°C
Long time drift	± 0,20 %/FSO
Full scale output	0,5 ... 4,5 V

Accessories

Pitot tube	B 261 209 700
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Order numbers

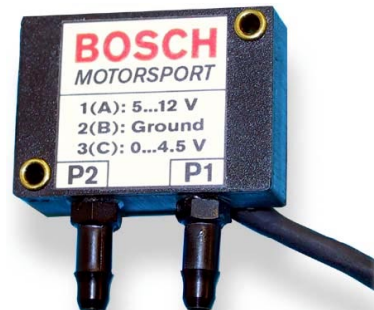
Type A	
AS 0-06-05PC-HE	B 261 209 696
Offer drawing	A 261 209 696
Type B	
AS 0-06-05PC-HE	B 261 209 697
Offer drawing	A 261 209 697



Differential Pressure Sensor DP-C

Pressure range: 0 ... 100 mbar differential

This low cost miniature differential pressure sensor is used for precision air pressure measurement. It is typically combined with a pitot tube.



Mechanical data	
Dimensions	35 x 25 x 11 mm
Pressure ranges	100 mbar differential
Fixing	2 x M2,5
Tightening torque	2 Nm
Weight	28 g

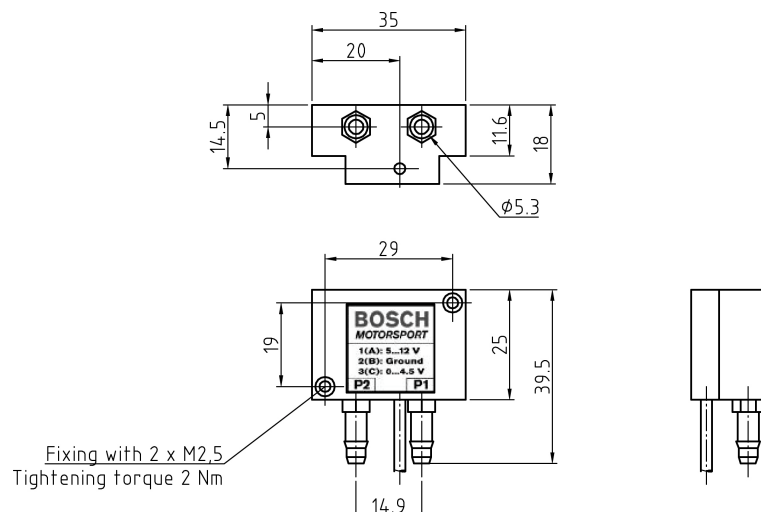
Conditions for use	
Temperature range	-20 ... 70°C

Characteristic	
Sensitivity	40 mV/mbar
Offset	500 mV

Electronic data	
Power supply	4,8 ... 15 V
Output current	10 mA
Compensated range	0 ... 50°C
Non linearity	0,5 %/FSO
Therm. Zero point drift	0,05 %/FSO/°C
Therm. sensitivity drift	0,05 %/FSO/°C
Long time drift	± 0,20 %/FSO
Full scale output	0,5 ... 4,5 V

Accessories	
Pitot tube	B 261 209 700

Order number	
AS 0-06-05PC-HE	B 261 209 701
Offer drawing	A 261 209 701



Differential Pressure Sensor DP-E

Pressure range: 0 ... 70 / 0 ... 100 mbar differential

A miniature differential pressure sensor for precision temperature compensated air pressure measurement. It is typically used as pitot tube sensor.



Mechanical data	
Dimensions	62 x 33 x 21 mm
Fixing	2 x M3
Tightening torque	2 Nm
Weight	50 g

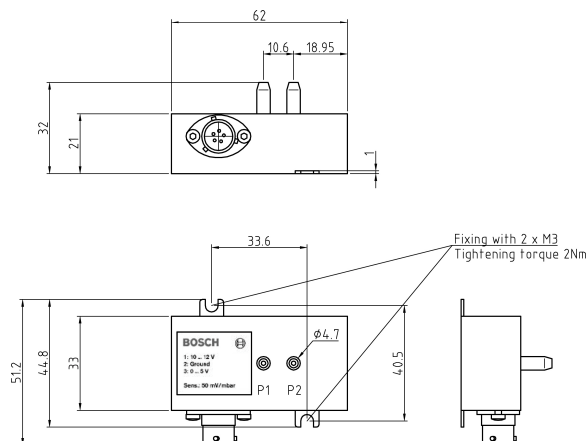
Conditions for use	
Temperature range	-20 ... 70°C

Characteristic	
Sensitivity	
0 ... 70 mbar	71,42 mV/mbar
0 ... 100 mbar	50 mV/mbar

Electronic data	
Power supply	7,5 ... 24 V
Compensated range	0 ... 70°C
Non linearity	0,25 %/FSO
Therm. zero point drift	0,30 %/FSO
Therm. sensitivity drift	0,20 %/FSO
Long time drift	0,10 %/FSO
Full scale output	0 ... 5 V

Accessories	
Pitot tube	B 261 209 700

Order numbers	
0 ... 70 mbar	
AS 0-06-05PN-HE	B 261 209 698
Offer drawing	A 261 209 698
0 ... 100 mbar	
AS 0-06-05PN-HE	B 261 209 699
Offer drawing	A 261 209 699



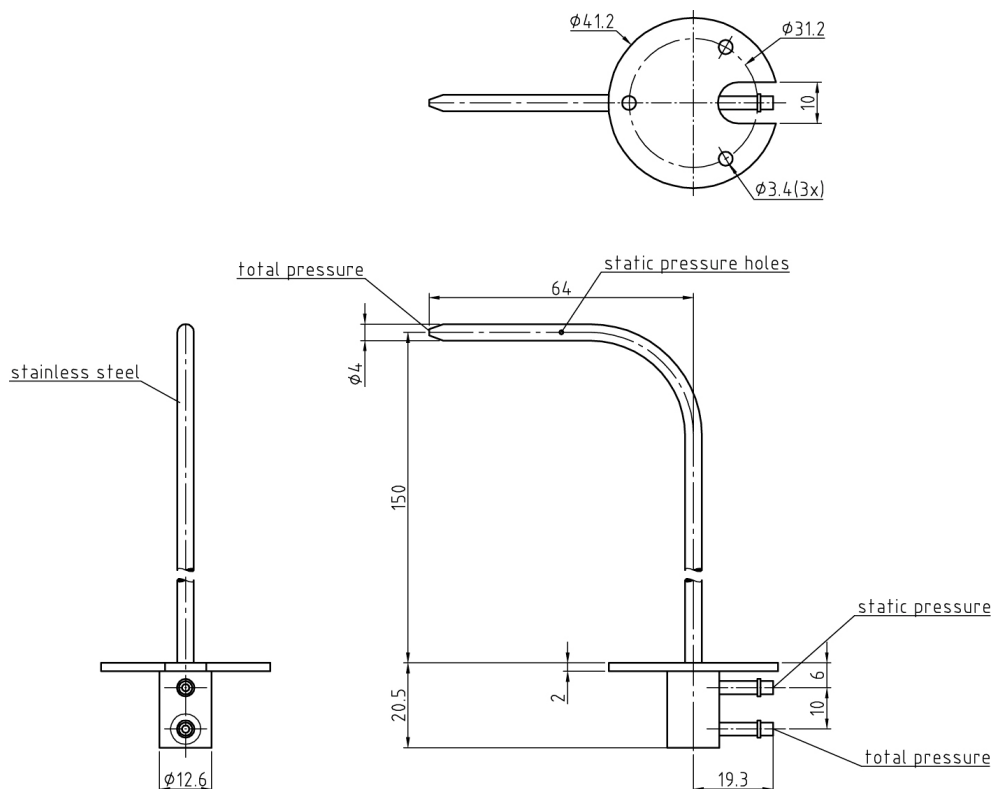
Pitot Static Tube PT

The pitot static tube consists basically of two concentric tubes, with the end turned through a right angle so that the tip can be faced into the air stream after insertion through the duct wall. The modified ellipsoidal nose form has a single forward facing hole for sensing total pressure and a ring of holes for sensing the static pressure. Both these inlets are individually connected to tapping outlets at the tail of the unit. A direction pointer is provided so that the pitot tube can be accurately aligned within the duct.



Mechanical data	
Weight	50 g
Height	150 mm
Tube diameter	4 mm

Order number	
	B 261 209 700
Offer drawing	A 261 209 700



total pressure = static pressure + velocity pressure

Air Velocity Calculations using S.I. Scales

The Standard formula for calculating velocity from velocity pressure is:

$$V = 1.291 \sqrt{P_v}$$

This is only correct for an air density of 1.2 kg/m³. For non-standard air conditions, this equation becomes:

$$V = 1.291 \sqrt{\frac{1013.25}{B} * \frac{T}{293} * \frac{100000}{100000 + P_s} * P_v}$$

V = velocity m/s

B = barometric pressure mbar

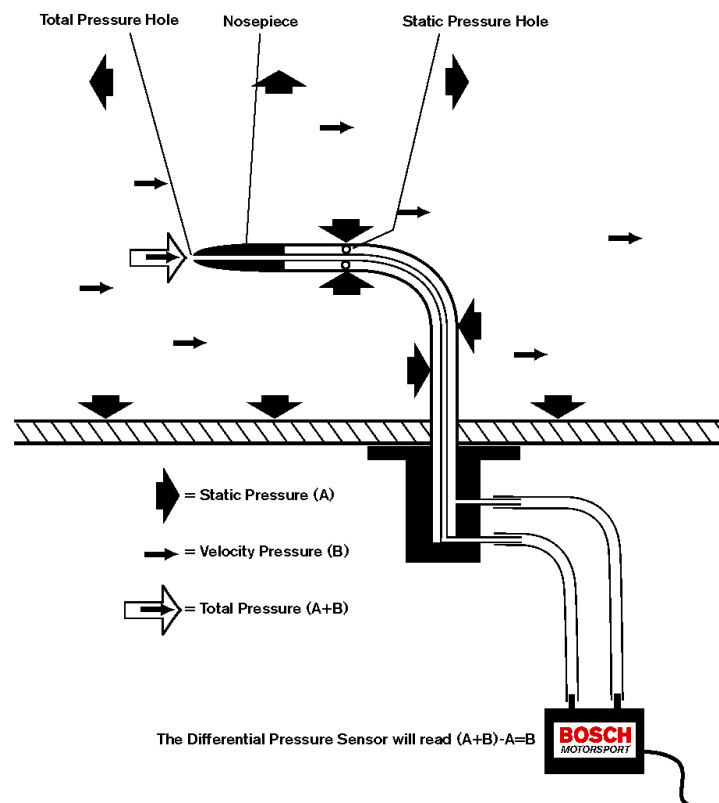
T = absolute temperature K (= $t^{\circ}\text{C} + 273$ where t is airstream temperature)

P_s = static pressure Pa

P_v = velocity pressure Pa

The expression $\frac{100000}{100000 + P_s}$ is a correction for the static pressure in the duct and may normally be ignored if P_s is less than 2500 Pa

Principle of Operation

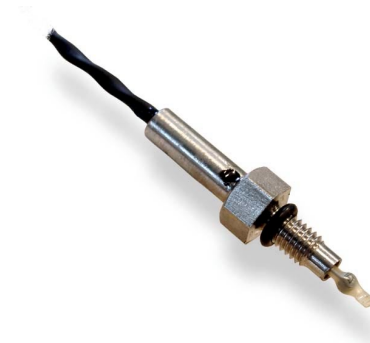


Temperature Sensors

Temperature Sensor NTC M-F

NTC M6-F, NTC M8-F, Temperature range 0 ... 125°C

The NTC M6-F and the NTC M8-F are created for very fast response air temperature measurement. Typical field of application is the measuring of intake air temperature.



NTC M6-F



NTC M8-F

Mechanical data

NTC M6-F

Thread	M6 x 1
Tightening torque	3 Nm
Wrench size	10 mm
Sealing	Viton 4,47 x 1,78
Weight	42 g

NTC M8-F

Thread	M8 x 1
Tightening torque	3 Nm
Wrench size	12 mm
Sealing	Viton 7,65 x 1, 63
Weight	45 g

Conditions for use

Temperature range	-40 ... 125°C
Max. vibration	70 g/5 ... 500 Hz

Electronic data

Nominal resistance	6,8 kΩ/25°C
Measuring range	0 ... 125°C
Accuracy	± 1,0 K
NTC M6-F Response time 90 %	≤ 2 s
NTC M8-F Response time 90 %	< 5 s

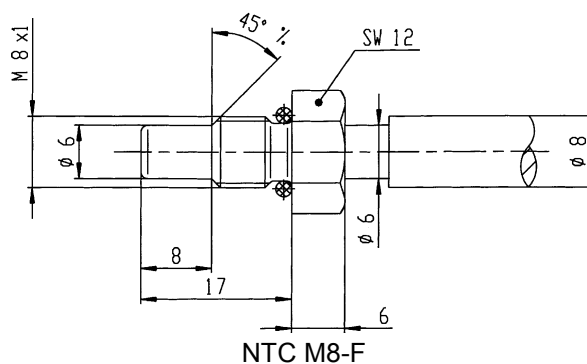
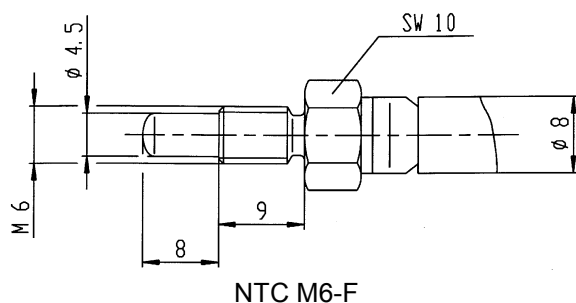
Order numbers

NTC M6-F

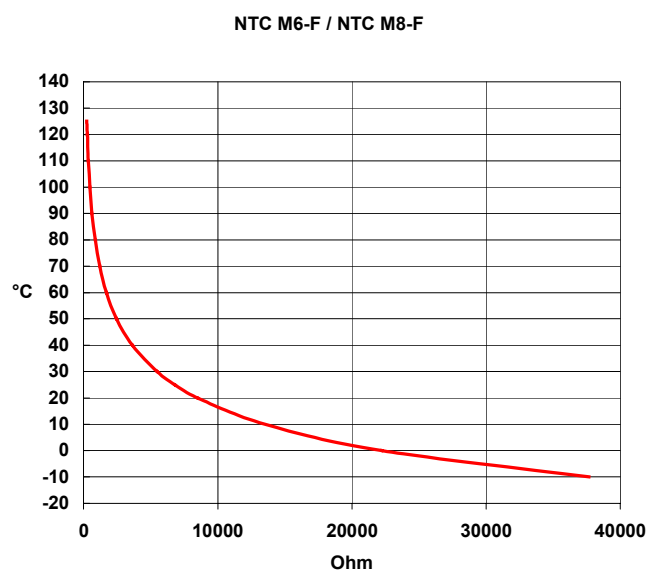
ASL 6-06-05PN-HE	B 261 209 398
Offer drawing	A 261 209 398

NTC M8-F

ASL 6-06-05PN-HE	B 261 209 818
Offer drawing	A 261 209 818



°C	R(Ω)
-20	66115
10	37645
0	22209
10	13533
20	8495
30	5479
40	3624
50	2452
60	1695
70	1195
80	858,2
90	626,7
100	464,8
110	350,4
120	267,1



Temperature Sensor NTC M6

Temperature range: 0 ... 200°C

A miniature M6 x 1 NTC sensor for fast response temperature measurement. It is manufactured in a DR-25 sleeve, various connector options are available.



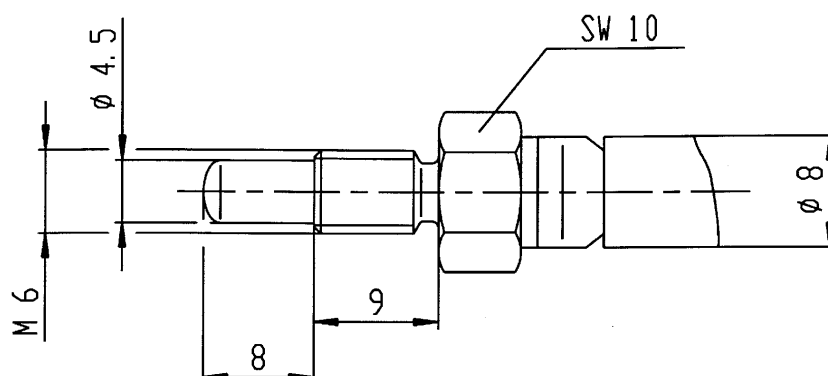
Mechanical data	
Thread	M6 x 1
Tightening torque	3 Nm
Wrench size	10 mm
Sealing	Viton 4,47 x 1, 78
Weight	45 g

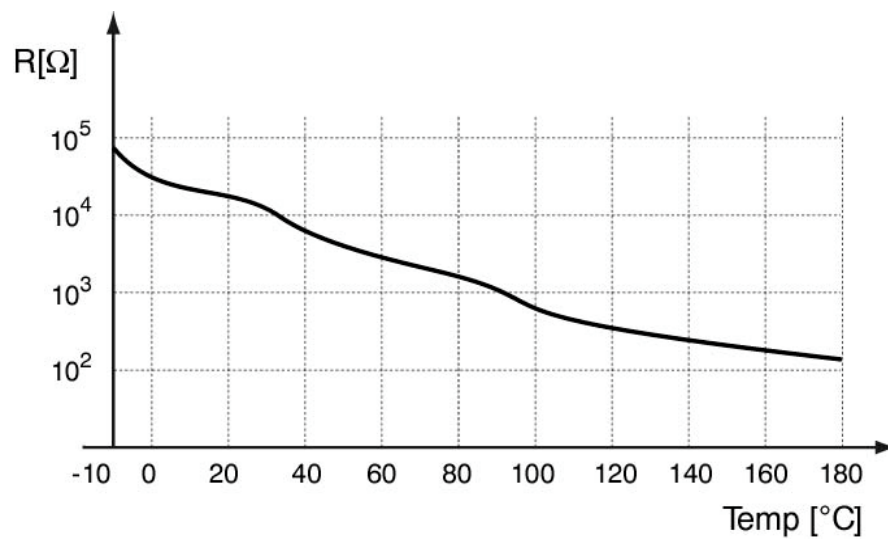
Conditions for use	
Temperature range	-30 ... 200°C
Vibration	80 g/5 ... 500 Hz

Characteristic	
NTC 15 kΩ	

Electronic data	
Nominal resistance	15 kΩ/25°C
Measuring range	0 ... 200°C
Accuracy	± 1,0 K
Response time 90 %	< 7 s

Order numbers	
KPTA 6E6-4P-C-DN	B 261 209 172
Offer drawing	A 261 209 172
ASL 6-06-05PN-HE	B 261 209 386
Offer drawing	A 261 209 386





°C	R(Ω)
-10	83317,5
0	49254,0
10	29959,5
20	18732,0
30	12012,0
40	7893,0
50	6651,0
60	5356,5
70	2544,0
80	1804,5

°C	R(Ω)
90	1305,5
100	945,0
110	703,5
120	526,5
130	400,5
140	309,0
150	240,0
160	187,5
170	148,5
180	120,0

Temperature Sensor NTC M8

Temperature range: 0 ... 200°C

This standard fluid temperature sensor combines temperature response with fine mechanical properties. It is manufactured in a DR-25 sleeve, various connector options are available.



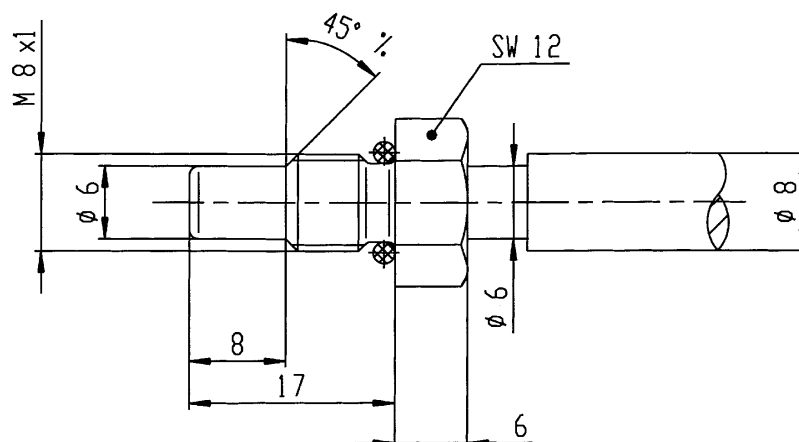
Mechanical data	
Thread	M8 x 1
Tightening torque	3 Nm
Wrench size	12 mm
Sealing	Viton 7,65 x 1, 63
Weight	45 g

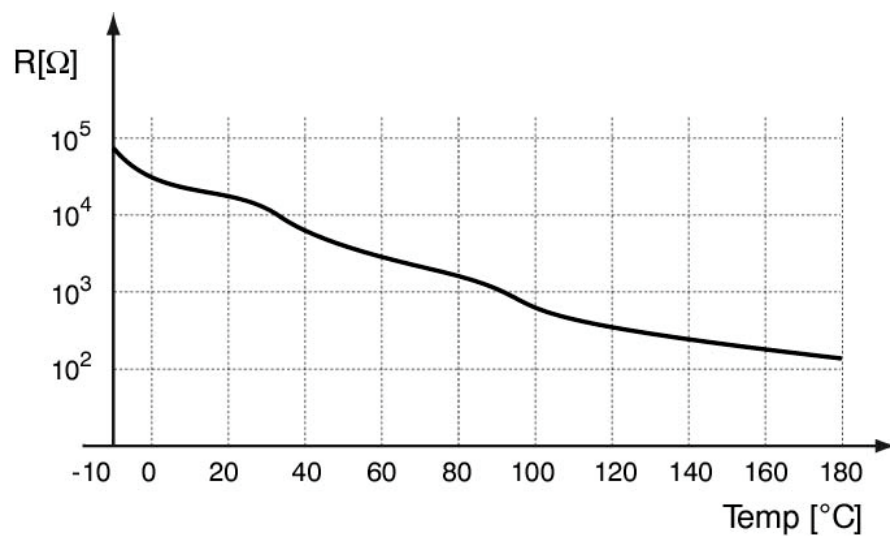
Conditions for use	
Temperature range	-30 ... 200°C
Vibration	80 g/5 ... 500 Hz

Characteristic	
NTC 15 kΩ	

Electronic data	
Nominal resistance	15 kΩ/25°C
Measuring range	0 ... 200°C
Accuracy	± 1,0 K
Response time 90 %	< 10 s

Order numbers	
KPSE 6E8-33P-DN	B 261 209 167
Offer drawing	A 261 209 167
KPSE 6E8-3AP-DN	B 261 209 173
Offer drawing	A 261 209 173
ASL 6-06-05PN-HE	B 261 209 384
Offer drawing	A 261 209 384
Without connector	B 261 209 176
Offer drawing	A 261 209 176





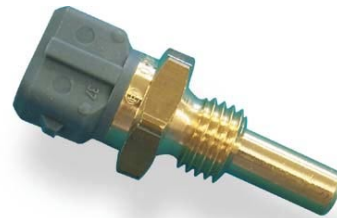
°C	R(Ω)
-10	83317,5
0	49254,0
10	29959,5
20	18732,0
30	12012,0
40	7893,0
50	5356,5
60	6651,0
70	2544,0
80	1804,5

°C	R(Ω)
90	1305,5
100	945,0
110	703,5
120	526,5
130	400,5
140	309,0
150	240,0
160	187,5
170	148,5
180	120,0

Temperature Sensor NTC M12

Temperature range: -30 ... 130°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.



General fields of application: oil-, fuel-, water temperature measurement.

Mechanical data	
Thread	M12 x 1,5
Tightening torque	25 Nm
Wrench size	19 mm
Weight	30 g

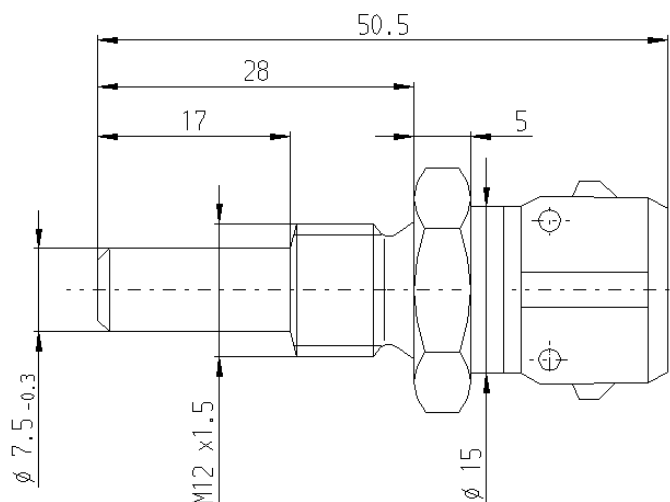
Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-30 ... 130°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

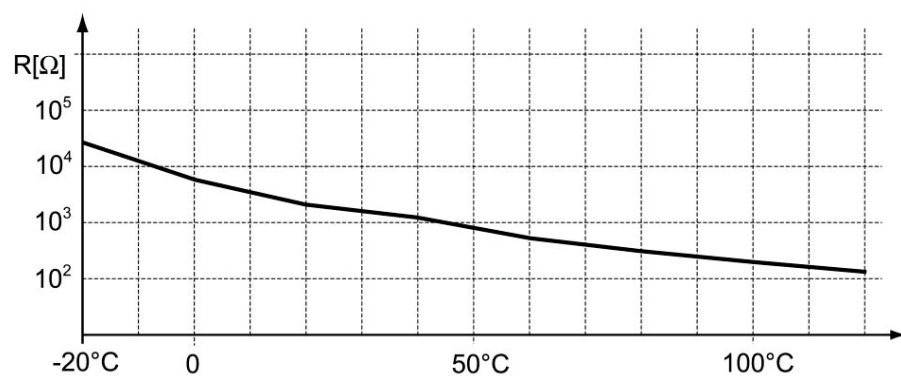
Conditions for use	
Temperature range	-30 ... 130°C
Vibration	60 g/5 ... 250 Hz

Connector	
Cable harness connector	1 284 485 198

Characteristic	
NTC 2,5 kΩ	

Order numbers	
1 284 485 198	0 280 130 026
KPSE 6E8-33P-DN	B 261 209 160
Offer drawing	A 261 209 160





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor NTC M12-H

Temperature range: -40 ... 150°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.



General fields of application: oil-, fuel-, water temperature measurement.

Mechanical data	
Thread	M12 x 1,5
Tightening torque	18 Nm
Wrench size	19 mm
Weight	30 g

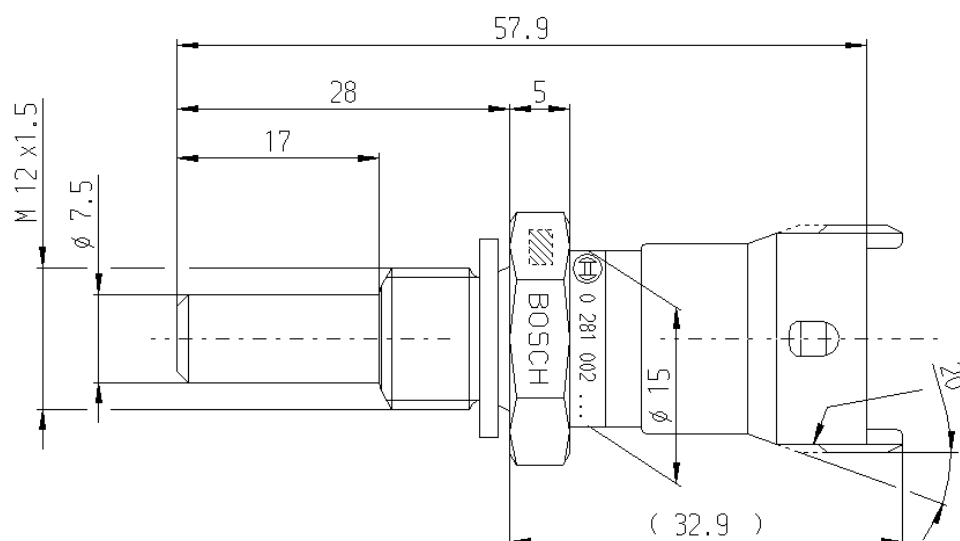
Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-40 ... +150°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

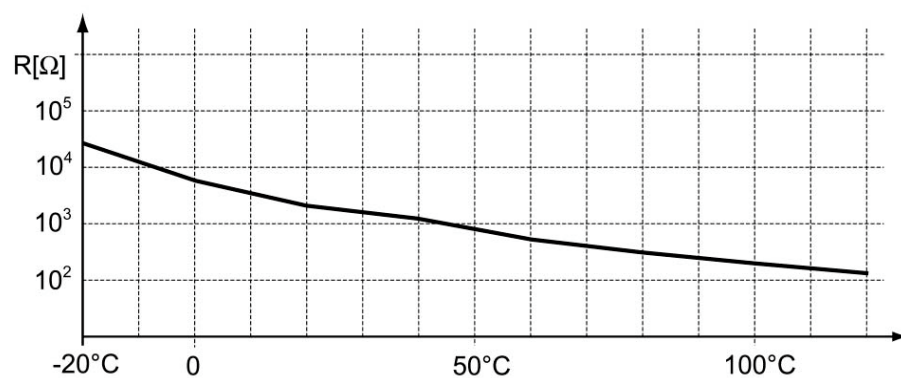
Conditions for use	
Temperature range	-40 ... 150°C
Vibration	30 g/5 ... 250 Hz

Connector	
Cable harness connector	1 928 403 137

Characteristic	
NTC 2,5 kΩ	

Order number	
	0 281 002 170
Offer drawing	A 280 130 110





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor NTC M12-L

Temperature range: -30 ... 130°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.



General fields of application: oil-, fuel-, air temperature measurement

Mechanical data	
Thread	M12 x 1,5
Tightening torque	15 Nm
Wrench size	19 mm
Weight	26 g

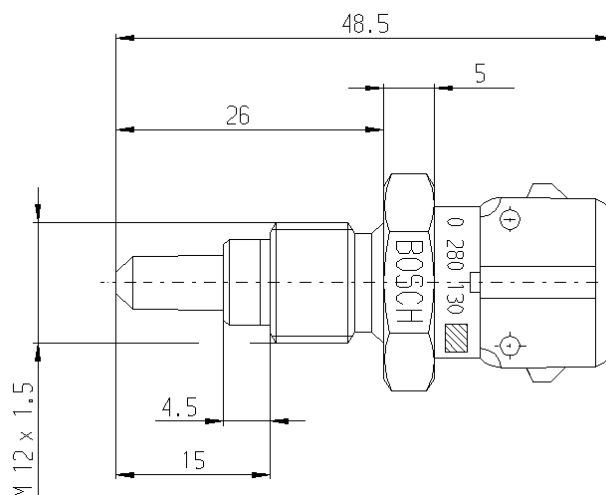
Conditions for use	
Temperature range	-30 ... 130°C
Vibration	60 g/50 ... 250 Hz

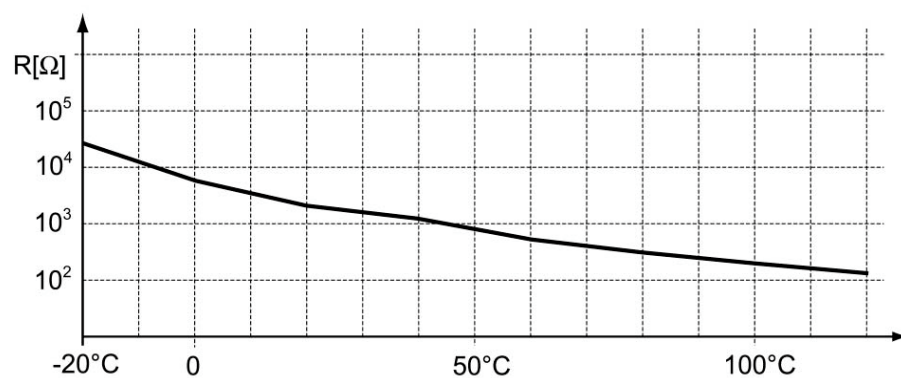
Characteristic	
NTC 2,5 kΩ	

Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-30 ... 130°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

Connector	
Cable harness connector	1 284 485 143

Order number	
	0 280 130 039
Offer drawing	A 280 130 206





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor PT100 M14

Temperature range: -50 ... 300°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low cost connection for automotive applications.



Mechanical data	
Thread	M14 x 1,5
Tightening torque	15 Nm
Wrench size	19 mm
Weight	25 g

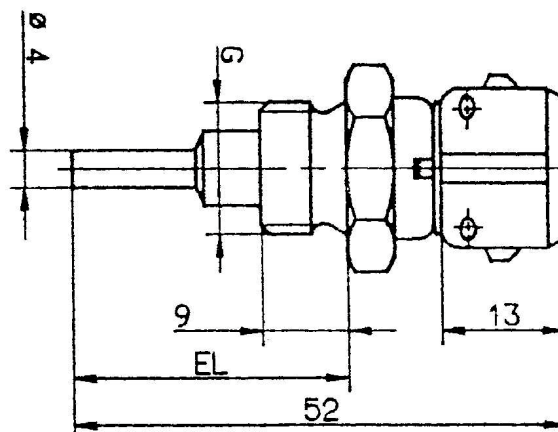
Electronic data	
Nominal resistance	100 Ω /0°C
Measuring range	-50 ... 300°C
Accuracy	$\pm 3,0$ K
Response time 90 %	< 10 s

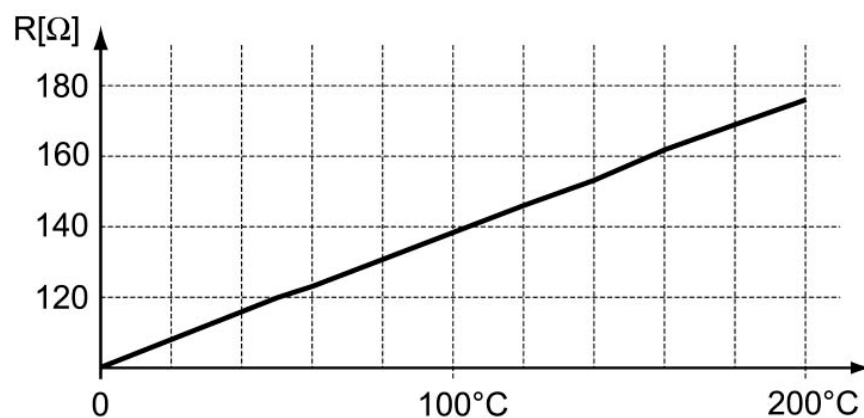
Conditions for use	
Temperature range	-50 ... 300°C
Vibration	40 g/5Hz ... 2kHz

Connector	
Cable harness connector	1 284 485 143

Characteristic	
PT 100 DIN/IEC 751	

Order number	
	B 261 209 174
Offer drawing	A 261 209 174





°C	R(Ω)
0	100,00
10	103,90
20	107,79
30	111,67
40	115,54
50	119,40
60	123,24
70	127,07
80	130,89
90	134,70
100	138,50

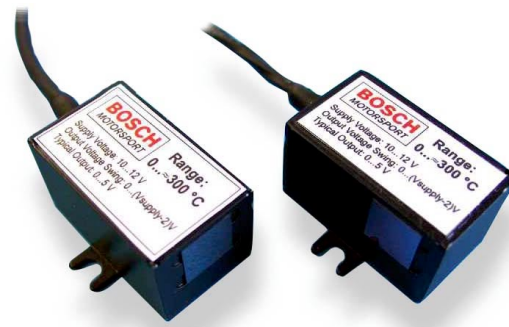
°C	R(Ω)
110	142,29
120	146,06
130	149,82
140	153,58
150	157,31
160	161,04
170	164,76
180	168,46
190	172,16
200	175,84

Temperature Sensors Infrared

Temperature Sensor TI 300

Temperature range: up to 300°C

This measurement system is used for the non-contact measurement of surface temperatures e.g. of tyres or brake discs based on IR-radiation. The sensor is integrated in an ambient temperature compensated module with mirror optics and additional IR-window in protection against contamination and condensation. Various connector options are available.

