Bosch Motorsport

Equipment for High Performance Vehicles

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BOSCH

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Warning: It is strictly forbidden to use Bosch Motorsport products on public roads. They are only developed for use in racing on private closed courses!

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Engine Control Units

Motronic MS 3 Sport

The MS 3 Sport 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. An external data logger or a DDU can be connected via CAN interface. The MS 3 Sport software is provided with an optimized function range.

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

Functionality
Asymmetric injection timing possible
Asymmetric ignition timing possible
Dual lambda control
Knock control (optional)
Traction control (optional)
Electronic throttle control (optional)
Support of 60-2 and 36-2 ignition trigger wheels

Electrical data
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
15 universal inputs 0 ... 5 V
2 inputs for vibration knock sensors
6 digital inputs
Outputs
6 injection power stages
6 ignition power stages
16 power stages (2 A/1 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 interface
1 CAN interface for external communication

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**

Conditions for use	
ECU temperature	-40 ... 125 °C
Max. power consumption	10 W at 14 V
Max. vibration	Vibration Profile 3 *(see Appendix or www.bosch-motorsport.com)*

Cable harness connectors
D 261 205 139
D 261 205 140

Application Hints

Depending on your experiences with application of ECUs we recommend application support from Bosch Motorsport.

Part number	
MS 3 Sport	**F 01T A20 067**

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. An external data logger or a DDU can be connected via CAN interface.

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

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

Conditions for Use	
ECU temperature	-40 ... 125 °C
Max. power consumption	10 W at 14 V
Max. vibration (see Appendix or www.bosch-motorsport.com)	Vibration Profile 3

Electrical Data	
In general	
2 microcontrollers with 16 bit organisation calculation capacity 20 MIPS	
Inputs	
2 lambda LSU 4 interfaces	
3 analog inputs 0 ... 5 V for water temperature, oil temperature, intake air temperature	
3 analog inputs 0 ... 5 V for oil pressure, fuel pressure, ambient pressure	
1 analog input 0 ... 5 V for throttle position sensor	
1 digital input for laptrigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for Hall-effect 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 K-line serial interface	
1 CAN interface for external communication	

Accessories	
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**

Connectors and Cables	
Connector Loom I	**D 261 205 139**
Connector Loom II	**D 261 205 140**

Application Hints

Depending on your experiences with application of ECUs we recommend application support from Bosch Motorsport.

Part Number	
MS 3.1 incl. Modas for notebook	**B 261 208 245-01**

Motronic MS 4 Sport

The MS 4 Sport 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. Two independent wide range lambda circuits allow lambda closed loop engine control. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger. The MS 4 Sport software is provided with an optimized function range.

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

Asymmetric injection timing possible
Asymmetric ignition timing possible
Dual lambda control
Knock control (optional)
Traction control (optional)
Turbo functionality
Electronic throttle control (optional)
Support of 60-2 and 36-2 ignition trigger wheels

Conditions for Use

Temperature range	-40 ... 75 °C
Max. power consumption	30 W at 14 V
Max. vibration	*Vibration Profile 2 (see Appendix or www.bosch-motorsport.com)*

Electrical Data

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 interface
2 CAN interfaces for external communication

Application Hint

Depending on your experiences with calibration of ECUs we recommend calibration support from Bosch Motorsport.

Part Number

MS 4 Sport	**F 01T A20 049 01**
MS 4 Sport Turbo	**F 01T A20 060 01**

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. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.

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
Traction control
Turbo functionality

Conditions for Use	
Temperature range	-40 ... 75 °C
Max. power consumption	30 W at 14 V
Max. vibration	*Vibration Profile 2 (see Appendix or www.bosch-motorsport.com)*

Electrical Data
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 interface
2 CAN interfaces for external communication

Application Hint
Depending on your experiences with application of ECUs we recommend application support from Bosch Motorsport.

Part Number	
MS 4.0 incl. Modas	**B 261 208 300**

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 (see Appendix or www.bosch-motorsport.com)	Vibration Profile 1

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

Electrical Data
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
Compact Flash Card memory for data acquisition

Part Number	
MS 4.2 incl. Modas	**F 01E B01 638**

Motronic MS 4.4 Sport

The MS 4.4 Sport is a highly sophisticated engine management system for high performance engines. The system contains 10 ignition drivers for external power stages and 10 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels and logged on the external data logger. Four vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.

The MS 4.4 Sport software is provided with an optimized function range.

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	
Size	174 x 133 x 39 (23) mm
Weight	859 g

Functionality
Asymmetric injection timing possible
Asymmetric ignition timing possible
Dual lambda control
Knock control (optional)
Traction control (optional)
Turbo functionality (optional)
Electronic throttle control (optional)
Support of 60-2 and 36-2 ignition trigger wheels (10-cylinders only 60-2!)

Conditions for use	
Temperature range	-40 ... 75 °C
Max. power consumption	20 W at 14 V
Max. vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*

Electrical data
Inputs
1 input for inductive crankshaft sensor
4 inputs for camshaft control
4 inputs for Hall-effect wheel speed sensors
2 lambda interfaces LSU 4.9
39 inputs 0 ... 5 V (20 with switchable pullup)
4 inputs for vibration knock sensors
8 digital inputs
Outputs
10 injection power stages (2.2 A)
10 ignition drivers for external power stages
21 power stages (2.7 A/0.6 A; low side)
2 power stages for lambda heater
1 H-bridge (7 A)
3 sensor supply 5 V/600 mA
Communication interfaces
1 K-line serial interface
2 CAN interfaces for external communication

Application Hint
Depending on your experiences with calibration of ECUs we recommend calibration support from Bosch Motorsport.

Part number	
MS 4.4 Sport	**F 01T A20 068**
MS 4.4 Sport Turbo	**F 01T A20 074 01**

Motronic MS 4.4

The MS 4.4 is a highly sophisticated engine management system for high performance engines. The system contains 10 ignition drivers for external power stages and 10 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels and logged on the external data logger. Four 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	
Size	174 x 133 x 39 (23) mm
Weight	859 g

Conditions for use	
Temperature range	-40 ... 75 °C
Max. power consumption	20 W at 14 V
Max. vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*

Functionality
Asymmetric injection timing possibe
Asymmetric ignition timing possible
Dual lambda control
Knock control
Traction control
Turbo functionality
Electronic throttle control (optional)
Support of 60-2 and 36-2 ignition trigger wheels (10-cylinders only 60-2!)

Electrical data
Inputs
1 input for inductive crankshaft sensor
4 inputs for camshaft control
4 inputs for Hall-effect wheel speed sensors
2 lambda interfaces LSU 4.9
39 inputs 0 ... 5 V (20 with switchable pullup)
4 inputs for vibration knock sensors
8 digital inputs
Outputs
10 injection power stages (2.2 A)
10 ignition drivers for external power stages
21 power stages (2.7 A/0.6 A; low side)
2 power stages for lambda heater
1 H-bridge (7 A)
3 sensor supply 5 V/600 mA
Communication interfaces
1 K-line serial interface
2 CAN interfaces for external communication

Application Hint
Depending on your experiences with application of ECUs we recommend application support from Bosch Motorsport.

Part number	
MS 4.4	**F 01T A20 040**

Motronic MS 5.2

The MS 5.2 is a 1 to 12 cylinder gasoline engine control for engine speeds up to 20.000 rpm. Design is based on our new digital core with a very high computing power and a high-end FPGA for additional performance and flexibility. The new software development process for this unit allows fast response times to algorithm changes. All software functions are designed, tested and simulated with MATLAB/Simulink. Code and documentation are generated automatically. The integration of individual customer functions is possible. The systems flexibility allows the support of any unusual engine configuration or chassis functionality.

Mechanical Data	
Dust and waterproof aluminium housing	
4 connectors in military technology with high pin density	
220 pins, each pin individually filtered	
Vibration damped circuit boards	
Size	200 x 170 x 36.5 mm
Weight (approx.)	1250 g

Conditions for Use	
Temp. range (at internal sensors)	-20 ... 85 °C
Approx. power cons. (w/o loads)	10 W at 14 V
Power Supply	
Full operation	6,5 ... 18 V
Recommended	11 ... 14 V
Absolute maximum	6 ... 24 V
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*

Basic Functionality
Injection timing
Ignition timing
Lambda control with adaptation function
Knock control
Traction control
Launch control
Gearcut function
Calibration interface: CCP via CAN or XCP via Ethernet
Interface to Bosch Data Logging System

Electrical Data
Inputs
2 thermocouple exhaust gas temperature sensors
2 lambda interfaces (LSU 4.9)
1 crankshaft sensor (2-wire, inductive or Hall-effect)
1 camshaft sensor (2-wire, inductive or Hall-effect)
2 turbo speed sensors (2-wire, inductive or Hall-effect)
4 wheel speed sensors (inductive or Hall-effect)
2 gearbox speed sensors (inductive or Hall-effect)
45 universal analog inputs 0 ... 5 V; 12 Bit
14 analog inputs (angle synchronous or time synchronous triggering up to 250 ksps, 12 Bit)
4 inputs for vibration knock sensors
1 laptrigger input
Outputs
12 injection power stages (peak & hold)
12 ignition power stages (up to 20 A)
16 power stages (2 A; low side; PWM)
4 power stages (4 A; low side; PWM)
4 H-bridge valve drivers (+/- 100 mA)
2 H-bridges (5 A)
3 sensor supplies 5 V/400 mA and 1x 10 V/100 mA
6 diagnostic outputs with selectable internal signals
12 outputs with configurable function (FPGA)
1 timebase synch-in/out
Communication interfaces
2 x 100 Mbps Ethernet interfaces
1 x RS232 serial interface
4 x 1 Mbps CAN interfaces

Application Hints
Depending on your experiences with application of ECUs we recommend application support from Bosch Motorsport.

Part Number	
MS 5.2	**F 01T A20 069-01**

EDC MS 15.1

The MS 15.1 is an ECU for Diesel engines with up to 8 cylinders. It is developed for the combination with Bosch solenoid injectors.

Mechanical data	
Dust and waterproof aluminium housing	
4 connectors in military technology with high pin density, 187 pins	
Vibration damped circuit boards	
8 flexible housing fixation points	
Size	210 x 36 x 199 mm
Weight	1780 g

Conditions for use	
Temperature range	-40 ... 75°C
Typical power consumption	140 W at 14 V
Max. vibration (see Appendix or www.bosch-motorsport.com)	Vibration profile 1

Functionality
Injection timing:
2 pilot injections
2 main injection
1 post injection
Lambda measurement
Data acquisition, external Logger C 55
Telemetry (external unit FM 40 in combination with data logger C 55)
Traction control (optional)
Basic functionality for up to two turbochargers in parallel mode
Gear cut for sequential gearbox
Speed limiter
Optional function packages available

Electrical data
Inputs
2 inputs for thermocouple exhaust gas temp. sensors
2 lambda interfaces LSU
4 inputs for wheel speed sensors; basic design for inductive sensors
4 inputs for turbo speed sensors; basic design for inductive sensors
1 input for inductive crankshaft sensor
1 input for Hall-effect camshaft sensor
3 system inputs 0 ... 5 V
13 universal inputs 0 ... 5 V, fixed pull-up
27 universal inputs 0 ... 5 V, switchable pull-up
3 digital inputs
Outputs
8 injection power stages
12 power stages (low side)
2 power stages for lambda heater
2 H-bridge
2 sensor supply 5 V/ system use
3 sensor supply 5 V/300 mA
3 sensor supply 10 V/100 mA
Communication interfaces
3 CAN interfaces (dash, application, customer use)
1 firewire interface for external communication

Application Hints
Depending on your experiences with application of Diesel ECUs we recommend application support from Bosch Motorsport.

Part number	
MS 15.1 solenoid injector	**F 01T A20 022**

EDC MS 15.2

The MS 15.2 is an ECU for Diesel engines with up to 6 cylinders. It is developed for the combination with Bosch piezo injectors.

Mechanical data	
Dust and waterproof aluminium housing	
4 connectors in military technology with high pin density, 187 pins	
Vibration damped circuit boards	
8 flexible housing fixation points	
Size	210 x 36 x 199 mm
Weight	1780 g

Conditions for use	
Temperature range	-40 ... 75 °C
Typical power consumption	140 W at 14 V
Max. vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*

Functionality
Injection timing:
2 pilot injections
1 main injection
1 post injection
Lambda measurement
Data acquisition, external Logger C55
Telemetry (external unit FM40 in combination with data logger C55)
Traction control (optional)
Basic functionality for up to two turbochargers in parallel mode
Gear cut for sequential gearbox
Speed limiter
Optional function packages available

Electrical data
Inputs
2 inputs for thermocouple exhaust gas temp. sensors
2 lambda interfaces LSU
4 inputs for wheel speed sensors; basic design for inductive sensors
4 inputs for turbo speed sensors; basic design for inductive sensors
1 input for inductive crankshaft sensor
1 input for Hall-effect camshaft sensor
3 system inputs 0 ... 5 V
13 universal inputs 0 ... 5 V, fixed pullup
27 universal inputs 0 ... 5 V, switchable pullup
3 digital inputs
Outputs
6 injection power stages
12 power stages (low side)
2 power stages for lambda heater
2 H-bridges
2 sensor supply 5 V/ system use
3 sensor supply 5 V/300 mA
3 sensor supply 10 V/100 mA
Communication interfaces
3 CAN interfaces (dash, application, customer use)
1 firewire interface for external communication

Application Hints
Depending on your experiences with application of Diesel ECUs we recommend application support from Bosch Motorsport.

Part number	
MS 15.2 Piezo injector	**F 01T A20 023**

Displays

Display DDU Sport

The DDU Sport is a light and compact dashboard unit with a high contrast display. Customised display configurations can be programmed to suit individual customer requirements. All illuminated components are dimmable.

For enhanced flexibility the DDU Sport can be interfaced to a range of stand-alone I/O modules that provide the driver with additional information or alternatively enable the driver to interface with multiple vehicle functions.

The display has an integrated logger with a memory capacity of 512 MB. Data acquisition and application software RaceLab Sport and one set of connectors are inclusive.

Mechanical Data	
Dimensions	160 x 110 x 26 mm
Weight	433 g

Display	
LCD display / LED background light	
Active area	91 x 56 mm
Resolution	240 x 128 pixel
Dot size	0,38 x 0,41 mm
	4 programmable pages
Mounting	4 x M5 threads on backside

Conditions for Use	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Temperature	-10 ... 65 °C

Switches
4 internal switches for operation (pages, mode, setting), available also on backside connectors

Electrical Data	
7 sequential shift LEDs	
512 MB Data logger integrated	
Calculation capacity	10 MIPS
4 analog input (0-5 V) 10 bit resolution	
4 digital input (HL = 2,5 – 32 V)	
Real Time Clock	
2 x CAN-Bus	
1 x 100 Mbit LAN	
Voltage supply range: 7,5 ... 35 V	
Sensor supply: 5 V, 500 mA	
Data acquisition and application software RaceLab Sport inclusive	

Connector
Binder 712

Part Number	
DDU Sport	**F 01T A20 050**

Display DDU 4

The DDU 4 is a light and compact dashboard unit with a high contrast colour display. Up to 12 customized display pages can be programmed to suit individual customer requirements. All illuminated components are dimmable.

Mathematic functions and alarms can be programmed and linked to values and LEDs.

Using the new CAN interface the DDU 4 can be connected to any ECU.

Mechanical Data	
Dimensions	164 x 117 x 37 mm
Weight	753 g

Display	
1x active matrix TFT high contrast colour display	
Active area	111 x 83 mm
Resolution	320 x 240 pixel
Dot size	0,116 x 0,348 mm

Conditions for Use	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Temperature	-10 ... 75 °C
Display panel with optical double-sided antiglare coating for highest contrast and display accuracy.	

Electrical Data
1 x CAN interface for communication with ECU via CCP and free configurable for any ECU messages
5 LED shift indicators (5 drivers, open collector, 2,2 A)
10 LED multi purpose indication lights
Dedicated battery voltage measurement
Programming over MSA-Box (USB)

Connectors and Cables	
Connector	AS 6-12-35PN

Accessory	
Aluminium holder	**F 01E B01 457**
Carbon fibre holder	**F 01E B01 458**
External switches for page select and brightness adjustment	**B 261 209 659**
MSA-Box (USB)	**B 261 208 015**

Part Number	
DDU 4 incl. cable, without holder	**F 01E B01 461**

Display DDU 6

The DDU 6 is a light and compact, steering wheel mounted dashboard unit. It is equipped with a high contrast colour display. Up to 12 customized display configurations can be programmed to suit individual customer requirements. All illuminated components are dimmable.

Mathematic functions and alarms can be programmed and linked to values and LEDs.

Using the new CAN interface the DDU 6 can be connected to any ECU.

Mechanical Data	
Dimensions	165 x 104 x 32 mm
Weight	342 g

Display
1x active matrix TFT high contrast colour display
Active area 54 x 72 mm
Resolution 240 x 320 pixel
Integrated switches for page select and brightness adjustment.

Conditions for Use	
Max. Vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*
Temperature	-10 ... 65 °C

Electrical Data
1 x CAN interface for communication with ECU via CCP and free configurable for any ECU messages
Programming over MSA-Box (USB)
5 LED shift indicators
4 LED warning lights

Connectors and Cables	
Connector	AS 6-12-35PN

Accessory	
MSA-Box	B 261 208 015

Part Number	
DDU 6	**F 01E B01 459**

Communication

Data Logging and Signal Processing

Data Logger C Sport

The data logger C Sport is a device used for data acquisition. It is developed to read in analogue and digital signals. The measured data are stored on an internal 512 MB memory. The data are transmitted with RaceLab Sport via Ethernet to the data logger C Sport.

Acquisition and application software RaceLab Sport and one set of connectors are inclusive.