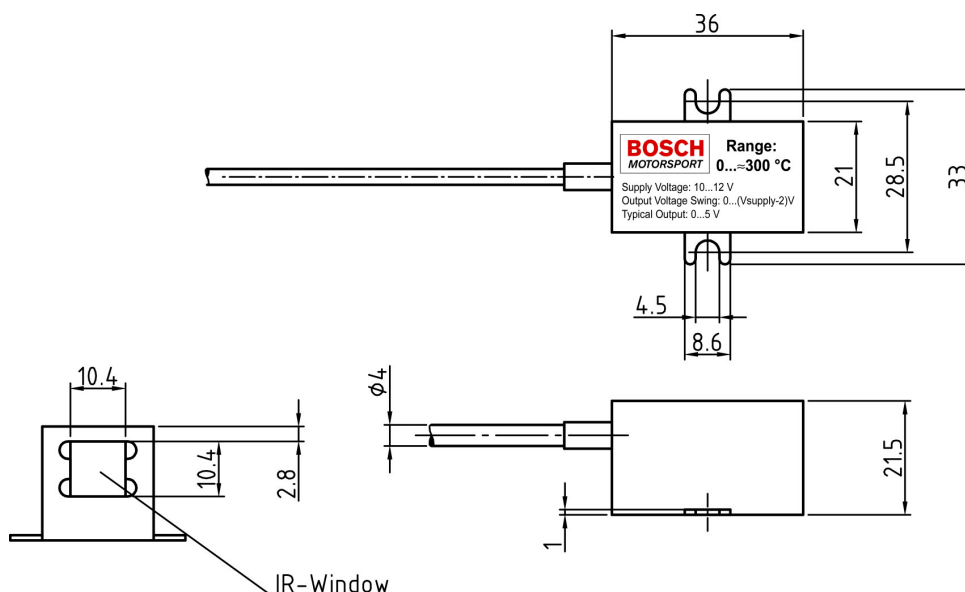


Mechanical data	
Dimensions	20 x 21 x 36 mm
Length L	100 ... 1500 mm
Weight	51 g

Electronic data	
Power supply	10 ... 12 V
Input current	2,5 mA
Output voltage swing	0 ... (Vsupply - 2) V
Typical output	0 ... 5 V
Response time	20 ms

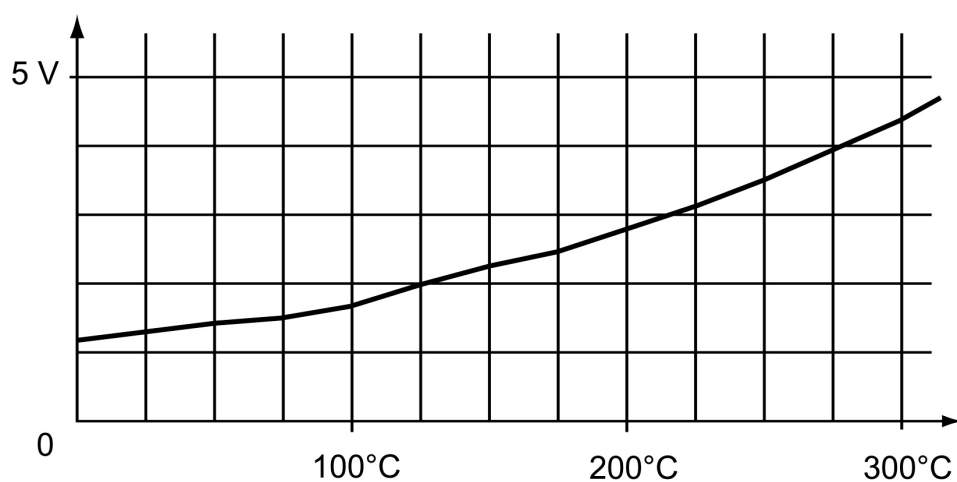
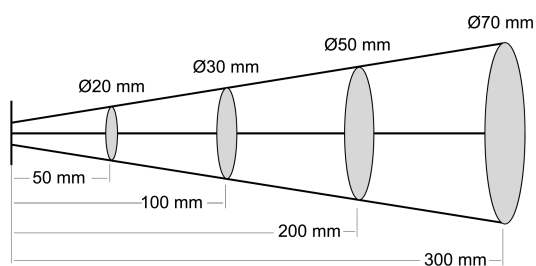
Conditions for use	
Temperature range	-20 ... 300°C
Field of view	± 3°

Order numbers	
Front view:	
ASL 6-06-05PN-HE	B 261 209 388
Offer drawing	A 261 209 388
Right view:	
ASL 6-06-05PN-HE	B 261 209 389
Offer drawing	A 261 209 389



Working area (Example)

Spot size of the sensor for 90 % of irradiance from field view:



Tobject°C	Vout
-20	1,176
0	1,232
20	1,303
25	1,323
40	1,390
60	1,497
80	1,622
100	1,768
120	1,935

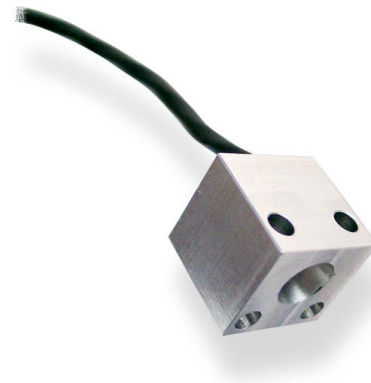
Tobject°C	Vout
140	2,123
160	2,332
180	2,562
200	2,813
220	3,085
240	3,377
260	3,689
280	4,021
300	4,371

Temperature Sensor TI-C

Temperature range: up to 150°C / up to 900°C

The TI-C is a non-contact infrared temperature sensor that enables mechanics and technicians to monitor critical temperatures for maximum racing performance and safety. Inaccessible, moving or unsafe objects can be measured easily and very fast. It is commonly used for monitoring tire, track, cylinder head and other temperatures.

Infrared temperature sensors absorb ambient infrared radiation given off by a heated surface. The incoming light is converted to an electric signal, which corresponds to a particular temperature.



Mechanical data	
Dimensions	20 x 18,8 x 20 mm
Weight	20 g

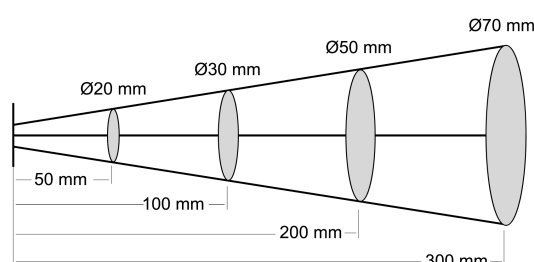
Electronic data	
Power supply	5 V
Input current	2 mA
Output voltage swing	0,25 V
Response time	150 ms

Conditions for use	
Temperature range TI-C 150	-25 ... 150°C
Temperature range TI-C 900	-25 ... 900°C
Field of view	±3,5°

Connector	
Cable harness connector	ASL 6-06-05-PN-HE

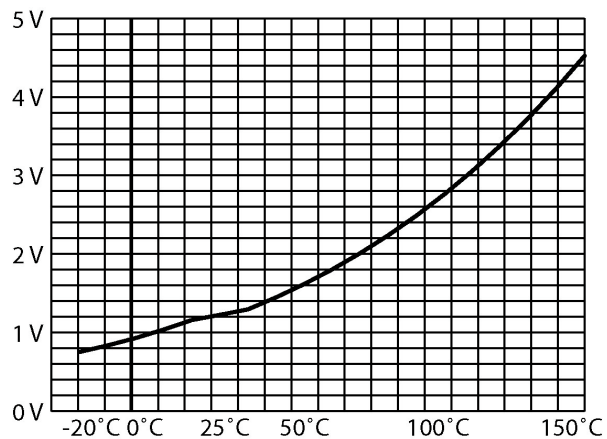
Order numbers	
TI-C 150	B 261 209 827
TI-C 900	on request
Offer drawing	A 261 209 827

Working area (Example)	
Spot size of the sensor for 90 % of irradiance from field view:	

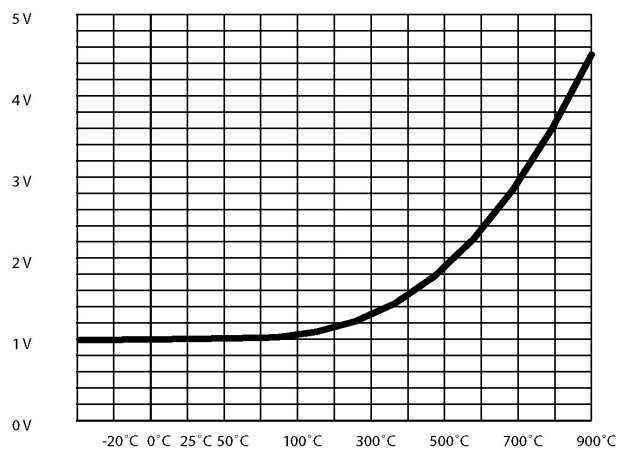


Characteristic TI-C 150

Tobject°C	Vout
-20	0,753
-10	0,836
0	0,930
10	1,038
20	1,159
25	1,225
30	1,295
40	1,447
50	1,616
60	1,803
70	2,010
80	2,238
90	2,487
100	2,760
110	3,058
120	3,382
130	3,733
140	4,113
150	4,524


Characteristic TI-C 900

Tobject°C	Vout
-20	0,991
0	0,995
25	1,000
50	1,006
75	1,014
100	1,024
200	1,091
300	1,221
400	1,440
500	1,772
600	2,234
700	2,839
800	3,596
900	4,505



Temperature Sensor TI-S

Temperature range: up to 150°C

The TI-S is a non-contact infrared temperature sensor that enables mechanics and technicians to monitor critical temperatures for maximum racing performance and safety. Inaccessible, moving or unsafe objects can be measured easily and very fast. It is commonly used for monitoring tire, track, cylinder head and other temperatures.

Infrared temperature sensors absorb ambient infrared radiation given off by a heated surface. The incoming light is converted to an electric signal, which corresponds to a particular temperature.



Mechanical data	
Dimensions	M 12x1, SW 15
Length	24 mm
Weight	10 g

Electronic data	
Power supply	5 V
Input current	2 mA
Output voltage swing	0,25 V
Response time	150 ms

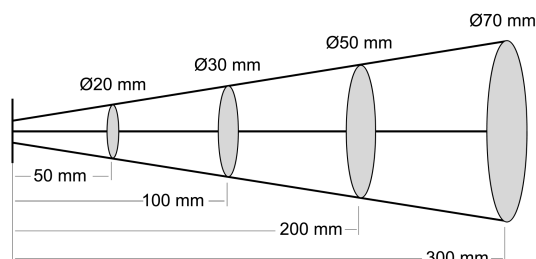
Conditions for use	
Temperature range	-25 ... 100°C
Field of view	±3,5°

Connector	
Cable harness connector	ASL 6-06-05-PN-HE

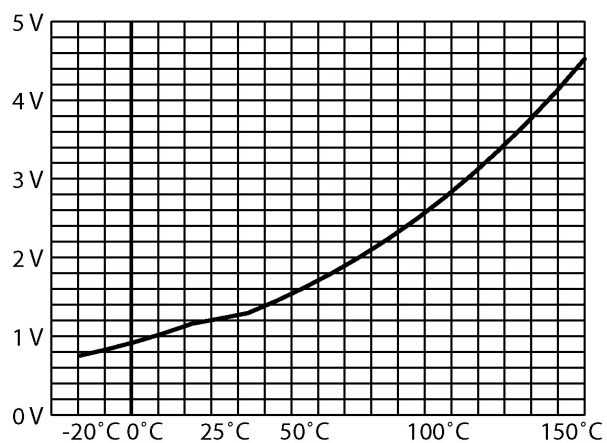
Order number	
	B 261 209 826
Offer drawing	B 261 209 826

Working area (Example)

Spot size of the sensor for 90 % of irradiance from field view:



Tobject°C	Vout
-20	0,753
-10	0,836
0	0,930
10	1,038
20	1,159
25	1,225
30	1,295
40	1,447
50	1,616
60	1,803
70	2,010
80	2,238
90	2,487
100	2,760
110	3,058
120	3,382
130	3,733
140	4,113
150	4,524



Thermocouple Probes

Thermocouple Probe TCP-K

Temperature range: 32 ... 1300°C

A flexible K-type thermocouple for measuring exhaust-gas temperatures. The installation fitting allows an adjustable gas-tight mounting at the exhaust pipe. It is manufactured in a DR-25 sleeve, various connector options are available. The sensor length can be modified on request.



Mechanical data	
Thread	M8 x 1
Tightening torque	12 Nm
Wrench size	13 mm
Weight	18 g

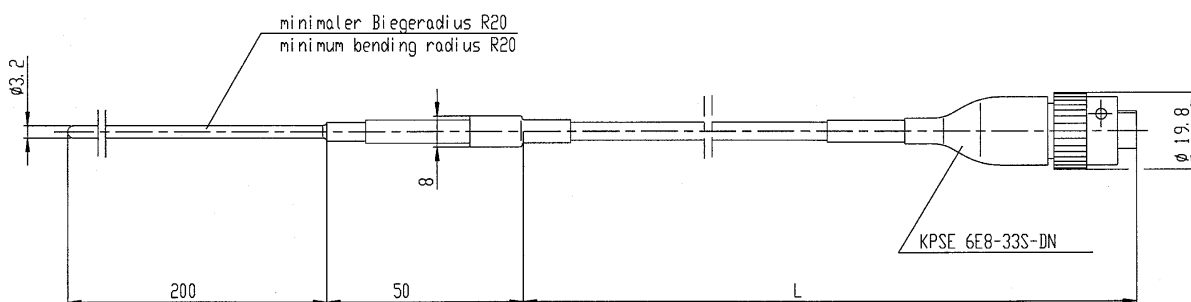
Cutting ring	
Tightening torque	2,5 Nm
Wrench size	11 mm

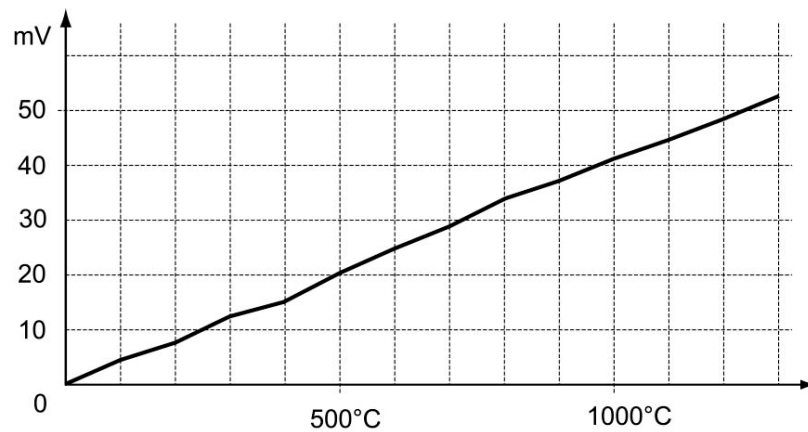
Electronic data	
Thermocouple	NiCr-Ni

Characteristic	
DIN IEC 584	

Sensor data	
Vibration	80 g/5 ... 500 Hz
Length L	150 ... 740 mm
Weight	60 g

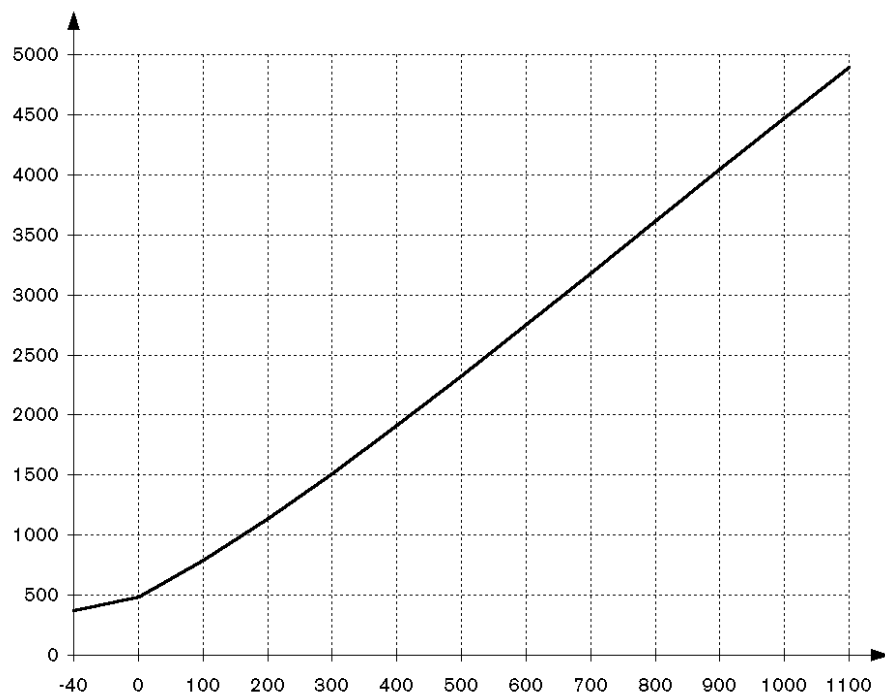
Order numbers	
KPTA 6E6-4SW-C-DN	B 261 209 169
Offer drawing	A 261 209 169
ASL 6-06-98PN	B 261 209 179
Offer drawing	A 261 209 179
ASL 6-06-05PD-HE	B 261 209 385
Offer drawing	A 261 209 385
Installation fitting	B 261 209 159
Offer drawing	A 261 209 159





Input °C	Output mV
0	0
100	4,095
200	8,137
300	12,207
400	16,395
500	20,640
600	24,902

Input °C	Output mV
700	29,128
800	33,277
900	37,325
1000	41,269
1100	45,108
1200	48,828
1300	52,398



Input °C	Output mV
-40	372
0	485
100	790
200	1135
300	1513
400	1912
500	2327

Input °C	Output mV
600	2752
700	3183
800	3615
900	4046
1000	4473
1100	4845

Speed Sensors Inductive

Inductive Speed Sensor IA

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

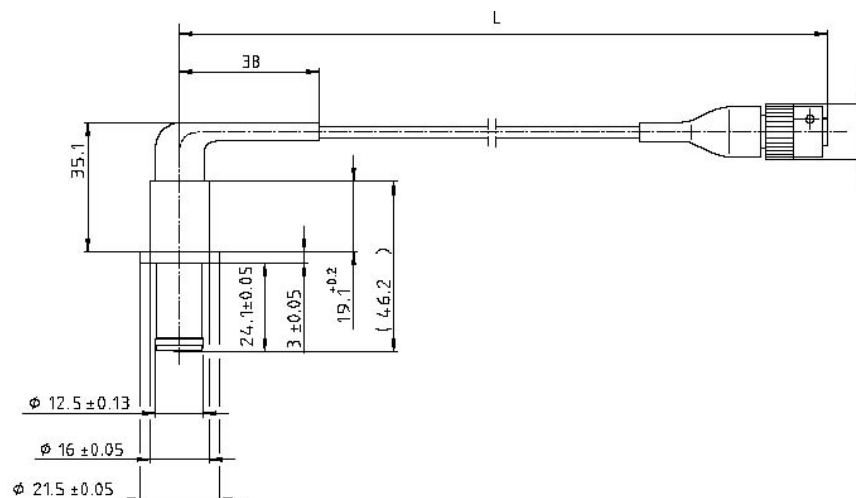


Mechanical data	
Magnetic pole	round
Drill diameter	12,9 mm
Tightening torque	8 Nm
Weight	70 g
Installation depth L2	13,2/24,1/32,2/41,5 mm

Conditions for use	
Temperature range	-40 ... 230°C
Vibration	80 g/max. 80 h

Electronic data	
Electrical strength	1200 V/max. 3 sec.
Resistance	$R_i = 1200 \Omega$
Inductance	max. 400 mH

Order numbers	
L2: 24, 1 mm	
KPTA 6E6-4SW-C-DN	B 261 209 500
Offer drawing	A 261 209 500
KPSE 6E8-3AS-DN	B 261 209 023
Offer drawing	A 261 209 023
L2: 32,2 mm	
ASL 6-06-05SN-HE	B 261 209 519
Offer drawing	A 261 209 519
KPSE 6E8-3AS-DN	B 261 209 022
Offer drawing	A 261 209 022



Inductive Speed Sensor IA-C

This sensor is designed for incremental measurement of revolutions at engine applications.



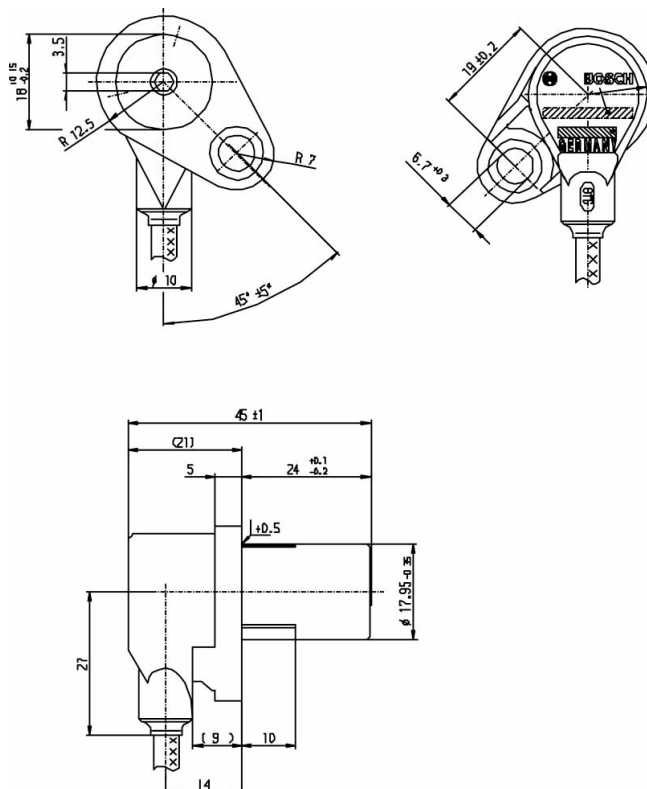
Mechanical data	
Magnetic pole	round
Fixing	M6 x 12
Length	510 mm
Tightening torque	8 Nm
Weight	80 g
Installation depth	24 mm

Electronic data	
Resistance	860 Ω /20° $\pm$ 10 %
Inductance	370 $\pm$ 60 mH/1 kHz

Connector	
Cable harness connector	1 928 402 868

Conditions for use	
Temperature range	-40 ... 130°C
Vibration	80 g/max. 80 h

Order number	
	0 261 210 136
Offer drawing	A 265 461 845



Inductive Speed Sensor IS

This sensor is designed for incremental measurements of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

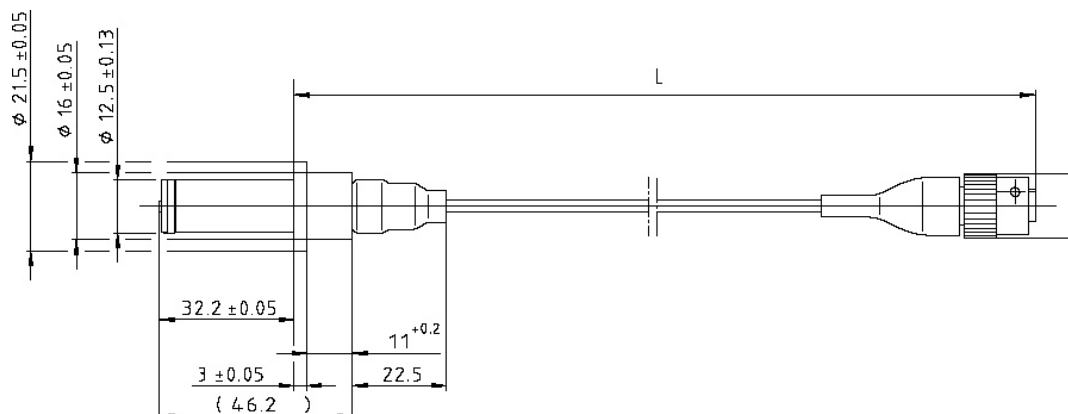


Mechanical data	
Magnetic pole	round
Drill hole	12,9 mm
Tightening torque	8 Nm
Weight	70 g
Installation depth L2	13,2/24,1/32,2 mm

Conditions for use	
Temperature range	-40 ... 230°C
Vibration	80 g/max. 80 h

Electronic data	
Electrical strength	1200 V/max. 3 sec.
Resistance	$R_i = 1200 \Omega$
Inductance	max. 400 mH

Order numbers	
L2: 24,1 mm	
KPTA 6E6-4SW-C-DN	B 261 209 509
Offer drawing	A 261 209 509
L2: 32,2 mm	
ASL 6-06-05SN-HE	B 261 209 517
Offer drawing	A 261 209 517
KPTA 6E6-4SW-C-DN	B 261 209 501
Offer drawing	A 261 209 501
KPSE 6E8-3AS-DN	B 261 209 021
Offer drawing	A 261 209 021



Inductive Speed Sensor IS-C

This sensor is designed for incremental measurement of revolutions at chassis applications. We manufacture one version with a metric thread and a second version with an inch thread. The sensor is available in a DR-25 sleeve with various connector options.

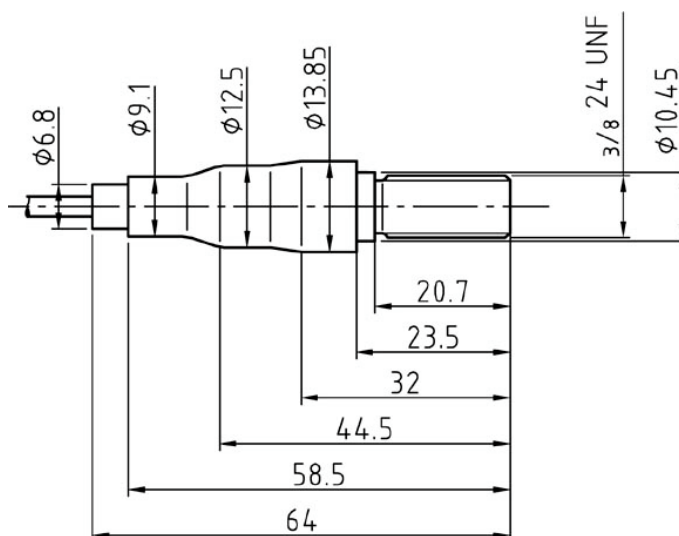


Mechanical data	
Magnetic pole	round
Drill hole	M10 x 1
or	3/8-24 UNF-2A THD
Mounting torque	10 Nm (7.3 ft-lb) maximum
Weight	16 g

Conditions for use	
Temperature range	-40 ... 150°C

Electronic data	
Resistance	$R_i = 340 \, \Omega \pm 20 \, \%$
Inductance	$64 \, \text{mH} \pm 20 \, \%$

Order numbers	
ASL 6-06-05 SN-HE	
M10 x 1	B 261 209 617
3/8-24 UNF-2A THD	B 261 209 609



Inductive Speed Sensor IS-T

This sensor is designed for incremental measurements of revolutions at turbochargers. It is available in a DR-25 sleeve with various connector options.



Mechanical data	
Magnetic pole	round
Fixing	not defined
Drill diameter	250-40UNS-2ATHD
Length	150 ... 600 mm
Wrench size	8 mm
Tightening torque	1,4 Nm
Weight	14 g
Air gap	0,5 mm, 2 k Ω load, 0,75 V pk-pk

Conditions for use	
Temperature range	-54 ... 230°C

Electronic data	
Resistance	140 ... 190 Ω
Inductivity	2,6 mH (typical)

Order number	
ASL 6-06-05SN-HE	B 261 209 662
Offer drawing	A 261 209 662

Speed Sensors Hall-effect / magneto.

Speed Sensor HA

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options.

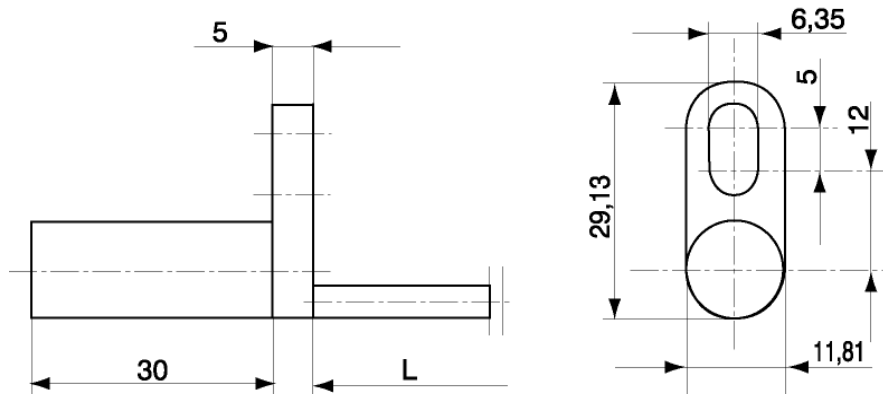


Mechanical data	
Fixing	M6
Drill hole	11,8 mm
Max. distance	1,52 mm
Tightening torque	6 Nm
Weight	70 g

Conditions for use	
Temperature range	-40 ... 150°C
Vibration	100 g/10 Hz ... 2 kHz

Electronic data	
Power supply	4,5 ... 24 V
Input current	10 mA typ., 20 mA max.
Signal output (active)	0,4 V max.
Output current	20 mA max.

Order numbers	
KPTC 6E8-3P-C-DN	B 261 209 046
Offer drawing	A 261 209 046
KPTA 6E6-4P-C-DN	B 261 209 552
Offer drawing	A 261 209 552



Speed Sensor HA-P

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications.



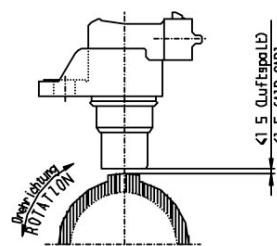
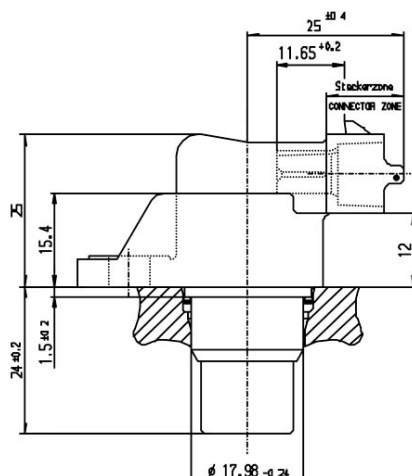
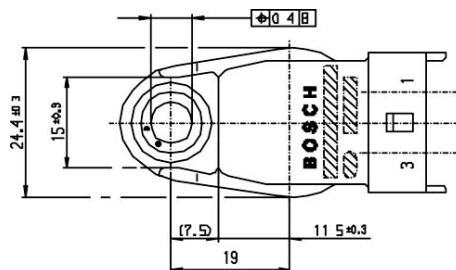
Mechanical data	
Fixing	M6
Drill hole	18 mm
Max. distance	1,52 mm
Tightening torque	6 Nm
Weight	70 g
Installation dimensions	30 mm

Conditions for use	
Temperature range	-30 ... 130°C
Vibration	100 g/10 Hz ... 2 kHz
Air gap	max. 1,5 mm

Electronic data	
Power supply	4,5 ... 24 V
Input current	10 mA typ., 20 mA max.
Signal output (active)	0,4 V max.
Output current	20 mA max.

Connector	
Cable harness connector	1 928 403 110

Order number	
	0 232 103 022
Offer drawing	A 232 090 314



Speed Sensor MA-A/B/C/D

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options.



Mechanical data

Fixing	M6
Drill hole	11,8 mm
Max. distance	1,2 mm
Tightening torque	6 Nm
Weight	12 g

Conditions for use

Temperature range	-40 ... 120°C
Vibration	300 g/200 ... 500 Hz

Please notice

Stray magnetic fields have an influence on the switching behaviour of the sensor element.

Direction of squarewave depends both on design and mounting position of the sensor.

Electronic data

Power supply	5 ... 10 V
Input current	7,5 mA
Signal output high level	> 4,25 V
Signal output low level	< 0,2 V

Order numbers

MA-A

ASL 6-06-05PC-HE high active	B 261 209 556
Offer drawing	A 261 209 556
KPTA 6E6 4P-C-DN high active	B 261 209 680
Offer drawing	A 261 209 680

MA-B

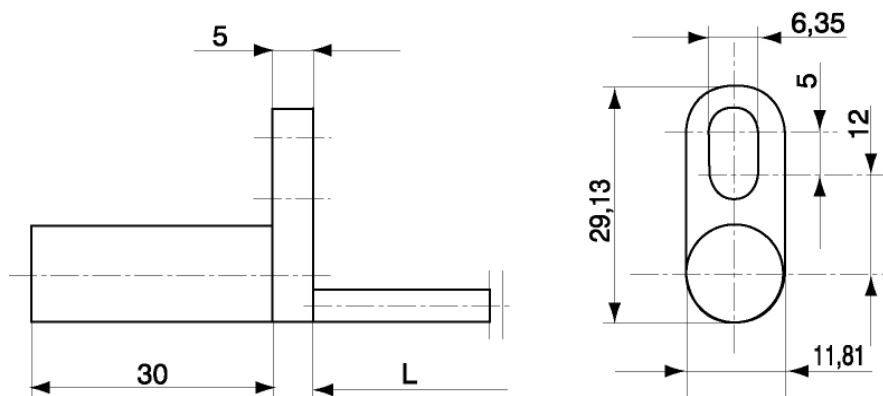
ASL 6-06-05PC-HE low active	B 261 209 559
Offer drawing	A 261 209 559

MA-C

ASL 6-06-05PC-HE high active	B 261 209 681
Offer drawing	A 261 209 681

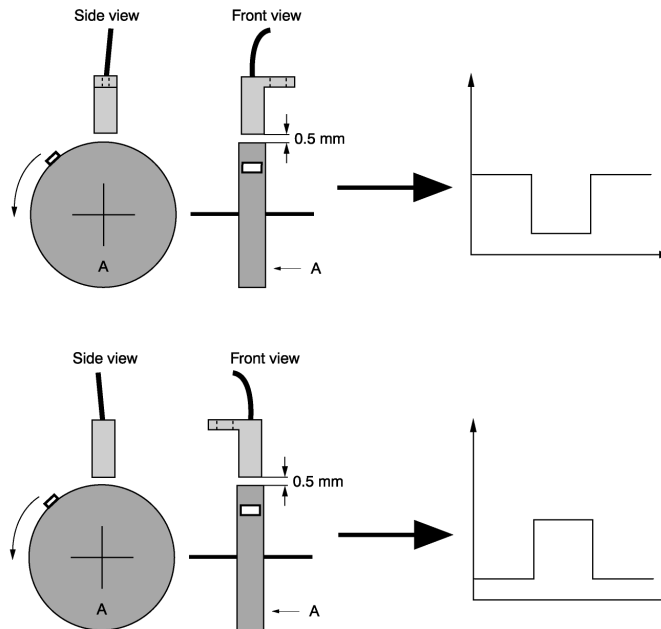
MA-D

ASL 6-06-05PC-HE high active	B 261 209 682
Offer drawing	A 261 209 682

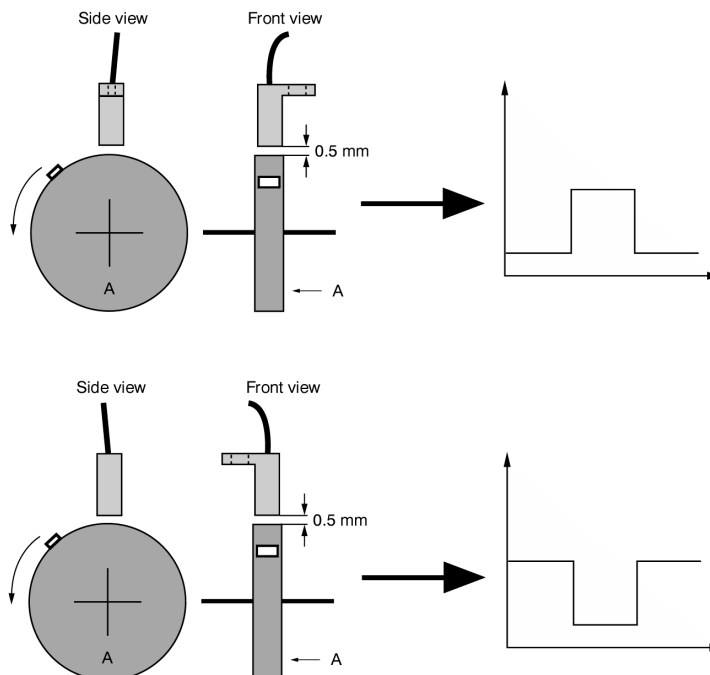


Influence of mounting position on signal shape

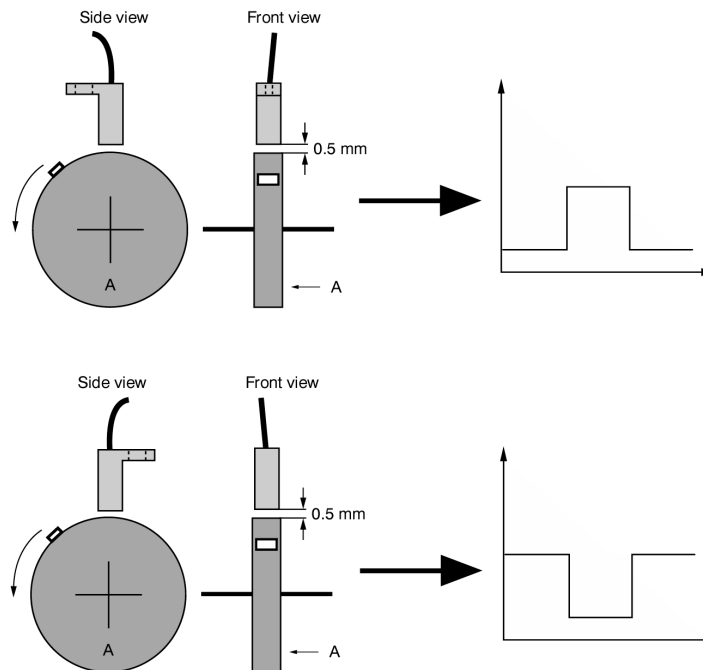
Speed sensor MA-A



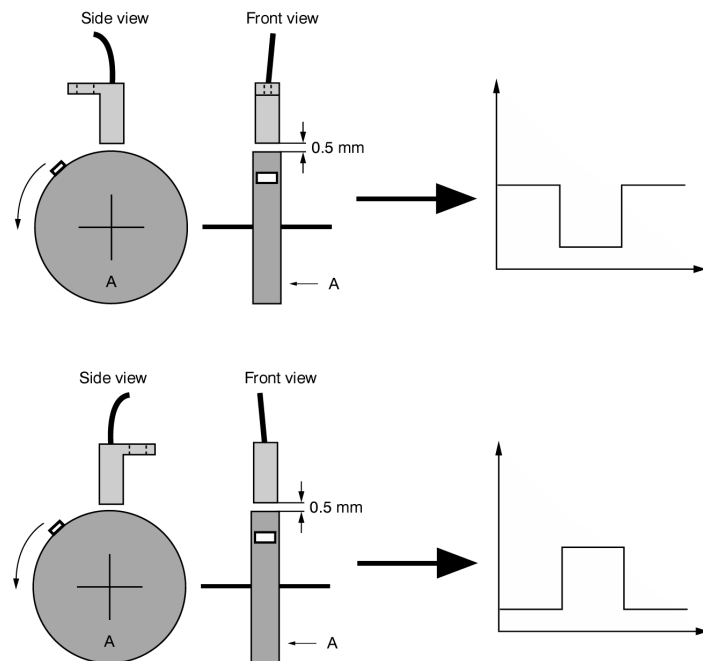
Speed sensor MA-B



Speed sensor MA-C



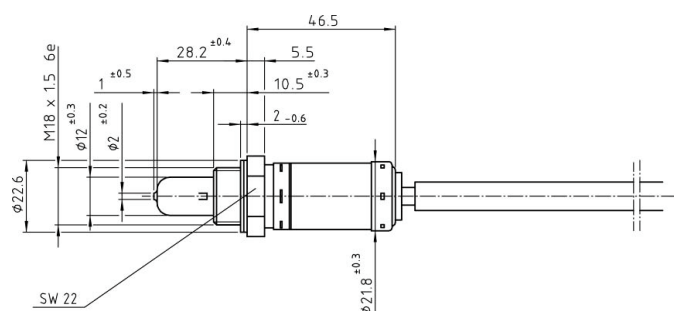
Speed sensor MA-D



Lambda Sensor LSM 11



	0 258 104 002
Offer drawing	A 258 104 002



A lambda LSM 11 standard production sensor, manufactured in a DR-25 sleeve, various connector options are available.



Length	250 ... 1390 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	160 g
Vibration	30 g/5 Hz ... 2 kHz

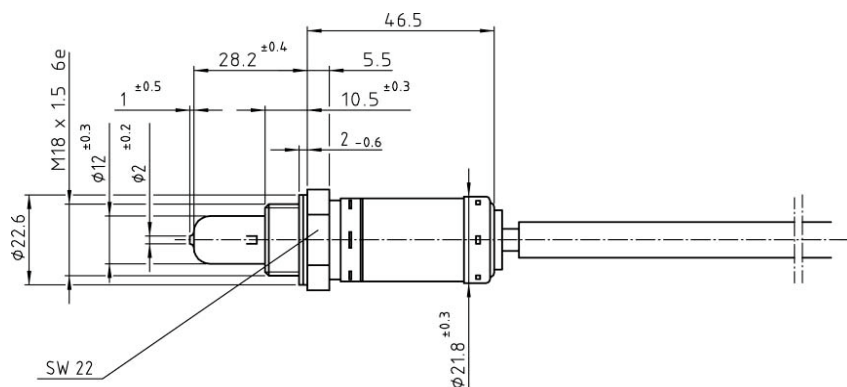
Sulphur (weight)	0,2 %
Lead	0,6 g/l

Ceramic tip	250 ... 800°C
Hexagon nut	< 570°C
Cable duct	< 250°C
Connector	< 130°C

Heater supply voltage	12 ... 14 V
Heater power	18 W
Sensor element	ZrO ₂ (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,68 ... 1,32
Accuracy at lambda < 1	< 1,5 %

Please observe the installation instructions on page 82.

KPTC 6E8-4P-C-DN	B 261 209 105
Offer drawing	A 261 209 105



An individually selected wide-band LSM 11 lambda sensor. It is specially modified for motorsport use, manufactured in a Viton sleeve. Various connector options are available.



Length	250 ... 1390 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	160 g
Vibration	70 g/5 Hz ... 2 kHz

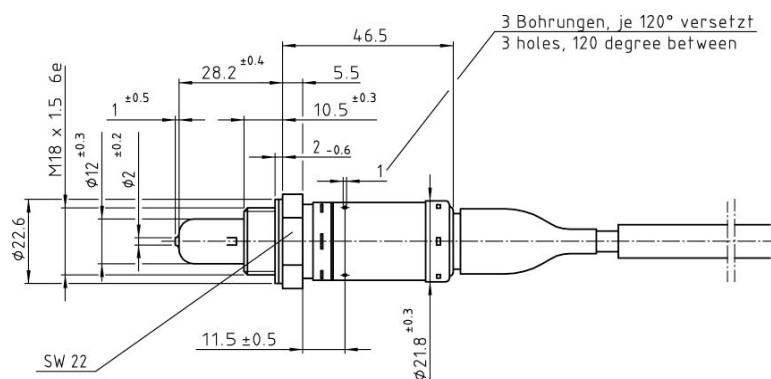
Sulphur (weight)	0,2 %
Lead	0,6 g/l

Ceramic tip	250 ... 850°C
Hexagon nut	< 570°C
Cable duct	< 250°C
Connector	< 130°C

Heater supply voltage	12 ... 14 V
Heater power	18 W
Sensor element	ZrO ₂ (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,68 ... 1,32
Accuracy at lambda < 1	< 1,5 %

Please observe the installation instructions on page 82.

KPTC 6E8-4P-C-DN	B 261 209 101
Offer drawing	A 261 209 101



Lambda Sensor LSU

The wide-band lambda sensor LSU is a planar ZrO_2 dual cell limiting current sensor with integrated heater. It is used to measure the oxygen content and the lambda value of engine exhaust gases. Its output signal in the range of $\lambda = 0,7$ to air makes the LSU capable to be used as an universal sensor for $\lambda = 1$ measurement as well as for other lambda ranges.

The connector module carries a trimming resistor, which defines the characteristics of the sensor and is necessary for the sensor function. The wide band sensor LSU operates only in conjunction with a special control unit.



Mechanical data

Length L1	460 mm/600 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	120 g
Vibration	30 g/5 Hz ... 2 kHz

Fuel additives

In accordance with DIN EN 228 for commercially available unleaded fuel.

Temperature ranges

Exhaust gas at sensor element	850°C
Hexagon of the sensor housing	< 570°C
Cable grommet (PTFE formed house)	
-Sensor side	< 250°C
-Cable side	< 200°C
Cable and protection sleeve	< 250°C
Connector	< 120°C

Electronic data

Heater supply voltage	9 V
Heater power	10 W
Sensor element	ZrO_2 (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,70 ... ∞

Installation instructions

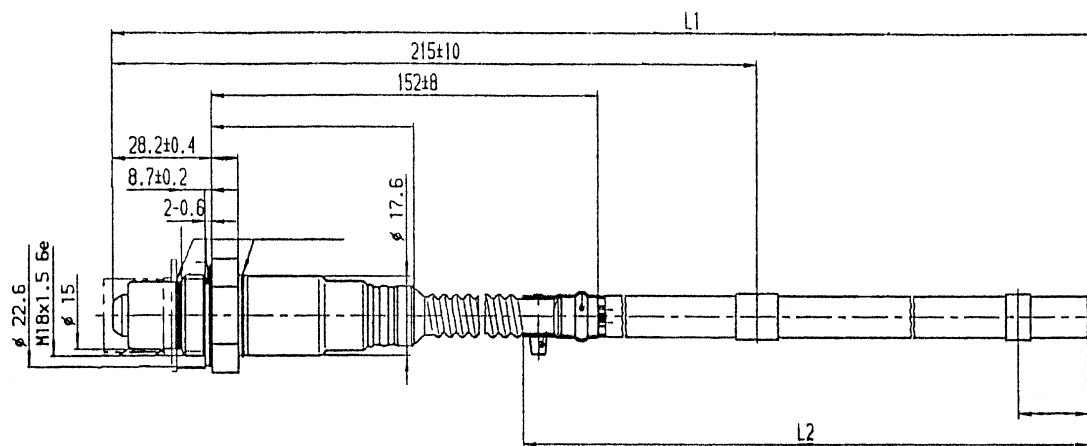
Please observe the installation instructions on page 82.

Connector

Cable harness connector	D 261 205 138
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Order numbers

L1: 460 mm	0 258 006 066
L1: 600 mm	0 258 006 065
Offer drawing	A 258 400 021



Lambda Sensor Mini-LSU 4.9

This wide-band lambda is a planar ZrO_2 dual cell limiting current sensor with integrated heater. It is especially designed for high vibration and ambient temperature applications. Its output signal in the range of $\lambda = 0,7$ to air makes the LSU capable to be used as an universal sensor for $\lambda = 1$ measurement as well as for other lambda ranges.

The connector module carries a trimming resistor, which defines the characteristics of the sensor and is necessary for the sensor function. The wide band sensor LSU operates only in conjunction with a special control unit.



Mechanical data	
Length	60 mm
Thread	M16x1,5
Tightening torque	30 Nm
Wrench size	17 mm
Weight	28 g

Temperature ranges	
Exhaust gas at sensor element	850°C
Hexagon of the sensor housing	< 570°C
Cable grommet cable side	< 310°C permanent < 500°C short time
Cable and protection sleeve	< 250°C
Connector	< 120°C

Electronic data	
Heater supply voltage	7,5 V
Heater power	7,5 W
Sensor element	ZrO_2
Lambda measuring range	0,70 ... ∞

Fuel additives	
In accordance with DIN EN 228 for commercially available unleaded fuel	

Installation instructions	
Please observe the installation instructions on page 82.	

Order numbers	
1 928 404 682 serial connector	B 258 490 103
AS 007-35PN	B 261 209 353

Installation instructions

The Lambda sensor should be installed at a point which permits the measurement of a representative exhaust-gas mixture, and which does not exceed the maximum permissible temperature. The sensor is screwed into a mating thread and tightened with 50 ... 60 Nm.

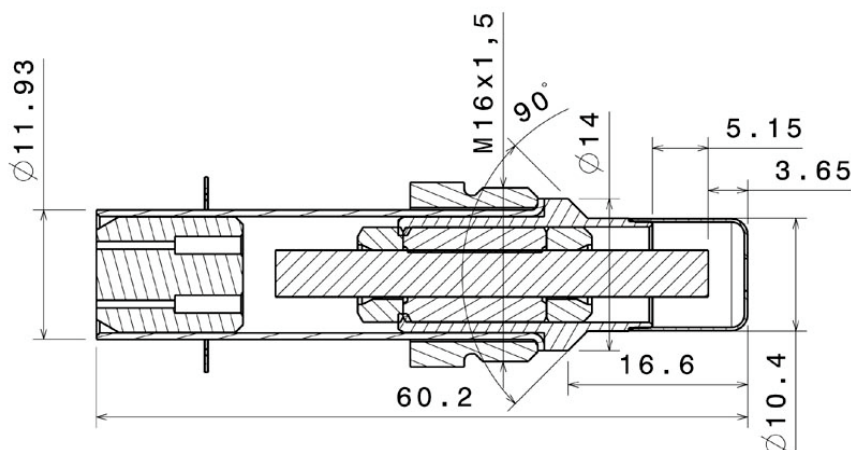
- Install at a point where the gas is as hot as possible.
- Observe the maximum permissible temperatures.
- As far as possible install the sensor vertically, whereby the electrical connections should point upwards.
- The sensor is not to be fitted near to the exhaust outlet so that the influence of the outside air can be ruled out. The exhaust-gas passage opposite the sensor must be free of leaks in order to avoid the effects of leak-air.
- Protect the sensor against condensation water.
- The sensor body must be ventilated from the outside in order to avoid overheating.
- The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Only the recommended grease is to be used for lubricating the threads.

The connection cable must not be soldered. It must only be crimped, clamped, or secured by screws.

Connector Pin out

For connectors 1 928 404 682 and AS 007-35PN

Pin	Name	Description
1	IP	Pump current
2	VM	Virtual ground
3	Gnd heater	Ground for heater
4	Ubat heater	External power supply
5	IA	Pump current
6	UN	Nernst voltage



AWS_LSU 4.9

The AWS_LSU 4.9 is used in combination with the lambda sensor Mini-LSU 4.9. The box supplies two LSU 4.9 lambda probes. It includes two heaters and converts each specific sensor signal into two separate lambda signals. Further more, the temperature of the sensor, the duty cycle of the heater and diagnosis of the probe is available. The signal output is via CAN-message.



Mechanical data	
Weight	80 g
Size	38 x 43 x 16 mm
Cable length	150 mm

Conditions for use	
Operating temperature	10 ... 60°C

Diagnosis	
$\lambda_{\text{Value}} = 0,0069$:	failed sensor (short cut or not connected)
$\lambda_{\text{Value}} = 0,0686$:	probe did not reach 600°C (up to 30 sec)
$\lambda_{\text{Value}} = 0,1373$:	heating periode

Electronic data	
Power supply	5 ... 20V
Rent consumption	120 mA at 12 V + heater current (max. 2 A per probe)
Channels	2 A/F
Resolution	0,01
Sampling rate	100 Hz per channel

CAN-ID
For each probe, the following CAN-IDs will receive the A/F value as **16-bit unsigned Integer** and the heating value and the temperature as **8-bit unsigned byte** (Motorola-type):

CAN -ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x290	A/F1		A/F2		Temp1	Temp2	Heat1	Heat2

$$A/F_{\text{Value}} = 0,001 * A/Fx$$

$$\begin{aligned} \lambda_{\text{Value}} &= A/F_{\text{Value}} / 14,57 \\ &= A/F_{\text{Digits}} / 14570 \\ &= A/F_{\text{Digits}} * 0,00006863418 \end{aligned}$$

$$\text{Heiz-Temp} = \text{Temp}_{\text{Digits}} * 2 + 496,9^{\circ}\text{C}$$

Order number
F 01E B01 622

Knock Sensors

Knock Sensor KS-P

This sensor is designed to measure the structure borne noise resulted from irregular engine combustion. The robust sensor is suitable for use under extreme conditions.



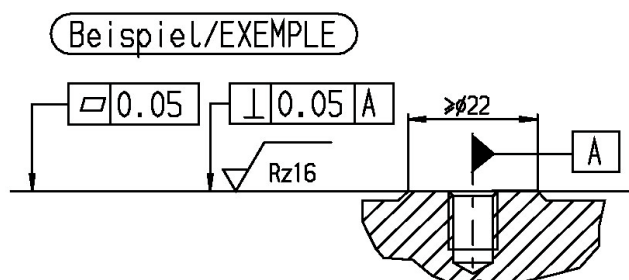
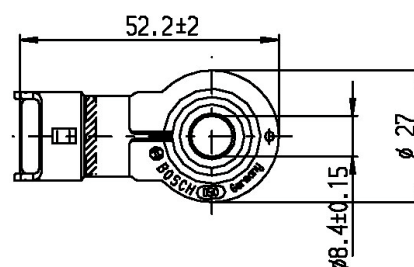
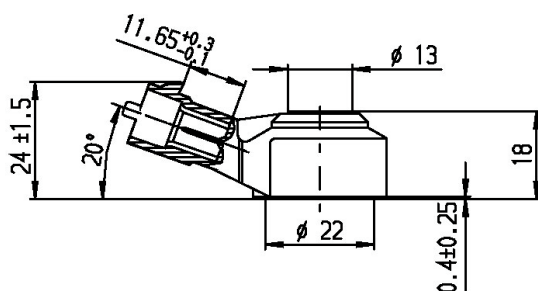
Mechanical data	
Thread	M8 x 30 (aluminium engine block) M8 x 25 (cast iron engine block)
Weight	48 g
Tightening torque	15 ... 25 Nm
Mounting position	random

Conditions for use	
Temperature range	-40 ... 150°C
Vibration, constant	≤ 80 g
Vibration, short	≤ 400 g

Electronic data	
Main resonance frequency	> 20 kHz
Impedance R:	> 1MΩ
C	1100 ± 300 pF
Measuring range	0,1 ... 400 g
Sensitivity at 5 kHz	26 ± 8 mV/g
Range of frequency	1 ... 20 kHz

Connector	
Cable harness connector	1 928 403 137

Order number	
	0 261 231 120
Offer drawing	A 261 230 170



Sensor darf nur auf seinen Metall-
Flächen aufliegen (keine Sicherungs-
scheiben verwenden)
ONLY THE METALLIC PART OF THE
SENSOR MAY HAVE CONTACT WITH THE
ENGINE (NO WASHERS ARE TO BE USED)

Auflagefläche soll rotationssymmetrisch zur Gewindebohrung bearbeitet werden.
THE CONTACT SURFACE MUST BE MACHINED ROTATIONALLY SYMMETRICAL TO THE THREADED BORE.

Knock Sensor KS-R

This sensor is designed for knock detection and control. It is also available in a DR-25 sleeve with various connector options. Other sensors are available on request.



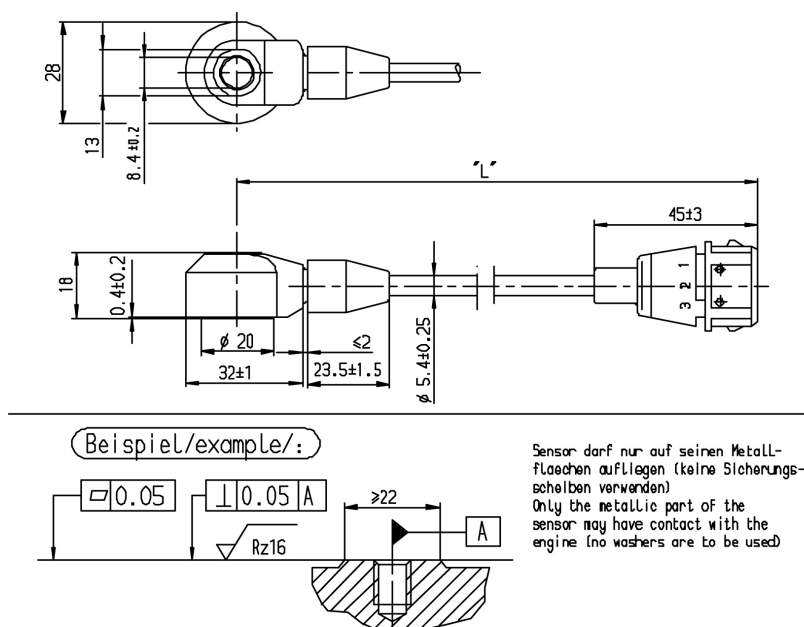
Mechanical data	
Thread	M8 x 30 (aluminium engine block) M8 x 25 (cast iron engine block)
Weight	82 g
Tightening torque	15 ... 25 Nm
Length	100 ... 500 mm

Conditions for use	
Temperature range	-40 ... 180°C

Electronic data	
Main resonance frequency	> 25 kHz
Impedance R:	> 1MΩ
C	1200 ± 400 pF
Measuring range	0,1 ... 400 g
Sensitivity at 5 kHz	26 + 8 - 5 mV/g
Range of frequency	1 ... 20 kHz

Connector	
Cable harness connector	1 284 485 112

Order number	
	0 261 231 047
Offer drawing	A 261 230 073-03



Rotary Potentiometers

Rotary Potentiometer RP 55

Possible range: 55°

This sensor is designed to measure throttle position, chassis data acquisition and more. The sensor is manufactured in an aluminium housing. Various range and connector options are available on request.

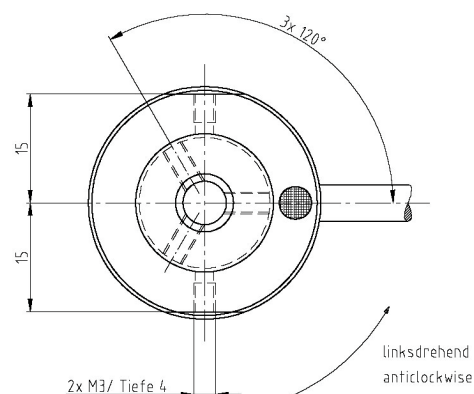
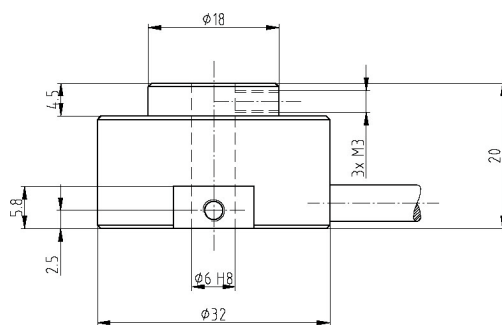


Mechanical data	
Mounting	2 x M3
Standard shaft	6 mm
Length	160 ... 300 mm
Mech. range	360°
Tightening torque	0,5 Nm
Weight	41 g
Life expectancy	> 50 x 10 ⁶ rotations

Electronic data	
Nominal resistance	5 kΩ
Resistance tolerance	20 %
Linearity	± 0,25 %
Temp. coefficient	5 ppm/°C
Max. current	10 mA
Max. power supply	50 V
Usual power supply	5 V

Conditions for use	
Temperature range	-25 ... 75°C
Vibration	10 g/30 ... 500 Hz

Order number	
ASL-6-06-05PA-HE	B 261 209 578
Offer drawing	A 261 209 578



Rotary Potentiometer RP 86

Possible range: 86°

This sensor is designed to measure rotational movement, especially throttle positions. Each sensor is individually laser-calibrated.



Mechanical data

Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	< 86°
Max. rotation speed	120 x 1/min
Tightening torque	1,5 ... 2,5 Nm
Weight	60 g
Life expectancy	> 2 x 10 ⁵ rotations

Electronic data

Nominal resistance	2,5 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use

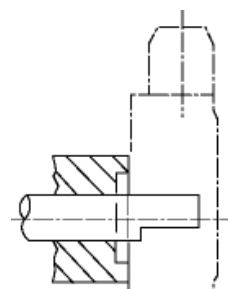
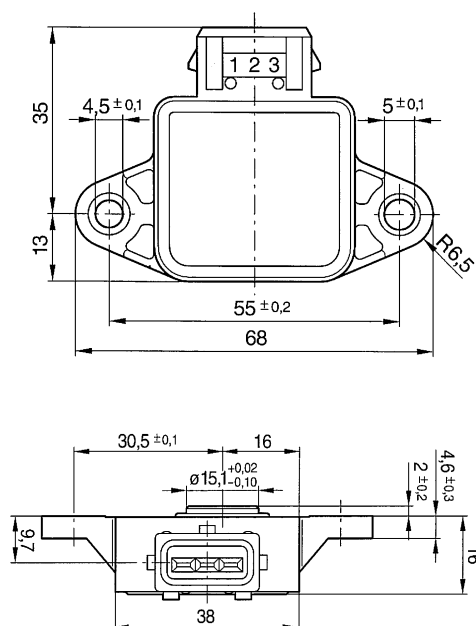
Temperature range	-40 ... 130°C
Vibration	40 g/5 Hz ... 2 kHz

Connector

Cable harness connector	1 928 402 868
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Order number

	0 280 122 016
Offer drawing	A 280 121 252



Rotary Potentiometer RP 100

Possible range: 100°

This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

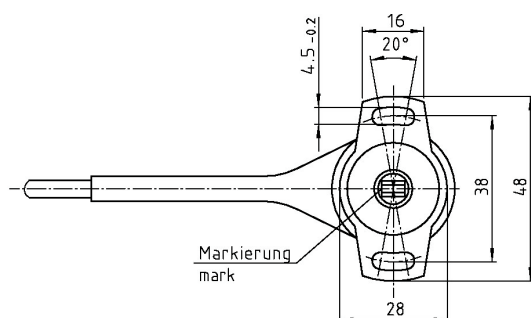


Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10 ⁵ rotations

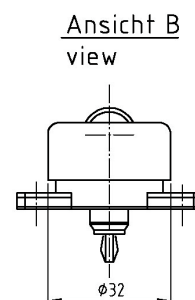
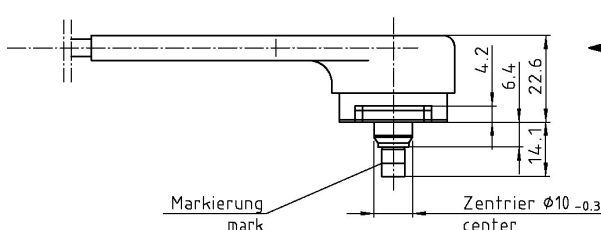
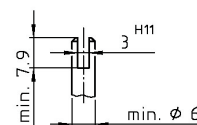
Electronic data	
Nominal resistance	3 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 ... 150°C
Vibration	40 g/5 Hz ... 2 kHz

Order numbers	
ASL 6-06-05PA-HE	B 261 209 127
Offer drawing	A 261 209 127



- Abmessungen der Antriebsseite
- dimension of driveshaft



Rotary Potentiometer RP 130

Possible range: 130°

This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

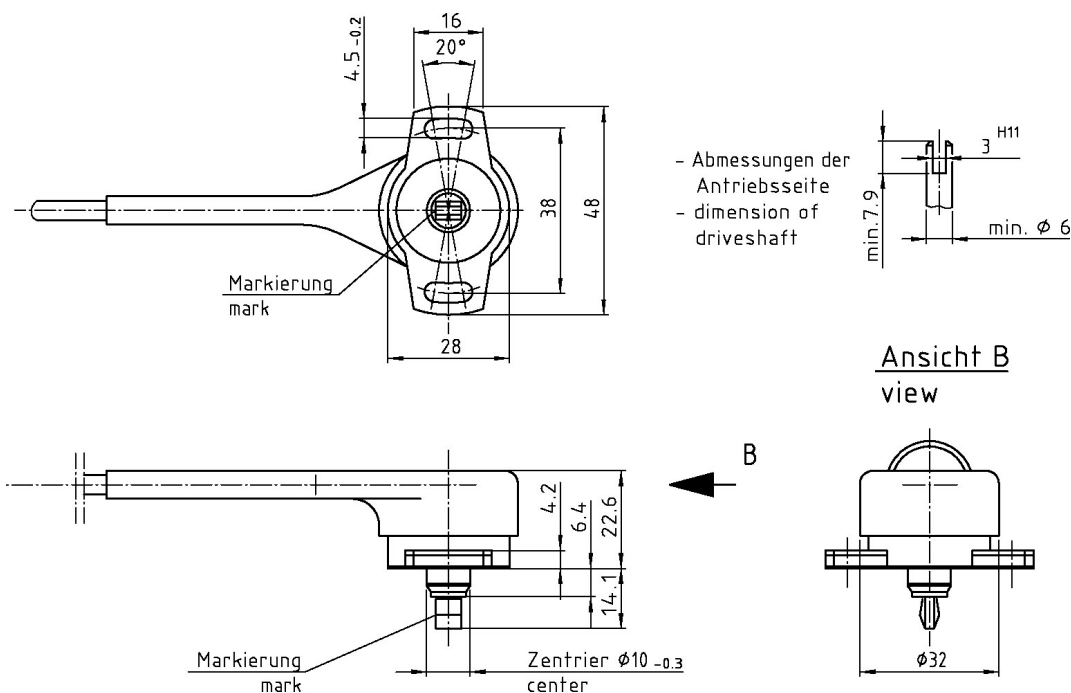


Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10 ⁵ rotations

Electronic data	
Nominal resistance	3 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 ... 150°C
Vibration	40 g/5 Hz ... 2 kHz

Order number	
ASL 6-06-05PA-HE	B 261 209 128
Offer drawing	A 261 209 128



Rotary Potentiometer RP 130-M

Possible range: 130°

This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

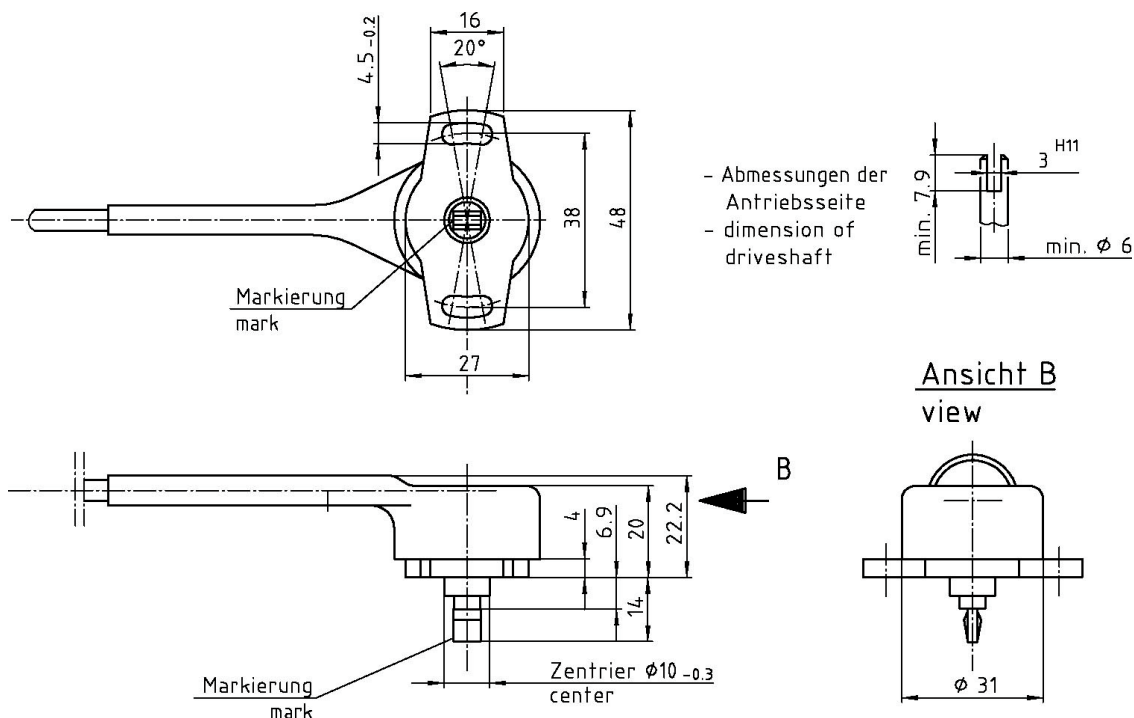


Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10 ⁵ rotations

Electronic data	
Nominal resistance	6 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-55 ... 125°C
Vibration	40 g/5 Hz ... 2 kHz

Order number	
KPTA 6E6-4P-C-DN	B 261 209 576
Offer drawing	A 261 209 573



Rotary Potentiometer RP 308

Possible range: 308°

This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

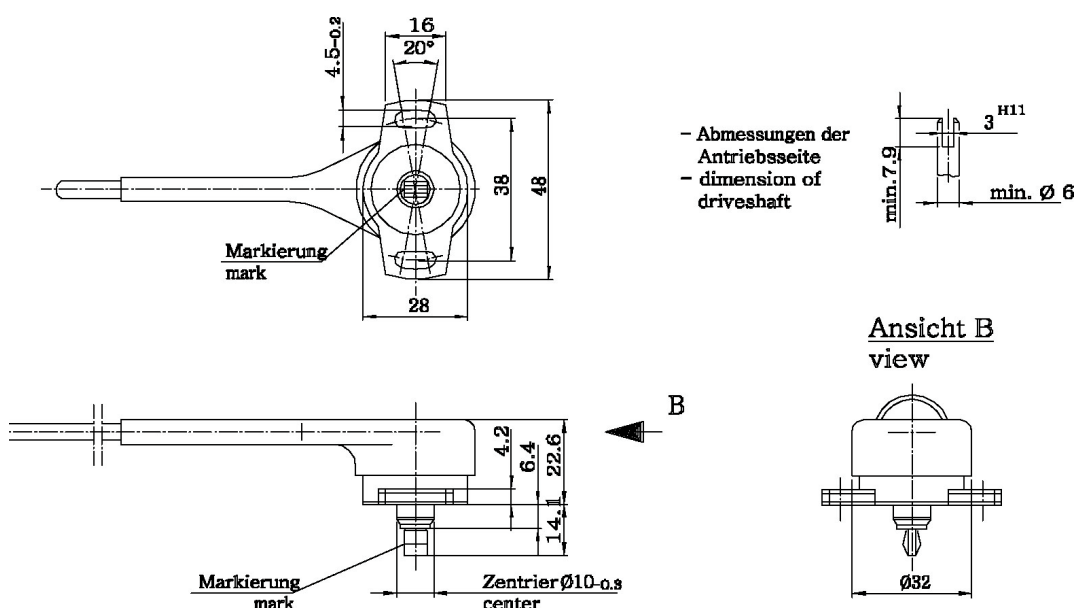


Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	$\pm 360^\circ$
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	$> 50 \times 10^5$ rotations

Electronic data	
Nominal resistance	5 k Ω
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/ $^\circ$ C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 ... 150 $^\circ$ C
Vibration	40 g/5 Hz ... 2 kHz

Order numbers	
ASL 6-06-05PA-HE	B 261 209 570
Offer drawing	A 261 209 570



Rotary Potentiometer RP 350-M

Possible range: 350°

This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

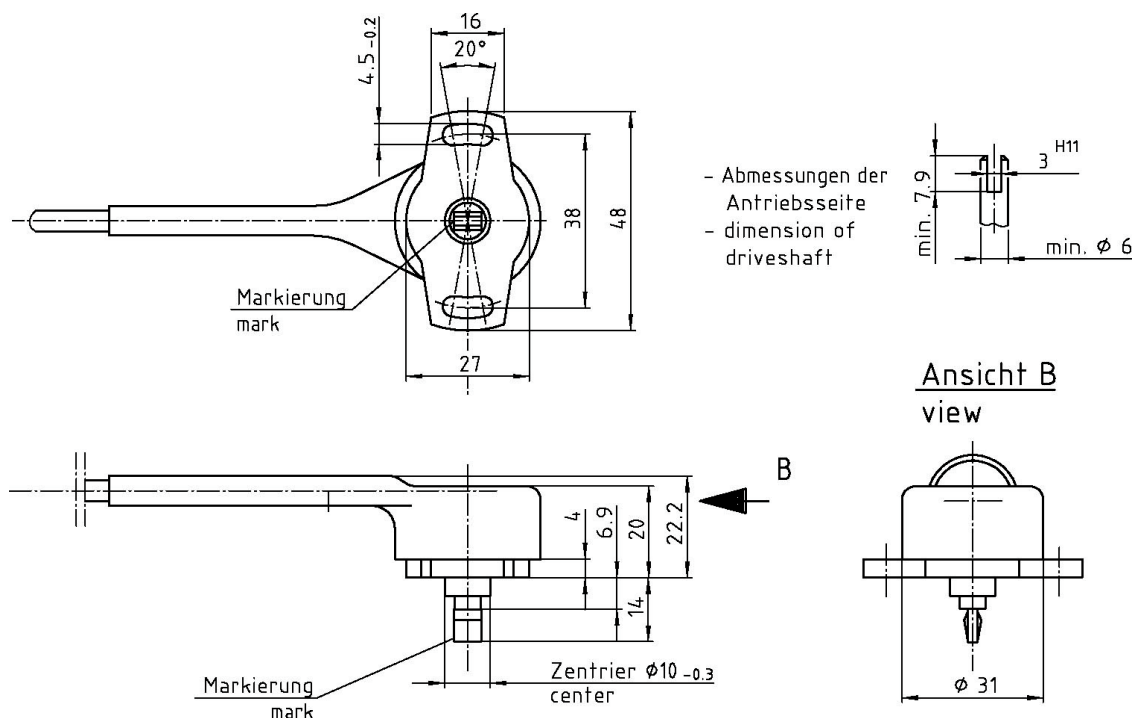


Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10 ⁵ rotations

Electronic data	
Nominal resistance	6 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-55 ... 125°C
Vibration	40 g/5 Hz ... 2 kHz

Order number	
ASL 6-06-05PA-HE	B 261 209 577
Offer drawing	A 261 209 577



Linear Potentiometers

Linear Potentiometer LP 10

Possible mechanical range: 10 mm

This sensor is designed to measure stabilizer movement. It is manufactured in a DR-25 sleeve. Various connector options are available.