Mechanical data	
Size	102 x 62 x 27 mm
Weight	210 g
Required power supply	7,5 ... 35 V
Dust and splash waterproof aluminium housing	
Flexible housing fixation points	

Conditions for use	
Temperature range	-20 ... 65 °C
Max. power consumption	4 W at 14 V
Max. vibration	*Vibration Profile 1 (see Appendix)*

Connector
4 x Binder 712

Electrical data
1 CAN Bus link (ECU)
1 CAN Bus link (to cascade C Sport or attach DDU Sport)
1 Ethernet connector (for PC connection)
512 MB internal memory
Real time clock
Total calculation capacity approximately 10 MIPS
4 digital inputs
4 analog single ended inputs 16 bit resolution
4 analog differential inputs 16 bit resolution
1 digital output
Data acquisition and application software RaceLab Sport inclusive

Part number	
C Sport	**F 01T A20 061**

CardMemory C 40 / C 40 Plus

The CardMemory is a device used for data logging. The basic model C 40 is designed for data transfer via CAN for MS 3.x and MS 4.x ECUs. The extended model C 40 Plus is developed to read in additional 15 analog 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 analog inputs with 10 bit resolution and 5 ms sample rate time (only C 40 Plus)	
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 128 MB	**F 01E B01 105 01**
Flash card 256 MB	**F 01E B01 106 01**
Flash card 512 MB	**F 01E B01 107 01**
Flash card 1024 MB	**F 01E B01 108 01**
Flash card 2048 MB	**F 01E B01 109 01**
Memory adapter	**B 261 206 864**
C40 adapter cable	**B 261 209 433**

Connector	
Cable harness connector C40	AS0-14-35 SN
Cable harness connector C40 Plus	AS0-14-35 SN

Part numbers	
C40	**F 01T A20 403**
C40 Plus	**B 261 206 860**
C40 Plus incl. chassis adjust	**B 261 206 880**
Upgrade C40 to C40 Plus	**on request**
Software chassis adjust	**on request**

Data Logging 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 up to 2048 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 C 40 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 C 40 to the vehicle cable harness the special C 40 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

Part numbers	
Flash card 128 MB	**F 01E B01 105 01**
Flash card 256 MB	**F 01E B01 106 01**
Flash card 512 MB	**F 01E B01 107 01**
Flash card 1024 MB	**F 01E B01 108 01**
Flash card 2048 MB	**F 01E B01 109 01**
Memory adapter	**B 261 206 864 01**
Flash card adapter	**B 261 205 814 01**
Software Chassis Adjust	**B 261 206 870**
C 40 adapter cable	**B 261 209 433**

Data Logging System DLS

System

The Data Logging System (DLS) is a many-sided and flexible measuring system for acquisition and recording of sensor data in a race car. The measuring channels in the DLS can be administered comfortably and can be adapted individually for every race car. The DLS is a modular system that consists of different hard- and software components.

Hardware

The hardware serves the data acquisition and the recording of physical data in the vehicle. The data logger (CardMemory) and the data acquisition (MSI devices) which delivers the sensor data to the data logger belong to the hardware components. Additional data transfer takes place via burst or via online telemetry.

Software

The software allows the real configuration and consequently the adjustment of the system. It enables you to create measuring projects, to check data, to record measuring channels and to analyse the measuring channels.

DLS components	
Datalogger, System manager	C 55
Burst telemetry	BT 55, BR 55
Online telemetry	FM40
Modular Sensor Interface	MSI 55
Extended CAN Modules	EM-50, EM-100, EM-I4 EM-L5, EM-O5, EM-C,EM-D8, EM-D1, EM-A6, EM-H4,
DLS configuration Software	DLS-Desk
System Software	WinDCP, Modas, WinDarab

Technical details
High measuring accuracy by 12 bits of analogue / digital transformation and tenfold oversampling
High recording rate up to 1 ms
High recording duration by CF card up to 2 GB
High-linear analogue filtering and digital filtering for the removal of interference signals.
Flexibly with the extensibility of the components and measuring channels
Temporal synchronisation between the different measuring channels
Connectivity and data transfer via telemetry
Free and individual application by special software

CardMemory C 55

The CardMemory C55 is a device used for data logging and DLS system management. The measured data are stored on a compact flash card with a maximum capacity of 1024 MB.

Mechanical data	
Size	157 x 92 x 30 mm
Weight	500 g
Dust and splashwater proof aluminium housing	

Conditions for use	
ECU temperature	-20 ... 65 °C
Max. power consumption	20 W at 14 V
Max. vibration	*Vibration profile 1 (see Appendix)*

Electrical data
1 CAN interface
2 Fire wire interfaces
2 Ethernet interfaces
Real time clock
Non volatile flash card memory

Additional equipment	
Flash card 256 MB	**F 01E B01 106_0B**
Flash card 512 MB	**F 01E B01 107_0B**
Flash card 1024 MB	**F 01E B01 108_0B**
Memory adapter	**B 261 206 864**

Documents	
Dimension sheet	**Y261A25051.pdf**
3D model	**Y261A25051.stp**
Data sheet	**F01EB01630.xls**

Part number	
CardMemory C 55	**F 01E B01 630**

Modular Sensor Interface MSI 55

The MSI 55 is a high quality data acquisition of analog and digital sensors.

The MSI 55 offers 16 configurable analog inputs, 4 frequency inputs, 2 digital I/O and a freely configurable 1 MBit CAN Bus. Data is sent via FireWire interface to the C 55 datalogger.

Mechanical data	
Size	120 x 117 x 38 mm
Weight	600 g
Dust and water proof aluminium housing	
Filtered connectors of military design with high pin density (MIL-38999)	
Vibration damped printed circuit boards	

Conditions for use	
ECU temperature	-20 ... 65 °C
Max. power consumption	20 W at 14 V
Max. vibration	15 g sinus at 1.200 Hz for t < 5 h

Electrical data	
16 bit digital signal process organisation, calculation power 150 MIPS	
Required power supply	8 ... 18 V
4 differential analog inputs with switchable amplifier and switchable pullup resistor	
12 single analog inputs with switchable pullup resistor	
All analogue inputs offer analog and digital anti-aliasing filter and 12 bit AID resolution	
4 frequency inputs 0 ... 25,5 kHz switchable inductive sensor / Hall-effect sensor	
2 digital I/O	
2 PWM outputs 100 mA	
5 V sensor power supply	
3 ... 10 V configurable sensor power supply	
12 V sensor power supply	

Documents	
Dimension sheet	**Y261A21876.pdf**
3D model	**Y261A21876.stp**
Data sheet	**F01TA20024.xls**

Part number	
MSI 55	**F 01T A20 024**

Burst Telemetry Transmitter BT 55

The burst telemetry system BT 55 / BR 55 adds high speed burst telemetry transmission to a DLS-based data acquisition system. Each time the car passes the pit lane, up to 6 MByte of C 55 measurement data can be transmitted to the Pit network via a WiFi band high speed wireless link.

Mechanical data	
Size	168 x 92 x 30 mm
Weight	540 g
Dust and waterproof housing with LED indicators	

Conditions for use	
Vibration	15 g sinus at 1200 Hz for t < 5h
Temperature range	-20 ... 65 °C
Max. power consumption	20 W at 14 V
International standard	IEEE 802.11b

Electrical data	
Full duplex radio modem (bidirectional)	
Transmission power	100 mW
Frequency range	2,4 GHz ISM Band
Data rate	max. 11 MBit/s
Required power supply	8 ... 18 V
Max. current	< 2,5 A

Documents	
Dimension sheet	**A261208899.pdf**
3D model	**A261208899.stp**
Data sheet	**B261208899.xls**

Part number	
BT 55	**B261 208 899**

Lambdatronic LT4

The Lambdatronic LT4 provides controlled pumping current to supply up to 4 Bosch (Mini)-LSU 4.9. The lambda value, the sensor temperature and diagnostics are available via CAN and analog signal.

The LSU contains a Nernst and a pump cell. The lambda in the Nernst cell is controlled to lambda = 1.013 independent of the oxygen contents on the emission side, through a current through the pump cell. The current proportional output voltage of the IC is a measure of the lambda value. The unit can be configured by the included software MODAS.

The main feature and benefit of this unit is the combination of the Bosch well known lambda IC and a very compact box size with military specification. Furthermore the analog signal output can be configured freely.

Application	
Application	0,75 ... 10,12 lambda
Compatible Sensor Type	Bosch (Mini-)LSU 4.9
Nr. of Channels	4
Heater	internal
Operating Temp Range (housing)	-20 ... 85 °C
Storage Temperature Range	-20 ... 85 °C
Application SW	MODAS V3
Communication Link	K-Line / CAN

Electrical Data	
Power Supply U_s	(6,5) 10 ... 17 V
Max Power Supply (1 min) U_{smax}	26 V
Thermal Dissipation Loss	3 W @ 14 V
Current I_s	5 A
Current I_s (Heating up)	26 A

Connectors and Cable	
Connector	AS 6-14-35PN
Connector Loom	AS 1-14-35SN
Sleeve	Viton
Cable Size	26
Cable Length L	20 cm

Mechanical Data	
Weight with Cable	98 g
Sealing	100 % humidity
Fixation	Velcro
Size w/o Calbe (w*l*h)	54 x 59 x 13 mm
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*

Characteristic	
Signal Output 1	CAN
Signal Output 2	4 x 0... 5 V
CAN- Baudrate	1 Mbaud
Signal Resolution	$2,5 * 10^{-4}$ lambda
Signal Sampling Rate	100 Hz
CAN Refresh Rate	100 Hz

Application Hint I

The LT4 is designed to supply 4 Bosch (Mini)-LSU 4.9.

The unit can be connected to any CAN system (1 Mbaud) and analog measuring device.

To avoid signal errors, a cable length of maximum 1,5 m between sensor and box is recommended.

The unit is secure from miss-pinning.

Application Hint II

The reference ground (GND_REF) has to be connected either to the measuring device or to the system ground.

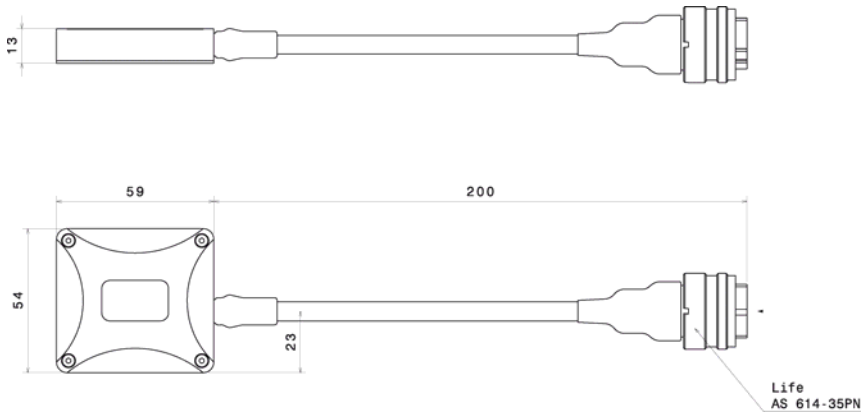
A ground offset of 2 V (max) between GND and GND_REF has not to be exceeded.

See the LT4 function manual for software documentation (CAN protocol e.g.).

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part number

Lambdatronic LT4	**F 01T A20 070 02**



Pin	Function
1	+ 12V (Battery +)
2	+ 12V (Battery +)
3	Ground (Battery -)
4	Ground (Battery -)
5	K-Line Diagnostic Connection
6	CAN1 + (high)
7	CAN1 – (low)
8	Analog out 1
9	Analog out 2
10	Analog out 3
11	Analog out 4
12	Reference GND for anal. out
13	Shield
14	Pump Current LSU1 IP1
15	Virtual GND LSU1 VM1
16	Heater PWM LSU1 Uh-1
17	Heater (Batt +) LSU1 Uh+1
18	Setup Current LSU1 IA1
19	Nernst Voltage LSU1 UN1

Pin	Function
20	Pump Current LSU2 IP2
21	Virtual GND LSU2 VM2
22	Heater PWM LSU2 Uh-2
23	Heater (Batt +) LSU2 Uh+2
24	Setup Current LSU2 IA2
25	Nernst Voltage LSU2 UN2
26	UN1Pump Current LSU3 IP3
27	Virtual GND LSU3 VM3
28	Heater PWM LSU3 Uh-3
29	Heater (Batt +) LSU3 Uh+3
30	Setup Current LSU3 IA3
31	Nernst Voltage LSU3 UN3
32	Pump Current LSU4 IP4
33	Virtual GND LSU4 VM4
34	Heater PWM LSU4 Uh-4
35	Heater (Batt +) LSU4 Uh+4
36	Setup Current LSU4 IA4
37	Nernst Voltage LSU4 UN4

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. Furthermore, 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	
λ_{Value} = 0,0069:	failed sensor (short cut or not connected)
λ_{Value} = 0,0686:	probe did not reach 600 °C (up to 30 sec)
λ_{Value} = 0,1373:	heating periode

Electrical data	
Power supply	5 ... 20 V
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 values 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_{Value}	= 0,001 * A/Fx
λ_{Value}	= A/F_{Value} / 14,57 = A/F_{Digits} / 14570 = A/F_{Digits} * 0,00006863418
Heat-Temp	= $Tempx_{Digits}$ * 2 + 496,9 °C

Part number

F 01E B01 622

CAN Module EM-A6

6 analog Channels

The extended module EM-A6 measures up to 6 analog channels, converts the values to a 10 bit format and combines them to a CAN-Message. The module has a CAN-Interface (CAN2.0 B) which is used for transmitting the information from and to the module.

Weight and space required for the wiring harness can be reduced by daisy-chaining multiple extended modules because power and communication lines are routed through the device.

Application	
Operating Temperature Range	-20 °C ... 85 °C

Mechanical Data	
Size	155.0 x 38.0 x 32.1 mm
Weight	153 g
Max. Vibration	*Vibration Profile 1* *(see Appendix or www.bosch-motorsport.com)*

Electrical Data	
Power Supply	10 V ... 18 V
Supply Current (without load)	max. 80 mA
ADC resolution	10 Bit (4.8 mV)

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID
Switchable software pull-ups

Loom Side Connector
ASL606-05PN-HE red
ASL606-05PD-HE green
ASL606-05SN-HE red

Connector ASL206-05SN-HE (red); ANAx	
Pin-No.	Function
1	UB_SG
2	AGND
3	ANA_INx
4	Vref50
5	N/C

Connector ASL206-05SD-HE (green), XOUT	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-High
4	CAN-Low
5	GND

Connector ASL206-05PN-HE (red), XIN	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Low
4	CAN-High
5	GND

Part Number	
CAN Module EM-A6	**F 01T A20 007**

CAN Module EM-C

Module for programming ALWS

The extended EM-C module is part of the measurement equipment. It displays the current angle of the camshaft that is measured by the Bosch camshaft angle sensor LWS4 and transmitted via CAN. The EM-C module receives this message and displays the angle (-180° ... +180°) in its bright red dot-matrix display.

Moreover, the EM-C module features a reset-button which, during engine assembly, enables the engine builder to precisely set the LWS4 sensor reference to “zero” when the camshaft is at the desired “zero” position. The module has a 500 kBaud CAN-Interface (CAN2.0 B) which is used for transmitting the information from and to the module.

The module is delivered with a connection adapter between housing and connector.

Mechanical Data	
Size	94,2 x 30,0 x 24,2 mm
Weight	97 g

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current (100 % brightness, dots on)	max. 300 mA

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID

Loom Side Connector
AS6-06-05SN-HE

Connector ASL-006-05PN-HE	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

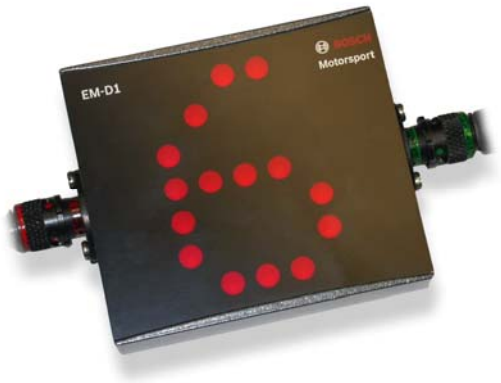
Part Number	
CAN Module EM-C	**F 01T A20 025**

CAN Module EM-D1

Large, single Character

The extended module EM-D1 displays 1 character of arbitrary information on a large bright red dot-matrix display with 16 intensity levels. The module has a CAN-Interface (CAN2.0 B) which is used for transmitting the information from and to the module.

Weight and space required for the wiring harness can be reduced by daisy chaining multiple extended modules because the power and communication lines are routed through the devices (2 connectors option only).



Application	
Operating Temperature	-20 °C ... 85 °C

Mechanical Data	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Size	69,45 x 62,45 x 16,83 mm
Weight	87 g

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current (100 % brightness, dots on)	max. 395 mA

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID and characters

Loom Side Connector
ASU-6-03-05SN-HE (red)
ASU-6-03-05PD-HE (green)

Input Connector ASU-0-03-05PN-HE (red)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Output Connector ASU-0-03-05SD-HE (green)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Part Number	
CAN Module EM-D1	**F 01T A20 006**

CAN Module EM-D8

8 Characters

The extended module EM-D8 displays up to 8 characters of arbitrary information on a bright red dot-matrix display. The module has a CAN-Interface (CAN2.0 B) which is used for transmitting the information from and to the module.

Weight and space required for the wiring harness can be reduced by daisy chaining multiple extended modules because the power and communication lines are routed through the devices (2 connectors option only).

Application	
Operating Temperature	-20 °C ... 85 °C

Mechanical Data	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Size	85,4 x 32,3 x 17,1 mm
Weight	51 g

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current (100 % brightness, dots on)	max. 300 mA

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID
Programmable text message

Loom Side Connector
ASU-6-03-05SN-HE (red)
ASU-6-03-05PD-HE (green)

Input Connector ASU-0-03-05PN-HE (red)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Output Connector ASU-0-03-05SD-HE (green)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Note that ASU-0-03-05PN-HE is the default connector on every device while ASU-0-03-05SD-HE is an optional extra connector if daisy chaining of devices is intended.

Part Number	
CAN Module EM-D8 (with output connector)	**F 01T A20 004**
CAN Module EM-D8 (without output connector)	**F 01T A20 046**

CAN Module EM-H4

4 Hall Speed sensors

The extended module EM-H4 acquires the signal periods of up to 4 Hall-effect speed sensors and transmits them as 16-bit values with 3,2us quantization to a CAN-Interface (CAN2.0 B) in a single CAN-message.

The module is delivered with an adapter between housing and connector.

Application	
Operating Temperature Range	-20 ... 85 °C

Mechanical Data	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Size	85,4 x 32,3 x 17,1 mm

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current	max. 70 mA
Input	10 ... 10000 impulses/s

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID and CAN Speed

Loom Side Connector
AS-6-10-35SN-HE

Connector AS-0-10-35PN-HE	
Pin-No.	Function
1	UBATT
2	GND
3	N/C
4	CAN-Hi
5	CAN-LO
6	Front left
7	Front right
8	Rear left
9	Rear right
10	GND
11	SHIELD
12	N/C
13	N/C

Part Number	
CAN Module EM-H4	**F 01T A20 008 01**

CAN Module EM-I4

4 inductive Speed Sensors

The extended module EM-I4 acquires the signal periods of up to 4 inductive speed sensors and transmits them as 16-bit values with 3,2us quantization to a 1 MBaud CAN-Interface (CAN2.0 B) in a single CAN-message.

The module is delivered with an adapter between housing and connector.

Application	
Operating Temperature	-20 °C ... 85 °C

Mechanical Data	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Size	85,4 x 32,3 x 17,1 mm

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current	max. 70 mA
Input	10 to 10 000 impulses/s

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN ID

Loom Side Connector
AS-6-10-35SN-HE

Connector AS-0-10-35PN-HE	
Pin-No.	Function
1	UBATT
2	GND
3	N/C
4	CAN-Hi
5	CAN-LO
6	Front left
7	Front right
8	Rear left
9	Rear right
10	GND
11	SHIELD
12	N/C
13	N/C

Part Number	
CAN Module EM-I4	**F 01T A20 009**

CAN Module EM-L5

5 LEDs

The extended module EM-L5 uses 5 ultra bright LED lights with 16 user selectable levels of intensity to display the gear shift request signal from the ECU to the driver. The module has a 1 MBaud CAN-Interface (CAN2.0 B) which is used for transmitting the information from and to the module.

Weight and space required for the wiring harness can be reduced by daisy chaining multiple extended modules because the power and communication lines are routed through the devices (2 connector option only).

Application	
Operating Temperature	-20 °C ... 85 °C

Mechanical Data	
Max. Vibration	*Vibration Profile 1 (see Appendix or www.bosch-motorsport.com)*
Dimensions	85,4 x 32,3 x 17,1 mm
Weight	50 g

Electrical Data	
Power Supply (Note!)	10 V ... 15 V
Supply Current (100 % brightness, all LEDs on)	max. 200 mA

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID
Programmable thresholds for LEDs gear dependant

Loom Side Connector
ASU-6-03-05SN-HE (red)
ASU-6-03-05PD-HE (green)

Input Connector ASU-0-03-05PN-HE (red)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Output Connector ASU-0-03-05SD-HE (green)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Note that ASU-0-03-05PN-HE is the default connector on every device while ASU-0-03-05SD-HE is an optional extra connector if daisy chaining of devices is intended.

Part Number	
CAN Module EM-L5 (with output connector)	**F 01T A20 002**
CAN Module EM-L5 (without output connector)	**F 01T A20 045**

CAN Module EM-P5

5 low Power Outputs

The extended module EM-P5 has 5 open collector outputs and is used to switch small loads. Each of these output stages can drive a maximum load current of 100 mA. The module has a 1 MBaud CAN-Interface (CAN2.0 B) for the signal input.

The module is delivered with a Y-connection adapter.

Application	
Operating Temperature	-20 °C ... 85 °C

Mechanical Data	
Size	85,4 x 32,3 x 17,1 mm
Weight	63 g
Max. Vibration *(see Appendix or www.bosch-motorsport.com)*	*Vibration Profile 1*

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current (without Load)	max. 50 mA

Communication/Configuration Interface
CAN2.0 B, using interface MSA-Box and RaceCon
Programmable CAN-ID
Programmable thresholds and hysteresis for each output

Loom Side Connector
ASU-0-03-05SN-HE (red)
ASU-0-03-05PD-HE (green)

Input Connector ASU-0-03-05PN-HE (red)	
Pin-No.	Function
1	UBATT
2	GND
3	CAN-Hi
4	CAN-LO
5	N/C

Output Connector ASU-0-03-05SD-HE (green)	
Pin-No.	Function
1	L1 (Open collector output)
2	L2 (Open collector output)
3	L3 (Open collector output)
4	L4 (Open collector output)
5	L5 (Open collector output)
Note that both connectors are at the end of the connection adapter.	

Part Number	
CAN Module EM-P5	**F 01T A20 003**

ThermoCAN Module

4 Type K Thermocouple Sensors

The extended ThermoCAN module has 4 inputs for Type K thermocouple sensors. All 4 channels are galvanically isolated. The module has a 1 MBaud CAN-Interface (CAN2.0 B) for the signal input.

Application	
Operating Temperature	0 °C ... 70 °C
Temperature Range	-200 °C ... 1 000 °C
Supports NiCrNi Type K sensors	

Mechanical Data	
Max. Vibration *(see Appendix or www.bosch-motorsport.com)*	*Vibration Profile 1*
Size	70,0 x 40,0 x 16,0 mm
Weight	170 g

Electrical Data	
Power Supply	8 V ... 18 V
Supply Current (without load)	max. 70 mA
Sampling Rate	max. 200 Hz

Communication/Configuration Interface
Fix CAN-ID, must be changed by Bosch Motorsport

Loom Side Connector
ASL-606-05PD-HE (green)
ASL-006-05SA-HE (yellow)

Sensor Connector ASL-006-05SD-HE (green)	
Pin-No.	Function
1	n.c.
2	Signal minus
3	Signal positive
4	n.c.
5	screen

Comm. Connector ASL-606-05PA-HE (yellow)	
Pin-No.	Function
1	8-18 V positive
2	GND
3	CAN High
4	CAN Low
5	n.c.

Part Number	
ThermoCAN Module	**F 01T A20 028**

Telemetry

Telemetry Unit FM 40

The FM 40 is part of a real time telemetry system used to get measurement data from the car out on the racetrack.

It matches to the Bosch Motorsport ECUs and data logging equipment. Due to its high working range and the good data quality it is the optimum choice for the online telemetry.

In typical applications data are sent one way from the car to the pit station. With 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

Connectors	
RF	BNC female
Power / data	CGK SOT 8N35 PN

Electrical data	
Semi duplex radio modem (bidirectional)	
Internal data buffer and protocol management	
Frequency range	430 ... 470 MHz (hardware adjustable)
	F(center) ±1 MHz (software programmable)
Transmission power	1 ... 10 W
Receiver sensitivity	-116 dBm error detection and forward error correction (FEC)
RF channel bandwidth	12,5 kHz @ 9.6 kbps 25 kHz @ 19.2 kbps
Data interface	RS232
Data rate	9.6 / 19.2 kbps
Required power supply	10 ... 18 V
Max. current	< 2,5 A

Part number	
FM 40	**B 261 208 898**

Telemetry Accessories
FM40 Tester

The FM40 Tester is a tool for checking the performance of the installed telemetry transmitter FM40 in connection with the RF-cable and the car antenna. Measured parameters are the transmission power as well as the matching of the antenna together with the RF-cables.

Measurement range	
Transmission power	1 ... 15 (60) W
VSWR	1 ... 6
Frequency band	VHF / UHF

Connectors	
RF	BNC male / female

Part number
B 261 208 894

Telemetry Antenna Dummy Load

The telemetry antenna dummy load replaces the telemetry car antenna when running the FM40 transmitter in a garage in order to prevent high RF power radiation.

Measurement range	
RF power	15 W
VSWR	1.1
Frequency band	VHF / UHF

Connectors	
RF	BNC male / female

Part number
B 261 208 890

Telemetry (Dual Band) Car Antenna

Rugged telemetry antennas for car mounting

Parameter	
Single Band Car Antenna	
Frequency band	UHF
Type	1/4λ
Pattern (hor.)	omni
Length	150 mm
Dual Band Car Antenna	
Frequency band	VHF / UHF
Gain	1/4λ / 5/8λ
Pattern (hor.)	omni
Length	440 mm

Connectors	
RF	BNC male

Part number	
Single Band Car Antenna	**B 261 208 888**
Dual Band Car Antenna	**B 261 208 862**

Antenna Cable Kit
For car mounting

RF cable for installation of telemetry antennaes at the car. Intended for single hole mounting.

Measurement range	
Length	max. 2 m (tbd.)
Drill hole diameter	12,5 mm
Attenuation	max. 0.7 dB @ 2 m, 450 MHz

Connectors	
RF	BNC male / female

Part number	
Antenna Cable Kit	**B 261 209 490**

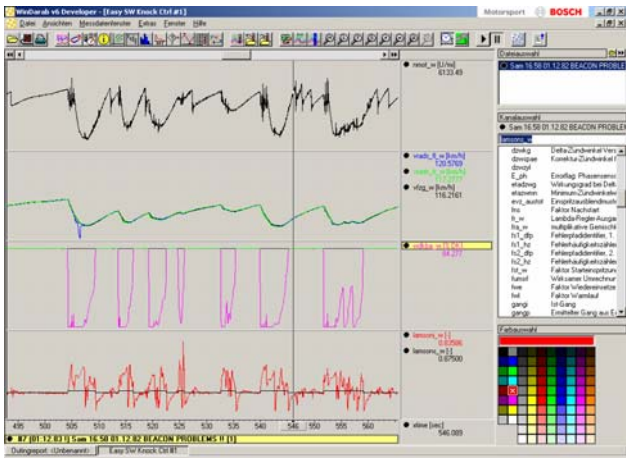
Analysing

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 different versions, WinDarab-Light and WinDarab-Expert. Additional we offer a dongle-free „Free“ version.

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 (analog 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

Part Numbers	
WinDarab-Free	**on request**
WinDarab-Light incl. Configuration tool WinDCP	**F 01E B01 402**
WinDarab-Expert incl. Configuration tool WinDCP	**F 01E B01 418**
Upgrade WinDarab-Light to WinDarab-Expert	**on request**

Encryption of data / access rights

The on-board recorded measuring data will be encrypted in the data logger via a so-called project key. Each project key belongs to a specified project or customer.

If you want to read or view data with WinDarab „Light“ or „Expert“, you need either

- a dongle with key information on it or
- a project license with corresponding key information on your PC.

You can install the project license on as many PCs as you want, whereas the single-user license needs the stuck dongle for operation. So the data are secured against misuse.

Dongle-free working with WinDarab „Free“

You can install WinDarab „Free“ on as many PCs as you want, as you know it from the project licenses. Therefore we offer WinDarab „Free“ exclusively for free available Bosch software and project keys. To ensure our customers data we will not offer a WinDarab „Free“ installation for customers program datasets or project keys.

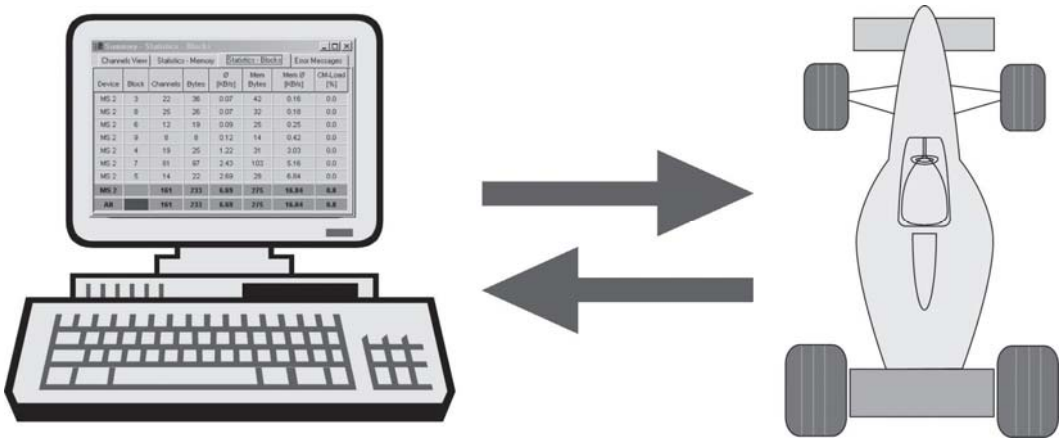
WinDarab Feature List			
	Free	**Light**	**Expert**
Function			
Limited number of opened files	2	4	–
Limited number of measuring data windows	1	2	–
Limited number of areas in measuring data windows	2	4	–
Views - Histogram	•	•	•
Views - (x/y)-Plot	•	•	•
Views - Distribution	–	•	•
Views - Min/Max-Tables		•	•
Views - Fourier-Transformation		•	•
Views - Outing report		–	•
Views - Lap analysis		–	•
Views - Flowcharts	–	–	•
Views - Instrument Panel (numeric/bargraph/round scale)	•	•	•
User defined Physical Units	•	•	•
Language Support German/English	•	•	•
Racetrack generation via speed/lateral G or GPS	•	•	•
ASCII Export	•	•	•
Matlab Import (seperated tool)	•	•	•
Extras - Functions/Conditions/Differences		–	•
Extras - Settings - Comments		–	•
Measuring data window - Area channel name - View options		–	•
Desktop load/save	•	•	•
Free dongle read-in (single user license)		•	•
Free read-in (project license)		•	•
Telemetry		•	•
Data security (data recording, Darab files)	–	•	•

Application

INCA-MSD

INCA is a software tool for measuring and calibrating of 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 DAMOS/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:

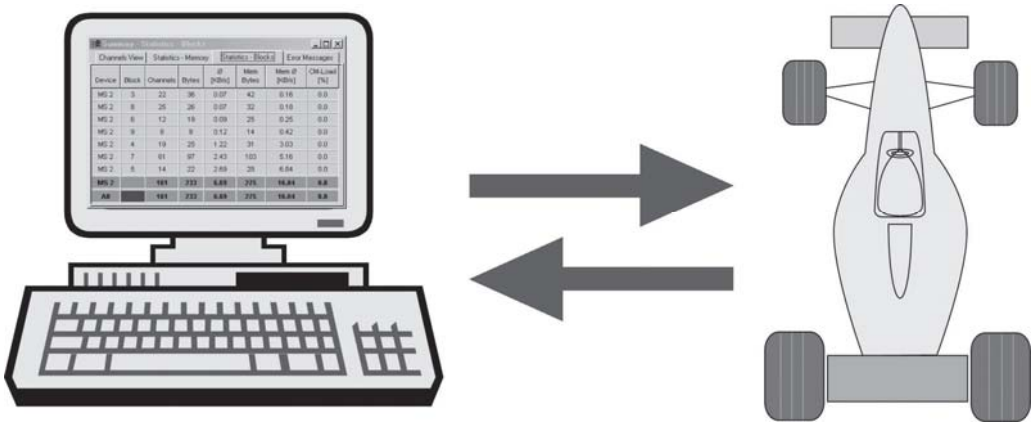
Windows 98, 2000, NT and XP

Part number

INCA-MSD Expert License	**B 261 206 423**

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 menue. 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

Part number	
Modas License	**On request**

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

Electrical 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 linterface	40 g/5Hz ... 2kHz
Temperature range	-30 ... 70°C
Control P-module output	
Output voltage	0 ... 4,096 V
Quantisation	⊗V=1,0 mV
Resolution	12 bit

Part 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 01**

K-Line Extension

The K-Line Extension is an extension for KIC 2 and therefore also a 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. The K-Line Extension enables a much longer distance than the KIC 2 can.

For the K-Line Extension three parts are needed: The PC-Printer port adapter, the K-Line adapter and the extension cable (length is user defined). The user can handle the K-Line Extension in the same way like a standard K-Line interface.

Details
Long distance K-Line function
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 Printer Port Adapter	17 x 60 x 78 mm
Size Converter	35 x 115 x 60 mm
Size Extension Cable	10/25/50 m

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
Max. extension cable length	200 m
Temperature range	-30 ... 70 °C

Part numbers	
Converter	**F 01T A20 041**
Extension Cable	**F 01T A21 003 10/25/50**
Printer Port Adapter	**F 01T A20 042**

MSA-Box
(K-Line / CAN Interface)

The MSA-Box is the low cost unit for PC-supported application with MODAS on K-Line or CAN interface of an ECU.

The MSA-Box is coupled to the PC via the USB interface. This ensures a powerful and universal link to all common PCs. The coupling to the ECU is effected via K-Line or CAN of the diagnosis interface.

Mechanical data	
Size	84 x 33 x 20 mm
Diagnosis cable length	2 m
USB cable length	0,5 m

Conditions for use	
Temperature range	0 ... 70 °C

Electronic data	
Input voltage (vehicle side)	8 ... 32 V
Power consumption (powered from USB)	typ. 0,5 W
Processor	ATMEL AT91SAM7X256
Flash Eprom	256 kByte
RAM	64 kByte
USB	USB 2.0, full speed (12 Mbit/s)
K-Line	300 Bd ... up to 320 kBd
CAN	10 kBit/s ... 1 MBit/s

Operating system
Windows 2000
Windows XP

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
According to ISO 9141-2 for diagnosis tester
Up to 300 kBaud transfer rate (K-Line) and up to 1 MBit/s transfer rate (CAN)
Plug suitable for motor vehicles (VS 20)
Protocols: KWP 2000, CCP

Part number	
MSA-Box	**B 261 208 015 01**

Handheld Test Devices

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

Part number
B 261 206 879

RS 2000

With the RS 2000 you can simulate crank shaft-, cam shaft- and wheel-speed-signals quickly and comfortable.

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.