Mechanical data

Mounting	2 x M3
Cable length	150 ... 1000 mm
Weight	70 g

Conditions for use

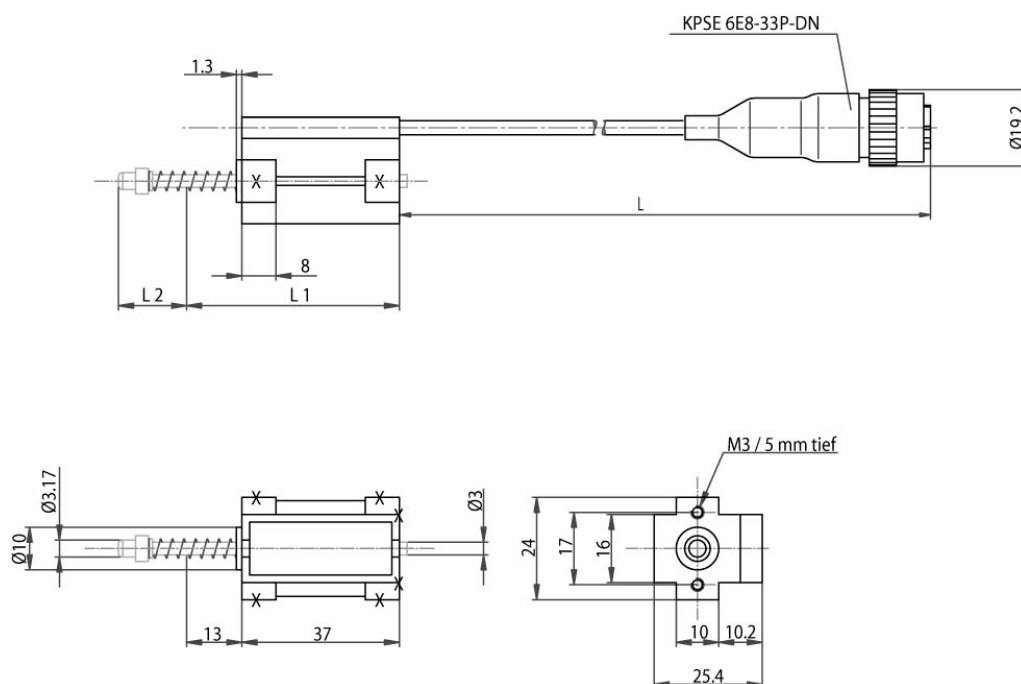
Temperature range	-25 ... 75°C
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Electronic data

Nominal resistance	1 k Ω $\pm$ 20 %
Max. current	1 mA
Non-linearity	1 %
Usual power supply	5 V
Power consumption	0,3 W

Order number

KPSE 6E8-33P-DN	B 261 209 535
Offer drawing	A 261 209 535



Linear Potentiometer LP 50

Possible mechanical range: 50 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.



Mechanical data

Possible mech. range [L2]	50 mm
Min. length [L1]	172 mm
Cable length [L]	150 ... 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 ... 150 mm]	90 ... 150 g

Conditions for use

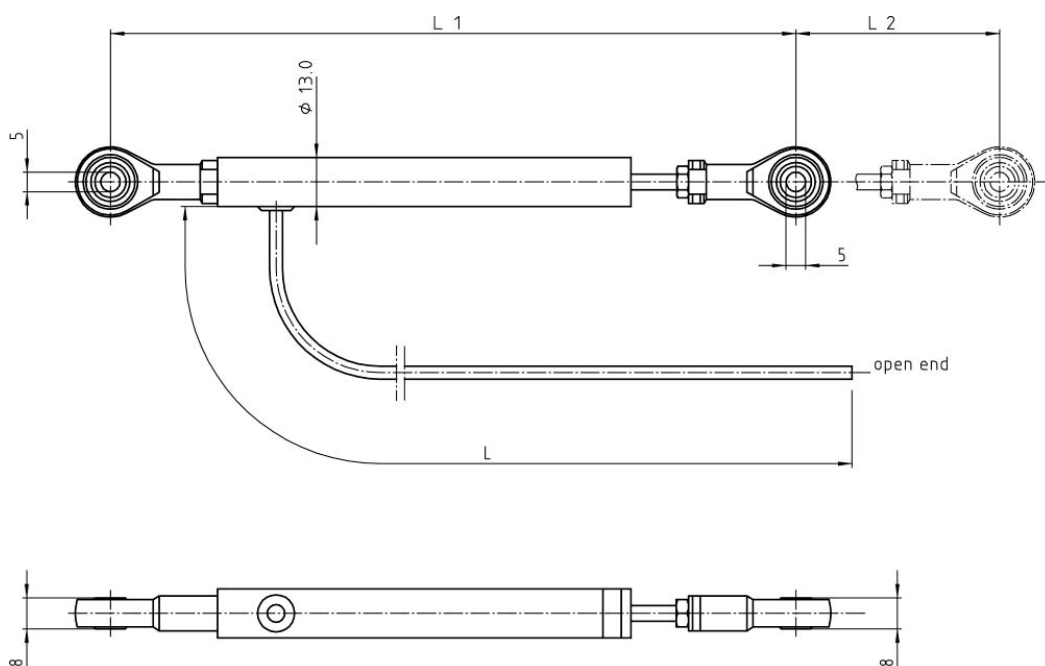
Temperature range	-20 ... 85°C
Vibration	10 g/5 ... 500 Hz
Shock	30 g/11 ms

Electronic data

Nominal resistance	2 kΩ
Max. current	< 1 mA
Non-linearity	0,25 %
Usual power supply	5 V
Max. power supply	42 V

Order number

KPTA 6E6-4P-C-DN	B 261 209 136
Offer drawing	A 261 209 136



Linear Potentiometer LP 75

Possible mechanical range: 75 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

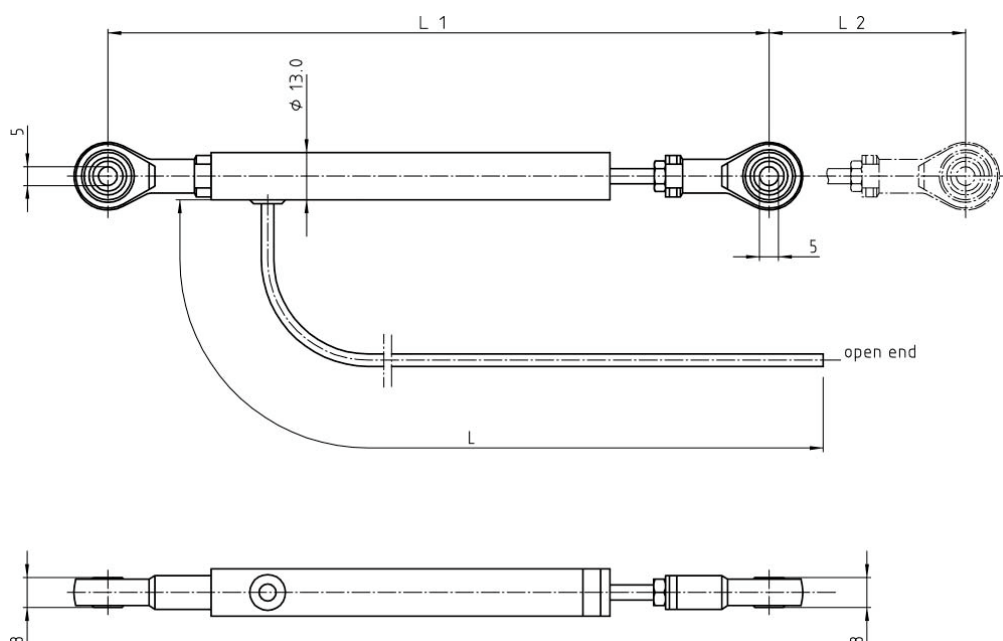


Mechanical data	
Possible mech. range [L2]	75 mm
Min. length [L1]	197 mm
Cable length [L]	150 ... 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 ... 150 mm]	90 ... 150 g

Conditions for use	
Temperature range	-20 ... 85°C
Vibration	10 g/5 ... 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance	3 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order number	
KPSE 6E8-33P-DN	B 261 209 530
Offer drawing	A 261 209 530



Linear Potentiometer LP 75F

Possible mechanical range: 75 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

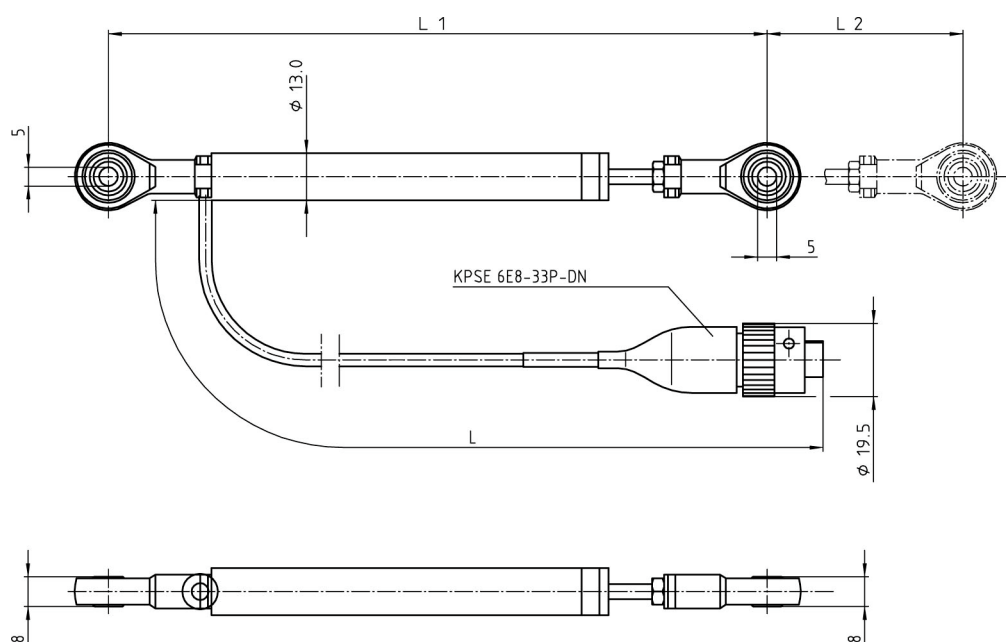


Mechanical data	
Cable length L	150 ... 1000 mm
Min. length L1	220 mm
Possible mech. range L2	79 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Max. shaft velocity	10 m/sec
Weight	52 g

Conditions for use	
Temperature range	-30 ... 100°C

Electronic data	
Nominal resistance	3 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	47 V

Order numbers	
KPSE 6E8-33P-DN	B 261 209 852
Offer drawing	A 261 209 852



Linear Potentiometer LP 100

Possible mechanical range: 100 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

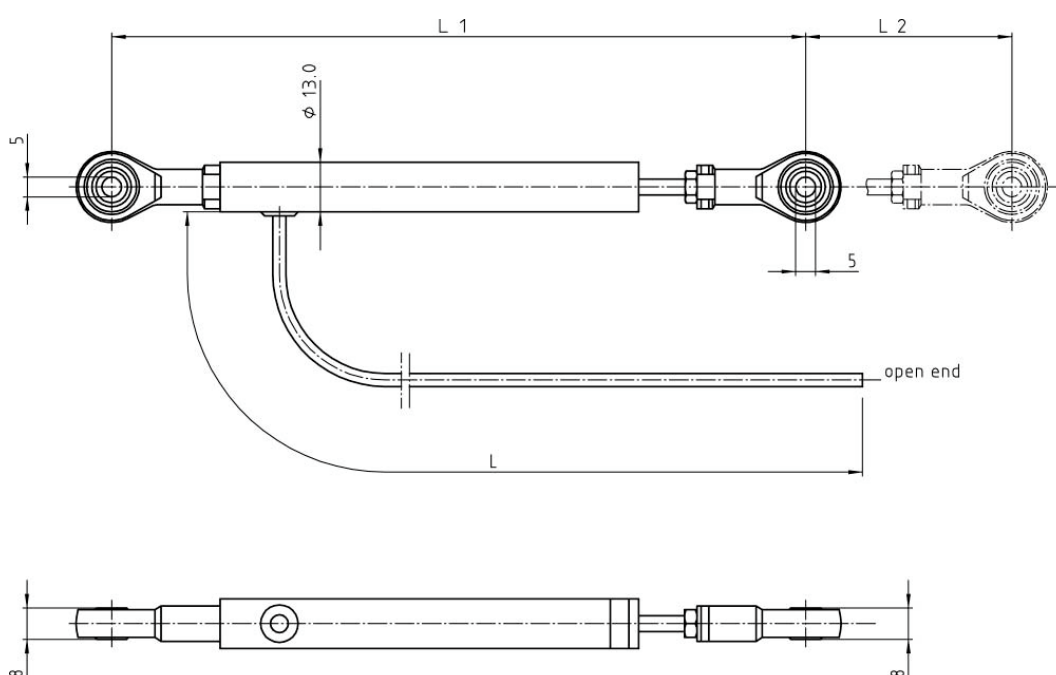


Mechanical data	
Possible mech. range [L2]	100 mm
Min. length [L1]	220 mm
Cable length [L]	150 ... 1000 mm
Mounting	2 x M5
Tightening torque	10 Nm
Sealing	O-ring shaft seal
Max. shaft velocity	1000 mm/sec
Weight [25 ... 150 mm]	90 ... 150 g

Conditions for use	
Temperature range	-20 ... 85°C
Vibration	10 g/5 ... 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance	4 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order numbers	
KPSE 6E8-33P-DN	B 261 209 134
Offer drawing	A 261 209 134
KPTA 6E6-4P-C-DN	B 261 209 137
Offer drawing	A 261 209 137



Linear Potentiometer LP 100F

Possible mechanical range: 100 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

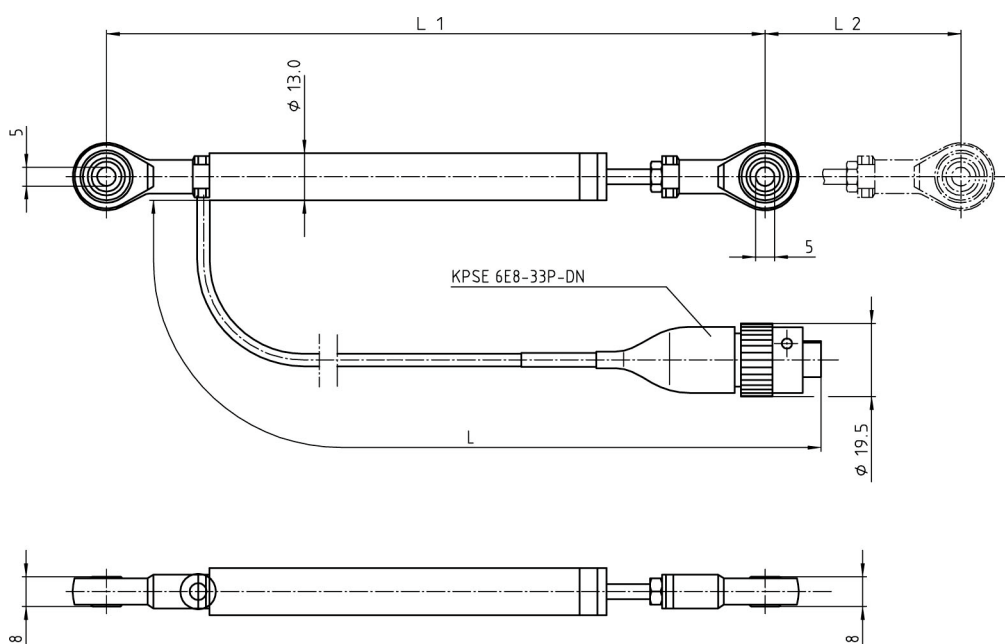


Mechanical data	
Cable length L	150 ... 1000 mm
Min. length L1	244 mm
Possible mech. range L2	104 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Max. shaft velocity	10 m/sec
Weight	62 g

Conditions for use	
Temperature range	-30 ... 100°C

Electronic data	
Nominal resistance	4 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	74 V

Order numbers	
KPSE 6E8-33P-DN	B 261 209 853
Offer drawing	A 261 209 853



Linear Potentiometer LP 150

Possible mechanical range: 150 mm

This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

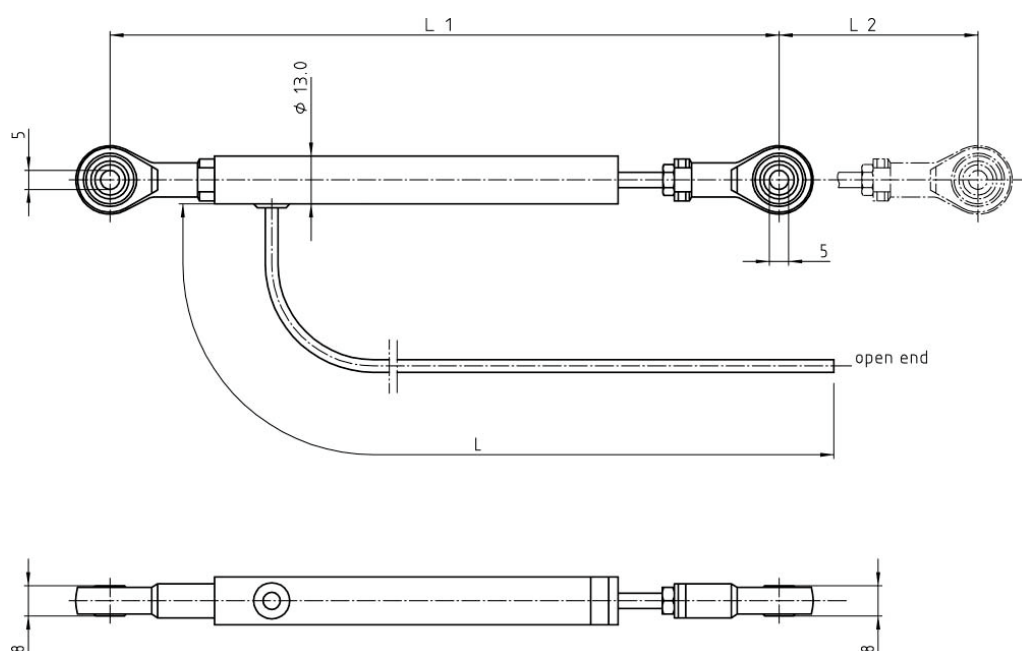


Mechanical data	
Possible mech. range [L2]	150 mm
Min. length [L1]	278 mm
Cable length [L]	150 ... 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 ... 150 mm]	90 ... 150 g

Conditions for use	
Temperature range	-20 ... 85°C
Vibration	10 g/5 ... 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance	6 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order numbers	
KPTA 6E6-4P-C-DN	B 261 209 138
Offer drawing	A 261 209 138
ASL 6-06-05PA-HE	B 261 209 534
Offer drawing	A 261 209 534



Wire Potentiometers

Wire Potentiometer WP 35

Possible mechanical range: 35 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.



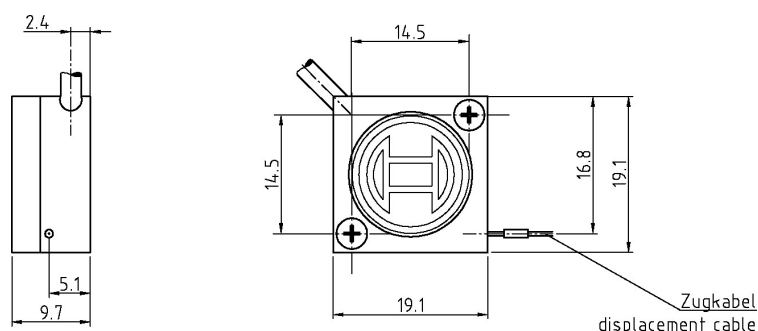
Mechanical data	
Possible mech. range	38,1 mm
Mounting	2 x 2-56 THD
Cable length	150 ... 450 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	15 g
Life expectancy	50 x 10 ⁶ rotations
Protection	IP 54
Dimensions	19 x 19 x 9,7 mm

Conditions for use	
Temperature range	-65 ... 125°C
Max. cable acceleration	15 g
Max. cable tension	1,7 N
Shock	100 g for 6 ms
Vibration	10 Hz ... 2 kHz at 15 g

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

Order number	
ASL 6-06-05PA-HE	B 261 209 541
Offer drawing	A 261 209 541

! Caution !	
User, please observe the following:	
- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide. - Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.	



Wire Potentiometer WP 50

Possible mechanical range: 50 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.



Various connector options available.

Mechanical data	
Possible mech. range	50,8 mm
Mounting	2 x 2-56 THD
Cable length	150 ... 450 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	28 g
Life expectancy	50 x 10 ⁶ rotations
Protection	IP 54
Dimensions	24,4 x 11,4 mm

Conditions for use	
Temperature range	-65 ... 125°C
Max. cable acceleration	40 g
Max. cable tension	3,3 N
Shock	100 g for 6 ms
Vibration	10 Hz ... 2 kHz at 15 g

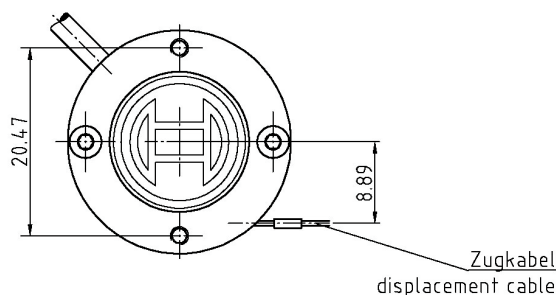
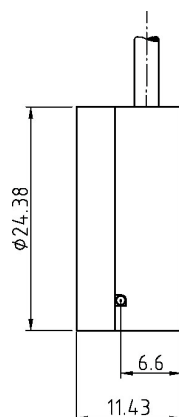
Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

Order number	
ASL 6-06-05PA-HE	B 261 209 542
Offer drawing	A 261 209 542

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.



Wire Potentiometer WP 75

Possible mechanical range: 75 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.



Various connector options available.

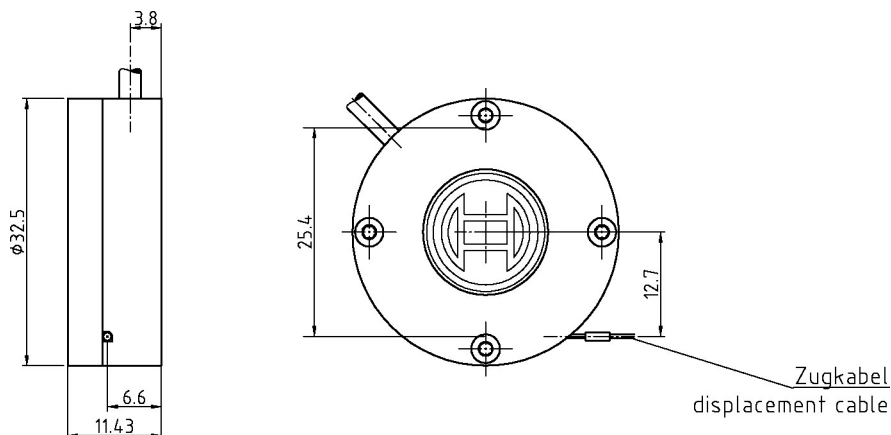
Mechanical data	
Possible mech. range	76,2 mm
Mounting	2 x 2-56 THD
Cable length	150 ... 450 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	28 g
Life expectancy	50 x 10 ⁶ rotations
Protection	IP 54
Dimensions	32,5 x 11,4 mm

Conditions for use	
Temperature range	-65 ... 125°C
Max. cable acceleration	17 g
Max. cable tension	3,3 N
Shock	100 g for 6 ms
Vibration	10 Hz ... 2 kHz at 15 g

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

Order number	
ASL 6-06-05PA-HE	B 261 209 543
Offer drawing	A 261 209 543

! Caution !	
User, please observe the following:	
- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide. - Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.	



Wire Potentiometer WP 100

Possible mechanical range: 100 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.



Various connector options available.

Mechanical data	
Possible mech. range	101,6 mm
Mounting	2 x 2-56 THD
Cable length	150 ... 450 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	57 g
Life expectancy	50 x 10 ⁶ rotations
Protection	IP 54
Dimensions	43,3 x 12,5 mm

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

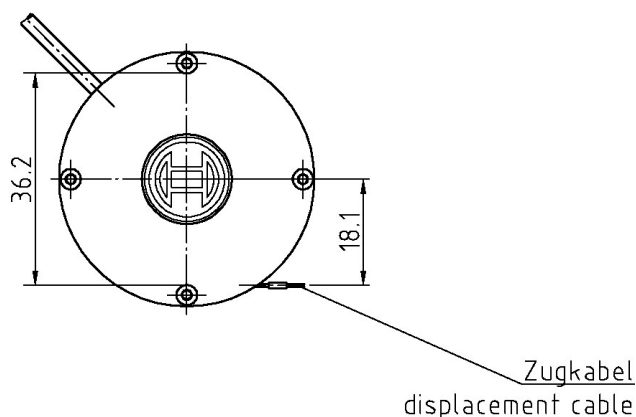
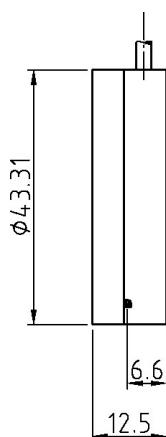
Order number	
ASL 6-06-05PA-HE	B 261 209 544
Offer drawing	A 261 209 544

Conditions for use	
Temperature range	-65 ... 125°C
Max. cable acceleration	9 g
Max. cable tension	2,8 N
Shock	100 g for 6 ms
Vibration	10 Hz ... 2 kHz at 15 g

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.

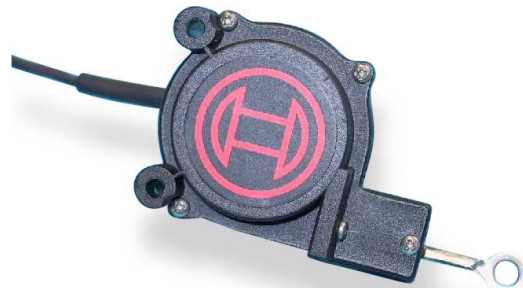


Wire Potentiometer WP 120

Possible mechanical range: 120 mm (96 mm on request)

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Manufactured in a DR-25 sleeve, various connector options available.



Mechanical data	
Possible mech. range	120 mm
Mounting	2 x M3
Cable length	150 ... 1000 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	90 g
Life expectancy	1 x 10 ⁶ rotations

Conditions for use	
Temperature range	-15 ... 60°C
Max. moving speed	10 m/s

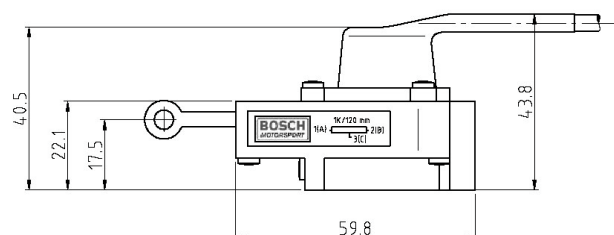
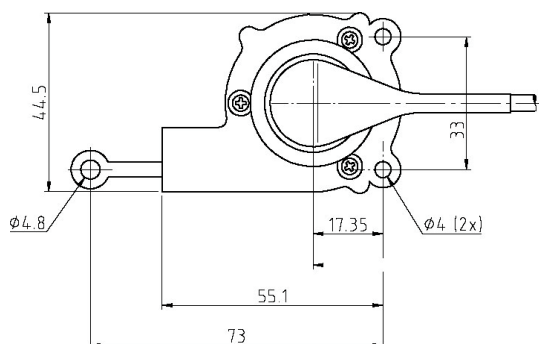
Electronic data	
Nominal resistance	1,0 kΩ
Non-linearity	± 1 %
Usual power supply	5 V
Max. power supply	25 V

Order number	
120 mm	
KPTA 6E6-4P-C-DN	B 261 209 536
Offer drawing	A 261 209 536
96 mm	on request

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.



Wire Potentiometer WP 125

Possible mechanical range: 125 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.



Various connector options available.

Mechanical data	
Possible mech. range	127,5 mm
Mounting	2 x 2-56 THD
Cable length	150 ... 450 mm
Tightening torque	1,5 ... 2,5 Nm
Weight	85 g
Life expectancy	50 x 10 ⁶ rotations
Protection	IP 54
Dimensions	50,5 x 13,2 mm

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

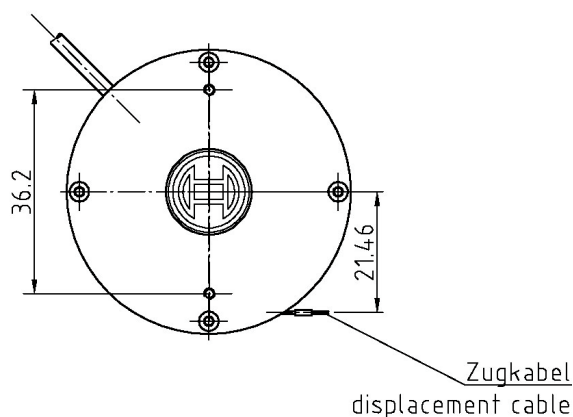
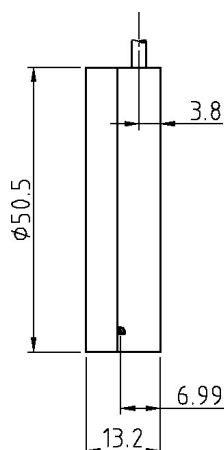
Order number	
ASL 6-06-05PA-HE	B 261 209 545
Offer drawing	A 261 209 545

Conditions for use	
Temperature range	-65 ... 125°C
Max. cable acceleration	8 g
Max. cable tension	2,5 N
Shock	100 g for 6 ms
Vibration	10 Hz ... 2 kHz at 15 g

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User's Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.



Acceleration Sensors

Accelerometer AM 5

This accelerometer is available to measure two axes in a single, robust package.



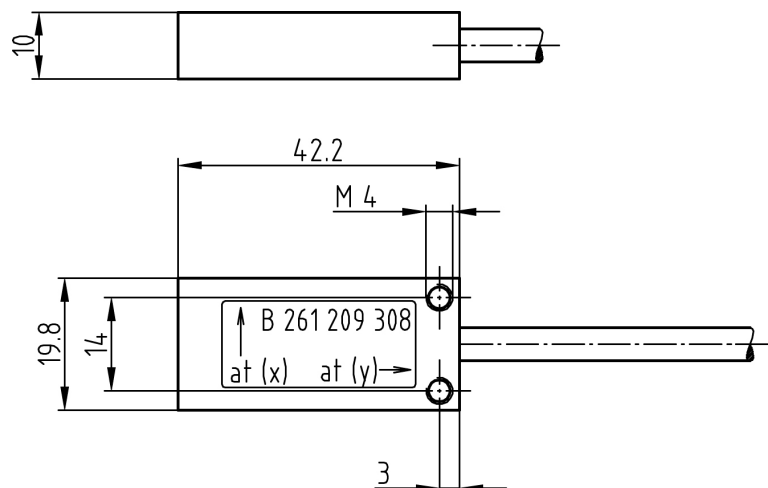
Mechanical data	
Weight	39 g
Length	150 ... 1000 mm
Measuring range	± 5 g
Overload	± 50 g
Dimensions	10 x 19,8 x 42,2 mm

Conditions for use	
Temperature range	-25 ... 125°C

Electronic data	
Supply voltage	12 V
Signal output	0 ... 5 V
Standard filter	10 Hz
Frequency response	1 ms

Characteristic	
Offset	2,5 V at 0 g
Sensitivity	500 mV/g

Order number	
ASL 6-06-05 PA-HE	B 261 209 308
Offer drawing	A 261 209 308



Accelerometer AM 500

This accelerometer is used in cars as part of the ABS and ASR systems. With reference to its fitting position, longitudinal and transversal acceleration up to 5 g can be measured. It is manufactured in a DR-25 sleeve, various connector options are available.