Electrical data	
Power supply	12 V

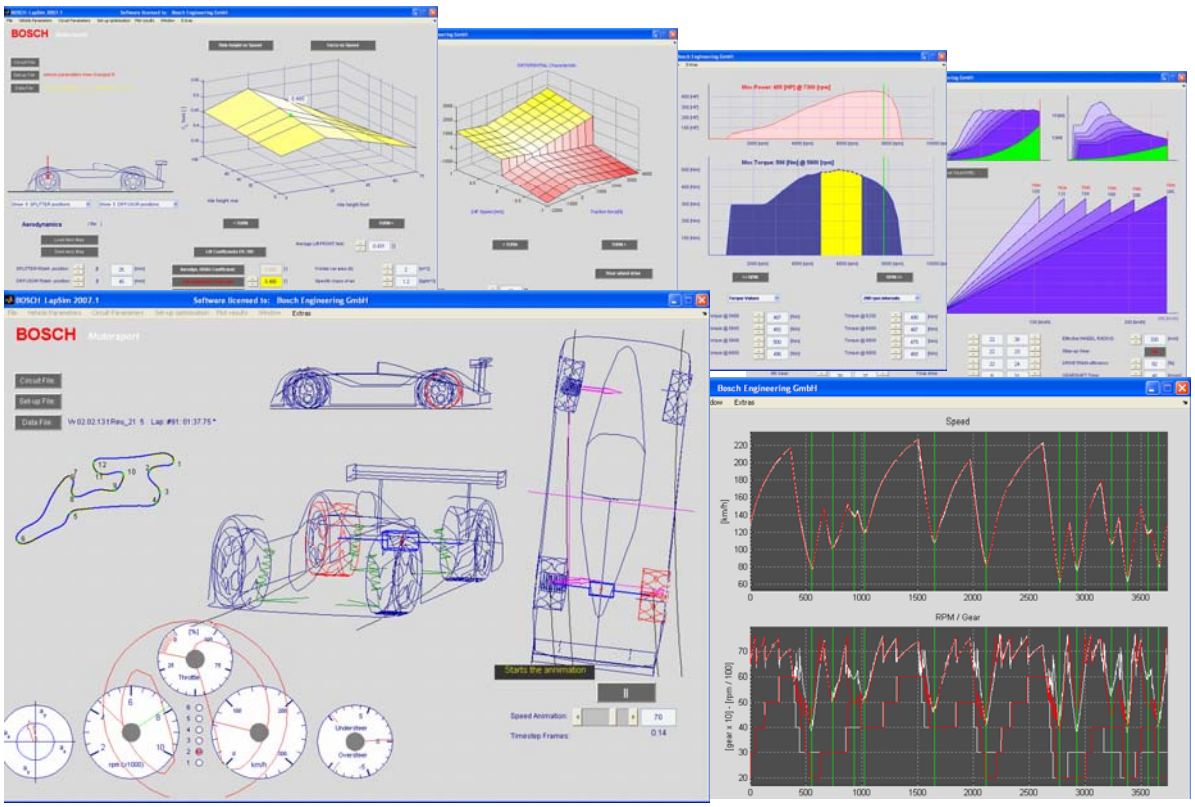
Part numbers	
RS 2000	**B 261 206 862 01**
Cable harness connector	**B 261 206 451**

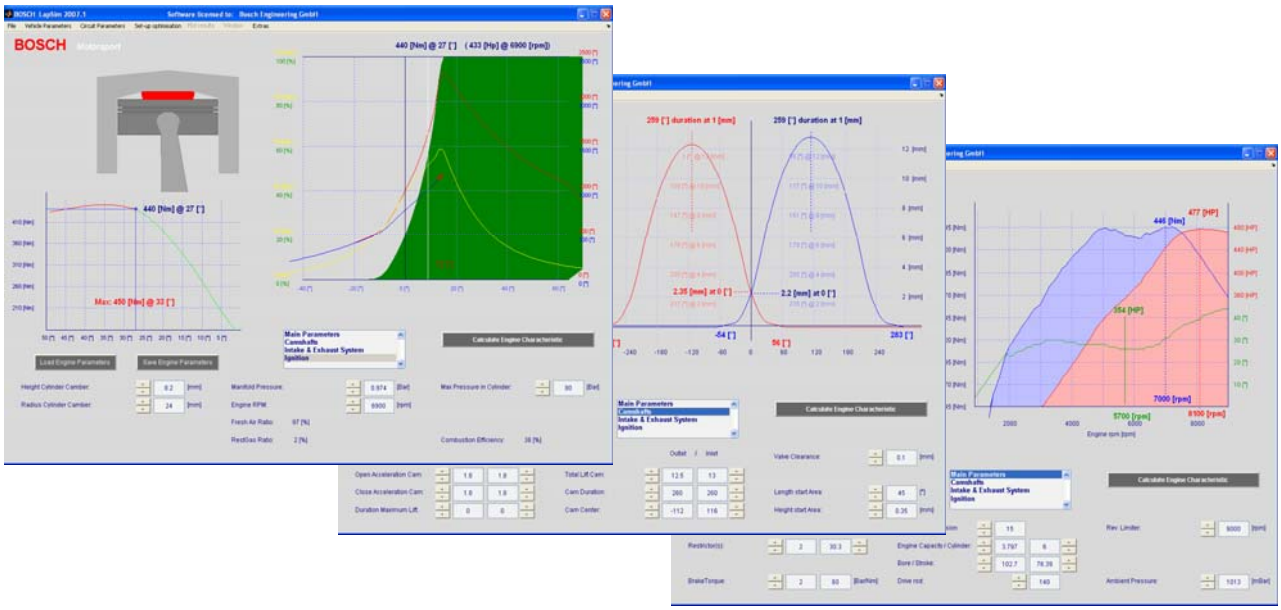
Simulation

LapSim

LapSim Chassis is both an analysis tool as well as a vehicle simulation program. By further processing the on-car recorded data, using parts of the simulation models, a much more profound analysis of the vehicle behaviour can be gained. Due to the direct link with the simulation model, vehicle parameters can be validated like aerodynamics, tyre behaviour, engine power, as well as driver performance. The visualisation of the vehicle behaviour creates a much easier and better understanding of the influence of several vehicle parameters on the performance independent of the technical background of the user.

LapSim Engine supplies an easy to use engine simulation package capable of generating a torque/power and a corresponding ignition curves out of the main parameters of an engine. The model is able to simulate any 4-stroke spark ignition (SI) race engine currently seen on the market, with or without air restrictor(s). To summarize, the engine software is aiming for 95% accuracy but 5% the effort of complex engine software packages. The engine software avoids a vast number of variables in order to define every engine detail, in order to improve usability as well as computational performance. The engine package is integrated in the lap simulation.





Data analysis

Post processing of the on-car recorded data with simulation models. Calculating vehicle handling state, aerodynamics, differential function, etc.

Determination of tyre parameters out of on-car recorded data. Possibility to analyse tyre performance over the laps.

Direct comparison between several outings and/or simulation model.

3D Animation of vehicle behaviour for a better and more thorough understanding.

By comparing recorded data with simulation data a validation possibility of vehicle parameters and vehicle functioning is made.

LapSim software adds all vehicle parameters to WinDarab Files and creates automatic database.

Chassis Simulation model

Practical Pacejka like tyre model. Tyre parameters can easily be determined out of on-car recorded data. No tyre data required.

Full vehicle model including limited slip (or visco-) differential

3D Aero maps

Ride height dependent suspension kinematics

Calculation time 3-4 times faster than real car

(PVI - 3 GHz)

Automatic set-up optimisation

Engine Simulation model

Engine model generates torque/power curve as well as ignition angle

Normally aspirate engines, with or without restrictor

2,3,4 and 5 valve cylinder heads

2-zone burn model in order to cope with all possible compression ratios and chamber geometries

Ignition point is determined by adjustable maximum pressure in cylinder

Fully adjustable camshaft profile

Engine model generates pressure curve over 720° crankshaft, which is integrated to calculate engine torque/power

10 seconds calculation time for 0 - 10.000 rpm range

Part numbers

LapSim Chassis Basic Version	**Free download at www.bosch-motorsport.com**
LapSim Chassis License	**B 261 206 432**
LapSim Engine License	**F 01T A20 056**
LapSim Engine & Chassis License	**F 01T A20 057**
Upgrade LapSim Engine License	**F 01T A20 058**
Upgrade LapSim Chassis License	**F 01T A20 059**

Laptrigger Systems

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	

Electrical 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

Part numbers	
IR-02-Receiver	
KPSE 6E8 3AP DN A34	**B 261 206 884 02**
ASL-6-06-05PD-HE	**B 261 206 887**
KPTA 6E6-4P-C-DN	**B 261 206 888**
IR-02-Transmitter	**B 261 206 890 01**

Laptrigger HF 24

This Laptrigger HF 24 system consists of a high frequency transmitter station and a receiver which is installed in the car.

The system allows an exact lap time measurement. Section time measurement for comparison of different car setups is also available if several transmitters are used. We offer optionally a tripod for mounting the transmitter anywhere along the race track.

Mechanical data	
HF 24 Receiver	
Size	125 x 37 x 28 mm
Weight	130 g
Internal antenna with radome	
Dust and waterproof aluminium housing	
HF 24 Transmitter	
Size	290 x 118 x 93 mm
Weight	1880 g
Dust and waterproof	
Tripod	
Maximum height	~ 150 cm
Minimum height	~ 65 cm
Weight	1370 g

Conditions of use	
Working range	up to 50 m
Ambient temperature	-10 ... 85 °C
Power consumption HF 24 Receiver	0,8 W
Power consumption HF 24 Transmitter	1 W

Electrical data	
System	
RF wideband chirp transmission	
Working frequency band	2,40 ... 2,47 GHz
User codes	16
HF 24 Receiver	
Sensitivity	-92 dBm @ BER 10^{-3}; 1 Mbps
Supply voltage	6,5 ... 30 V
Connector type	ASL 606-05PD-HE
Pin 1	+12 V
Pin 2	GND
Pin 3	Trigger Out
Mechanical drawing	Y 261 A25 087
HF 24 Transmitter	
Transmission power	10 dBm
Transmitter antenna	flat panel
Supply voltage	10 ... 30 V
Supply current	90 mA
Selection main / sub trigger	
Low battery detection	
Mechanical drawing	Y 261 A25 038

Application hints

HF 24 Transmitter

Before setting the main switch to ON, select the code and the working mode (main / sub trigger).

The transmitter reads the switches for code and main / sub trigger only once at power up.

After setting the main switch to ON the transmitter executes a 10 sec. self test and then the transmitter indicator begins to flash green, e.g. the transmitter is running.

The battery condition is permanently checked. If the battery level becomes critical, the “low bat indicator” becomes red. When the battery level drops below 10 V, the transmitter stops working. The green transmitter indicator stops flashing.

The transmitter should be placed at the border of the lane in a height of about 1.5 ... 2.0 m.

HF 24 Receiver

Before switching on the DC power the code has to be selected.

After switching ON the receiver executes a 10 sec. self test and than it turns into the working mode.

When a trigger is detected the output pin goes low for a certain time:
-20 msec low @ main trigger
-40 msec low @ sub trigger

Standard output configuration:

low side switch with R=3.3 kOhm (*) to +5 VDC
(*) can be modified according to user demands

The white antenna radome must be turned to the transmitter side and should not be mounted behind metallic covers or carbon fiber filled elements.

Green indicator flashes when it detects a trigger condition.

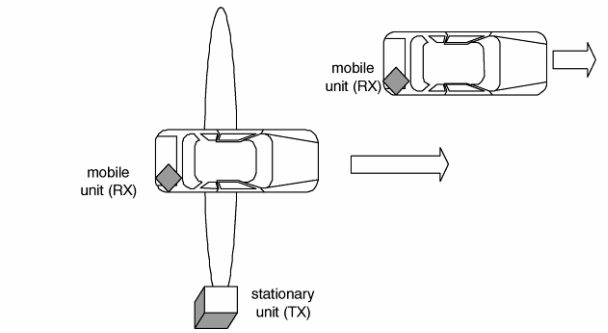
Function description

The transmitter sends via the directional antenna coded signals across the race track.

The receiver at the race car checks permanently the team code and the signal parameters. If the trigger condition is detected the receiver generates the appropriate output signal (main/sub trigger).

The trigger point is located at broadside of the transmitter antenna.

After detecting the trigger point and releasing the trigger signal the receiver is passive for a period of two seconds avoiding a multiple trigger signal.



Part numbers

HF 24 Receiver	**B 261 206 894**
HF 24 Transmitter	**B 261 206 895**
Tripod	**B 261 206 897**

Diesel System Components

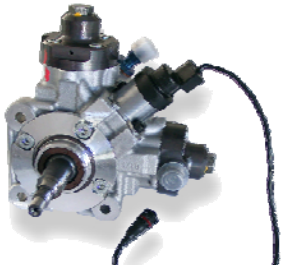
Diesel System Components

Injector CRI 2

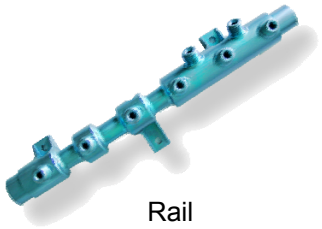
HP fuel pump CP3

Rail

Injector CRI 3



HP fuel pump CP4



Rail

Pressure sensor RDS

Pressure control valve DRV

Component	Specification
Injector CRI 2	Solenoid, 6 - 8 holes, up to 1,500 ccm/min at 100 bar, up to 1,800 bar
Injector CRI 3	Piezo, 6 - 14 holes, up to 1,400 ccm/min at 100 bar, up to 2,200 bar
High pressure fuel pump CP3 / CP4	Pump with control valve and optional gear pump, up to 1,400 ccm/rev
Pressure control valve DRV	Pressure range up to 2,400 bar
Pressure limiting valve DBV	Pressure range up to 2,200 bar
Pressure sensor RDS	Pressure range up to 2,400 bar
Rails	Common rail for up to 6 cylinders per bank

The geometry and characteristics of diesel engine components are more dependent upon the application than for gasoline engines. A single injector design will not fit all diesel engines due to varying mechanical and nozzle geometry requirements. In addition, the injection system can vary from year to year even within the same make of car.

Bosch Motorsport uses the same technology for racing that was developed by Bosch for production vehicle applications. This includes both solenoid (magnetic) technology used in earlier systems, and the latest cutting-edge piezo technology.

Bosch Motorsport can offer a wide variety of modifications to fit the system to your specifications. These modifications include:

- Definition of suitable base components from other (or larger) engine applications.
- Adaptation of components for mating, fit and orientation to suit the selected application.
- Flow enhancement of injectors and rails.
- Injector nozzle adaptation (flow rate, number of holes, spray cone angle etc.).

Our goal is to offer the best balance of cost and performance for your application. This is why we offer several different levels of modifications to choose from. Below is an example of the different levels for a 4-cylinder engine with 4 injectors, 1 high pressure pump, and a single fuel rail:

	1st Level	2nd Level	3rd Level
Description	series components with some minor modifications (e.g. series components from a bigger engine (e.g. pump) plus series injector with sample nozzle)	series components with modification (e.g. modified injector body with sample nozzle)	components manufactured completely to your specification (e.g. heavily modified series components or new products)
Functioning	Solenoid	Piezo	Piezo or Solenoid
Injectors	4 x 650.00 €	4 x 2,100.00 €	On request
High Pressure Pump	1,250.00 €	3,000.00 €	On request
Fuel Rail	500.00 €	1,000.00 €	On request
System Price	4,350.00 €	12,400.00 €	On request
	(Prices will be finalized in your personal offer once part numbers are defined)		

Additional remark:

Bosch Motorsport does not manufacture high pressure fuel lines, but we can assist you in finding a company that can build high pressure lines for your application.

When contacting us for more information on our diesel components, please have the following information ready so that we may best determine components required for your application:

- The base engine / the car where this engine originally is installed
- Model year and type of car / engine
- The base output level and the desired output level for the engine

- If it is a Bosch application, the part numbers of the components
- Alternatively the car / engine manufacturer part number of the original injection system.

Please note:
If your engine is originally equipped with Bosch components, modifications will be easier than replacing third party components.

We reserve the right to assess a fee for applications where the component specification requires an extraordinary amount of time.

Sensors

Pressure Sensors Air

Pressure Sensor Air PSA-B

This sensor is designed to measure the absolute air pressure, especially the air box pressure of gasoline or Diesel engines.

A piezo-resistive sensor element and electronic systems for signal-amplification and temperature-compensation are integrated on a silicon chip. The output of the sensor is an analog, ratiometric signal. Two different pressure ranges are available (0,1 ... 1,15 bar or 0,2 ... 2,5 bar).

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

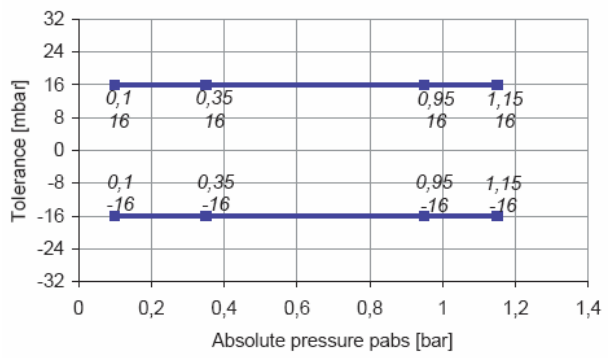
Application	
Application	*[1]* 0,1 ... 1,15 bar (a) *[2]* 0,2 ... 2,50 bar (a)
Pressure Reference Type	absolute
Max. Pressure	5 bar
Operating Temp. Range	-40 ... 130 °C
Media Temp. Range	-40 ... 130 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	2500 m/s² @ 200 Hz 1250 m/s² @ 440 Hz sine

Electrical Data	
Power Supply U_S	4,75 ... 5,25 V
Max. Power Supply	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

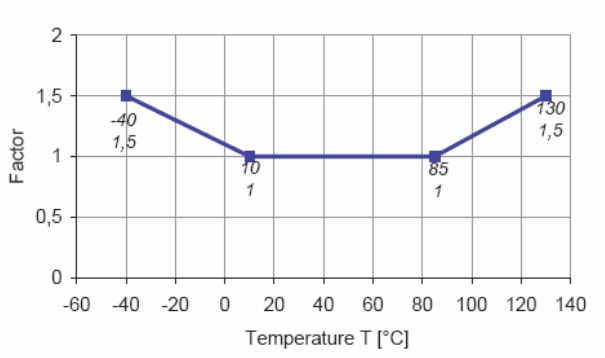
Mechanical Data	
Mounting	M6
Fitting	12,05 mm
Weight w/o Cable	17 g
Sealing	O-ring 7,59 x 2,62 mm

Characteristic	
Response Time T10/90	1 ms
Compensated Range	10 ... 85 °C
Tolerance (FS) @ U_S = 5 V	*[1]* ± 0,016 bar *[2]* ± 0,034 bar
Tolerance (FS)	*[1]* ± 1,39 % *[2]* ± 1,36 %
Sensitivity	*[1]* 4.040 mV/bar *[2]* 1.848 mV/bar
Offset	*[1]* -4,8 mV *[2]* 30,4 mV

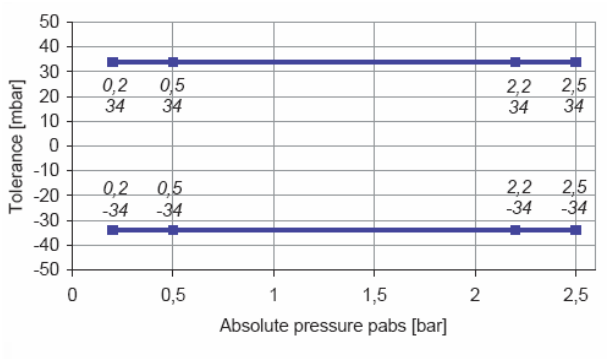
Tolerance *[1]*



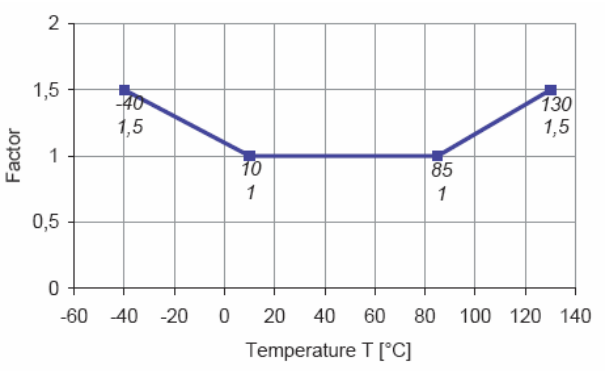
Expansion of Tolerance f(T) *[1]*



Tolerance *[2]*



Expansion of Tolerance f(T) *[2]*



Connectors and Cables

Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	Us
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint

The PSA-B is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.

The sensor can be connected directly to most control units.

To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.

Use engine oil (5W40) as O-Ring grease (no silicone based grease).

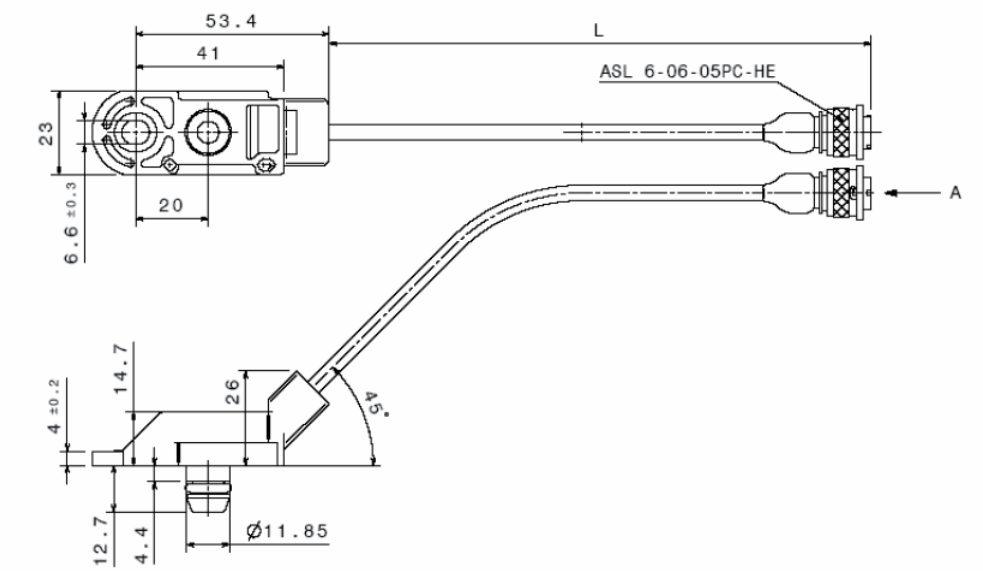
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers

PSA-B *[1]*	**B 261 209 702**
PSA-B *[2]*	**B 261 209 710**
Adapter for PSA-B	**B 261 209 725**


53.4
41
L
ASL 6-06-05PC-HE
23
20
6.6 ±0.3
A
14.7
26
4 ±0.2
45°
12.7
4.4
Ø11.85

Pressure Sensor Air PSA-C

This sensor is designed to measure the absolute air pressure, especially the air box pressure of gasoline or Diesel engines.

A piezo-resistive sensor element and electronic systems for signal amplification and temperature compensation are integrated on a silicon chip. The pressure which has to be measured can be connected via a tube to the sensor. The output of the sensor is an analog, ratiometric signal.

The main feature and benefit of this sensor is the combination of the high quality of the production part and a low price.

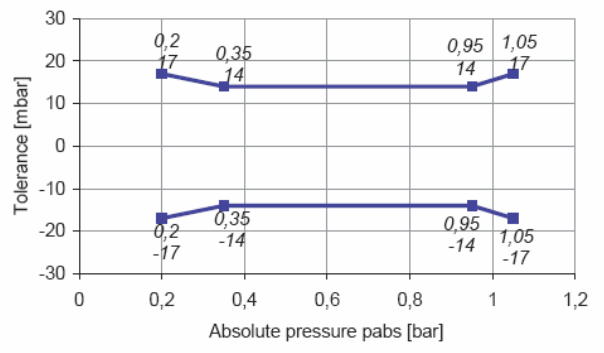
Application	
Application	*[1]* 0,2 ... 1,05 bar (a) *[2]* 0,2 ... 2,50 bar (a)
Pressure Reference Type	absolute
Max. Pressure p_{abs} max	5 bar
Operating Temp. Range	-40 ... 130 °C
Media Temp. Range	-40 ... 130 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	200 m/s² @ 10 ... 10.000 Hz

Electrical Data	
Power Supply U_S	4,75 ... 5,25 V
Max Power Supply U_S max.	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

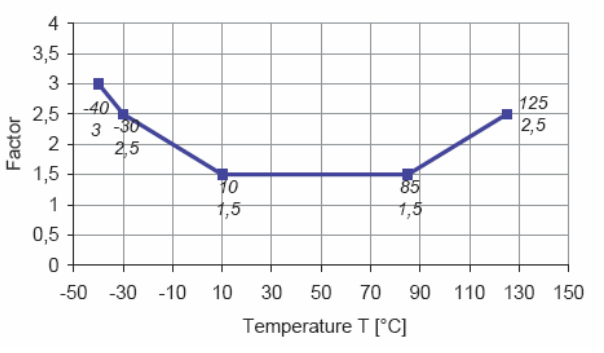
Mechanical Data	
Mounting	M6
Fitting	6 mm
Weight w/o Cable	40 g

Characteristic	
Response Time T10/90	10 ms
Compensated Range	10 ... 85 °C
Tolerance (FS) @ U_S = 5 V	*[1]* ± 0,017 bar *[2]* ± 0,042 bar
Tolerance (FS)	*[1]* ± 1,62 % *[2]* ± 1,68 %
Sensitivity	*[1]* 5.000 mV/bar *[2]* 1.532 mV/bar
Offset	*[1]* -600 mV *[2]* 724 mV

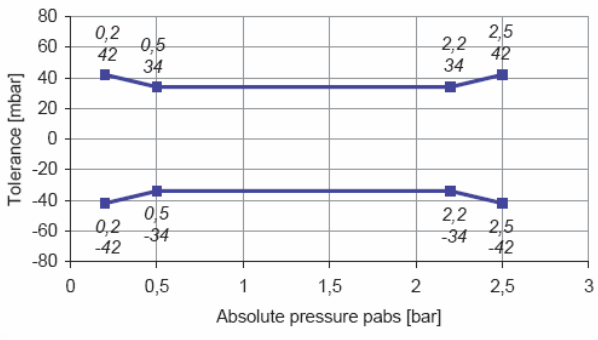
Tolerance *[1]*



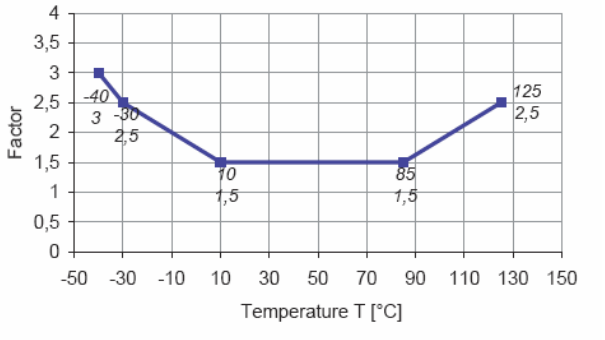
Expansion of Tolerance f(T) *[1]*



Tolerance *[2]*



Expansion of Tolerance f(T) *[2]*



Connectors and Cables

Connector	Bosch Jetronic
Connector Loom	D 261 205 289
Pin 1	U_S
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-

Various military and automotive connectors on request.

Application Hint

The PSA-C is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.

Avoid liquid entering the measuring cell.

The sensor can be connected directly to most control units.

To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.

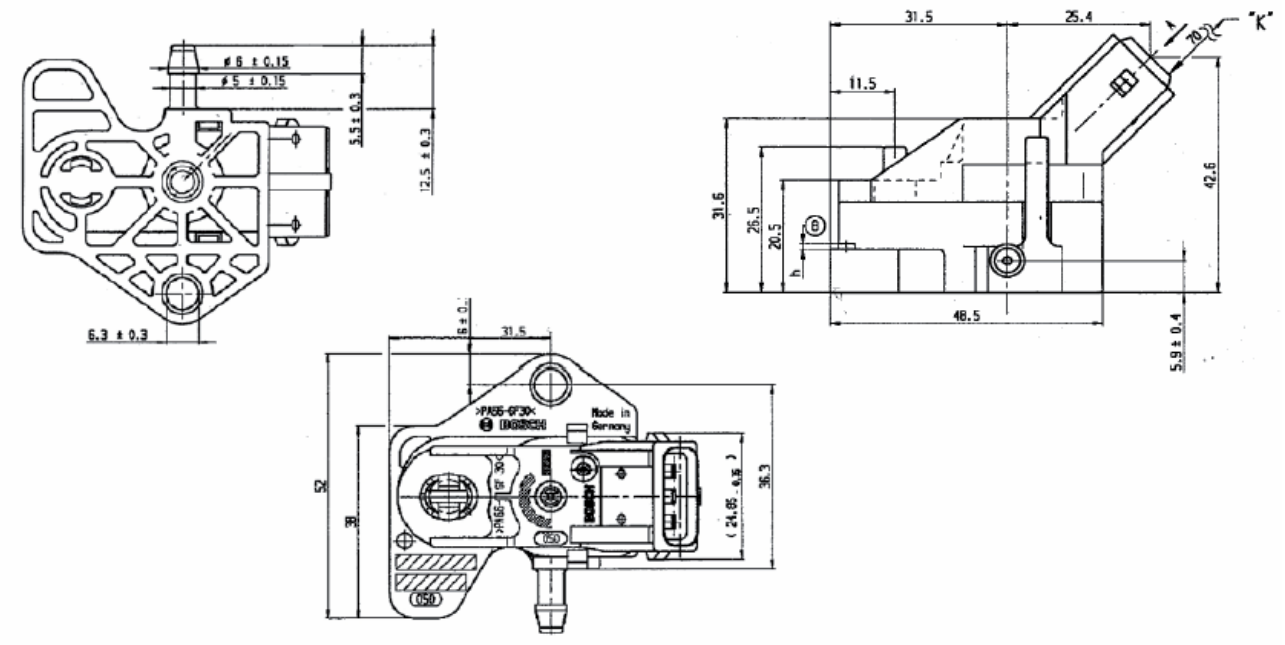
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers

PSA-C *[1]*	**0 261 230 037**
PSA-C *[2]*	**0 281 002 389**



Pressure Sensor Air PSB-2

This sensor is designed to measure the absolute air pressure, especially the air box and boost pressure of gasoline or Diesel engines very precisely.

A piezo-resistive sensor element and electronic systems for signal-amplification and temperature-compensation are integrated on a silicon chip. The output of the sensor is an analog, ratiometric signal.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection. Cause of the individual calibration data provided with each part, a very small tolerance can be achieved.

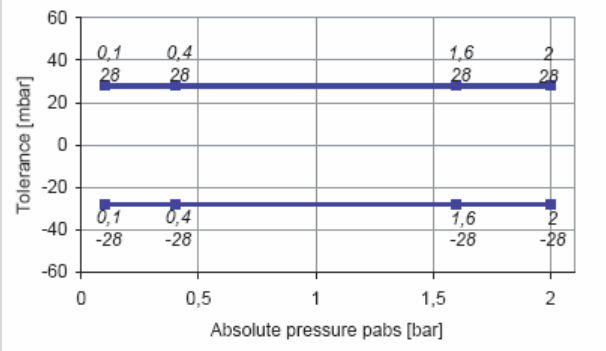
Application	
Application	0,1 ... 2,0 bar (a)
Pressure Reference Type	absolute
Max. Pressure	5 bar
Operating Temp. Range	-40 ... 130 °C
Media Temp. Range	-40 ... 130 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	200 m/s² @ 10 ... 10.000 Hz

Electrical Data	
Power Supply U_S	4,75 ... 5,25 V
Max Power Supply U_S max	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

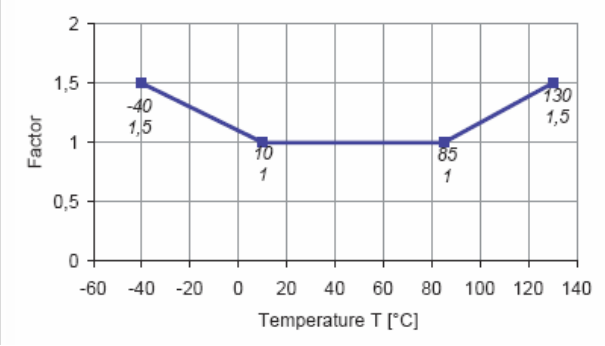
Mechanical Data	
Mounting	M6
Fitting	12,05 mm
Weight w/o Cable	17 g
Sealing	O-ring 7,59 x 2,62 mm

Characteristic	
Response Time T10/90	1 ms
Compensated Range	10 ... 85 °C
Tolerance (FS) @ U_S = 5 V	± 0,028 bar
Tolerance (FS)	± 1,4 %
Sensitivity	2236,84 mV/bar (an individual calibration sheet will be delivered)
Offset	176,315 mV (an individual calibration sheet will be delivered)

Tolerance



Expansion of Tolerance f(T)



Connectors and Cables

Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	U_S
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint

The PSB-2 is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.

The sensor can be connected directly to most control units.

To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.

Use engine oil (5W40) as O-Ring grease (no silicone based grease).

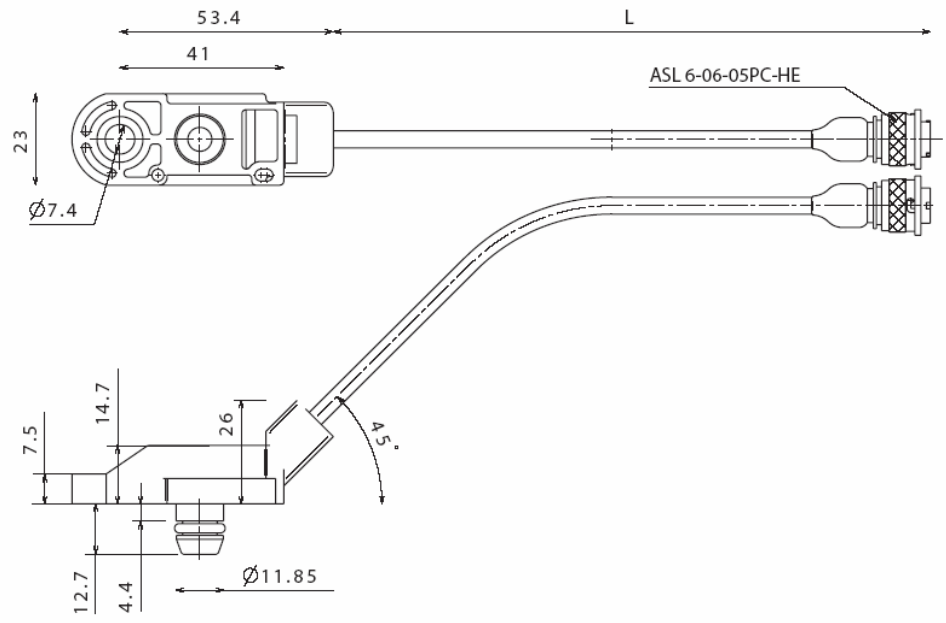
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).

To optimise the accuracy of this sensor, we offer an individually calibration data sheet of each sensor.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Number

PSB-2	**B 261 209 337**



Pressure Sensor Air PSB-4

This sensor is designed to measure the absolute air pressure, especially the air box and boost pressure of gasoline or Diesel engines very precisely and in a big range.

A piezo-resistive sensor element, electronic systems for signal-amplification and temperature-compensation are integrated on a silicon chip. The output of the sensor is an analog, ratiometric signal.

Cause of the individual calibration a very small tolerance can be achieved. Furthermore the sensor is characterized by a very quick response.

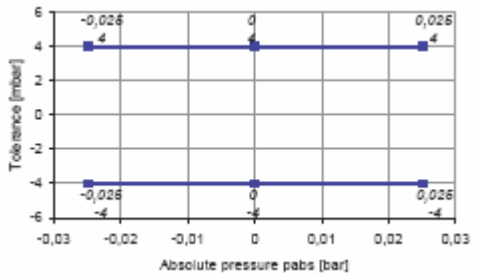
Application	
Application	0,5 ... 4 bar (a)
Pressure Reference Type	absolute
Max. Pressure	6 bar
Operating Temp. Range	-40 ... 130 °C
Media Temp. Range	-40 ... 130 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	20 m/s² @ 10 ... 1.000 Hz

Electrical Data	
Power Supply U_S	4,75 ... 5,25 V
Max Power Supply U_S max.	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

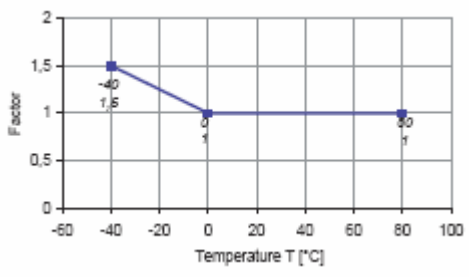
Mechanical Data	
Mounting	M6
Fitting	12,05 mm
Weight w/o Cable	20 g
Sealing	O-ring 7,59 x 2,62 mm

Characteristic	
Response Time T10/90	0,2 ms
Compensated Range	0 ... 80 °C
Tolerance (FS) @ U_S = 5 V	± 0,056 bar
Tolerance (FS)	± 1,4 %
Sensitivity	1142,857 mV/bar (an individual calibration sheet will be delivered)
Offset	-71,42 mV (an individual calibration sheet will be delivered)

Tolerance



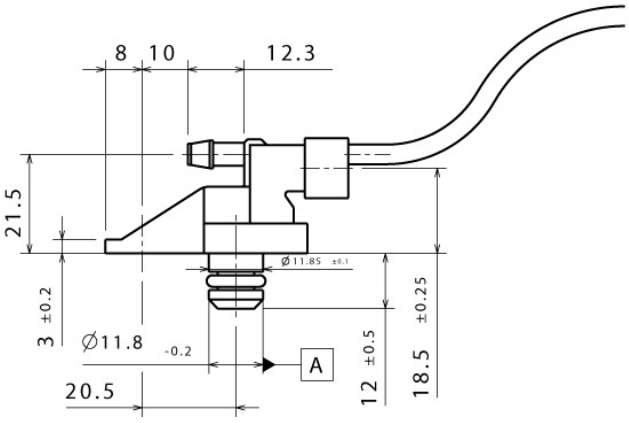
Expansion of Tolerance f(T)

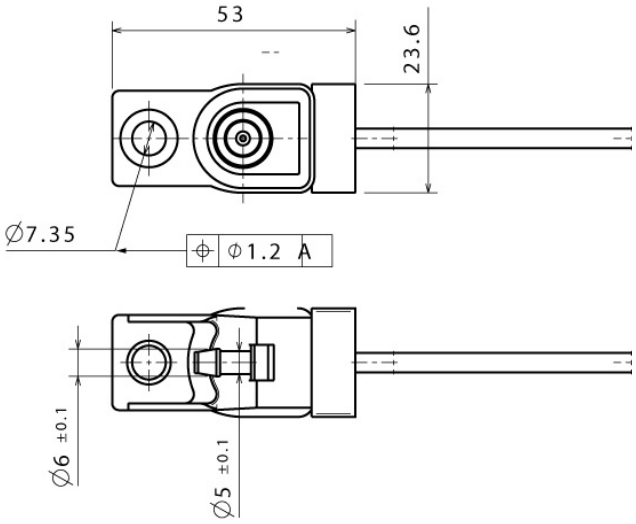


Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	U_S
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
The PSB-4 is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.
The sensor can be connected directly to most control units.
To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.
Use engine oil (5W40) as O-Ring grease (no silicone based grease).
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).
To optimize the accuracy of this sensor, we offer an individually calibration data sheet of each sensor.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Number	
PSB-4	**B 261 209 348**





Pressure Sensor Air PSP

This sensor is designed to measure the absolute air pressure, specially the air box pressure of gasoline or Diesel engines.