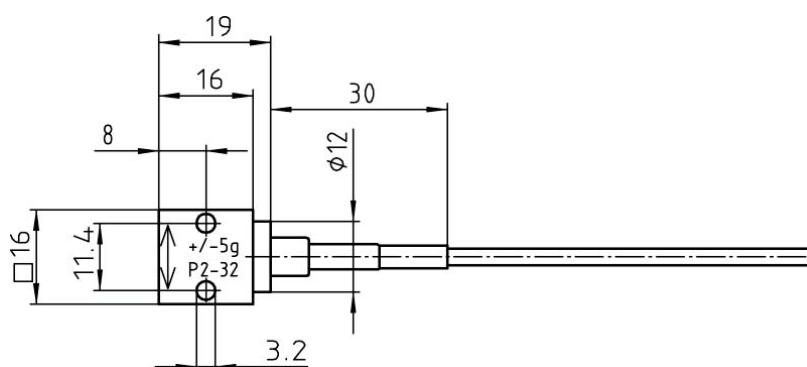
Mechanical data	
Weight	45 g
Length	150 ... 1000 mm
Measuring range	± 5 g
Overload	± 500 g
Dimensions	16 x 16 x 16 mm
Fixing	2 x M3
Tightening torque	2 Nm

Conditions for use	
Temperature range	0 ... 60°C

Electronic data	
Supply voltage	5 V
Max. supply voltage	6 V
Signal output	1 ... 4 V
Standard filter	10 Hz
Resonant frequency	ca. 390 Hz

Characteristic	
Offset	2,5 V $\pm$ 0,1 V at 0 g
Sensitivity	300 mV/g

Order numbers	
KPTA 6E6-4P-C-DN	B 261 209 003
Offer drawing	A 261 209 003
ASL 6-06-05PA-HE	B 261 209 302
Offer drawing	A 261 209 302



Accelerometer AM 600

These accelerometers are available to measure up to three axes in a single, robust package. With reference to its fitting position, longitudinal, transversal and horizontal acceleration up to 4,5 g can be measured.

Manufactured in DR-25 sleeve; various connector options available.



Mechanical data	
Weight	30 g
Length	150 ... 1000 mm
Measuring range	$\pm 4,5$ g
Overload	± 600 g
Dimensions	
2 axes	24 x 27 x 13,5 mm
3 axes	24 x 27 x 29,8 mm
Fixing	2 x M3
Tightening torque	2 Nm

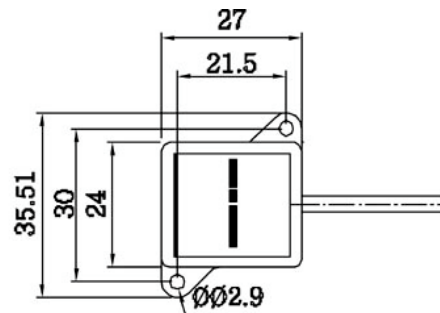
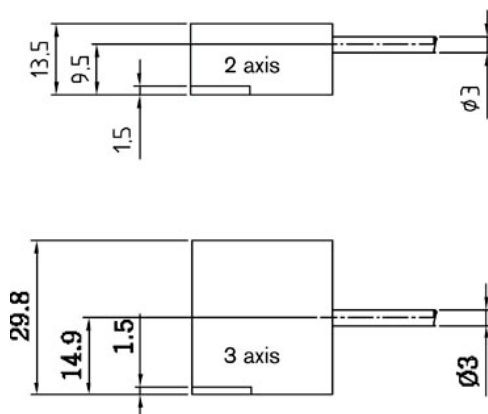
Conditions for use	
Temperature range	-40 ... 85°C

Characteristic	
Offset x, y, z	2,5 V at 0 g
Sensitivity x, y, z	440 mV/g

Electronic data	
Supply voltage	5 V DC
Max. supply voltage	6 V DC
Signal output	2,5 V = 0 g; 440 mV/g
Supply current	7 mA
Max. current	12 mA
Tolerance of sensitivity	± 3 %
Non-linearity of sensitivity	± 2 %

Connector	
Cable harness connector	ASL 6-06-05PA-HE

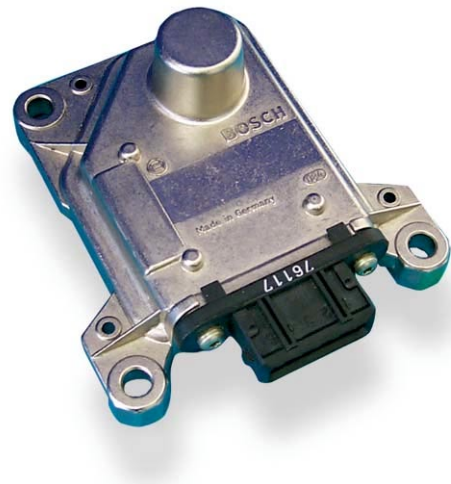
Order numbers	
2 axes	B 261 209 311
Offer drawing	A 261 209 311
3 axes	B 261 209 313
Offer drawing	A 261 209 313



Yaw Rate Sensor

Yaw Rate Sensor YRS

The principle of the angular rate sensor is based on a vibrating cylinder-gyrometer. A metal cylinder is excited to an amplitude controlled resonance vibration. Occurring nodes are displaced by the impact of a coriolis force. This displacement is shifted back to its "zero" position by a closed loop control. The required measure to do so is a measure for the applied angular rate.



Mechanical data

Measuring range	100°/s
Overload	300°/s
Weight	210 g

Conditions for use

Temperature range	-30 ... 85°C
Shock	300 g

Connector

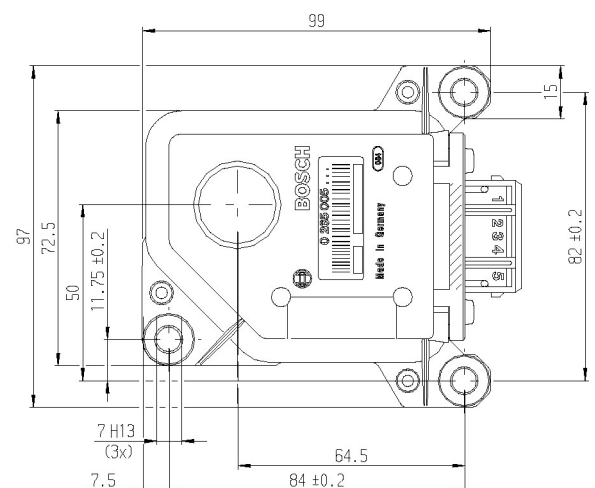
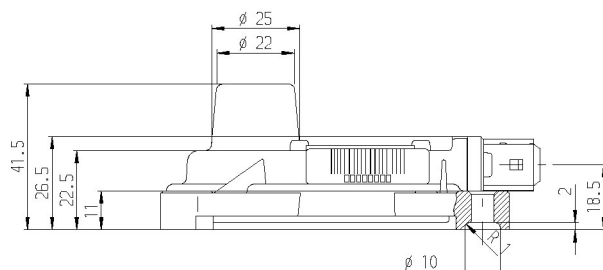
Cable harness connector	1 284 485 232
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Electronic data

Supply voltage	8,2 ... 16 V
Current consumption	< 40 mA
Power consumption	0,7 W
Output range	0,6 ... 4,4 V
Reference voltage	2,5 V
Voltage range	1,8 V
Electrical noise	< 0,25°s/0,1 ... 100 Hz
Sensitivity	18 mVs/° [-100 ... 100°/s]

Order number

	0 265 005 207
Offer drawing	A 265 466 074



Ride Height System

Ride Height System RHS

This infrared sensor is designed to measure chassis adjust like vehicle ride height, pitch and roll. The sensor is available in a DR-25 sleeve with various connector options on request.



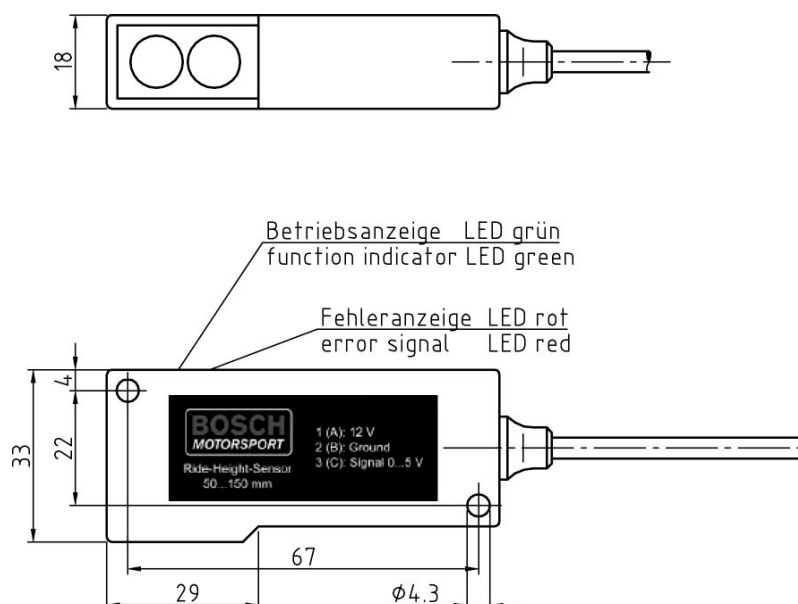
Mechanical data	
Weight	105 g
Measuring range	60 ... 140 mm
Dimensions	75 x 33 x 18 mm
Housing	plastic, fibreglass
Protection class	IP 67

Conditions for use	
Temperature range	-10 ... 60°C

Characteristic	
Light source	IR
Max. allowed ambient light	< 10000 lux
Wave length	660 nm

Electronic data	
Supply voltage	12 ... 24 V
Signal output	0,25 ... 4,75 V
Alarm output	PNP
Response time	5 ms
Resolution	0,5 ... 1 mm
Linearity	2 % FS

Order number	
KPTA 6E6-4P-C-DN	B 261 209 671
Offer drawing	A 261 209 671



Gear Shift Sensors

Gear Shift Sensor GSS

This sensor is specially designed for precision gear shift force measurement. It can be integrated into the gear shift lever of a sequential gear box. It is manufactured in a DR-25 sleeve, various connector options are available.



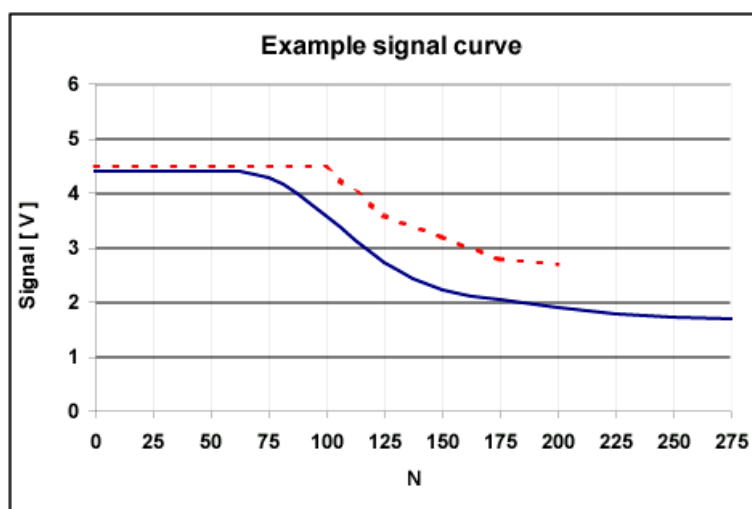
Mechanical data	
Weight	90 g
Max. deviation	$\pm 10^\circ$
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	22 x 22 x 50 mm

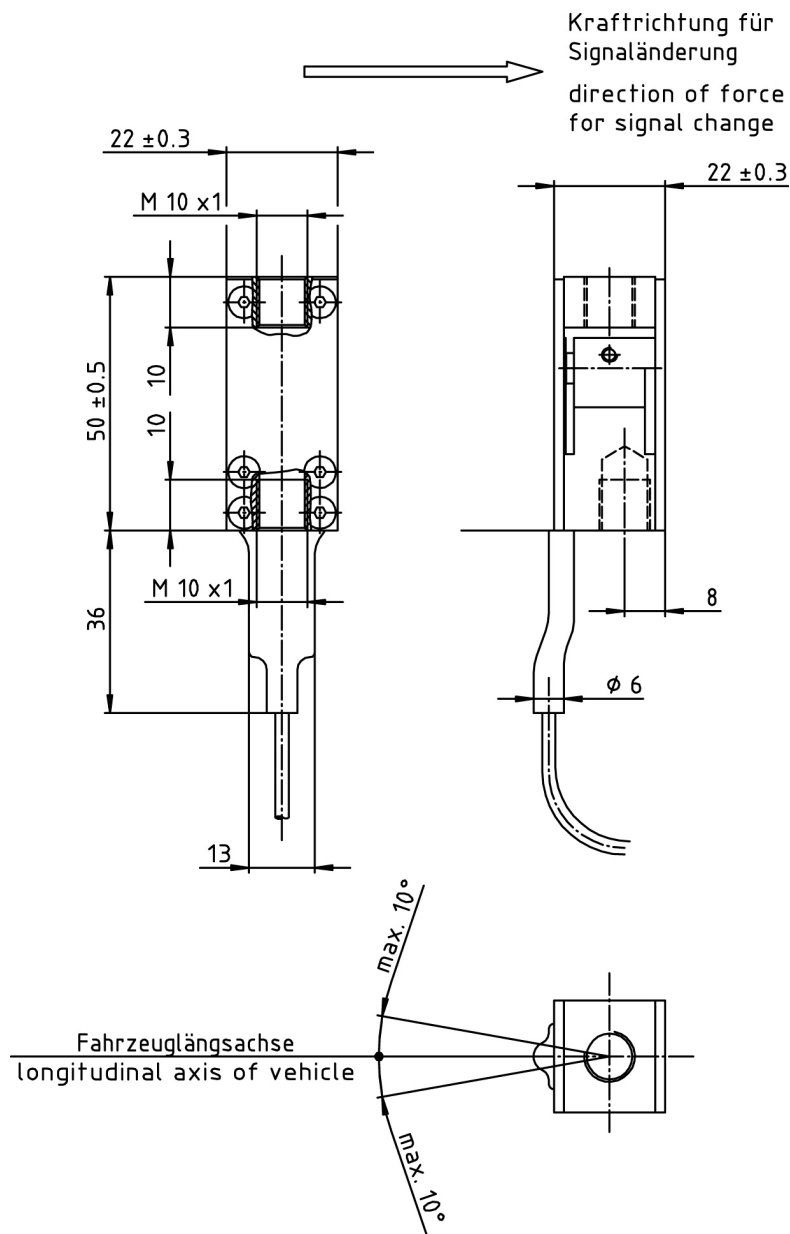
Conditions for use	
Temperature range	0 ... 80°C
Vibration	80 g/5 Hz ... 2 kHz

Characteristic	
Individual characteristic will be delivered with each sensor.	

Electronic data	
Supply voltage	10 V
Input current	< 1 mA
Signal output	1 ... 4 V $\pm 0,5$ V
Zero output	4 V $\pm 0,3$ V

Order numbers	
KPSE 6E8-33P-DN	B 261 209 222
Offer drawing	A 261 209 222
KPTA 6E6-4P-C-DN	B 261 209 224
Offer drawing	A 261 209 224
ASL 6-06-05PC-HE	B 261 209 225
Offer drawing	A 261 209 225





Gear Shift Sensor GSS-2

This sensor is specially designed for precision gear shift force measurement. It can be integrated into the gear shift lever of a sequential gear box. It is manufactured in a DR-25 sleeve, various connector options are available.



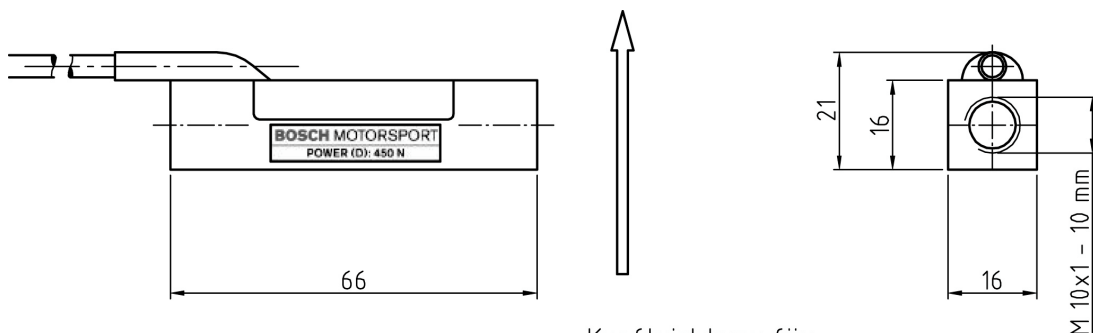
Mechanical data	
Weight	90 g
Max. deviation	$\pm 10^\circ$
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	65 x 16 x 16 mm
Mech. range (further ranges on request)	$\pm 45 \text{ kg}/450 \text{ N}$
Fmax	800 N
Mech. load limit	1800 N

Characteristic	
Individual characteristic will be delivered with each sensor.	

Electronic data	
Supply voltage	12 V
Signal output	0,5 ... 4,5 V
Zero output	2,5 V

Conditions for use	
Temperature range	0 ... 85°C
Vibration	80 g/5 Hz ... 2 kHz

Order number	
ASL 6-06-05PC-HE	on request
Offer drawing	on request



Krafttrichtung für
Signaländerung
direction of force
for signal change



Displays

Display DDU 2

The DDU 2 is a light dashboard controller with an integrated display unit, providing the driver with various types of information.

The basic model contains 6 different pages, programmable warning message for exceeded limits, shift up- and warning lights. These features are fully programmable to correspond to individual customer requirements.

Additional to the functions of the “Basic”-version the “Night”-version offers variable brightness.

As well we developed a cost-optimised version of the display unit. This “Light”-version offers 3 different pre-programmed fixed pages and refrains from a link to an application tool.



Graphic module

LCD display with high contrast	(320 x 240 pixels)
CFL illumination	
Dot size	0,3 x 0,3 mm
Visible display	100 x 75 mm (4,7 inches)

Mechanical data

Dimensions	172 x 125 x 36 mm
Weight	495 g
Dust and water proof housing	
2 LED for warning lights	
5 LED for shift up indication	

Conditions for use

Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Electronic data

1x CAN interface for data transfer
(reconstruction from CAN to K-Line possible)
1x RS 232 interface for programming
1x input for wheelspeed (Ind./Hall)
1x input for engine revolutions (Ind./Hall)
1x 5 V output for sensor supply
8 inputs 0 V-5 V (analog/digital)
8 programmable pull-up resistors for analog inputs
2 switch outputs (pushpull 0,5 A)
5 outputs for external shift up indication
(open collector, 100 mA)
7 outputs for external 7-segment display
(1 Digit, open collector, 100 mA)
1x internal temperature measurement (NTC)

**Variations****DDU 2-Basic:**

up to 6 different programmable displays
programmable warning messages for exceeded limits

2 warning lights

shift up lights

for generating displays and programming warning lights a tool is available

DDU 2-Night:

Basic with variable brightness

DDU 2-Light:

3 different displays, not programmable

2 warning lights

shift up lights

warning messages for oil temperature,
oil pressure, water temperature and fuel pressure

Switches

Dimmer switch LED **B 261 209 647**

Dimmer switch display **B 261 209 646**

Display position switch **B 261 209 144**

Display toggle switch **on request**

Order numbers

DDU 2-Basic **B 261 208 575**

DDU 2-Night **B 261 208 573**

DDU 2-Light **B 261 208 579**

Display DDU 3

The DDU 3 is a light and compact dashboard controller with an integrated display unit, providing the driver with various types of information.

Shift lights are designed as a satellite box to give maximum flexibility for the mounting position. 6 different displays are fully programmable to correspond to individual customer requirements.

The dashboard is equipped with various brightness and contrast. As well we developed a cost-optimised version of the display unit. This "Light"- version offers 3 different pre-programmed fixed pages and refrains from a link to an application tool.



Graphic module

LCD display with high contrast (320 x 240 pixels)	
LED illumination	
Dot size	0,22 x 0,22 mm
Visible display	78 x 59 mm
Weight	312 g

Mechanical data

Dimensions	118 x 80 x 25 mm
Dust and waterproof aluminium housing	
Touch keys for brightness and contrast	

Conditions for use

Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Shift indication satellite

Dimensions	95 x 20 x 15 mm
Weight	51 g
Single LED elements	5

Electronic data

1x CAN interface for data transfer (reconstruction from CAN to K-Line possible)
1x RS 232 interface for programming
Shift indication satellite controlled by the graphic module, 5 LEDs for shift up indication (open collector, 100 mA)
Output for external 7-segment display (1 Digit), (open collector, 100 mA)
8 inputs 0 ... 5 V (analogous/digital)

Switches

Display position switch	B 261 209 144
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Order number

F 01E B01 130

Display DDU Formula

The DDU Formula is a light and compact dashboard controller with an integrated display unit, providing the driver with various types of information.

Shift lights are designed as a satellite box to give maximum flexibility for the mounting position. 3 different displays are available to correspond to individual customer requirements.

The dashboard is equipped with various brightness and contrast.



Graphic module	
LCD display with high contrast (320 x 240 pixels)	
LED illumination	
Dot size	0,22 x 0,22 mm
Visible display	78 x 59 mm
Weight	312 g

Mechanical data	
Dimensions	118 x 80 x 25 mm
Dust and waterproof aluminium housing	
Touch keys for brightness and contrast	

Conditions for use	
Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Shift indication satellite	
Dimensions	95 x 20 x 15 mm
Weight	51 g
Single LED elements	5

Electronic data	
1x CAN interface for data transfer (reconstruction from CAN to K-Line possible)	
1x RS 232 interface for programming	
Shift indication satellite controlled by the graphic module, 5 LED for shift up indication (open collector, 100 mA)	
Output for external 7-segment display (1 Digit), (open collector, 100 mA)	
2 inputs 0 ... 5 V (analogous/digital)	

Switches	
Display position switch	B 261 209 144

Order number	
	F 01E B01 126



Actuators

Injection Valves

Injection Valve EV 6

The development of the EV 6 took into account all the essential functional requirements which originate from injector operation in multipoint electronic fuel injection systems (EFI).

This resulted in: low weight, "dry" solenoid winding, plastic encapsulation, finely matched flow-rate classes, good valve-seat sealing, excellent hot-start capabilities, close tolerances of the specified functional values, high level of corrosion resistance and long service life.



Mechanical data	
System pressure	max. 8 bar
Weight	45, 8 g

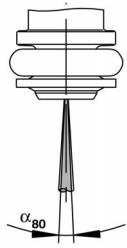
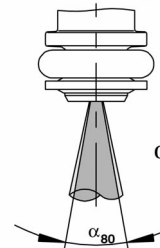
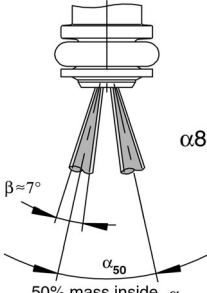
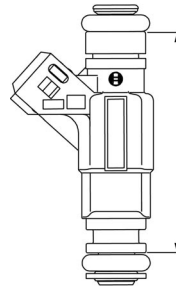
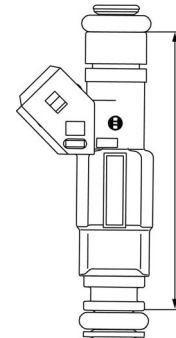
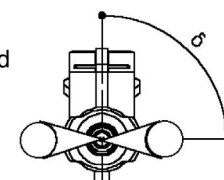
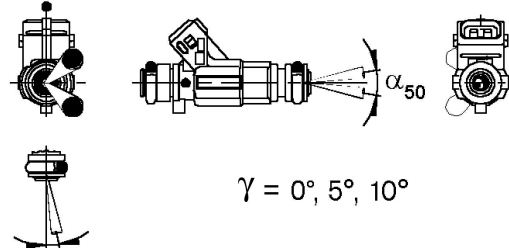
Electrical data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

Conditions for use	
Fuel input	axial (top-feed)
Operating temperature	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Climate proofness corresponds to saline fog test DIN 53 167	

Technical data						
Order numbers	Design	Fuel type	Spray type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
B 280 431 126	Standard	Gasoline	C	261,2 g/min	25°	12 Ω
B 280 431 127	Standard	Gasoline	C	261,2 g/min	70°	12 Ω
0 280 155 737	Long	Gasoline	C	261,2 g/min	15°	12 Ω
B 280 431 128	Standard	Gasoline	C	364,3 g/min	25°	12 Ω
B 280 431 129	Standard	Gasoline	C	364,3 g/min	70°	12 Ω
B 280 431 130	Standard	Gasoline	C	493,1 g/min	25°	1,2 Ω
B 280 431 131	Standard	Gasoline	C	493,1 g/min	70°	1,2 Ω
0 280 156 012	Standard	Gasoline	C	310,1 g/min	20°	12 Ω
B 280 434 499/1	Standard	Methanol	C	658 g/min	25°	12 Ω
B 280 434 499/2	Standard	Gasoline	C	658 g/min	25°	12 Ω

Further injection valves on request



B: Pencil Beam  $\alpha_{80} \sim 5^\circ$ 80% mass inside α_{80}	C: Conical Spray  $\alpha_{80} = 15^\circ$ (narrow) 20° (medium) 25° (wide) 80% mass inside α_{80}	E: 2-Spray  $\alpha_{80} = 15^\circ$ (narrow) 20° (medium) 25° (wide) $\beta \approx 7^\circ$ 50% mass inside α_{50} 70% mass of single spray inside β
standard  48,8 mm	long  60,3 mm	Angel between connection and spray level ($\delta = \text{delta}$): (only 2-spray preparation) $\delta = 0^\circ - 360^\circ$ possible   $\gamma = 0^\circ, 5^\circ, 10^\circ$

Injection Valve EV 12

The EV 12 injector is a development based on the EV 6. Its main feature is the fact that the position of its injection point can be varied. Compared with the EV 6, the EV 12 injection point can be moved forward up to 20 mm.



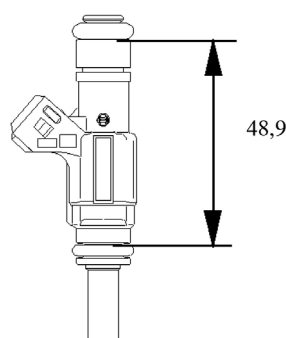
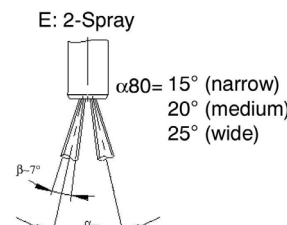
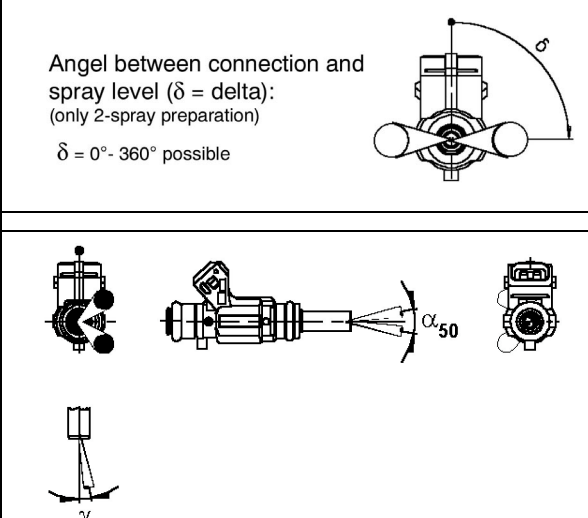
Mechanical data	
System pressure	max. 8 bar
Weight	40 g

Electronic data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-40 ... 110°C
Permissible fuel temperatures	$\leq 70^\circ\text{C}$
Climate proofness corresponds to saline fog test DIN 53 167	

Technical data								
Order numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	α	Spray β	angle γ	δ	Impedance
B 280 432 115	Medium	E	217 g/min	15°	15°	10°	270°	12 Ω
0 280 155 893	Medium	E	269 g/min	15°	7°	10°	270°	12 Ω
0 280 155 897	Medium	E	217 g/min	15°	7°	10°	270°	12 Ω

Further special versions on request

Medium  48,9	E: 2-Spray  $\alpha_{80} = 15^\circ$ (narrow) 20° (medium) 25° (wide) $\beta = 7^\circ$ 50% mass inside α_{50} 70% mass of single spray inside β	Angle between connection and spray level ($\delta = \text{delta}$): (only 2-spray preparation) $\delta = 0^\circ - 360^\circ$ possible 
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Injection Valve EV 14

The EV 14 injector is a further development based on the EV 6. It is even more compact, what allows its integration into the fuel rail.

In addition, this injector is also available with a variety of installation lengths, what makes an individual adaptation to the intake manifold possible.



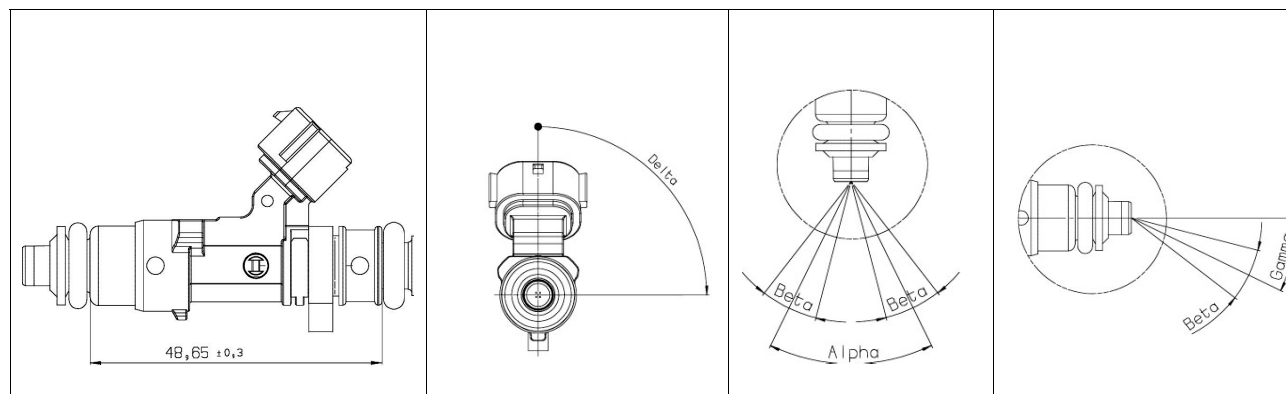
Mechanical data	
System pressure	max. 8 bar
Weight	25 g
Spray angle	25° or 70°

Electronic data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Installation lengths	48,65 mm
Climate proofness corresponds to saline fog test DIN 50 021	

Technical data					
Order numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
B 280 436 038/4	Standard	C	387,3 g/min	25°	12 Ω
B 280 436 038/2	Standard	C	503,5 g/min	25°	12 Ω
B 280 436 038/5	Standard	C	387,3 g/min	70°	12 Ω
B 280 436 038/1	Standard	C	503,5 g/min	70°	12 Ω

Further special versions on request



Ignition Coils

Single Fire Coil M

This ignition coil is specially designed for motorsport use. The electronic design connects high energy output with a small housing. The coil is available in a DR-25 sleeve with different options of connectors.



Electronic data	
High voltage	35 kV
I prim. (stand.)	10 A
Inductivity (prim.)	1,8 mH
Inductivity (sec.)	4,7 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	4,4 k Ω
Spark energy	33 mJ/10 A
U prim. (clamp.)	500 V
Voltage gradient	3,3 kV/ μ s

Mechanical data	
Weight	180 g
Vibration	80 g/5 ... 250 Hz

Conditions for use	
Temperature range	-20 ... 130°C

Order number	
	B 261 209 192
Offer drawing	A 261 209 192

Dwell time (ms)					
Ubatt	4 A	6 A	8 A	10 A	
8 V	1,30	2,40	3,20	4,20	
10 V	1,00	1,60	2,40	3,40	
12 V	0,80	1,25	1,80	2,40	
14 V	0,65	1,05	1,40	1,80	
16 V	0,55	0,85	1,18	1,46	

Single Fire Coil P

This coil is low cost concept for cylinder head installation.



Electronic data	
High voltage	35 kV
I prim. (stand.)	8,5 A
Inductivity (prim.)	2,8 mH
Inductivity (sec.)	16 H
Resistance (prim.)	0,37 Ω
Resistance (sec.)	8,8 k Ω
Spark energy	45 ... 55 mJ
U prim. (clamp.)	260 V
Voltage gradient	1,6 kV/ μ s

Conditions for use	
Temperature range	-40 ... 140°C

Mechanical data	
Weight	260 g
Vibration	40 g/5 Hz ... 2 kHz

Connector	
Cable harness connector	1 928 402 868

Order number	
	B 261 208 315
Offer drawing	A 221 152 139

Dwell time (ms)					
Ubatt	4 A	5 A	6 A	7 A	8 A
8 V	2,90	4,00	5,50	7,80	
10 V	2,00	2,70	3,50	4,40	5,20
12 V	1,65	2,10	2,65	3,17	3,52
14 V	1,35	1,75	2,15	2,55	2,90
16 V	1,10	1,40	1,75	2,05	2,35

Single Fire Coils PS and PS-T

These ignition coils are low cost concept for cylinder head installation.

Type P-T has an integrated transistor for use in combination with ECUs without internal ignition power stages.



Electronic data	
High voltage	>30 kV
I prim. (stand.)	7,3 A
Resistance (prim.)	0,5 Ω
Spark energy	35 mJ
U prim. (clamp.)	300 V
Voltage gradient	1,5 kV/ μ s

Dwell time, temperature of coil ca. 50°C	
Ubatt	7,3 A
8 V	6,2 ms
10 V	3,2 ms
12 V	2,4 ms
14 V	1,8 ms
16 V	1,5 ms

Mechanical data	
Weight Type PS	190 g
Weight Type PS-T	208 g
Vibration	40 g/5 Hz ... 2 kHz
Diameter	22 mm

Conditions for use	
Temperature range	-40 ... 140°C

Order number	
Type PS	0 221 504 460
Type PS-T	0 221 604 103
Offer drawing PS	A 221 141 014_009
Offer drawing PS-T	A 221 614 016_009

Single Fire Coil S

This ignition coil is specially designed for cylinder head mounting. The electronic design combines high energy output with a small housing. It is available in a DR-25 sleeve with different options of connectors.



Mechanical data		
Weight		148 g
Vibration	80 g/5 Hz ... 2,5 kHz	
Diameter		22 mm

Conditions for use	
Temperature range	-40 ... 140°C

Dwell time (ms), temperature of coil ca. 50°C		
Ubatt	12,5 A	
8 V	3350 µs	
10 V	1750 µs	
12 V	1250 µs	
14 V	960 µs	
16 V	800 µs	

Electronic data	
High voltage	>30 kV
I prim. (stand.)	12 A
Resistance (prim.)	0,2 Ω
Spark energy	33 ... 40 mJ
U prim. (clamp.)	390 V
Voltage gradient	3,3 kV/µs

Order number	
	B 221 141 821-01
Offer drawing	A 221 141 821-01

Double Fire Coil 2x2

2 x 2 Sparks

This dual spark ignition coil is designed for low-cost applications in 4-cylinder engines.