A piezo-resistive sensor element, electronic systems for signal-amplification and temperature compensation is integrated on a silicon chip. The output of the sensor is an analog, ratiometric signal.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

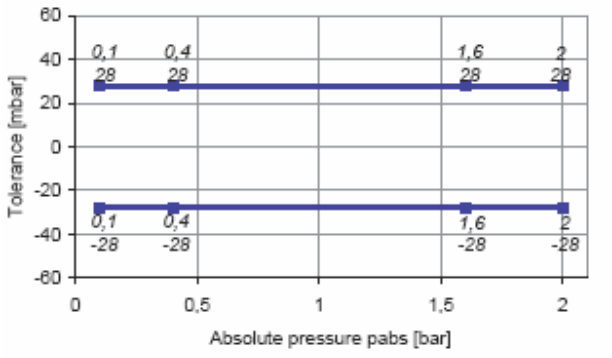
Application	
Application	0,2 ... 3 bar (a)
Pressure Reference Type	absolute
Max. Pressure pabs max	5 bar
Operating Temp. Range	-40 ... 125 °C
Media Temp. Range	-40 ... 125 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	0,19 mm @ 100 ... 200 Hz 250 m/s² @ 200 ... 500 Hz

Electrical Data	
Power Supply U_S	4,5 ... 5,5 V
Max Power Supply U_S max	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

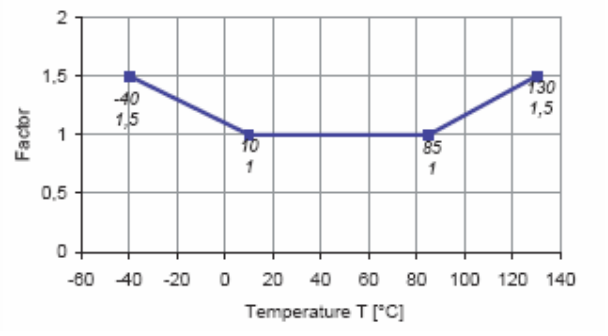
Mechanical Data	
Mounting	M6
Fitting	12,05 mm
Weight w/o Cable	17 g
Sealing	O-ring 7,59 x 2,62 mm

Characteristic	
Response Time T10/90	0,2 ms
Compensated Range	10 ... 85 °C
Tolerance (FS) @ U_S = 5 V	± 0,042 bar
Tolerance (FS)	± 1,4 %
Sensitivity	1.518 mV/bar
Offset	96 mV

Tolerance



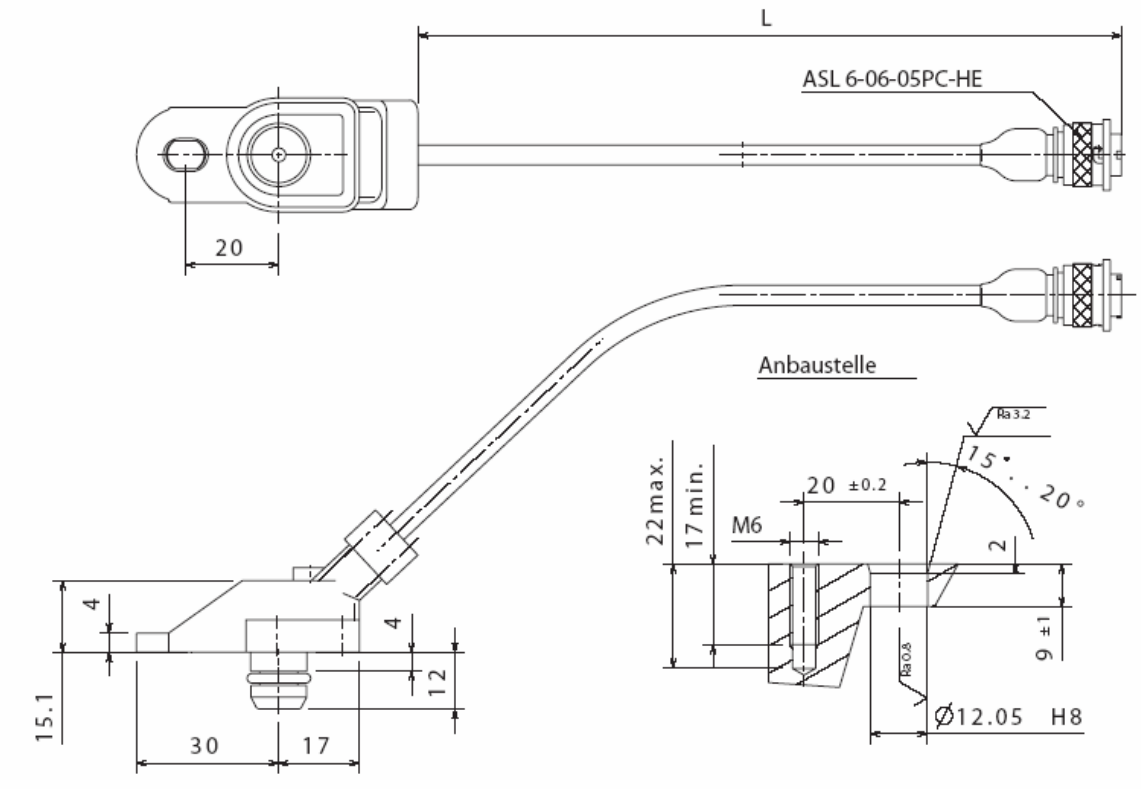
Expansion of Tolerance f(T)



Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	U_S
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
The PSP is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.
The sensor can be connected directly to most control units.
To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.
Use engine oil (5W40) as O-Ring grease (no silicone based grease).
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
PSP	**B 261 209 690**



Pressure Sensor Air PST

This sensor is designed to measure the absolute air pressure, especially the air box pressure of gasoline or Diesel engines and the air temperature.

A piezo-resistive sensor element, electronic systems for signal amplification and temperature compensation are integrated on a silicon chip. The output of the sensor is an analog, ratiometric signal. A NTC-resistor is used for the temperature measurement.

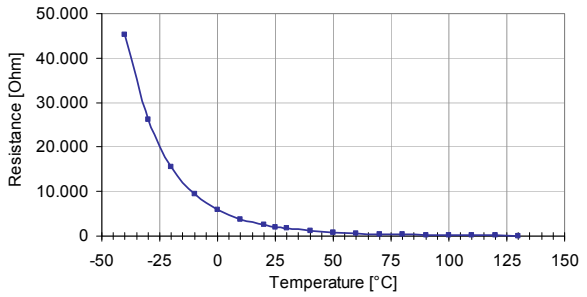
The main feature of this sensor is the integration of two sensors (air pressure and air temperature) in one housing. A further benefit of the PST is the high quality of the production part at a low price.

Application	
Application 1	0,1 ... 1,15 bar (a)
Application 2	-40 ... 125 °C
Pressure Reference Type	absolute
Max. Pressure p_{abs} max	5 bar
Operating Temp. Range	-40 ... 125 °C
Media Temp. Range	-40 ... 125 °C
Storage Temp. Range	-40 ... 130 °C
Max. Vibration	0,19 mm @ 100 ... 200 Hz 250 m/s² @ 200 ... 500 Hz sine

Mechanical Data	
Mounting	M6
Fitting	18 mm
Weight w/o Cable	30 g
Sealing	O-ring 13,95 x 2,62 mm

Electrical Data	
Power Supply U_S	4,5 ... 5,5 V
Max Power Supply U_S max.	16 V
Full Scale Output U_A @ 5 V	0,3 ... 4,8 V
Current I_S	9 mA

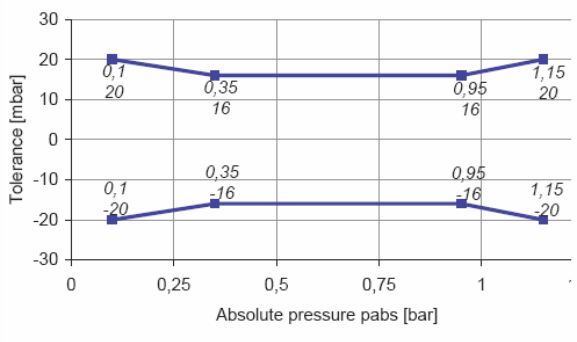
Characteristic Application 1	
T [°C]	R [Ohm]
-40	45.313
-30	26.114
-20	15.462
-10	9.397
0	5.896
10	3.792
20	2.500
25	2.057
30	1.707
40	1.175
50	834
60	596
70	436
80	323
90	243
100	187
110	144
120	113
130	89



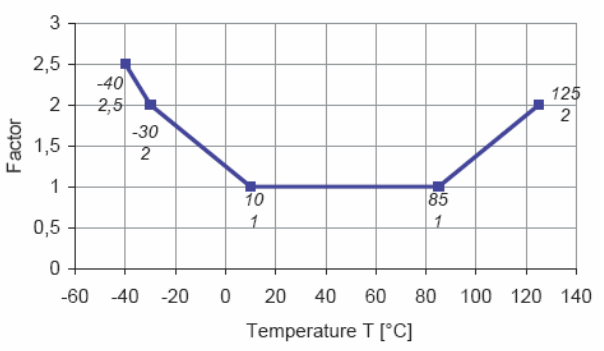
Characteristic Application 2	
Response Time T10/90	0,2 ms
Compensated Range	10 ... 85 °C
Tolerance (FS) @ U_S = 5 V	± 0,016 bar
Tolerance (FS)	± 1,39 %
Sensitivity	4.047 mV/bar
Offset	-4,76 mV

Resistance @ 20 °C	2,5 kOhm
Tolerance	5 %
Response Time τ_{63}	45 s @ air ; v = 6 m/s

Tolerance



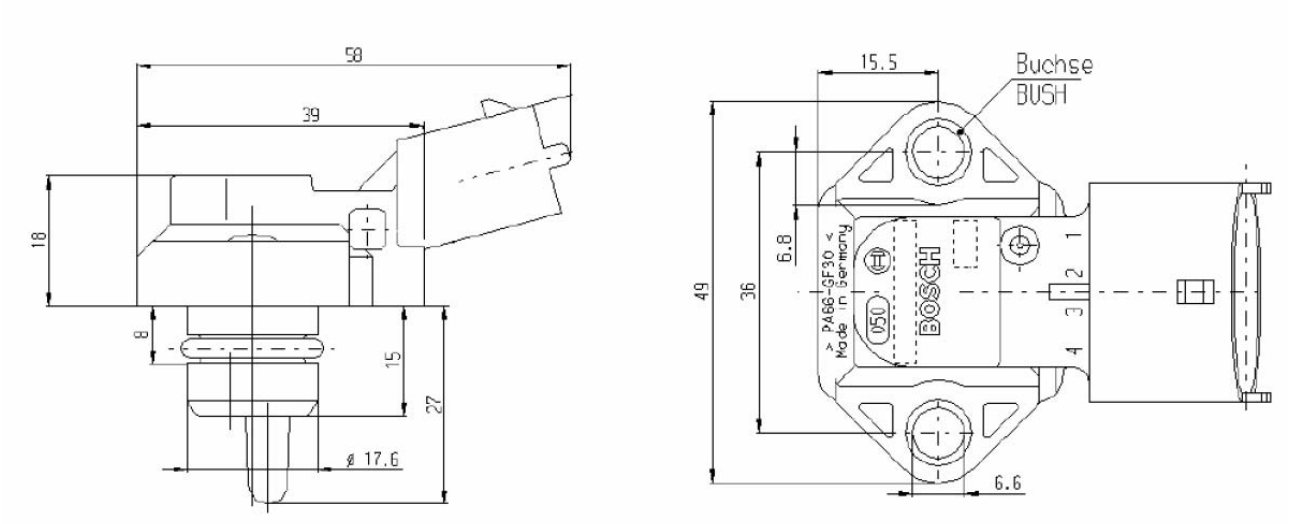
Expansion of Tolerance f(T)



Connectors and Cables	
Connector	Bosch Compact
Connector Loom	D 261 205 336
Pin 1	Gnd
Pin 2	Sig NTC
Pin 3	Us
Pin 4	Sig
Pin 5	-
Various military and automotive connectors on request.	

Application Hint
The PST is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.
The sensor can be connected directly to most control units.
To avoid noise, an ECU-input circuit with a RC-lowpass filter (τ = 2 ms) is recommended.
For the temperature measurement, a 1 kOhm pull-up at 5 V is recommended.
Use engine oil (5W40) as O-Ring grease (no silicone based grease).
Avoid miss-pinning (max. 5 minutes @ I = 0,3 A).
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
Absolute Pressure Sensor PST	**0 261 230 022**



Pressure Sensors Fluid

Pressure Sensor Fluid PSS-10

This sensor is designed to measure the absolute pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main benefit of this sensor is the high quality of a production part at a low price.

Application	
Application	0,5 ... 11 bar (a)
Pressure Reference Type	absolute
Max. Pressure	20 bar
Operating Temp. Range	-40 ... 125 °C (140 °C)
Media Temp. Range	-40 ... 125 °C (140 °C)
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2.000 Hz

Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation Torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

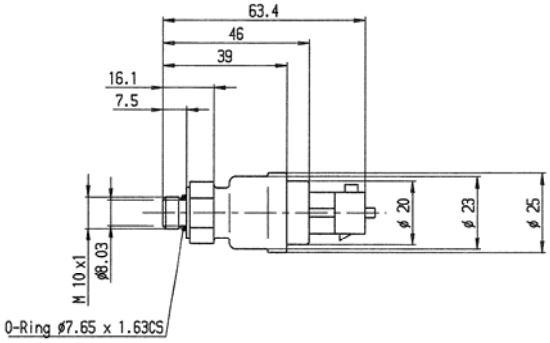
Electrical Data	
Power Supply U_S	*[1]* 4,75 ... 5,25 V *[2]* 8 ... 30 V
Max Power Supply U_S max	± 30 V
Full Scale Output U_A	
	[1] 10 ... 90 % Us ratiometric
	[2] 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

Characteristic	
Response Time T10/90	*[1]* 1,5 ms *[2]* 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	± 0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	*[1]* 400 mV/bar @ U_S = 5 V *[2]* 400 mV/bar
Offset	*[1]* 100 mV @ U_S = 5 V *[2]* 100 mV

Connectors and Cables	
Connector	Bosch Compact
Connector Loom	*[1]* D 261 205 339 *[2]* D 261 205 334
Pin 1	GND
Pin 2	SIG
Pin 3	U_S
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	

Application Hint
The PSS 10 can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSS-10 *[1]*	**B 261 209 341-01**
PSS-10 *[2]*	**B 261 209 064**



Pressure Sensor Fluid PSS-10R

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main benefit of this sensor is the high quality of a production part at a low price.

Application	
Application	0 ... 10 bar (r)
Pressure Reference Type	relative
Max. Pressure	20 bar
Operating Temp. Range	[1] -40 ... 125 °C (140 °C) [2] -40 ... 125 °C
Media Temp. Range	[1] -40 ... 125 °C (140 °C) [2] -40 ... 125 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2.000 Hz

Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

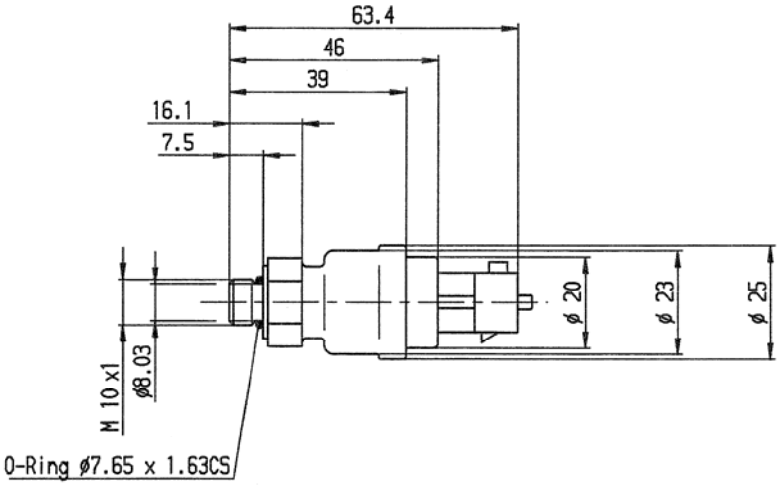
Electrical Data	
Power Supply US	[1] 4,75 ... 5,25 V [2] 8 ... 30 V
Max Power Supply Us max	± 30 V
Full Scale Output U_A	[1] 10 ... 90 % U_S ratiometric [2] 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

Characteristic	
Response Time T10/90	[1] 1,5 ms [2] 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	± 0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	[1] 400 mV/bar @ U_S = 5 V [2] 400 mV/bar
Offset	[1] 500 mV @ U_S = 5 V [2] 500 mV

Connectors and Cables	
Connector	Bosch Compact
Connector Loom	[1] D 261 205 339 [2] D 261 205 334
Pin 1	Gnd
Pin 2	Sig
Pin 3	U_S
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	

Application Hint
The PSS-10R can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSS-10R *[1]*	**F 01T A21 312**
PSS-10R *[2]*	**F 01T A21 307**



Pressure Sensor Fluid PSS-100R

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main benefit of this sensor is the high quality of a production part at a low price.

Application	
Application	0 ... 100 bar (r)
Pressure Reference Type	relative
Max. Pressure	200 bar
Operating Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Media Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2.000 Hz

Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation Torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

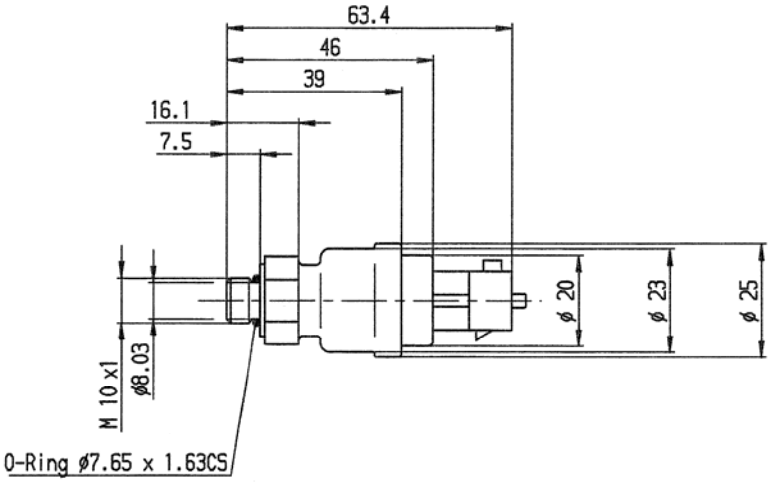
Electrical Data	
Power Supply U_S	*[1]* 4,75 ... 5,25 V *[2]* 8 ... 30 V
Max Power Supply	± 30 V
Full Scale Output U_A	[1] 10 ... 90 % U_S ratiometric *[2]* 0,5 ... 4,5 V non-ratiometric
Current IS	[1] 8 *mA* [2] 10 mA

Characteristic	
Response Time T10/90	*[1]* 1,5 ms *[2]* 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	± 0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	*[1]* 40 mV/bar @ U_S = 5 V *[2]* 40 mV/bar
Offset	*[1]* 500 mV @ U_S = 5 V *[2]* 500 mV

Connectors and Cables	
Connector	Bosch Compact
Connector Loom	*[1]* D 261 205 339 *[2]* D 261 205 334
Pin 1	GND
Pin 2	SIG
Pin 3	US
Various military and automotive connectors on request.	

Application Hint
The PSS-100R can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSS-100R *[1]*	**B 261 209 347**
PSS-100R *[2]*	**F 01T A21 310**



Pressure Sensor Fluid PSS-250R

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

Application	
Application	0 ... 250 bar (r)
Pressure Reference Type	relative
Max. Pressure	500 bar
Operating Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Media Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2.000 Hz

Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

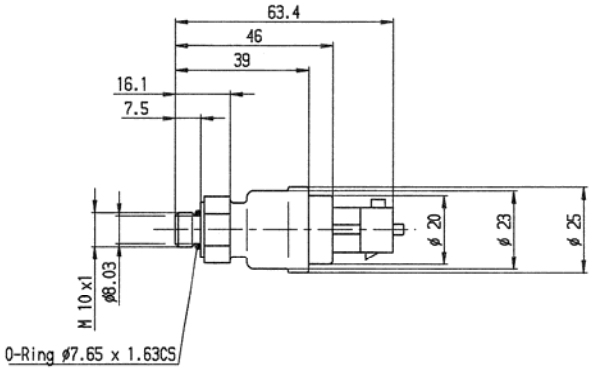
Electrical Data	
Power Supply U_S	*[1]* 4,75 ... 5,25 V *[2]* 8 ... 30 V
Max Power Supply Us max	± 30 V
Full Scale Output U_A	*[1]* 10 ... 90 % U_S ratiometric *[2]* 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

Characteristic	
Response Time T10/90	*[1]* 1,5 ms *[2]* 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ Us = 5 V	± 0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	*[1]* 16 mV/bar @ Us = 5 V *[2]* 16 mV/bar
Offset	*[1]* 500 mV @ Us = 5 V *[2]* 500 mV

Connectors and Cables	
Connector	Bosch Compact
Connector Loom	*[1]* D 261 205 339 *[2]* D 261 205 334
Pin 1	GND
Pin 2	SIG
Pin 3	Us
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	

Application Hint
The PSS-250R can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
PSS-250R *[1]*	B 261 209 965
PSS-250R *[2]*	B 261 209 067



Pressure Sensor Fluid PSC-10

This sensor is designed to measure the absolute pressure of various kind of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

Application	
Application	0,5 ... 11 bar (a)
Pressure Reference Type	absolute
Max. Pressure	20 bar
Operating Temp. Range	-40 ... 125 °C (140 °C)
Media Temp. Range	-40 ... 125 °C (140 °C)
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2000 Hz

Electrical Data	
Power Supply U_S	[1] 4,75 ... 5,25 V [2] 8 ... 30 V
Max Power Supply	± 30 V
Full Scale Output U_A	[1] 10 ... 90 % U_S ratiometric [2] 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

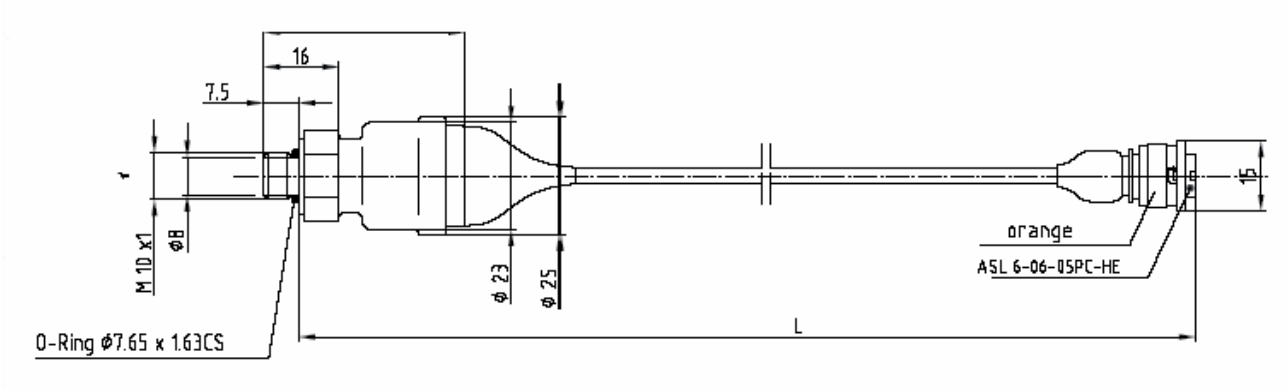
Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation Torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

Characteristic	
Response Time T10/90	[1] 1,5 ms [2] 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	[1] 400 mV/bar @ U_S = 5 V [2] 400 mV/bar
Offset	[1] 100 mV @ U_S = 5 V [2] 100 mV

Connectors and Cables	
Connector	KPTC 6E8-4P-C-DN
Connector Loom	KPTC 6E8-4P-C-DN
Pin 1	[2] U_S
Pin 2	GND
Pin 3	SIG
Pin 4	[1] U_S
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	13 ... 95 cm
Please specify the requested cable length with your order.	

Application Hint
The PSC can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSC-10 [1]	**F 01T A21 304**
PSC-10 [2]	**B 261 209 079**



Pressure Sensor Fluid PSC-10R

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air).

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

Application	
Application	0 ... 10 bar (r)
Pressure Reference Type	relative
Max. Pressure	20 bar
Operating Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Media Temp. Range	*[1]* -40 ... 125 °C (140 °C)
	[2] -40 ... 125 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² eff/rms @ 10 ... 2.000 Hz

Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation Torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

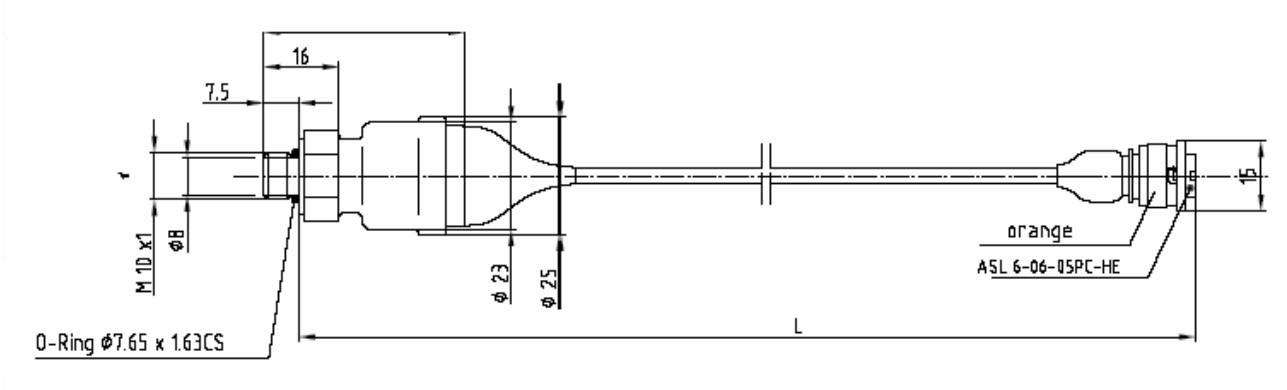
Electrical Data	
Power Supply U_S	*[1]* 4,75 ... 5,25 V *[2]* 8 ... 30 V
Max Power Supply U_S max.	± 30 V
Full Scale Output U_A	*[1]* 10 ... 90 % U_S ratiometric *[2]* 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

Characteristic	
Response Time T10/90	*[1]* 1,5 ms *[2]* 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	± 0,1 bar
Tolerance (FS)	± 1 %
Sensitivity	*[1]* 400 mV/bar @ U_S = 5 V *[2]* 400 mV/bar
Offset	*[1]* 500 mV @ U_S = 5 V *[2]* 500 mV

Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	*[2]* Us
Pin 2	GND
Pin 3	SIG
Pin 4	*[1]* Us
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	13 ... 95 cm
Please specify the requested cable length with your order.	

Application Hint
The PSC-10R can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSC-10R *[1]*	**F 01T A21 303**
PSC-10R *[2]*	**F 01T A21 305**



Pressure Sensor Fluid PSC-250R

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different supply voltages are available.

In our sensors we are using mainly stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. In this way complete media compatibility is guaranteed.

The main feature and benefit of this sensor is the combination of both high quality production part and military spec connection.

Application	
Application	0 ... 250 bar (r)
Pressure Reference Type	relative
Max. Pressure	500 bar
Operating Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Media Temp. Range	*[1]* -40 ... 125 °C (140 °C) *[2]* -40 ... 125 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	100 m/s² g eff/rms @ 10 ... 2.000 Hz

Electrical Data	
Power Supply U_S	*[1]* 4,75 ... 5,25 V *[2]* 8 ... 30 V
Max Power Supply U_S max	± 30 V
Full Scale Output U_A	*[1]* 10 ... 90 % U_S ratiometric *[2]* 0,5 ... 4,5 V non-ratiometric
Current I_S	8 mA

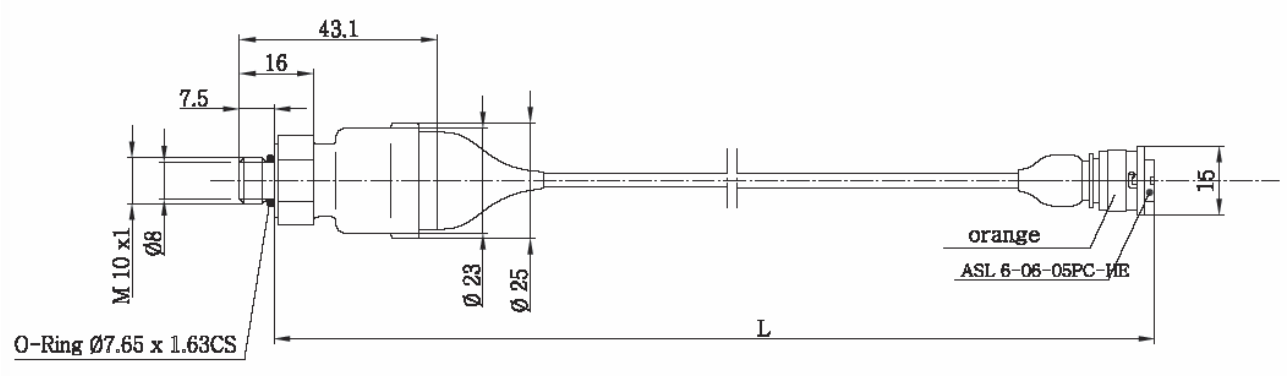
Mechanical Data	
Male Thread	M10x1
Wrench Size	17 mm
Installation Torque	15 Nm
Weight w/o Cable	45 g
Sealing	O-ring 7,65 x 1,63 mm

Characteristic	
Response Time T10/90	*[1]* 1,5 ms *[2]* 1,0 ms
Compensated Range	0 ... 90 °C
Tolerance (FS) @ U_S = 5 V	*[1]* ± 0,1 bar *[2]* ± 2,5 bar
Tolerance (FS)	± 1 %
Sensitivity	*[1]* 16 mV/bar @ U_S = 5 V *[2]* 16 mV/bar
Offset	*[1]* 500 mV @ U_S = 5 V *[2]* 500 mV

Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	*[2]* Us
Pin 2	GND
Pin 3	SIG
Pin 4	*[1]* Us
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	13 ... 95 cm
Please specify the requested cable length with your order.	

Application Hint
The PSC-250R can be connected directly to most control units.
The sensor has a protection for over voltage, reverse polarity and short-circuit.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSC-250R *[1]*	**F 01T A21 306**
PSC-250R *[2]*	**F 01T A21 311**



Pressure Sensor Fluid PSM

This sensor is designed to measure the abolute pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different pressure ranges are available.

The sensor utilises a flush metal diaphragm as a force collector. The force is transferred to a solid state piezo-resistive sensing element via a thin intervening film of noncompressible silicone oil. The housing is welded hermetically.

The main feature and benefit of this sensor is a very high durability concerning vibrations.

Application	
Application	*[1]* 0 ... 12 bar (a) *[2]* 0 ... 250 bar (a)
Pressure Reference Type	absolute
Max. Pressure	*[1]* 24 bar *[2]* 500 bar
Operating Temp. Range	-20 ... 120 °C
Media Temp. Range	-20 ... 120 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	1.000 m/s^2 max @ 5 ... 5.000 Hz (sine)

Characteristic	
Compensated Range	0 ... 120 °C
Tolerance (FS) @ U_S = 5 V	*[1]* ± 0,12 bar *[2]* ± 2,50 bar
Tolerance (FS)	± 1 %
Sensitivity/Offset	(an individual calibration sheet will be delivered)

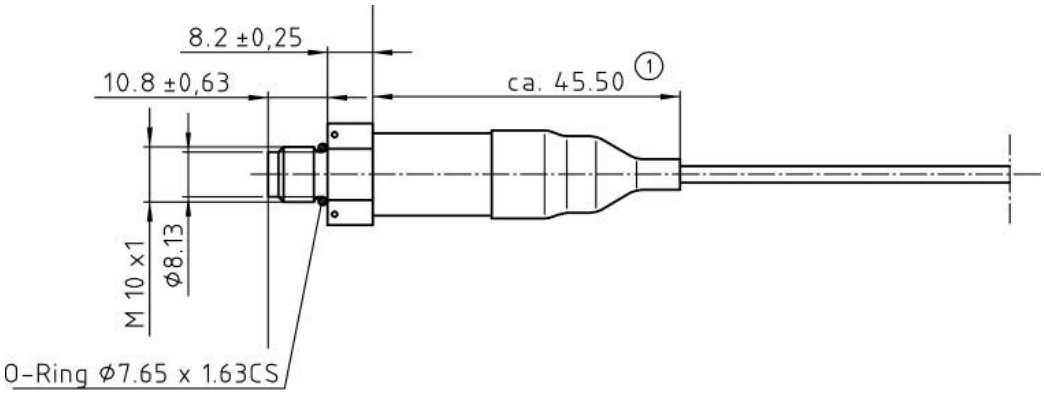
Mechanical Data	
Male Thread	M10x1
Wrench Size	16 mm
Installation Torque	10 Nm
Weight w/o Cable	24,5 g
Sealing	O-ring 7,65 x 1,63 mm

Electrical Data	
Power Supply U_S	8 ... 16 V
Full Scale Output U_A 4,9 V	± 1,5 %
Current I_S	25 mA

Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	U_S
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	SCR
Various military and automotive connectors on request.	
Sleeve	Viton
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
The PSM can be connected directly to most control units.
Each mounting orientation is possible.
100 % relative humidity is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSM *[1]*	**B 261 209 331**
PSM *[2]*	**B 261 209 332**



Pressure Sensor Fluid PSM-S

This sensor is designed to measure the absolute pressure of various kinds of applications (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). Different pressure ranges are available.

The sensor utilises a flush metal diaphragm as a force collector. The force is transferred to a solid state piezo-resistive sensing element via a thin intervening film of no compressible silicone oil. The housing is welded hermetically.

The main feature and benefit of this sensor is the very compact size and a very high durability concerning vibrations.