Mechanical data	
Weight	900 g
Vibration	20 g/5 ... 250 Hz

Conditions for use	
Temperature range	-20 ... 120°C

Primary connector	
Offer drawing	1 284 485 112

Electronic data	
High voltage	33 kV
I prim. (stand.)	7,5 A
Inductivity (prim.)	3,7 mH
Inductivity (sec.)	38 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	13,3 kΩ
Spark energy	70 mJ
U prim. (clamp.)	320 V
Voltage gradient	1,1 kV/μs

Order number	
	0 221 503 407
Offer drawing	A 221 151 089

Dwell time (ms)				
Ubatt	5 A	6 A	8 A	
8 V	6,0	8,5	12,0	
10 V	3,8	4,9	7,0	
12 V	2,8	3,5	5,0	
14 V	2,3	2,8	3,9	
16 V	2,0	2,4	3,0	

Double Fire Coil 3x2

3 x 2 Sparks

This dual spark ignition coil is designed for low-cost applications in 6-cylinder engines.



Mechanical data

Weight	1300 g
Vibration	20 g/5 ... 250 Hz

Conditions for use

Temperature range	-20 ... 120°C
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Primary connector

Offer drawing	1 284 485 118
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Electronic data

High voltage	33 kV
I prim. (stand.)	7,5 A
Inductivity (prim.)	3,7 mH
Inductivity (sec.)	38 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	13,3 kΩ
Spark energy	70 mJ
U prim. (clamp.)	320 V
Voltage gradient	1,1 kV/μs

Order number

	0 221 503 002
Offer drawing	A 221 151 810-006

Dwell time (ms)

Ubatt	5 A	6 A	8 A
8 V	6,0	8,5	12,0
10 V	3,8	4,9	7,0
12 V	2,8	3,5	5,0
14 V	2,3	2,8	3,9
16 V	2,0	2,4	3,0

Spark Plugs

Spark Plugs

The engines of competition vehicles are exposed to high thermal stress because of running them at full load most of the time.

Spark plugs for this operating conditions often have precious metal center electrodes (platinum, silver) and a short insulator base. This causes a very small heat absorption and a good heat derivation through the center electrode.

Corresponding to the various field of operations we manufacture over 1400 different types of spark plugs in production. You can get these standard spark plugs from your local Bosch-service and most spare parts dealers. The range of products includes versions with various seats and threads, thread lengths and electrode positions, the design parts air-gap, surface-gap and surface-air-gap types. You can choose between versions with one to four ground electrodes, the center electrode can be made from various materials.

Moreover we offer special versions and small batches which you should not hesitate asking for.



Fuel Pumps

Fuel Pump FP 100

Fuel delivery: > 100 l/h, 5 bar

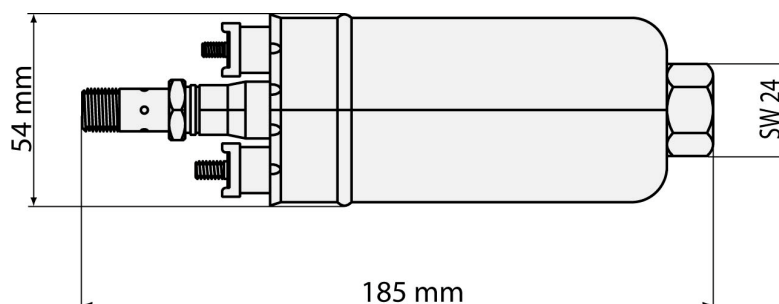


Description	
Fuel delivery	> 100 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	5 A (5 bar)
Weight	725 g
Non return valve	external

Accessories	
Primary connector	

Order number	
	Y 580 700 118
Offer drawing	Y 580 700 118

Connections	
Intake side	M16 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M4 / -: M5



Fuel Pump FP 165

Fuel delivery: > 165 l/h, 5 bar

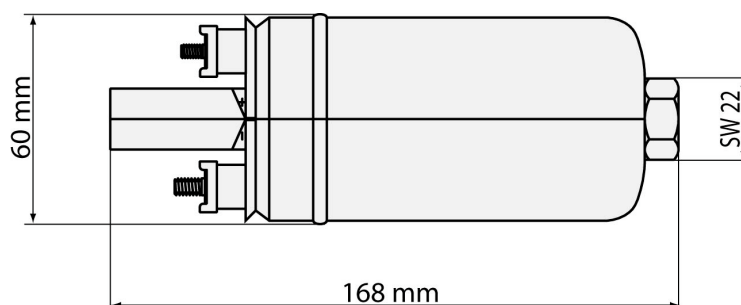


Description	
Fuel delivery	> 165 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	10 A (5 bar)
Weight	980 g
Non return valve	internal

Accessories	
Primary connector	

Order number	
	0 580 254 979
Offer drawing	A 580 152 325

Connections	
Intake side	M16 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M4 / -: M5



Fuel Pump FP 200

Fuel delivery: >200 l/h, 5/8 bar after a break-in period of 20 h

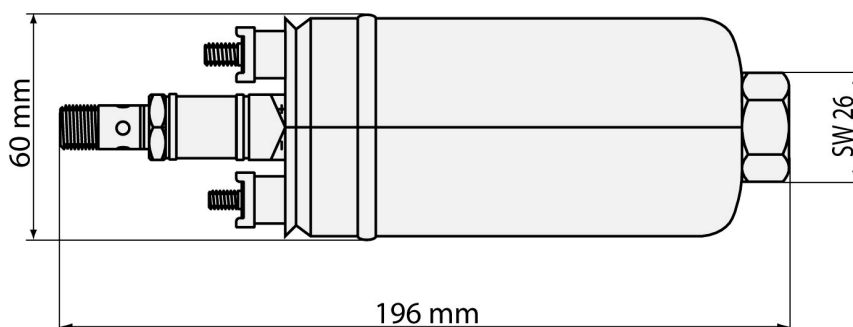


Description	
Fuel delivery	> 200 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	13 A
Weight	1030 g
Non return valve	external

Accessories	
Primary connector	

Order numbers	
5 bar	0 580 254 044
8 bar	B 261 205 413
Offer drawing	A 580 152 519

Connections	
Intake side	M18 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M6 / -: M5



Fuel Pressure Regulators

Fuel Pressure Regulator 34

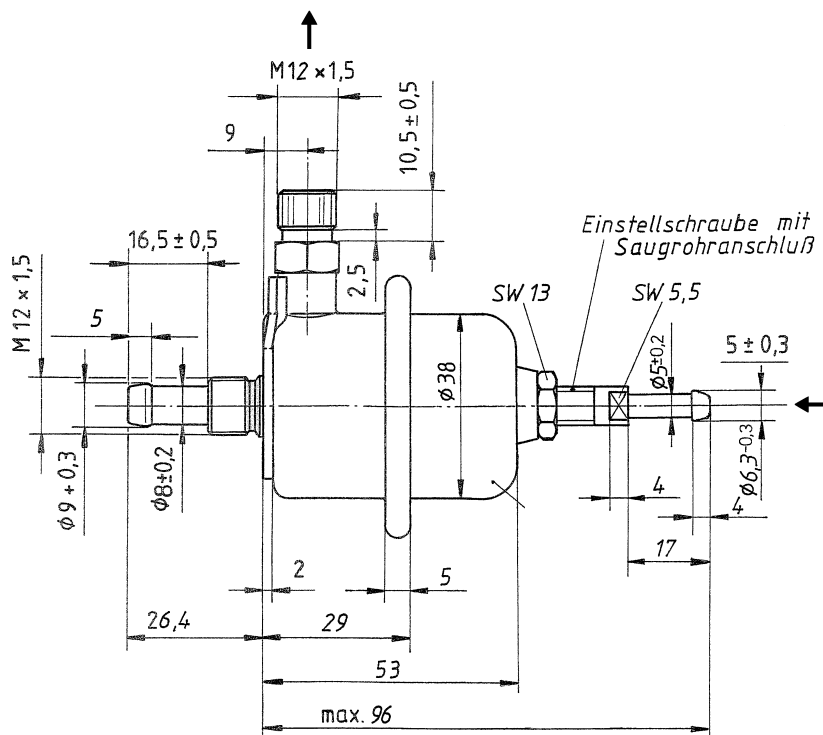
Pressure range: 3,4 bar



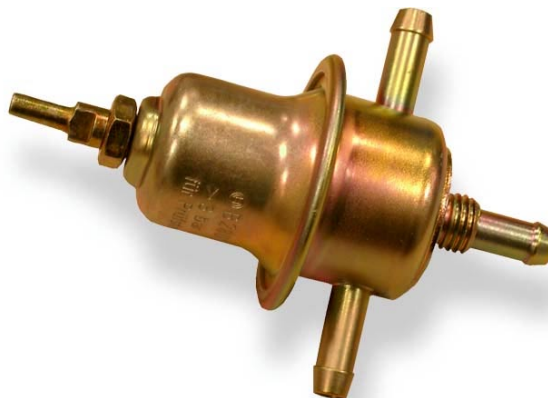
Mechanical data	
Supply	M12 x 1,5
Reflow	8 mm, tube connector

Order number	
	B 280 500 740
Offer drawing	A 280 500 740

Description	
Sheet steel housing with manifold connection	

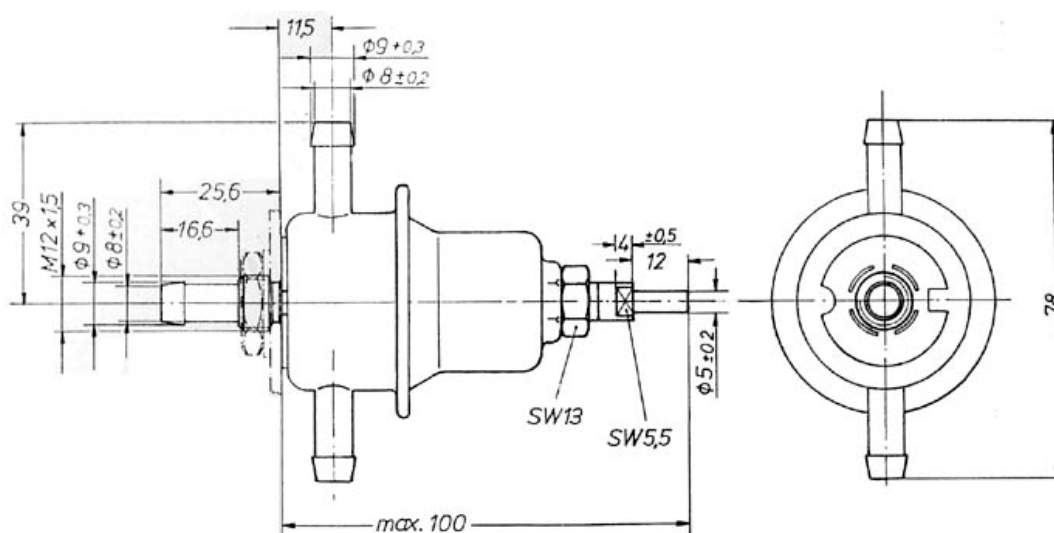


Pressure range: 0,5 ... 4 bar



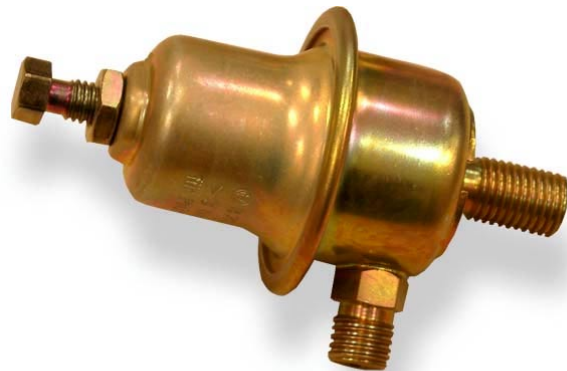
Order number	
	B 280 500 139
Offer drawing	A 280 500 104

Sheet steel housing with manifold connection



Fuel Pressure Regulator 05-40 B

Pressure range: 0,5 ... 4 bar



Mechanical data

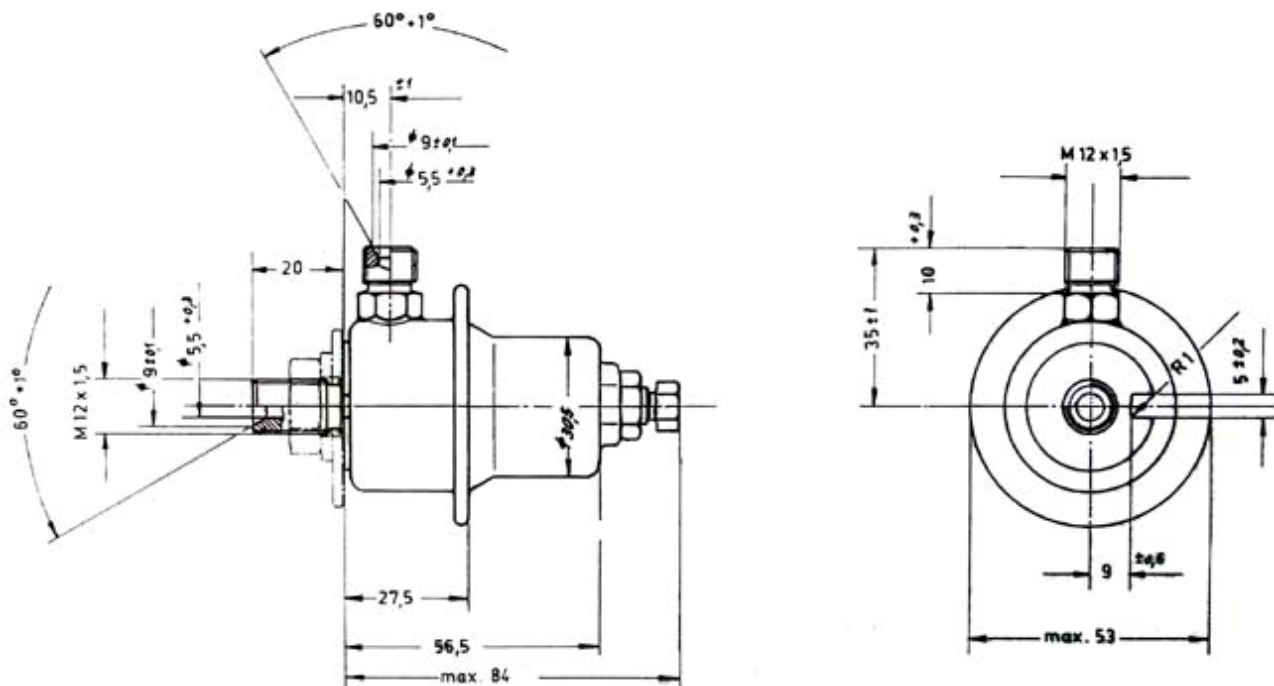
Supply	M12 x 1,5
Reflow	M12 x 1,5

Order number

	B 280 500 168
Offer drawing	A 280 500 168

Description

Sheet steel housing with manifold connection



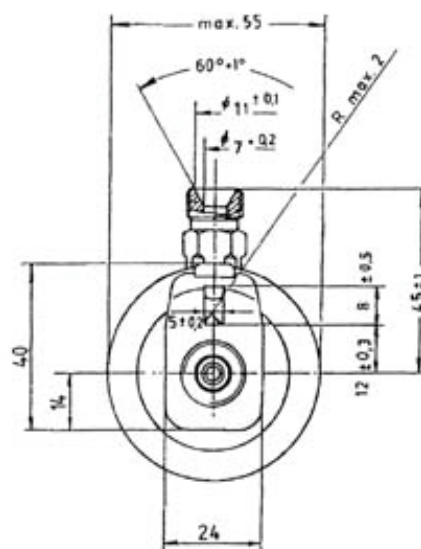
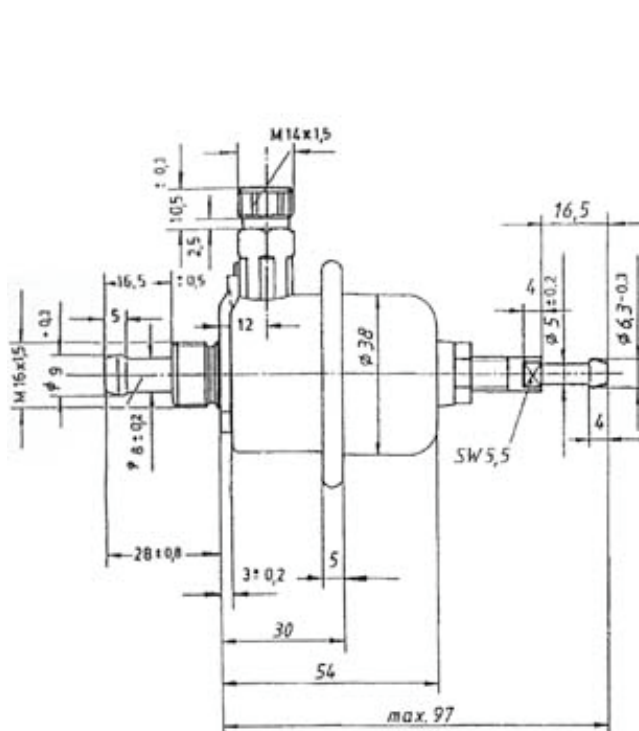
Pressure range: 1,4 ... 5 bar/3,2 ... 6 bar



Order numbers

1,4 ... 5 bar	B 280 500 701
3,2 ... 6 bar	B 280 500 581
Offer drawing	A 280 500 581

Sheet steel housing with manifold connection



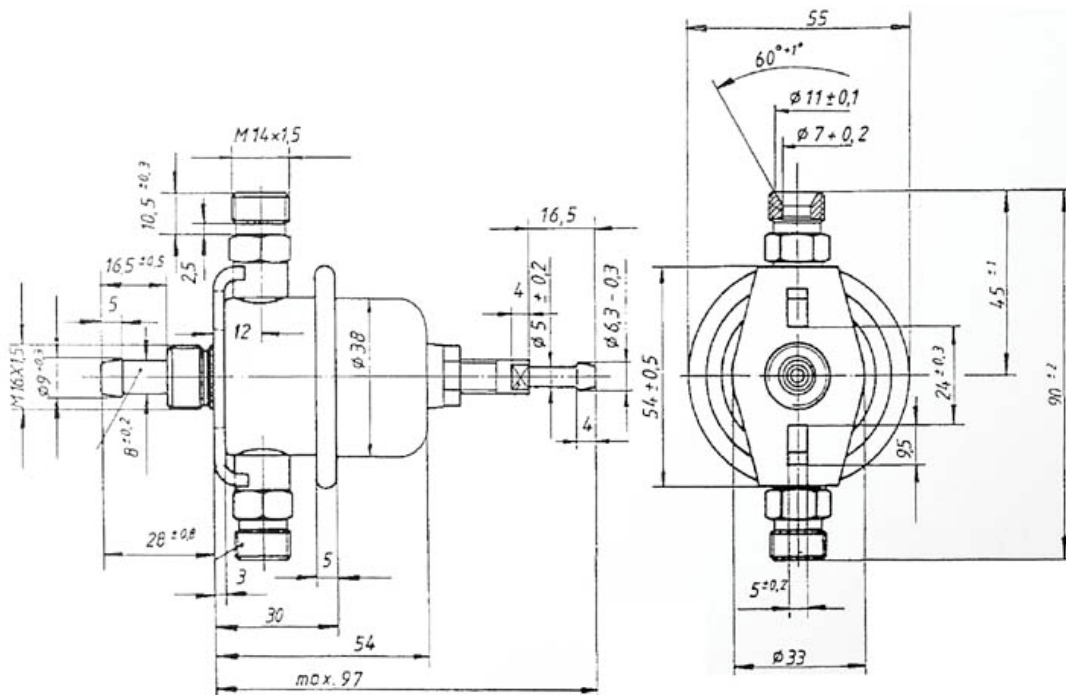
Pressure range: 1,5 ... 5 bar



Order number

	B 280 500 743
Offer drawing	A 280 500 743

Sheet steel housing with manifold connection



Fuel Pressure Regulator 19-50

Pressure range: 1,9 ... 5 bar



Mechanical data

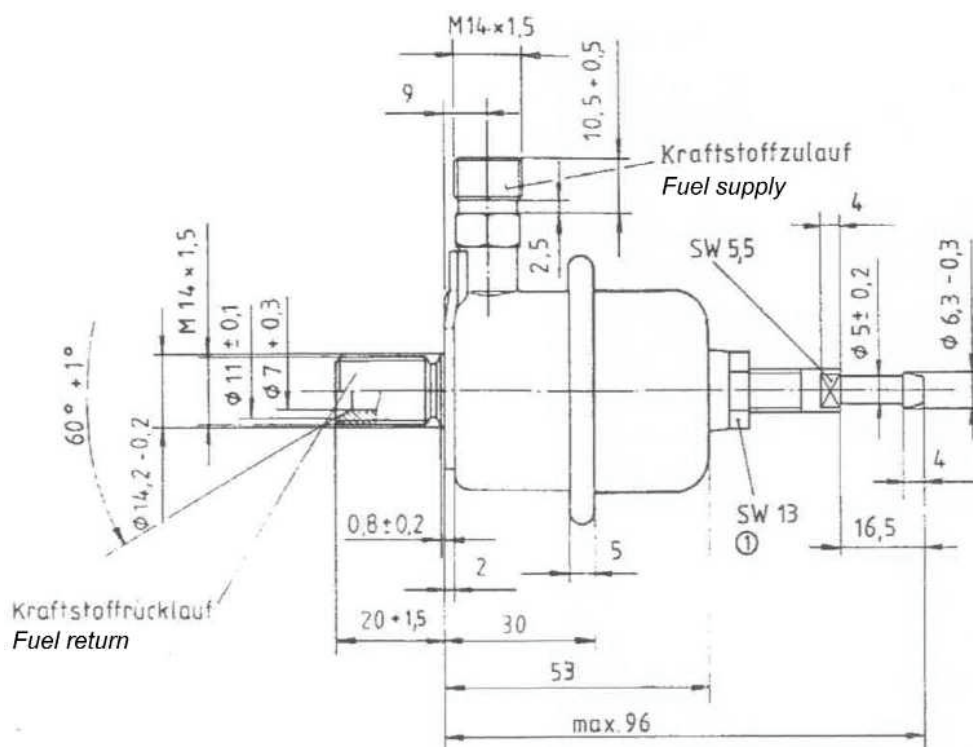
Supply	M14 x 1,5
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

Order number

	B 280 500 737
Offer drawing	A 280 500 662

Description

Sheet steel housing with manifold connection



Fuel Pressure Regulator 20-50

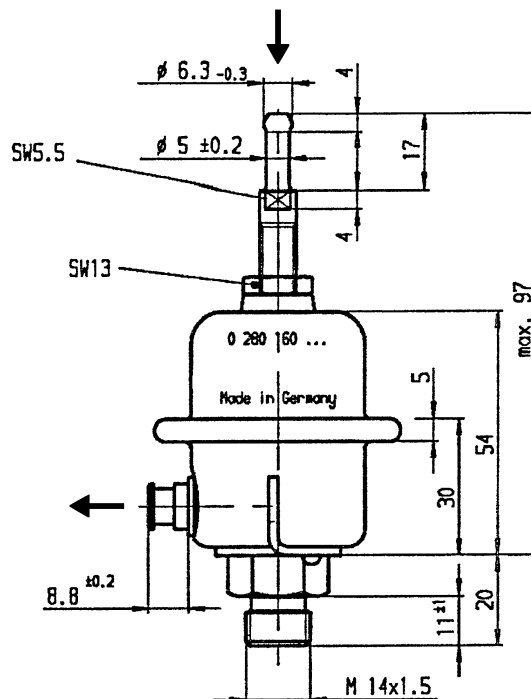
Pressure range: 2 ... 5 bar



Mechanical data	
Supply	10 mm, O-ring
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

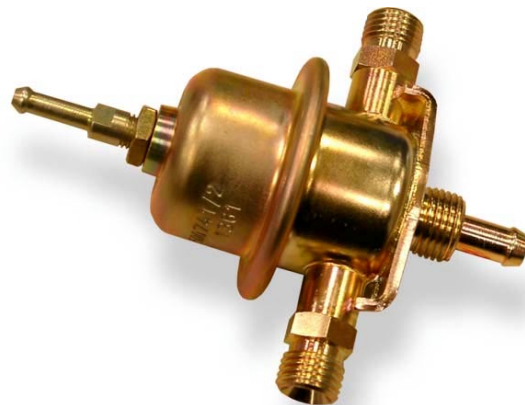
Order number	
	B 280 500 799
Offer drawing	A 280 500 799

Description	
	Sheet steel housing with manifold connection



Fuel Pressure Regulator 20x120

Pressure ranges: 2 ... 5 bar/ 3 ... 6 bar/ 4,5 ... 12 bar



Mechanical data

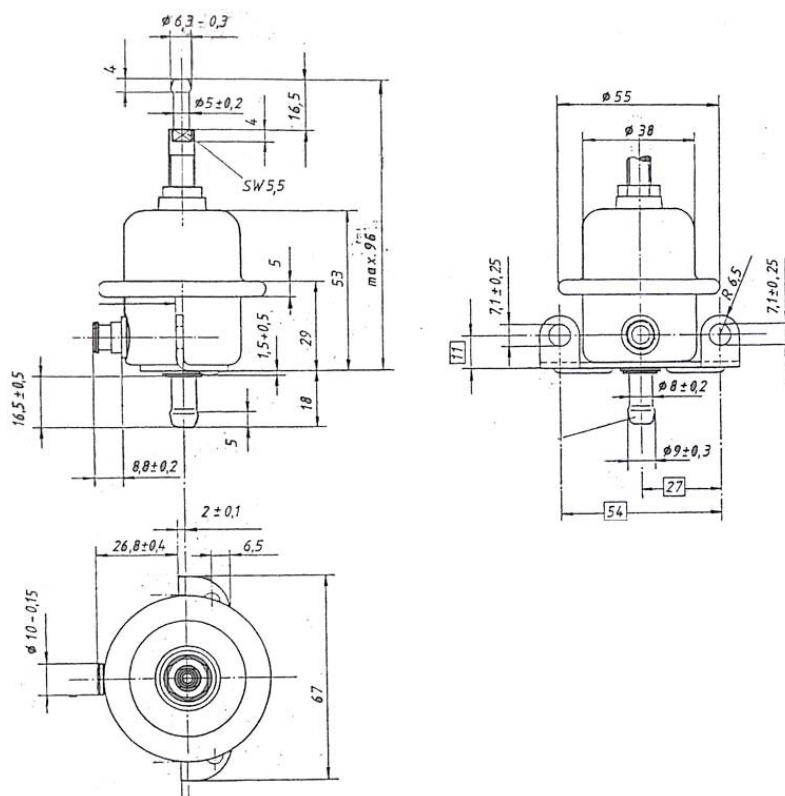
Supply	2 x M14 x 1,5
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

Order numbers

2 ... 5 bar	B 280 500 741
3 ... 6 bar	B 280 500 714
4,5 ... 12 bar	B 280 500 566
Offer drawing	A 280 500 714

Description

Sheet steel housing with manifold connection



Fuel Pressure Regulator Mini 38

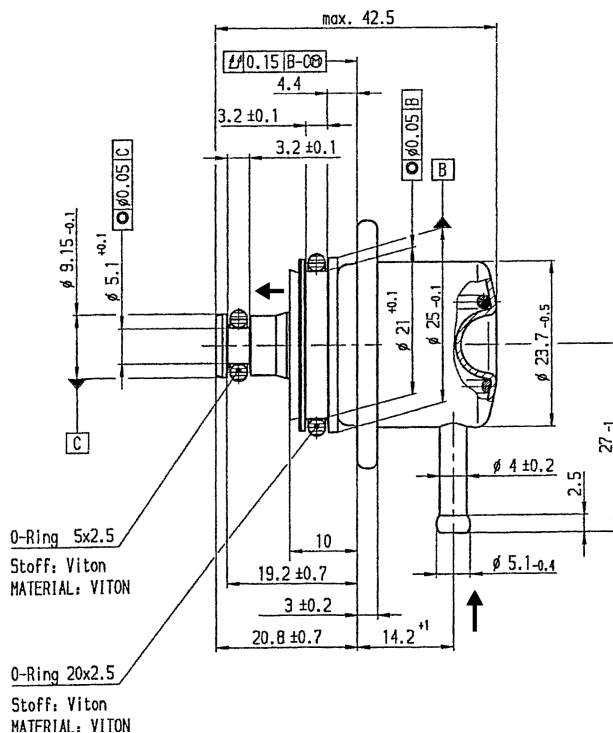
Pressure range: 3,8 bar



Mechanical data	
Set pressure	380 kPa
Set pressure accuracy	2 %
Linearity	1 %
External leak	no fuel leakage at 500 kPa
Bust pressure	> 1500 kPa

Conditions for use	
Temperature range	-40 ... 120° C
Vibration	< 600 m/s ²
Weight	45 g

Order number	
	0 280 160 616
Offer drawing	
	A 280 160 616



Erledigung durch Kunden Effect by customer

- O-Ringe leicht mit sauberem Motoröl einölen
Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
Operation with air is not allowed

Fuel Pressure Regulator Mini 50

Pressure range: 5,0 bar



Mechanical data

Supply	4 mm, tube connector
Reflow	9,15 mm, O-ring

Description

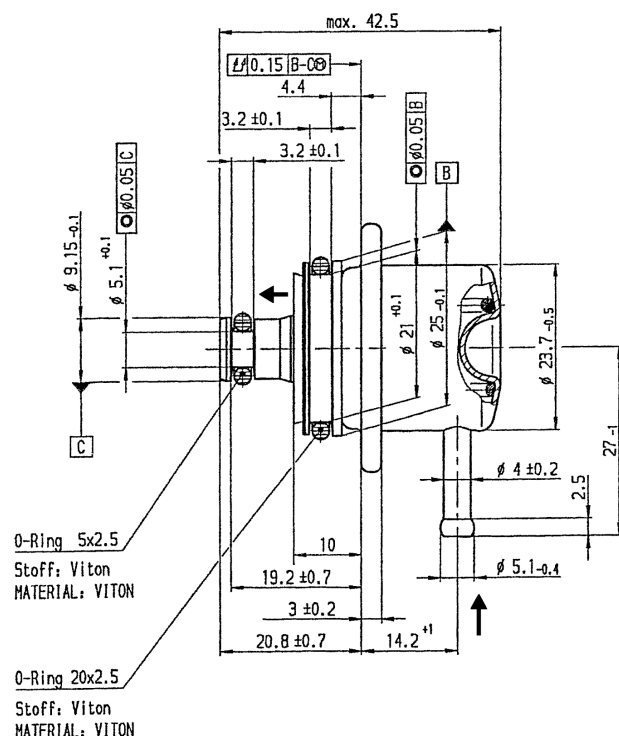
Sheet steel housing with manifold connection

Order number

B 280 550 113

Offer drawing

A 280 550 058



Erledigung durch Kunden Effect by customer

- O-Ringe leicht mit sauberem Motorenöl einölen
Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
Operation with air is not allowed

Fuel Pressure Regulator Mini A

Pressure ranges: 2,2 ... 3,5 bar/3,5 ... 5 bar

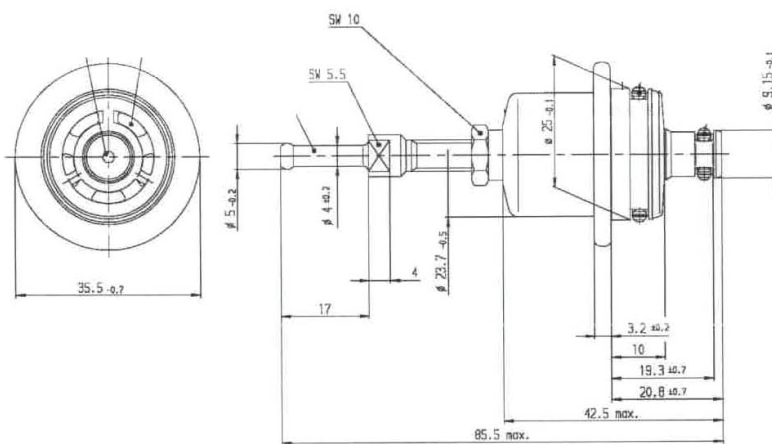


Mechanical data	
Supply	24,6 mm, O-ring
Reflow	9,15 mm, O-ring
Reflow quantity	min. 15 l/h, max. 220 l/h

Description	
Light weight aluminium housing	
No manifold connection	

Accessories	
Pre-filter	1 287 431 008

Order numbers	
2,2 ... 3,5 bar	B 280 550 340
3,5 ... 5 bar	B 280 550 341
Offer drawing	A 280 550 340



Erledigung durch Kunden Effect by customer

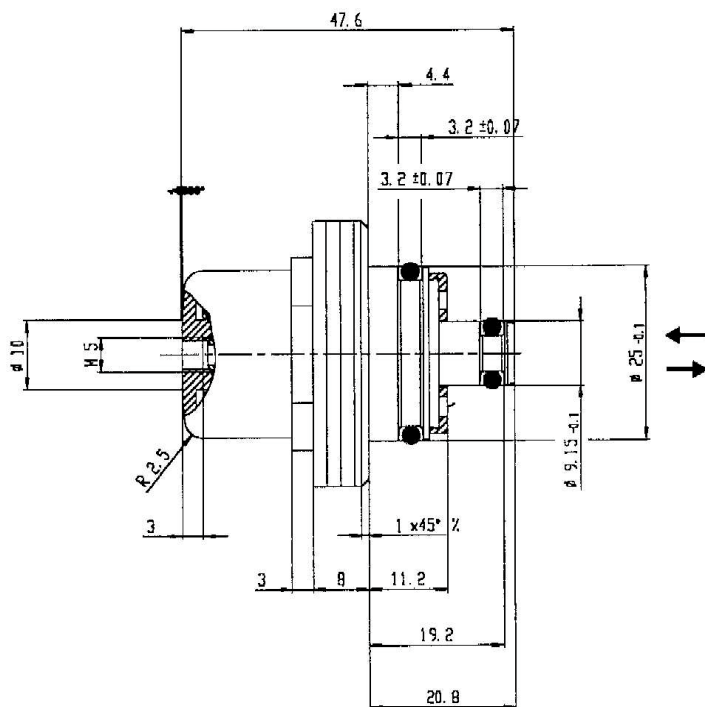
- O-Ringe leicht mit sauberem Motoröl einölen
Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
Operation with air is not allowed

Pressure range: 6/8/10 bar



Order numbers	
6 bar	B 261 208 106
8 bar	B 261 208 108
10 bar	B 261 208 109
Offer drawing	A 261 208 101

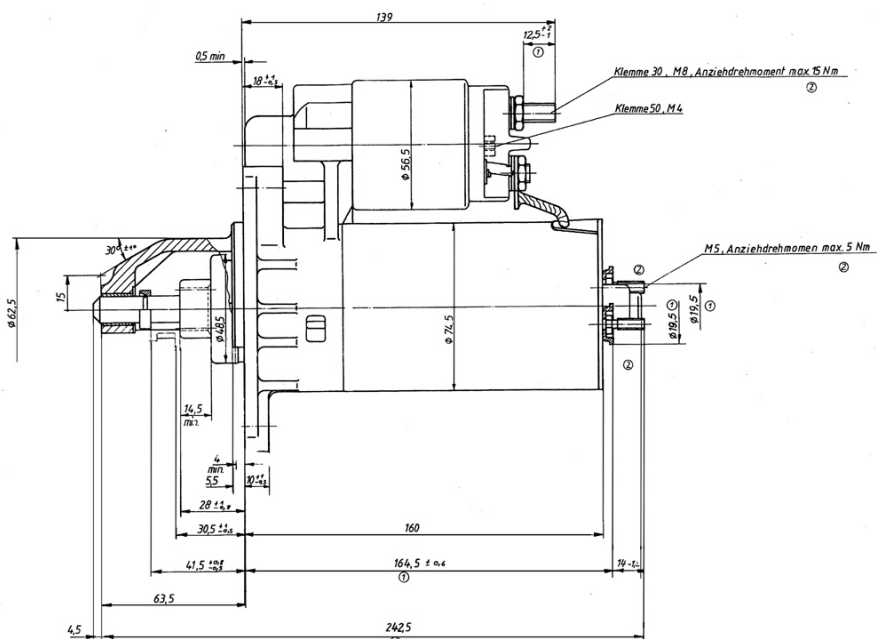
Description
Light weight aluminium housing
No manifold connection



- O-Ringe leicht mit sauberem Motoröl einölen
Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
Operation with air is not allowed

Starter 1,4 kW

Order number	
	B 261 206 115
Offer drawing	A 001 111 036



Starter 1,7 kW

This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter, we offer it in clockwise and anticlockwise version on request.



Mechanical data

Weight	3700 g
Revolutions	3600 x 1/min
Transmission ratio	i 5,0
Modul	2/11

Conditions for use

Max. temperature	150°C
Vibration	high protection

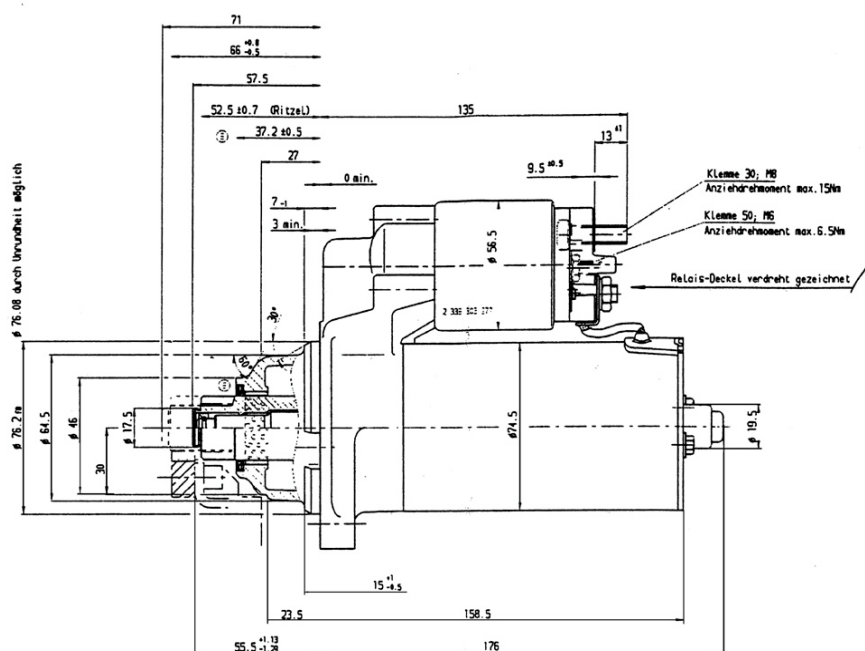
Electrical data

Performance	1,7 kW
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Order number

B 261 208 186

Offer drawing

A 261 208 186


Alternators

Alternator 80 A

This alternator is modified for motorsport demand, splash protected and delivered without pulley and fan. Clockwise and anticlockwise versions are possible, modifications are available on request.



Mechanical data	
Case material	aluminium
Weight	3300 g
Current regulator unit	integrated
Max. rotations	15 000 x 1/min

Dimensions	
Diameter	108 mm
Length without shaft stub	116 mm
Distance between mounting points	144 mm

Conditions for use	
Temperature range	-10 ... 90°C
Vibration	high protection
Installation without rubber mounting	

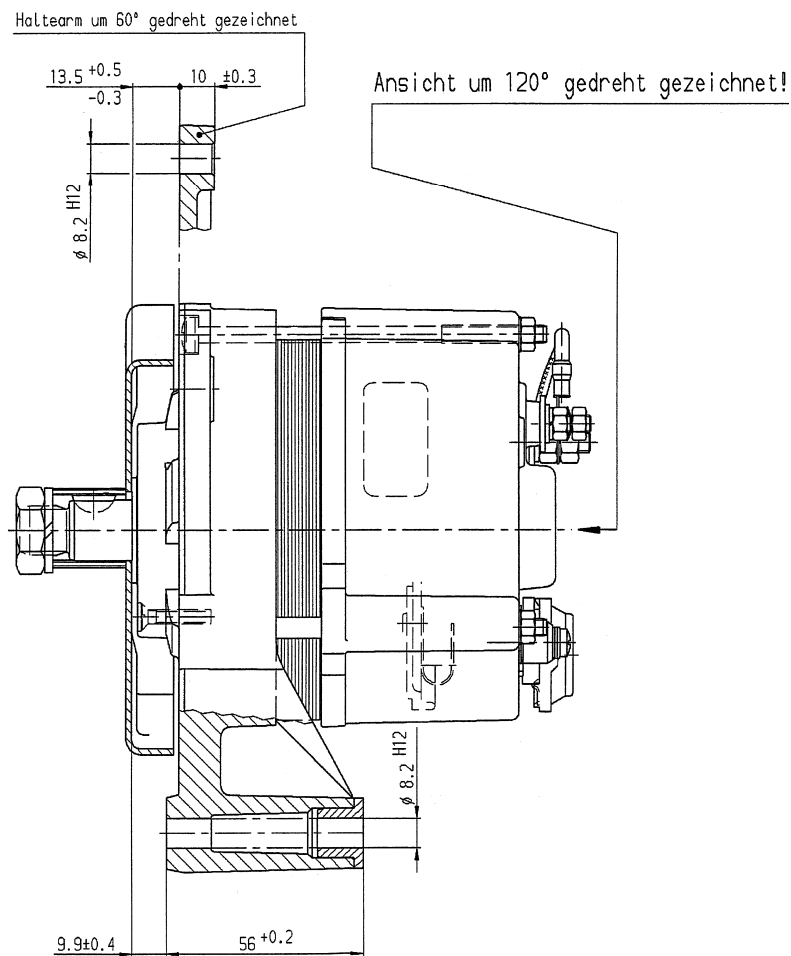
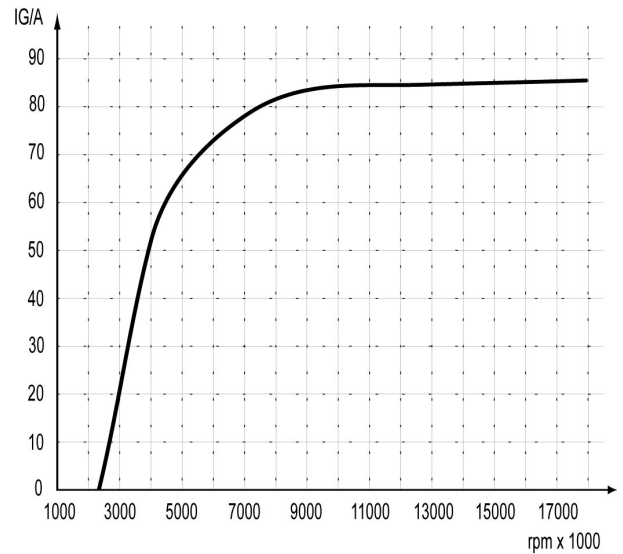
Electronic data	
Rated current	80 A
Supply voltage	13,5 V
Cut-in speed	2800 x 1/min
Coupling	screws

Order numbers	
Alternator	B 120 300 023
Pulley/fan anticlockwise	B 261 205 903
Pulley/fan clockwise	C 120 934 602
Offer drawing	A 120 300 020



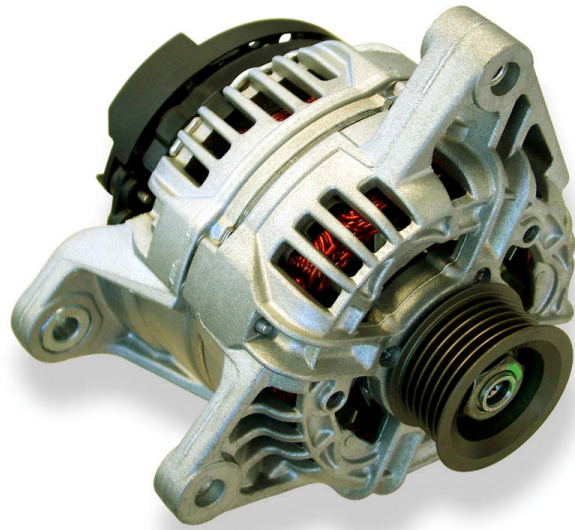
Characteristic

Rpm	IG (A) 25°C
1000	0
2000	0
3000	18
4000	51
5000	66
6000	74
7000	81
8000	83
9000	84
10000	85
12000	85
15000	85
18000	85



Alternator 90 A

This alternator is modified for motorsport demand. It is a clockwise rotation type and is series part in the Porsche Cup cars. We deliver the alternator inclusive fan and pulley. Modifications are available on request.



Mechanical data	
Case material	aluminium
Weight	5400 g
Current regulator unit	integrated
Rotation	clockwise
Max. rotations	17500 x 1/min
Dimensions	
Diameter	143 mm
Length without shaft stub	144 mm
Between mounting points	157 mm

Conditions for use	
Temperature range	-10 ... 90°C
Vibration	high protection
Installation without rubber mounting	

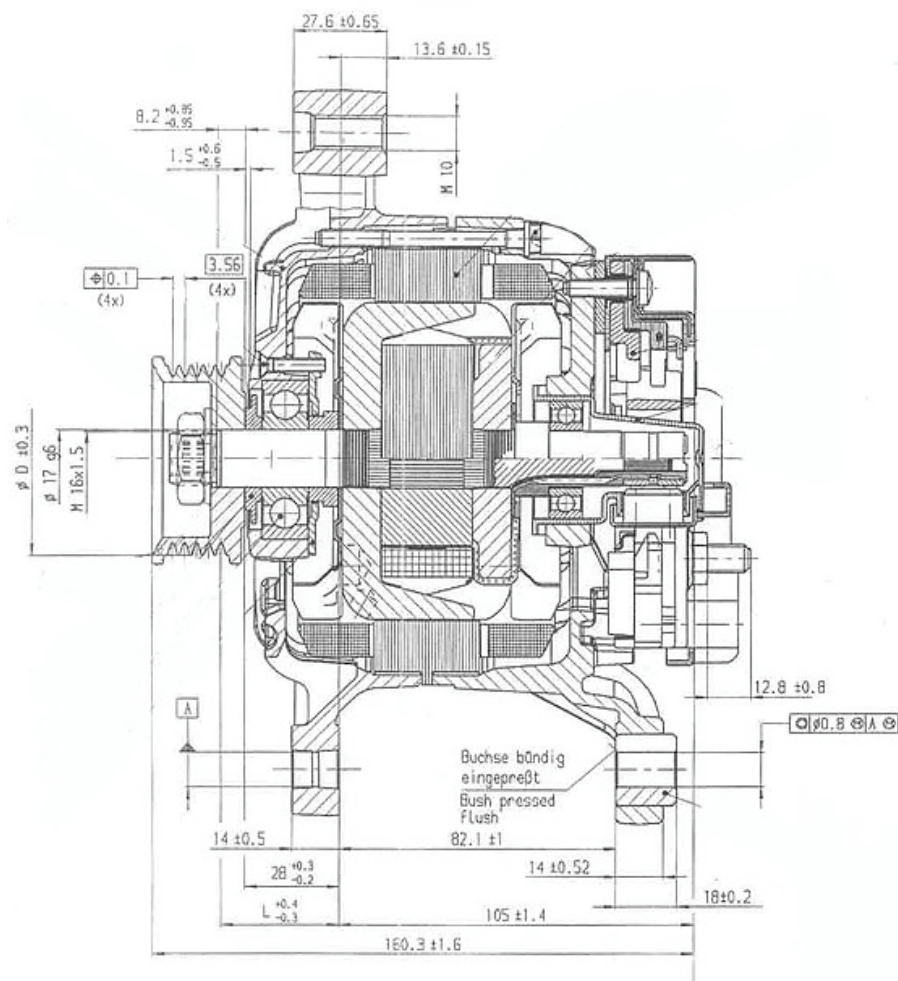
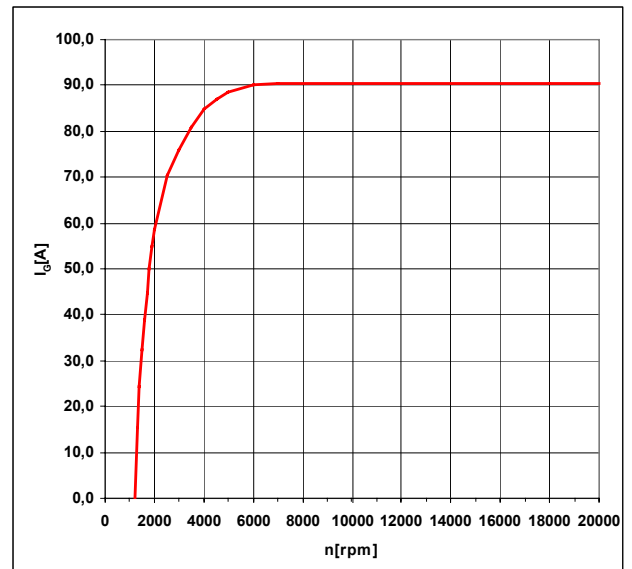
Electronic data	
Rated current	90 A
Supply voltage	14 V
Cut-in speed	1300 x 1/min
Coupling	screws

Order numbers	
	B 120 416 264
Offer drawing	A 124 315 014



Characteristic

rpm	IG (A) 25°C
1000	0
1300	15,5
1500	32,5
1700	44,8
2000	58,5
3000	76,0
4000	85,0
5000	88,5
6000	90,0
7000	90,3
8000	90,5
9000	90,5
10000	90,5
15000	90,5
20000	90,5



Alternator GC 100 A

This alternator is modified for motorsport demand and splash protected. Clockwise and anticlockwise versions are possible, modifications are available on request.



Mechanical data	
Case material	aluminium
Weight	4500 g
Current regulator unit	integrated
Max. rotations	18 000 x 1/min
Dimensions	
Diameter	125 mm
Length without shaft stub	133 mm
Distance between mounting points	154 mm

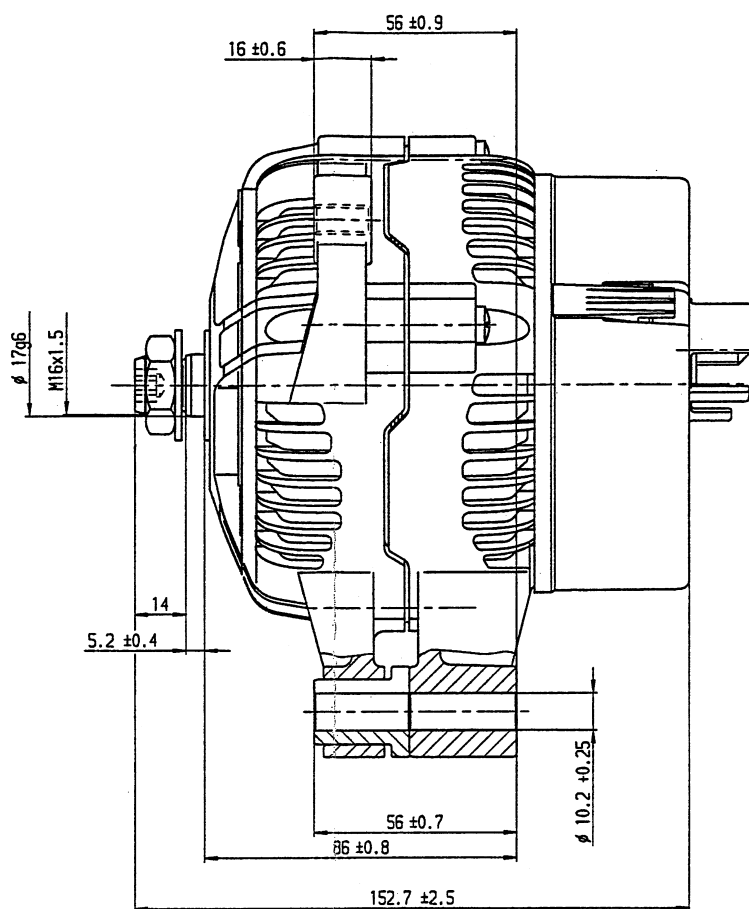
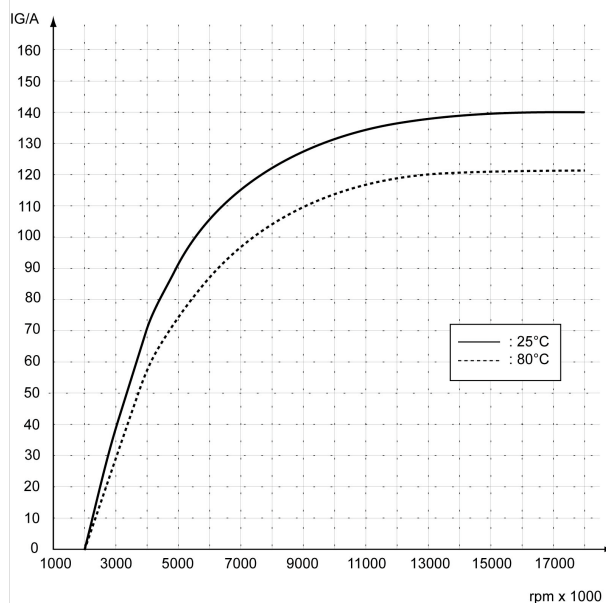
Conditions for use	
Temperature range	-10 ... 90°C
Vibration	high protection
Installation without rubber mounting and in a well ventilated area	

Electronic data	
Rated current	100 A
Supply voltage	14 V
Cut-in speed	1500 x 1/min
Coupling	screws

Order numbers	
Anticlockwise rotation	B 120 310 176
Clockwise rotation	B 120 310 175
Offer drawing	A 120 310 175

Characteristic

Rpm	IG (A) 25°C	IG (A) 80°C
1000	0,0	0,0
2000	57,1	41,5
3000	90,3	64,7
4000	106,6	71,7
5000	115,6	79,3
6000	121,0	82,9
7000	124,8	86,9
8000	127,2	89,5
9000	128,8	91,9
10000	129,9	93,1
12000	131,2	96,0
15000	132,7	99,9
18000	133,6	102,5



Alternator GCM1

110/130/140 A

This alternator is modified for motorsport demand and splash protected. The stator windings are handmade, the rotor is extra fine balanced. Clockwise and anticlockwise versions are possible, modifications are available on request.



Mechanical data

Case material	aluminium
Weight	3400 g
Current regulator unit	integrated
Max. rotations	18 000 x 1/min

Dimensions

Diameter	108 mm
Length without shaft stub	128 mm
Distance between mounting points	154 mm

Conditions for use

Temperature range	-30 ... 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data

Rated current	110/130/140 A
Supply voltage	13,5 V
Cut-in speed	3000 x 1/min
Coupling	screws

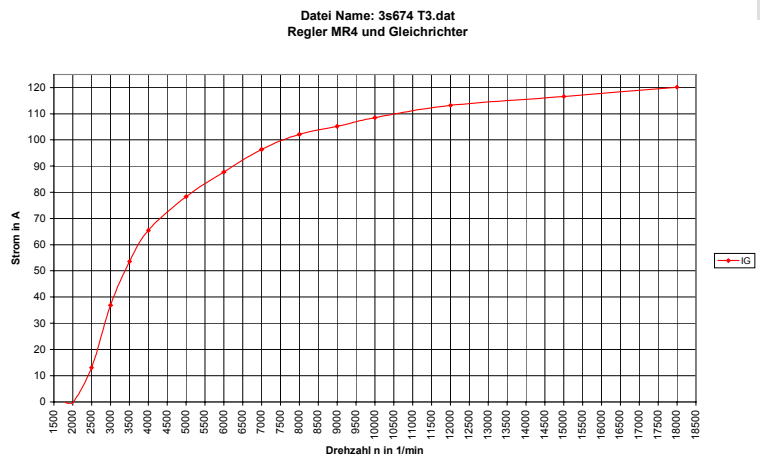
Order numbers

110 A	
Anticlockwise rotation	B 261 208 606
Clockwise rotation	B 261 208 607
130 A	
Anticlockwise rotation	B 261 208 604
Clockwise rotation	B 261 208 605
140 A	
Anticlockwise rotation	B 261 208 602
Clockwise rotation	B 261 208 603
Offer drawing	
0 124 OAD 32A	



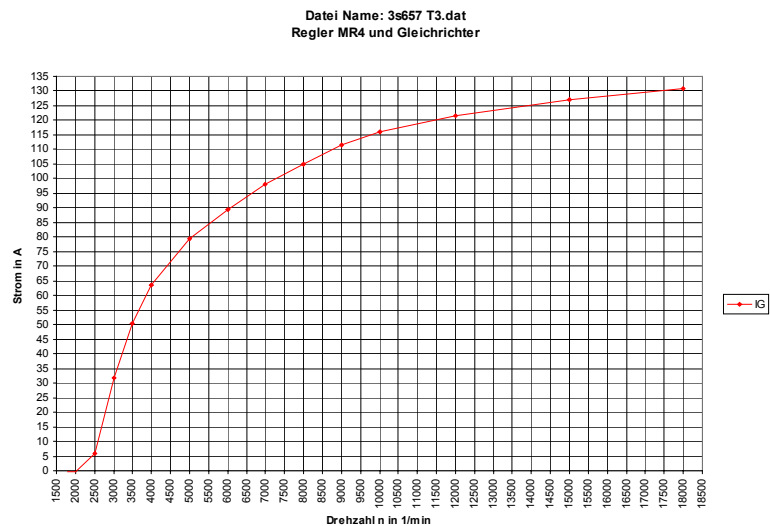
Characteristic 110 A

Rpm	IG (A) at 90°C
2000	0
2500	13
3000	37
3500	54
4000	65
5000	78
6000	88
7000	96
8000	102
9000	105
10000	108
12000	113
15000	117
18000	120



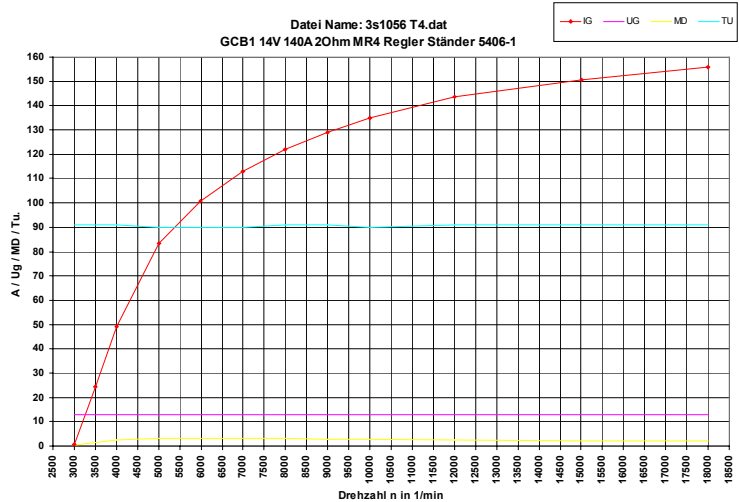
Characteristic 130 A

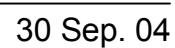
Rpm	IG (A) at 90°C
2000	0
2500	6
3000	32
3500	51
4000	63
5000	80
6000	90
7000	98
8000	105
9000	111
10000	116
12000	121
15000	127
18000	131



Characteristic 140 A

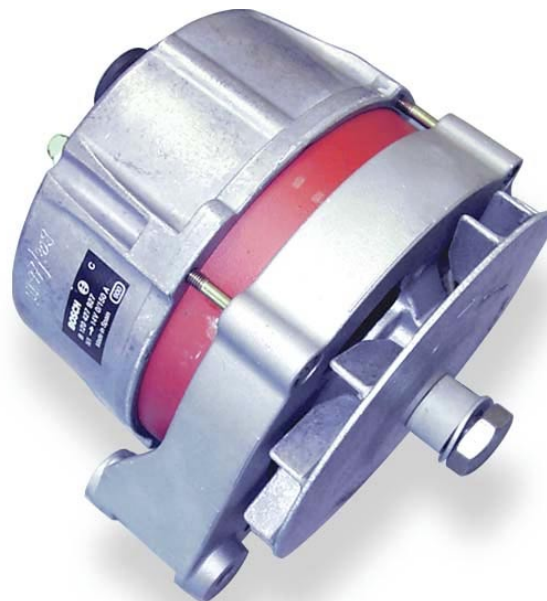
Rpm	IG (A) at 90°C
2000	0
2500	0
3000	1
3500	25
4000	49
5000	83
6000	101
7000	113
8000	122
9000	129
10000	135
12000	144
15000	151
18000	156





Alternator 150 A

This alternator is modified for motorsport demand, splash protected and delivered without pulley and fan. Clockwise and anticlockwise versions are possible, modifications are available on request.



Mechanical data	
Case material	aluminium
Weight	5500 g
Current regulator unit	integrated
Max. rotations	15 000 x 1/min

Dimensions	
Diameter	138 mm
Length without shaft stub	136 mm
Distance between mounting points	156 mm

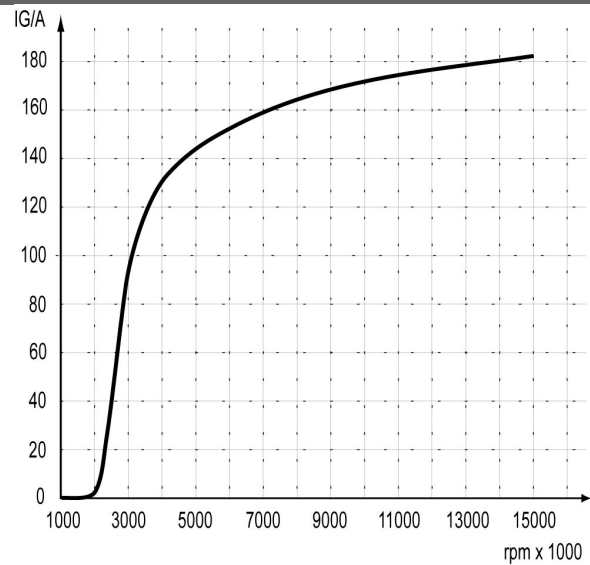
Conditions for use	
Temperature range	-10 ... 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data	
Rated current	150 A
Supply voltage	13,5 V
Cut-in speed	1700 x 1/min
Coupling	screws

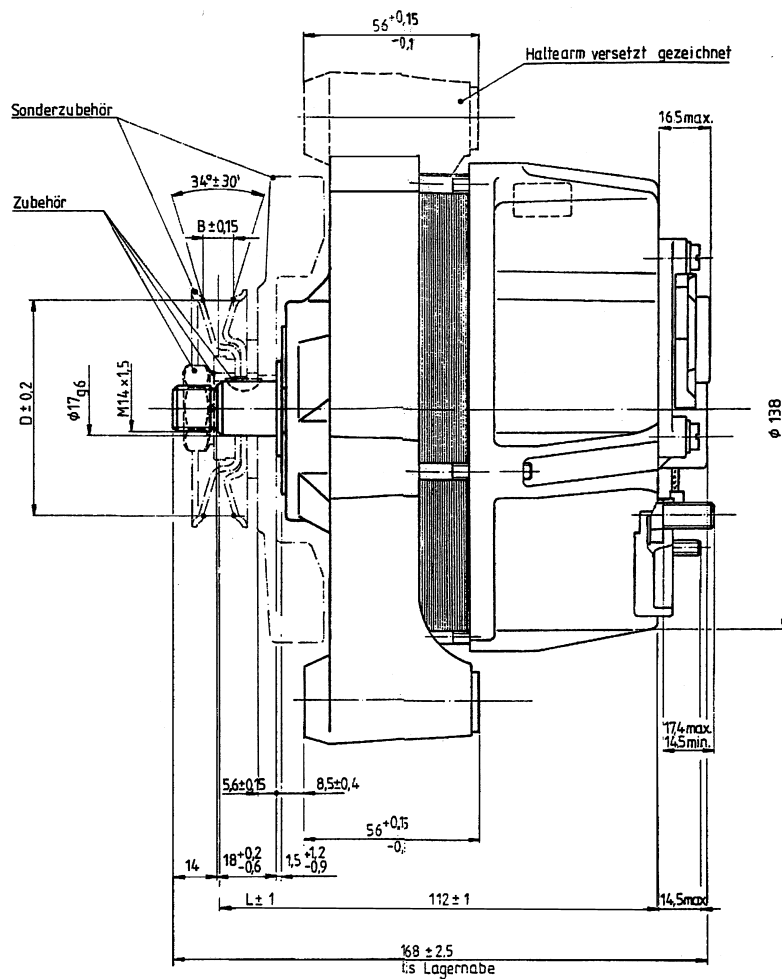
Order numbers	
Anticlockwise rotation	B 120 427 927
Pulley/fan anticlockwise	C 120 932 020
Pulley/fan clockwise	B 261 205 905
Offer drawing	A 120 427 872

Characteristic

rpm	IG (A) 25°C
1000	0
2000	8
3000	95
4000	129
5000	143
6000	153
7000	160
8000	164
9000	168
10000	173
12000	178
15000	183



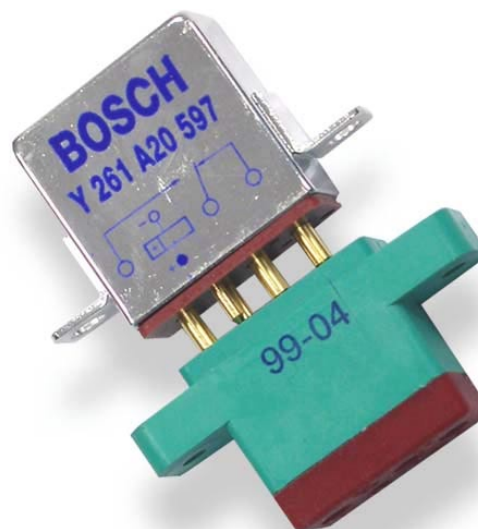
Design



Relay

Relay 25 A

A miniature DC-contactor for electrical power control. The rated current is 25 A for secondary power distribution with high inrush current like hydraulic- and fuel motor loads. The base part allows a quick change of the relay.



Mechanical data	
Drill hole	3,1 mm
Weight	61 g

Conditions for use	
Temperature range	-30 ... 125°C
Vibration	30 g/70 Hz ... 3 kHz
Shock	100 g (11 ms)

Electronic data	
Supply voltage	12 ... 14,5 V
Max. current	25 A
Min. switches	20 000

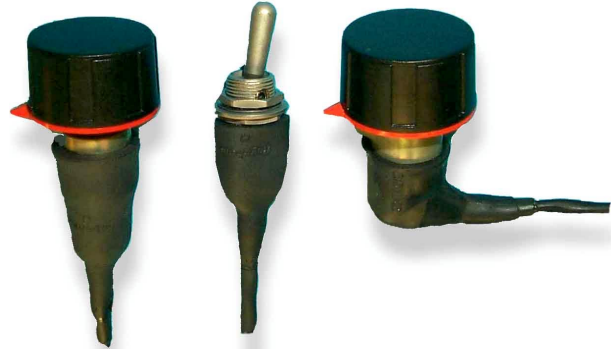
Order numbers	
Relay	Y 261 A20 597
Offer drawing	Y 261 A25 338
Base	Y 261 A20 598
Offer drawing	Y 261 A25 338

Switches

Switches

We offer a wide range of switches for the special demands of motorsport.

You can combine all types with every design and every connector cable equivalent to your individual requirement.



Type
For MAP Function
For display-toggle-function
3 steps for MAP-function
4 steps
4 steps for MAP-function
6 steps for display switch over
12 steps

Connector cables
Without
KPTA 6E6-4P-C-DN
KPTC 6E8-3P-C-DN
ASL 6-06-05PN-HE

Extras
With integrated resistor network
Lockable
Variable number of steps
Variable form of rotary waver switch
Without end stop

Application range
Motor or dashboard functions
Display switch over
Display dimmer

Design
Straight
90° angled

Order numbers			
Model	Design	Connector	
12 steps	Straight	KPTC 6E8-3P-C-DN	B 261 209 143
12 steps	90° angled	KPTC 6E8-3P-C-DN	B 261 209 144
12 steps	straight	KPTC 6E6-4P-C-DN	B 261 209 146
4 steps	straight	KPTC 6E6-4P-C-DN	B 261 209 147
12 steps without	straight	KPTC 6E6-4P-C-DN	B 261 209 148
4 steps LED dimmer display		KPTC 6E8-3P-C-DN	B 261 209 527
4 steps display dimmer DDU		KPTC 6E8-3P-C-DN	B 261 209 528
4 steps display dimmer DDU	90° angled	KPTC 6E8-4P-C-DN	B 261 209 630
12 steps	straight	ASL 6-06-05PN-HE	B 261 209 643
for MAP function	straight	ASL 6-06-05PN-HE	B 261 209 644
4 steps display dimmer DDU	straight	ASL 6-06-05PN-HE	B 261 209 646
4 steps LED dimmer DDU	straight	ASL 6-06-05PN-HE	B 261 209 647
6 steps display dimmer and switch over DDU	straight	ASL 6-06-05PN-HE	B 261 209 659



Communication

Data Logging

CardMemory

The CardMemory is a device used for data acquisition. The basic model C5 is designed with a 5 pin connector, for data transfer via CAN. The extended model C40 Plus is developed to read in additional 15 analogous signals and 1 rev signal. The measured data are stored on a compact flash card.



Mechanical data

Dust and splashwater proof aluminium housing	
Flexible housing fixation points	
Connector	with 5 or 40 pins
Size	150 x 90 x 22 mm
Weight	330 g

Conditions for use

ECU temperature	-40 ... 75°C
Max. power consumption	7 W at 14 V
Max. vibration	15 g sinus at 20 Hz ... 2 kHz for t < 5 h

Electrical data

1 microcontroller with 16 bit organisation	
1 CAN interface	
Real time clock	
Non volatile flash card memory	
Total calculation capacity approximately 10 MIPS	

Options

15 analogous inputs with 10 bit resolution and 5 ms sample rate time	
1 inductive crankshaft sensor interface	
Sensor supply outputs	5 V/100 mA 10 V/100 mA
Calibration functions are realised with an additional software tool	

Necessary equipment

Flash card 24 MB	F 01E B01 101
Flash card 48 MB	F 01E B01 102
Flash card 96 MB	F 01E B01 103
Memory adapter	B 261 206 864
C40 adapter cable	B 261 209 433

Connector

Cable harness connector C5	ASL 6-06-05SN HE
Cable harness connector C40 Plus	AS0-14-35 SN

Order numbers

C5	B 261 206 858
C40 Plus	B 261 206 860
Upgrade C5 to C40 Plus	B 261 206 869
Software chassis adjust	B 261 206 870

Sensor Interface Box ESIB

ESIB is a special device for measuring the signals of multiple sensors. The flexible use of microboards allows the adaptation to a great variety of measuring tasks.

For data recording the integrated CAN-bus can be linked to a Bosch Motronic or CardMemory.



Mechanical data	
Dust and water proof aluminium housing	
Filtered connectors of military design with high pin density (MIL-38999)	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size	120 x 114 x 38 mm
Weight	550 g

Electronic data	
1 microcontroller with 16 bit organisation, calculation power 16 MIPS	
0,5 MB RAM and up to 9 MB non-volatile flash RAM	

Conditions for use	
ECU temperature	-40 ... 85°C
Max. power consumption	7 W at 14 V
Max. vibration	15 g/20 Hz ... 2 kHz for t < 5 h

Variations	
ESIB Basic	Flexible use of microboards
ESIB-Lam 8	Lambda measurement with 8 channels
ESIB-Lam 8S	Lambda measurement with 8 channels and further signals
ESIB-Thermo 8	Exhaust-gas temperature measurement with 8 channels
ESIB-Thermo 8S	Exhaust-gas temperature measurement with 8 channels and further signals
ESIB-Ana 16S	Measuring of 16 analog signals and 6 wheelspeed signals
ESIB-Ana 24	Measuring of 24 analog signals

ESIB Basic

Flexible use of microboards

Functionality

28 multifunctional input/output connector pins configured with insertion of function specific microboards

Max. 6 microboards

Data transfer via CAN for data logging or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps

8 PWM power stages with 2,0 A output current

Precise and independent 10 V and 5 V sensor supply available

Inputs

Depending on microboards used

Alternative microboards

I8L: 8 ch analog input

I8H: 8 ch analog input (high resolution)

I6W: 6 ch wheel speed detection

L4M: 4 ch lambda measurement (LSM-type)

O4B: 4 ch universal output

I2D: 2 ch differential input

I4D: 4 ch differential input

I2T: 2 ch LVDT

E4T: 4 ch exhaust-gas temp.measurement

ESIB-Lam 8

Lambda measurement with 8 channels

Functionality

Lambda measuring with 8 wide range lambda sensors

Data transfer via CAN for data logging or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps

8 PWM power stages with 2,0 A output current

Precise and independent 10 V and 5 V sensor supply available

Inputs

8 channels wide band lambda measuring from λ 0,8 to 1,3

Integrated microboards

2 x L4M

Order number

B 261 208 228

ESIB-Lam 8S

Lambda measurement with 8 channels and further signals

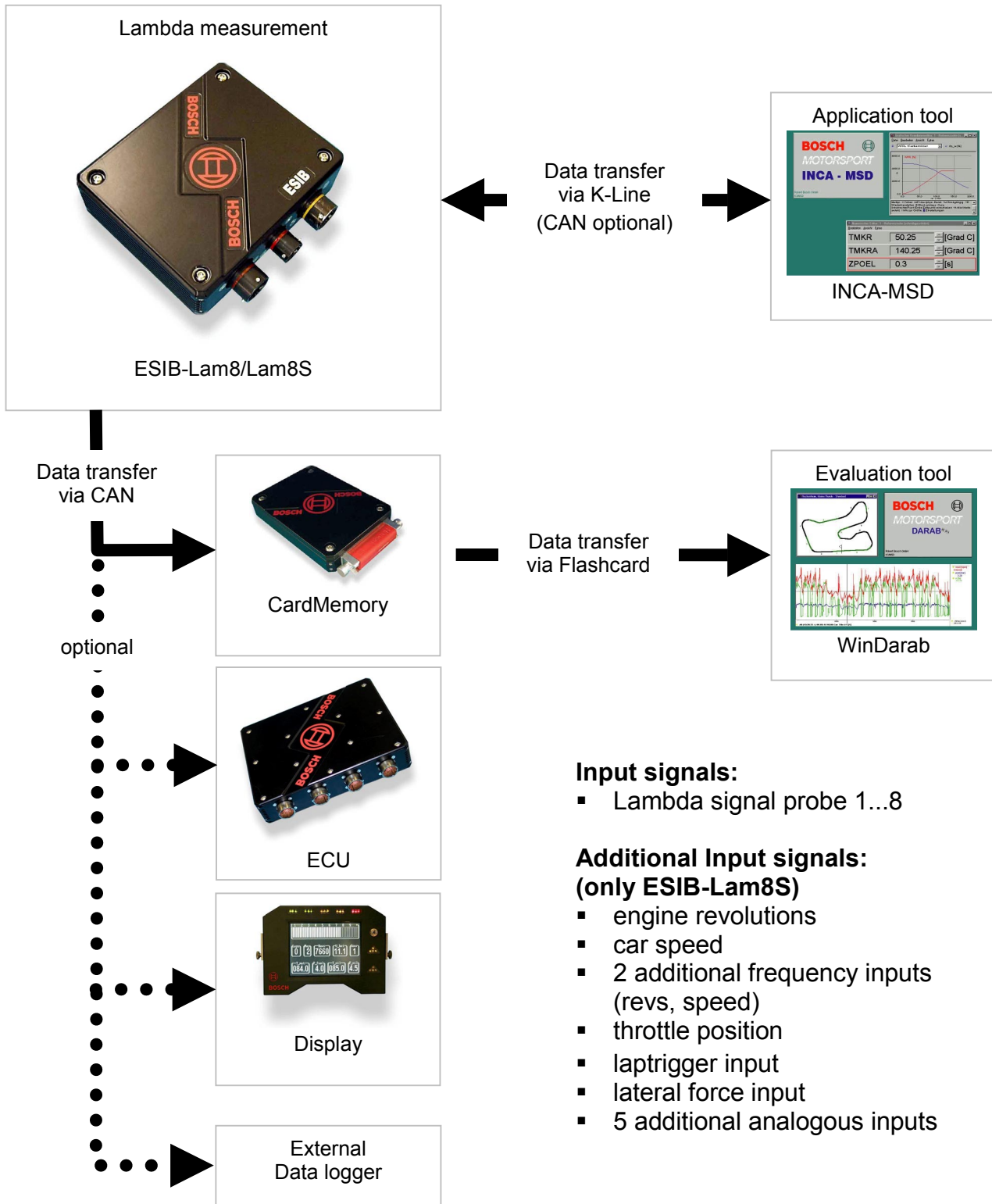
Functionality	Inputs
Lambda measuring with 8 wide range lambda sensors	8 channels wide band lambda measuring from λ 0,8 to 1,3
Vehicle speed and track distance with inductive or hall effect speed sensor	8 channels ADC 0 ... 5 V
Engine revolutions	4 wheelspeed interfaces inductive or hall effect, free programmable
Throttle position	
Lap trigger signal	
Lateral acceleration	
5 analog inputs	
Data transfer via CAN for data logging or via K-Line for online measuring	
Outputs	Integrated microboards
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps	2 x L4M
8 PWM power stages with 2,0 A output current	1 x I8L
Precise and independent 10 V and 5 V sensor supply available	1 x 6W
	Order number
	B 261 208 229

System Variations

	ESIB Lam8	ESIB Lam8S	Card Memory C5	KIC2 Interface	DDU2-Light	INCA Light	WinDarab Light incl. DCP	
Variation 1 (Stand-alone basic variation)	●				●			B 261 208 247
Variation 2 (For use in combination with other systems)	●							B 261 208 228
Variation 3 (For engine dyno use and restricted car use)	●			●		●		B 261 208 233
Variation 4 (For car use)		●	●				●	B 261 208 234
Variation 5 (For engine dyno and car use)		●	●	●		●	●	B 261 208 235

ESIB-Lam8/Lam8S

System Overview



ESIB-Thermo 8

Exhaust-gas temperature measurement with 8 channels

Functionality

8 exhaust-gas temperatures
Data transfer via CAN for data logging
or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps
serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor
supply available

Inputs

8 channels thermocouple probe sensor,
Type K, DIN IEC 584

Integrated microboards

2 x E4T

Order number

B 261 208 261

ESIB-Thermo 8S

Exhaust-gas temperature measurement with 8 channels and further signals

Functionality

8 exhaust-gas temperatures
Vehicle speed and track distance with inductive
or hall effect speed sensor
Engine revolutions
Throttle position
Lap trigger signal
Lateral acceleration
5 analog inputs
Data transfer via CAN for data logging
or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps
serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor
supply available

Inputs

8 channels thermocouple probe sensor, Type K,
DIN IEC 584
8 channels ADC 0 ... 5 V
4 wheelspeed interfaces inductive or hall effect,
free programmable

Integrated microboards

2 x E4T
1 x I8L
1 x 6W

Order number

B 261 208 262

ESIB-Ana 16S

Measuring of 16 analog signals and 6 wheelspeed signals

Functionality

16 multifunctional analog inputs
6 wheelspeed inputs
Data transfer via CAN for data logging
or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps
serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor
supply available

Inputs

16 channels ADC 0 ... 5 V
6 wheelspeed interfaces inductive or hall effect,
free programmable

Integrated microboards

2 x I8L
1 x 6W

Order number

B 261 208 227

ESIB-Ana 24

Measuring of 24 analog signals

Functionality

24 multifunctional analog inputs
Data transfer via CAN for data logging
or via K-Line for online measuring

Outputs

Serial CAN protocol to main ECU with 1 Mbps
serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor
supply available

Inputs

24 channels ADC 0 ... 5 V

Integrated microboards

3 x I8L

Order number

B 261 208 226

Accessories

Compact flash cards, adapters and drivers are necessary to use the Card memory. For some optional functions additional cables and software are on offer.

Compact flash cards are offered with a storage capacity of 96 MB, 128 MB and 256 MB. The compact flash card adapter is used to insert the card to the PCMCIA slot of the PC for data download and card formatting.

In conjunction with the memory C40 Plus, a software tool for additional calibration functions is offered. Together with an individual cable harness it is possible to calibrate further sensors for chassis data logging. To connect memory C40 to the vehicle cable harness the special C40 adapter cable is necessary.



Conditions for use

Operating temperature	-40 ... 84°C
Humidity	5 % to 95 %, non condensing
Vibration	15 g peak to peak
Shock	max. 2,0 g

Order numbers

96 MB flash card	F 01E B01 103-B
128 MB flash card	F 01E B01 105-B
256 MB flash card	F 01E B01 106-B
Memory adapter	B 261 206 864
Flash card adapter	B 261 205 814
Software Chassis Adjust	B 261 206 870
C40 adapter cable	B 261 209 433

Laptrigger HF

This Laptrigger system consists of a high frequency transmitter station and a receiver which is installed in the car.

The system allows an exact laptime measurement. Sectiontime measurement for comparison of different car setups is also available if several transmitters are used.



Mechanical data	
HF-Receiver	
Size	60 x 98 x 24 mm
Weight	130 g
Patch antenna fixed to housing, antenna coated with foil for mechanical protection	
Dust and waterproof aluminium housing	
HF-Transmitter	
Size	200 x 77 x 45 mm
Weight	1300 g
Dust and waterproof PVC housing	

Conditions for use	
Working range	up to 150 m
Ambient temperature	-10 ... 70°C
Power consumption HF-Receiver	2,0 W
Power consumption HF-Transmitter	3,5 W

Electronic data	
HF-Receiver	
32 kByte EPROM	
1 microcontroller	8 bit
Transmitting frequency	5,5 Ghz
Supply voltage	7,5 ... 15 V
HF-Transmitter	
32 kByte EPROM	
1 microcontroller	8 bit
Transmitting frequency	5,5 Ghz
Supply voltage	7,5 ... 15 V
Adjustable transmission power	max. 15 mW

Order numbers	
HF-Receiver	B 261 206 856
HF-Transmitter	B 261 206 857

Laptrigger IR-02

This laptrigger system consists of an infrared transmitter station and a receiver installed in the car. The system allows an exact laptime measurement. Section time measurement for comparison of different car setups is also available if several transmitters are used.

Notice: our old laptrigger IR is not compatible with IR-02. If both laptriggers are used at the same time, the transmitters have to be positioned with a minimum distance of 5 m.



Mechanical data	
IR-02-Receiver	
Size	42 x 20 x 10 mm
Weight	39 g
Dust and waterproof aluminium housing	
IR-02-Transmitter	
Size with diode	90 x 40 x 28 mm
Weight	124 g
Dust and waterproof aluminium housing	

Conditions for use	
Working range	15 m
Ambient temperature	-25 ... 70°C
Same height between receiver and transmitter	
Visibility connection between receiver and transmitter	
Avoid direct exposure to sunlight	

Electronic data	
IR-02-Receiver	
Frequency codes	16
Supply voltage	8 ... 16 V
Output voltage	5 V
IR-02-Transmitter	
Frequency codes	16 plus 16 offset codes for section times
Supply voltage	8 ... 16 V

Order numbers	
IR-02-Receiver	
KPSE 6E8 3AP DN A34	B 261 206 884
ASL 6-06-05PB-HE	B 261 206 887
KPTA 6E6-4P-C-DN	B 261 206 888
IR-02-Transmitter	
	B 261 206 890

Speed Box 2

This box determines the speed signals of two wheels and passes the higher value on. This enables the logging of vehicle speed even with one wheel locked.



Mechanical data	
Size	40 x 40 x 38 mm
Weight	89 g
Environmental	IP65

Conditions for use	
Operating temperature	10 ... 60°C

Connectors	
Input	2 x KPSE 120061-28
Output	1 x KPSE 6E8-3AP-DN

Electronic data	
Supply voltage	6 ... 18 V
Supply current	4 mA

Order numbers	
Speed Box 2 incl. cable harness	B 261 208 281
Speed Box 2	B 261 208 284
Cable harness	B 261 208 285

Speed Box 4

This box determines the speed signals of four wheels and converts them into a CAN-message. The message includes the time between each tooth-gap. The box is optimized for the MS 3-use.



Mechanical data

Size	70 x 40 x 19 mm
Weight	90 g

Conditions for use

Operating temperature	10 ... 60°C
-----------------------	-------------

Connector

	AS0-10-35PN
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Electronic data

Power supply	4 ... 18 V
Current consumption	120 mA at 12 V
Channels	4 Speed
Channel input	1 ... 150 V

Order number

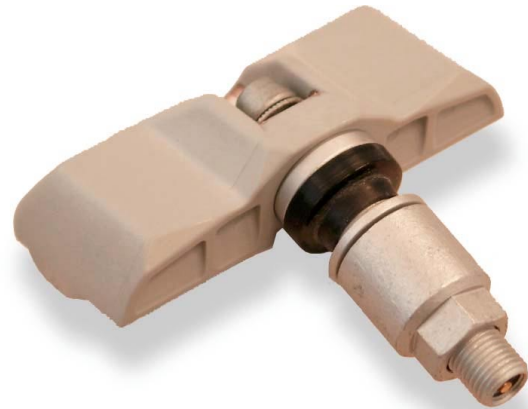
Speed Box 4	B 261 208 286
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Tyre Monitoring Transmitter Type A

Measures and transmits tyre pressure and temperature, provides continuous monitoring of tyres during test, practice and race conditions. Installs in a standard 11,3 mm valve hole compliant with ETRTO standards (typical production car rim).

Transmitted data is encrypted and carries a unique serial number ensuring reliable error free data transmission. Each sensor is individually calibrated to a traceable standard, resulting in very high accuracy across the wide operating temperature range (-20 to 125°C).

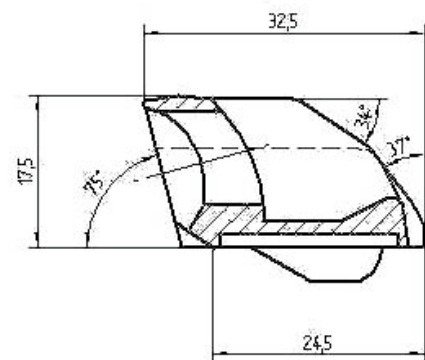
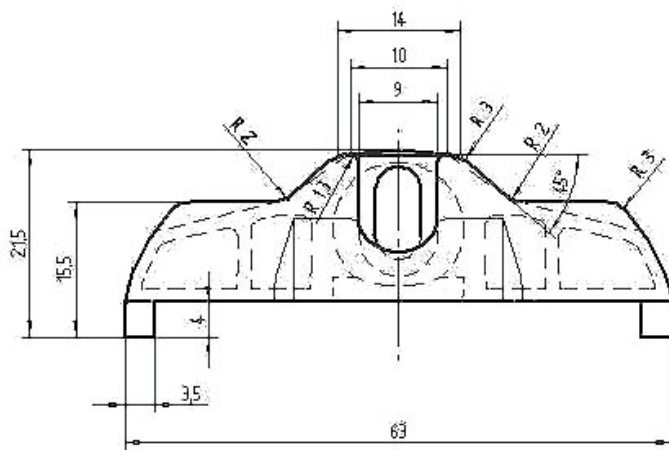
Calibration for any required range up to 10 bar can be provided, the resolution will be typically 200 bits at any temperature over the full pressure range.



Sensor Specification	
Pressure measuring range	0 ... up to 10 bar
Measuring resolution	max. pressure/200
e.g. 5 bar →	5/200 = 25 mbar resolution
Pressure accuracy	+/- 1 %
Temperature measuring range	-20 ... 125°C
Resolution	1°C
Housing	moulded plastic
Weight	23 g (39 g with valve stem)
Transmit rate	adaptive up to 1 Hz
Battery	Lithium Thionyl cell
Radio frequency	433,92 MHz
RF emission category	MPT 1340, ETS 300-220
Typical TX range	20 m (free space)

Operating modes	
Active mode:	When pressure is above 0,17 bar and temperature is above active threshold (typically 40°C). Transmit interval 1 sec (2 sec option)
Power save mode:	When pressure is above 0,17 bar and temperature is below active threshold. Transmit interval 60 sec (120 sec option). If pressure change 25 mbar additional transmissions made
Sleep mode:	If pressure is below 0,17 bar the sensor makes no transmissions.
Expected battery live:	>1 500 000 transmissions (approx. 750 hrs active, 9000 hrs power save, 15 000 hrs sleep mode). Battery replacement can be carried out by factory or authorised service agent

Order number
on request

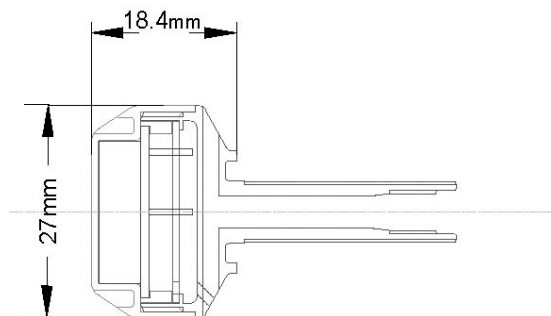


Tyre Monitoring Transmitter Type B

Measures and transmits tyre pressure and temperature, provides continuous monitoring of tyres during test, practice and race conditions. Installs in a standard 11,3 mm valve hole (8,8 mm optional) with O-ring seal as a valve replacement, accepts standard valve core. All valve threads conform to ISO 4570:2002.

Transmitted data is encrypted and carries a unique serial number ensuring reliable error free data transmission. Each sensor is individually calibrated to a traceable standard, resulting in very high accuracy across the wide operating temperature range (145°C).

Calibration for any required range up to 10 bar can be provided, the resolution will be typically 200 bits at any temperature over the full pressure range.



Sensor Specification	
Pressure measuring range	0 ... up to 10 bar
Measuring resolution	max. pressure/200
e.g. 5 bar →	5/200 = 25 mbar resolution
Pressure accuracy	+/- 1 %
Temperature measuring range	10 ... 145°C
Resolution	1°C
Housing	Al 7075 T6 (Titanium option)
Weight	23 g (29 g Titanium)
Transmit rate	adaptive up to 2 Hz
Battery	High-temp Lithium Thionyl cell
Radio frequency	433,92 MHz
RF emission category	MPT 1340, ETS 300-220
Typical TX range	20 m (free space)

Operating modes

Active mode:

When pressure is above 0,17 bar and temperature is above active threshold (typically 40°C). Transmit interval 1 sec (0,5 sec optional)

Power save mode:

When pressure is above 0,17 bar and temperature is below active threshold. Transmit interval 30 sec (60 sec optional). If pressure change 25 mbar additional transmissions made

Sleep mode:

If pressure is below 0,17 bar the sensor makes no transmissions.

Expected battery live:

>1 500 000 transmissions (approx. 500 hrs active, 6000 hrs power save, 15 000 hrs sleep mode). Battery replacement can be carried out by factory or authorised service agent

Order numbers

T6	8,8 mm	on request
Ti	8,8 mm	on request
T6	11,3 mm	on request
Ti	11,3 mm	on request

Tyre Monitoring Receiver

Compact, lightweight data receiver monitors RF signals from the wheel transmitters. It decodes the sensor messages and sends calibrated pressure and temperature data to vehicle logging system via CAN or RS232 interface.

Each receiver recognises data from only its team sensor codes. The receiver holds a current library of team sensors that can be easily updated using a PC software utility.

Optional internal data logger, records last 30 minutes of pressure and temperature data.



Technical data	
CAN interface	Conforms to CAN 2.0A bus rate up to 1 Mbps
RS 232 interface	9,6 ... 19,2 K baud
Data output	pressure, temperature, message count
Additional flags	sensor over temp, sensor battery status
Main connector	AS007-35PN
RF connector	SMA (helical wound antenna supplied)
Power supply	7,5 ... 24 V, 45 mA
Housing	Al 7075 T6, black hard anodised (IP65)
Weight	69 g
Dimensions	82 x 42 x 23 mm
Operating conditions	0 ... 85°C
Radio frequency	433,92 MHz
Internal data logger	256 Kb, approx. 30 min

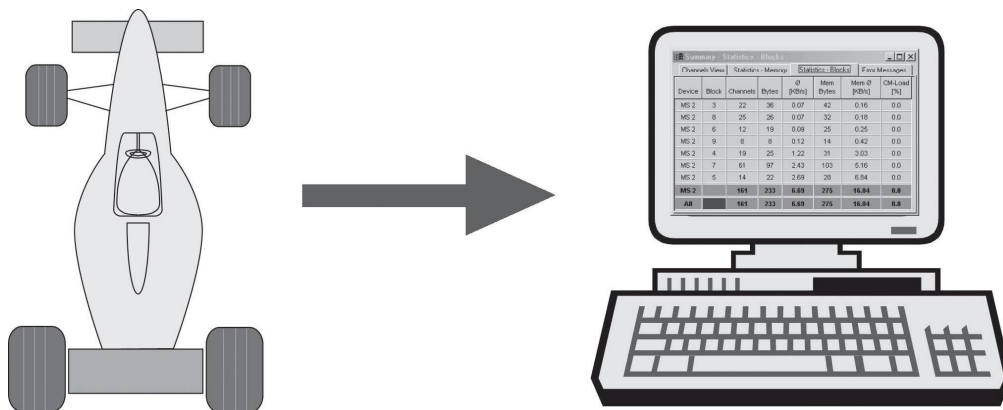
Order number
on request

Analysing

WinDarab

Data Recording, Analysing and Influencing

WinDarab is an evaluation tool for monitoring and analysing of logged data. It is Windows-based and specially designed for motorsport use. Depending on the functionality the software is available in two different versions, WinDarab-Light and WinDarab-Expert. For selection of monitored data channels and setting of sample rates the integrated configuration tool WinDCP is used.



Data evaluation

- Auto load and auto store
- Adjustable axis: time or distance
- Direct read in of memory data without reader
- Graphic display of all measured and stored channels
- Various displays available (analogous and digital)
- Number of displays available
- Various display set-ups selectable and storable
- Laptrigger signal included

Functionality

- Creating of race tracks
- Several segments adjustable for each race track
- Lap reports and lap comparison
- Inform displays
- Data extract and export

Functions

- Min/max-calculations
- Histograms
- Mathematical functions
- Filter functions incl. FFT
- x/y-plots

Data comparison

- Calculation of differences lap by lap

Order numbers

WinDarab-Light incl.	F 01E B01 402
Configuration tool WinDCP	
WinDarab-Expert incl.	F 01E B01 401
Configuration tool WinDCP	
Upgrade	B 261 206 430
WinDarab-Light to	
WinDarab-Expert	

Telemetry

Telemetry Unit FM4-Plus

The FM4-Plus is a real-time telemetry system used to get always actual data from the car out on the track. It fits most of the Bosch Motorsport management systems and is designed to transmit many various car and engine data due to its high speed data rate.

In typical applications data are sent from the car to the receiving station. With the optional software for bi-directional transmission, data can be sent in both directions.



Mechanical data

Size	151 x 138 x 28 mm
Weight	720 g
Dust and waterproof housing with LED indicators	
Car antenna compatible to existing Bosch telemetry systems	

Conditions for use

Vibration	6 g/20 Hz ... 2 kHz
Temperature range	0 ... 60°C
Max. power consumption	25 W at 14 V
International standard	I-ETS 300 220 ETS 300 113 FCC

Electronic data

Semi duplex radio modem (bidirectional)	
Internal data buffer and protocol management	
Transmission power	1 ... 10 W
Frequency range	430 ... 470 MHz (hardware adjustable)
Receiver sensitivity	-116 dBm error detection and forward error correction (FEC)
Data rate	max. 19200 bps
Required power supply	10 ... 18 V
Max. current	< 2,5 A

Connectors

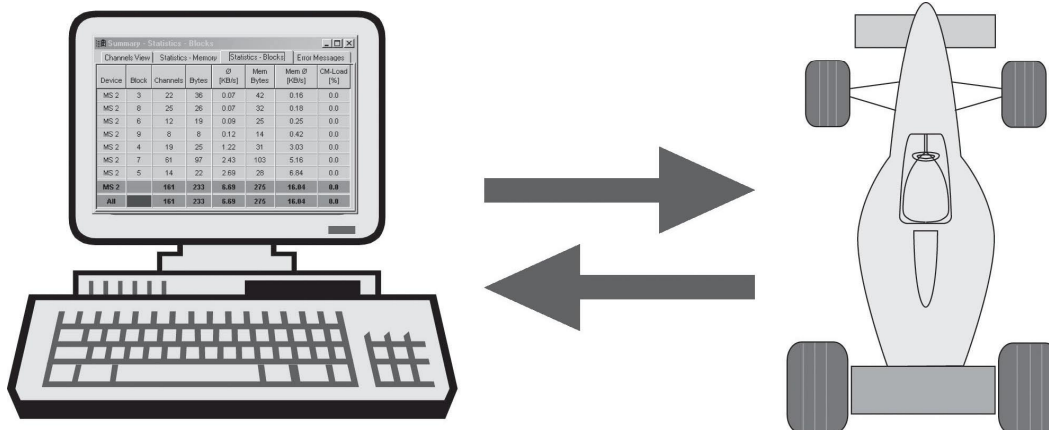
RF	BNC female
Power / data	CGK SOT 8N35 PN

Order number

B 261 208 885

Application

INCA-MSD



INCA is a software tool for measuring and calibrating defined engine parameters. According to different levels of functionality INCA is available in two different versions:

- The basic version INCA-Light is made for the quick use.
- The highly sophisticated version INCA-Expert is made for calibration and optimization.

Performance description

INCA-MSD is a combination of:

• Project management:

Visualization, processing and management of calibration, measurement and documentation data.

• Programming system:

Programming and management of program (code) and calibration data.

• Measuring system:

Acquisition, visualization, documentation and evaluation of measurement data.

• Calibration system:

Visualization and manipulation of parameters (calibration data).

• Diagnosis system:

Visualization, processing, documentation and evaluation of diagnosis data.

General functions

Online measurement and calibration

Basic configuration of a number of views

User-configurable menus of the diagnostic services and the displays on the screen

Easy switch between the configured views

Universal use for different ECUs

Controlled by mouse or menu, fast grip via keyboard and shortcuts

Data acquisition via central main window

**Measurement system function**

The measurements can be displayed in various ways: e.g. oscilloscopes, vertical or horizontal bar charts, numerical displays for numerical values or bit displays for binary values.

The oscilloscope allows you to have several scalar or binary measured signals displayed simultaneously.

Once measuring has been completed, you can complete the evaluation of the data either directly or in detail evaluation programs, such as the VS 100 program provides.

INCA processes characteristics and measured signals in the form of variables. These are structured alphabetically according to the DA-MOS/ASAP 2 definition, but are also available in an additional hierarchical display.

Using an editor, you define individual functions and so react in this way to different application tasks, such as the integration of different external data sources (thermo-scan, lambda display).

Free selection of measuring cells.

Calibration system function

INCA provides you with various editors for different characteristics, e.g. the tabular editor for processing curves and maps.

These curves and maps can be spread over several windows so that all values can be displayed at the same time.

To evaluate the data, use either the provided VSW program or copy the data to a spreadsheet program using the Windows buffer.

Free selection of calibration cells.

Functionality of potentiometer board: up to 12 pots with individually configuration.

Evaluation function**Calibration comparison function**

A lot of auxiliary functions are supporting the user during the period of working in.

Required hardware components**PC:**

IBM PC/AT compatible, 586 processor or higher, 166 MHz

Approx. 64 MB RAM

Approx. 30 MB harddisc space

VGA monitor

Operating systems:

Windows 98, 2000, NT and XP

Order number

INCA-Expert

B 261 206 423

KIC 2

(K-Line Interface Compact)

KIC 2 is part of the INCA module family. Within this family, the KIC 2 is the low cost unit for PC-supported application on the serial diagnosis interface of an ECU.

KIC 2 is coupled to the PC via the parallel printer interface. This ensures a powerful and universal link to all common PCs. The coupling to the ECU is effected via the K-line of the diagnosis interface. The functionality of KIC 2 is essentially determined by the operating programs of the PC.



Details	
Compact design	
Fully suitable for motor vehicle use	
Power supply through the connection to the ECU from board mains with galvanic separation	
All inputs and outputs to the PC galvanically separated	
Firmware update possible via PC	
According to ISO 9141-2 for diagnosis tester	
Up to 250 kBaud transfer rate	
Plug suitable for motor vehicles (VS 20)	
Protocols: McMess, KP 2000, Keyword 71	

Mechanical data	
Size	17 x 60 x 78 mm

Electronic data	
Input voltage	6 ... 30 V
Power consumption	typ. 1 W at 13,5 V
Power consumption in stand by	30 mW at 13,5 V
Processor	µP 87C520, 12 kByte
Flash Eprom	2 x 48 kByte
Centronics Iinterface	40 g/5Hz ... 2kHz
Temperature range	-30 ... 70°C
Control P-module output	
Output voltage	0 ... 4,096 V
Quantisation	ΔV=1,0 mV
Resolution	12 bit

Order numbers	
KIC 2, standard connector	B 261 206 859
KIC 2, diagnosis connector with ignition bridge	B 261 206 866
KIC 2, diagnosis connector without ignition bridge	B 261 206 867

Lambda Tester

This tester simulates the output signals of the lambda sensor in a quick and comfortable way. It allows you to check the function of the lambda control loop's hardware and software just before installing it into the vehicle.



Technical data

Power supply	9 V
Output signals	40 / 800 / 900 mV
Internal resistance	10 / 50 / 100 Ω
Representable lambda values	0,65 ... 1,08

Function

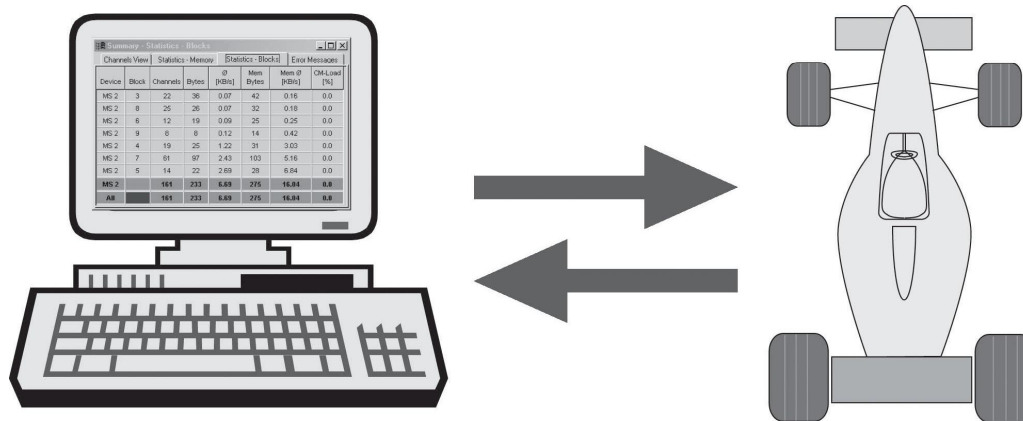
High precious simulation of various lambda values

Order number

B 261 206 879

Modas

Modas is a software tool for measuring and calibrating defined engine values and curves. It is specially designed for race track use. Developing Modas we set great store by easy handling and quick access to the ECU.



General functions

Online measurement and calibration

Universal use for different ECUs

Modas facilitates operating and working in by using the Windows standard. In the office Modas is controlled by mouse or menu. If Modas is used in a mobile way a fast grip is possible by keyboard and shortcuts.

Required hardware components:

PC:

IBM PC/AT compatible, 586 processor or higher, 166 MHz

Approx. 64 Mbyte of RAM

Approx. 30 Mbyte harddisc space

VGA monitor

Operating systems:

Windows 98, 2000, NT and XP

Performance description

Modas is a combination of

- **Project (Data) management:**

Visualisation, processing and management of calibration, measurement and documentation data

- **Programming system:**

Programming and management of calibration data

- **Calibration system:**

Visualisation and manipulation of parameters (Calibration data)

- **Diagnosis system:**

Visualisation, processing, documentation and evaluation of diagnosis data

Order number

B 261 206 441

Potiboard POP

(Parameter Operating Panel)

POP is part of the INCA module family. It is designed for online mapping on dyno supporting the INCA calibration function. POP is coupled to the PC via serial link on the SMB bus.



Details

Robust design

External power supply

Modification of calibration data by potentiometer operation

4 potentiometers, individual assignment to 4 characteristic values (fixed values, characteristic lines or maps)

Additive or multiplicative modification selectable

POP configuration saved together with the INCA display

Order number

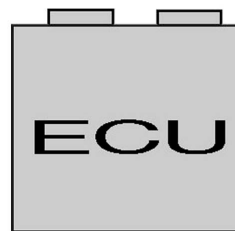
B 261 206 428

for Windows 98SE , 2000, NT and XP

Summary - Statistics - Blocks [X] [?] [Z]

Channels View Statistics - Menu Statistics - Tools File Messages

Device	Block	Channels	Bytes	P	Mean [pB/s]	Mean-P [pB/s]	Chk/Load [%]
HS2	3	22	36	0.07	42	0.16	0.0
HS2	8	26	36	0.07	32	0.19	0.0
HS2	6	12	19	0.09	25	0.25	0.0
HS2	9	8	8	0.12	14	0.42	0.0
HS2	4	19	25	1.22	31	3.03	0.0
HS2	7	51	87	2.43	113	5.16	0.0
HS2	5	14	22	2.69	39	6.94	0.0
HS2		161	233	6.49	275	16.84	0.0
AR		161	233	6.59	275	16.84	0.0



B 261 206 442

RS 2000

With RS 2000 you can simulate crankshaft-, camshaft- and wheel-speed-signals quickly and comfortably.



Functions

Infinitely variable simulation of Hall- and inductive signal

Compatible with all Bosch-Motorsport-ECUs from MS 1.9 to MS 4.1

Adjustable on cylinder numbers from 4 to 12

Usable for increment- and segment-systems

Electronic data

Power supply 12 V

Order numbers

B 261 206 862

Cable harness connector **B 261 206 451**

**Bosch Engineering GmbH
Motorsport
An der Bracke 9
71706 Markgröningen
Germany**

**Phone: 00 49 (0) 711/811-3981
Fax: 00 49 (0) 711/811-3982**

**North American Office:
Robert Bosch Corporation
Motorsport, Dep. AP/EAP
38000 Hills Tech Drive
Farmington Hills, MI 48331-3417
Phone: 00 1 248 848-2977
Fax: 00 1 248 324-7373**

**E-mail: motorsport@bosch.com
www.bosch-motorsport.com**

BOSCH