Application	
Application	*[1]* 0 ... 12 bar (a) *[2]* 0 ... 70 bar (a)
Pressure Reference Type	absolute
Max. Pressure pabs max	*[1]* 36 bar *[2]* 210 bar
Operating Temp. Range	-55 ... 140 °C
Media Temp. Range	-55 ... 140 °C
Storage Temp. Range	-20 ... 50 °C
Max. Vibration	15.000 m/s² max @ 5 ... 10.000 Hz (sine)

Characteristic	
Compensated Range	0 ... 125 °C
Tolerance (FS) @ U_S = 5 V	*[1]* ± 0,24 bar *[2]* ± 0,7 bar
Tolerance (FS)	*[1]* ± 2 % *[2]* ± 1 %
Sensitivity/Offset	(an individual calibration sheet will be delivered)

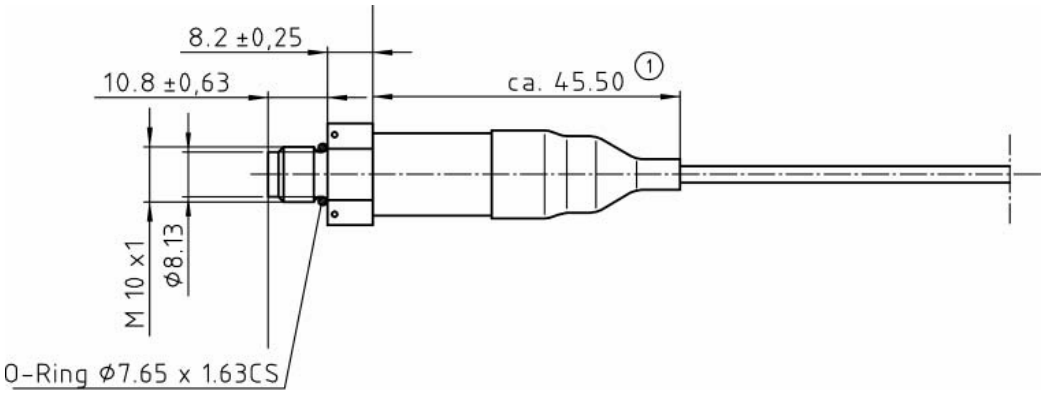
Mechanical Data	
Male Thread	M8x1
Wrench Size	13 mm
Installation Torque	6 Nm
Weight w/o Cable	20 g
Sealing	O-ring 6,07 x 1,62 mm

Electrical Data	
Power Supply U_S	8 ... 16 V
Full Scale Output U_A	4,7 V ± 1,5 %

Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	U_S
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	SCR
Various military and automotive connectors on request.	
Sleeve	Viton
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
The PSM-S can be connected directly to most control units.
Each mounting orientation is possible.
100 % relative humidity is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Numbers	
PSM-S*[1]*	**F 01T A21 315**
PSM-S*[2]*	**F 01T A21 316**



Pressure Sensors Differential

Pressure Sensor Differential DP-A

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. non-corrosive, non-ionic working fluids, such as dry air and dry gases).

The sensor supplies two pressure connections (horizontal / vertical). This enables you to use this as a differential pressure measuring device. A typical application is the measuring of the vehicle speed by using a pitot tube.

The main feature and benefit of this sensor is the combination of high quality production part and robust design with metal housing and military spec connection. The sensor also provides a very fine resolution at small pressure ranges.

Application	
Application	0 ... 0,1 bar (r)
Pressure Reference Type	relative
Max. Pressure	1,4 bar
Operating Temp. Range	-20 ... 70 °C
Media Temp. Range	-20 ... 70 °C
Storage Temp. Range	-40 ... 85 °C
Max. Vibration	200 m/s², 10 ... 500 Hz

Electrical Data	
Power Supply U_S	4,8 ... 15 V
Max. Power Supply U_S max.	15 V
Full Scale Output U_A @ 5 V	0,5 ... 4,5 V
Current I_S	12 mA

Mechanical Data	
Mounting	M3x2
Fitting	4,5 mm
Installation Torque	2 Nm
Weight w/o Cable	58 g
Size	37(49) x 29(41) x 19 mm
Pressure Port	5 mm

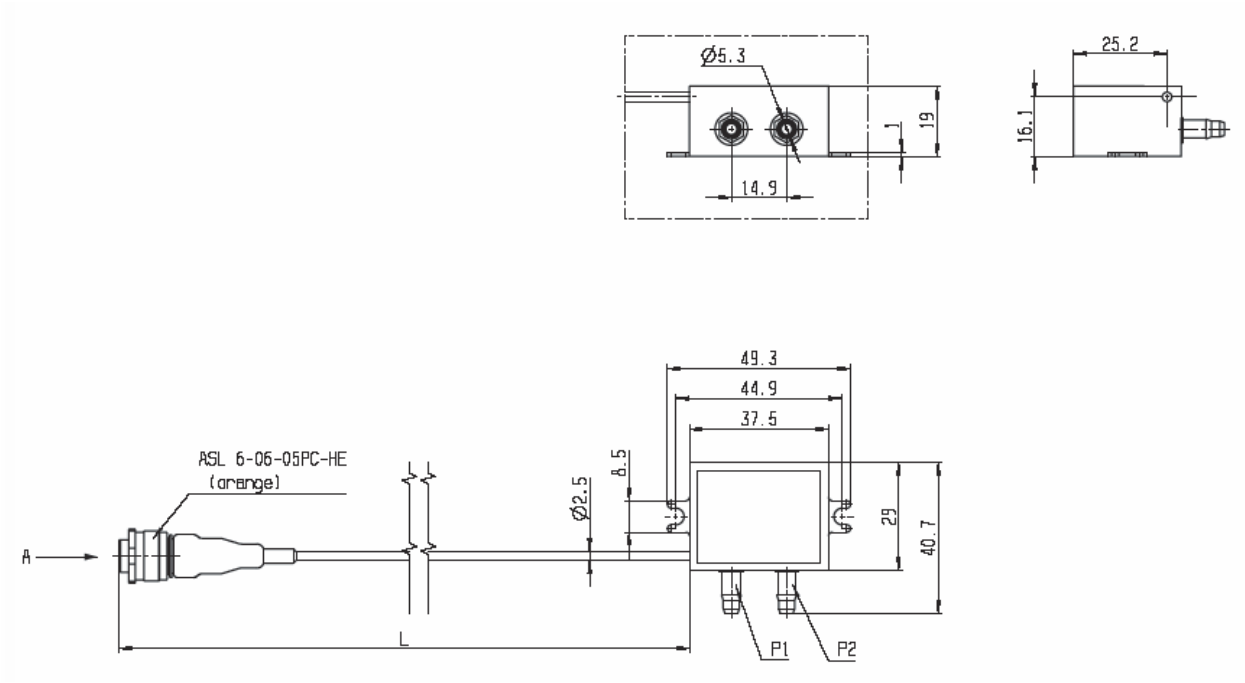
Characteristic	
Response Time T10/90	0,1 ms
Compensated Range	0 ... 50 °C
Thermal Effects @ 0 ... 50 °C rel to 25 °C	0,1 % FS/°C
Non-Linearity and Hysteresis	0,1 % FS
Long Term Stability (1 Mio cyl. or 1 year)	± 0,2 % FS
Sensitivity	40.000 mV/bar
Offset	500 mV

Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	U_S
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
Media: Non-corrosive, non-ionic working fluids, such as dry air and dry gases.
The DP-A can be connected directly to most control units.
Any mounting orientation is possible.
Take care about the range of supplied pressure: P2 ≥ P1.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Accessories	
Pitot static tube PT	**B 261 209 700**

Part Numbers	
DP-A	**B 261 209 696**



Pressure Sensor Differential DP-C

This sensor is designed to measure the relative pressure of various kinds of applications (e.g. non-corrosive, non-ionic working fluids, such as dry air and dry gases).

The sensor supplies two pressure connections (horizontal / vertical). This enables you to use this as a differential pressure measuring device. A typically application is the measuring of the vehicle speed by using a pitot tube.

The main feature and benefit of this sensor is the combination of high quality, small size, and military spec connection. The sensor provides a very fine resolution at small pressure ranges.

Application	
Application	0 ... 0,1 bar (r)
Pressure Reference Type	relative
Max. Pressure p_absmax	1,4 bar
Operating Temperature Range	-20 ... 70 °C
Media Temperature Range	-20 ... 70 °C
Storage Temperature Range	-40 ... 85 °C
Max. Vibration	200 m/s², 10 ... 500 Hz

Electrical data	
Power supply U_S	4,8 ... 15 V
Max Power Supply U_S max.	15 V
Full Scale Output U_A	0,5 ... 4,5 V
Current I_S	12 mA

Mechanical data	
Mounting	2 x M2,5
Fitting	2,6 mm
Installation Torque	2 Nm
Weight w/o Cable	24 g
Size	35 x 25(40) x 18 mm
Pressure Port	5 mm

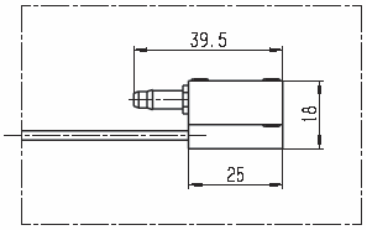
Characteristic	
Response Time T10/90	0,1 ms
Compensated Range	0 ... 50 °C
Thermal Effects @ 0 ... 50 °C rel to 25 °C	0,1 % FS/°C
Non-Linearity and Hysteresis	0,1 % FS
Long Term Stability (1 Mio cyl or 1 year)	± 0,2 % FS
Sensitivity	40 mV/mbar
Offset	500 mV

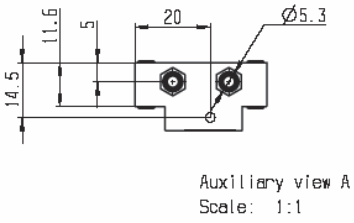
Connectors and Cables	
Connector	ASL 6-06-05PC-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	U_S
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 100 cm

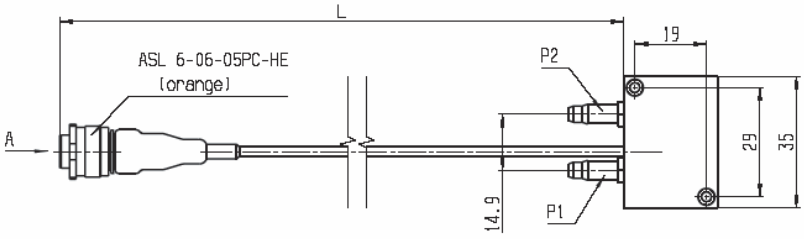
Application Hint
Media: Non-corrosive, non-ionic working fluids, such as dry air and dry gases.
The DP-C can be connected directly to most control units.
Any mounting orientation is possible.
Take care about the range of supplied pressure: P2 ≥ P1.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Accessories	
Pitot static tube PT	**B 261 209 700**

Part Number	
DP-C	**B 261 209 701**





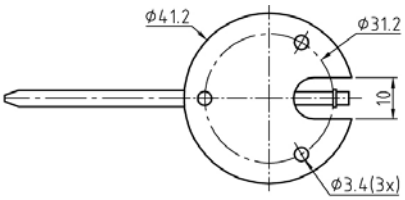


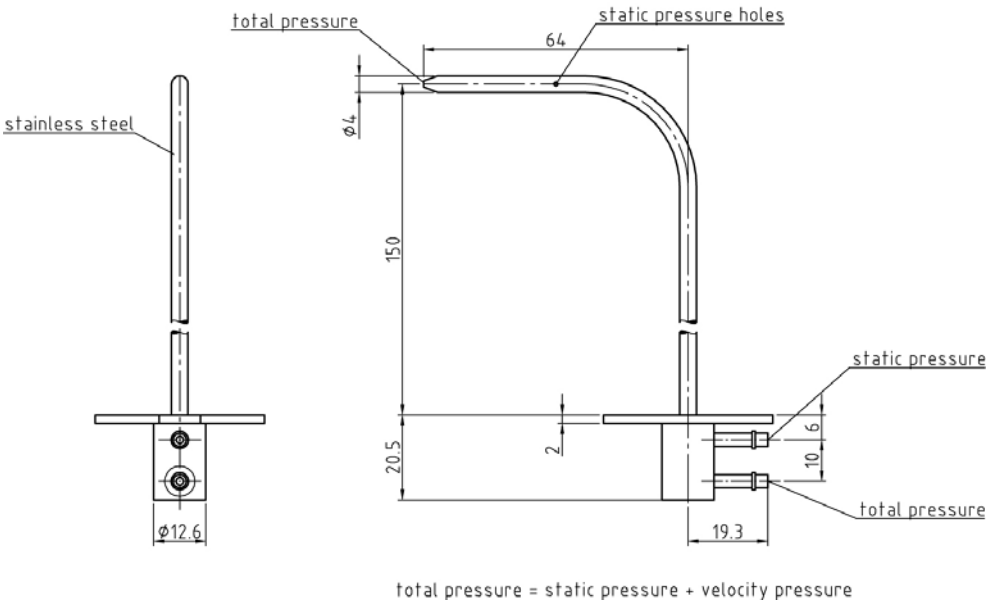
Pitot Static Tube PT

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 side 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

Part number	
Pitot Static Tube PT	**B 261 209 700**
Offer drawing	**A 261 209 700**





Air Velocity Calculations using S.I. Scales

The Standard formula for calculating velocity from velocity pressure is:

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

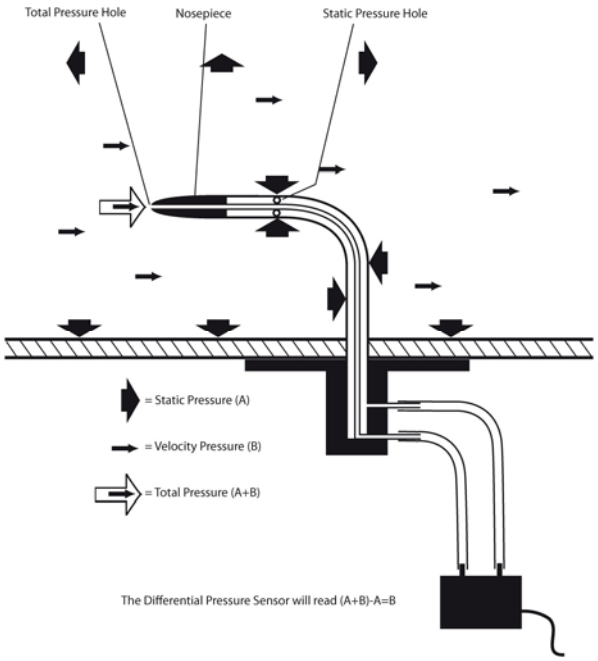
This is only correct for an air density of 1.2 kg/m³. For non-standard air conditions, this equation becomes:

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

V = velocity m/s
B = barometric pressure mbar
T = absolute temperature K (= t°C + 273 where t is airstream temperature)
Ps = static pressure Pa
Pv = velocity pressure Pa

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

Principle of Operation



Temperature Sensors

Temperature Sensor NTC M6

This sensor is designed to measure the fluid temperatures of oil, water, fuel e.g. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC-resistor has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. The NTC-sensor is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to a AWG 24 cable. To achieve a perfect temperature measurement, the thermistor is molded into a high performance heat paste.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design.

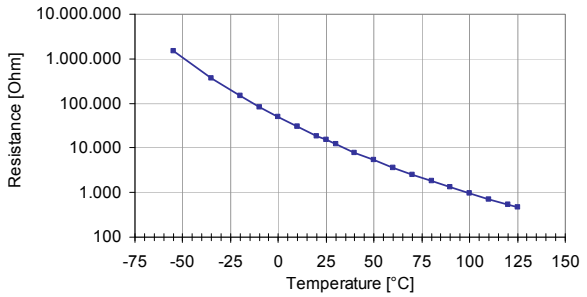
Application	
Application	-55 ... 125 °C
Storage Temperature Range	0 ... 100 °C
Max. Vibration	800 m/s², 5 ... 500 Hz

Electrical Data	
Characteristic	NTC
Max. Power @ 25 °C	200 mW
Nominal Resistance @ 25 °C	15 kOhm

Mechanical Data	
Male Thread	M6x1
Wrench Size	10 mm
Installation Torque	3 Nm
Weight w/o Cable	8,5 g
Sealing	4,47 x 1,78 mm

Characteristic	
Accuracy @ 25 °C	± 1,1 °C
Accuracy @ 100 °C	± 4,4 °C
Relative Resistance Tolerance @ 25 °C	± 5 %
Response Time τ_{63} in still water	< 9 s

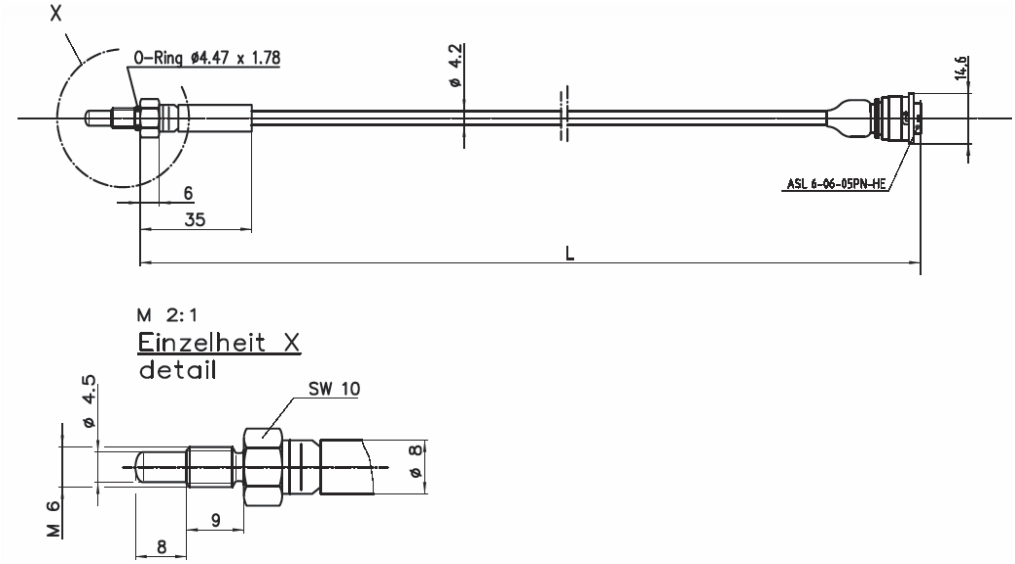
T [°C]	R [Ohm]
-55	1.493.300
-35	366.720
-20	145.880
-10	83.317
0	49.254
10	29.959
20	18.732
25	15.000
30	12.012
40	7.894
50	5.356
60	3.651
70	2.545
80	1.804
90	1.301
100	945
110	704
120	528
125	460



Connectors and Cables	
Connector I	ASL 6-06-05PN-HE
Connector Loom I	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 50 cm
Please specify the requested cable length with your order.	

Application Hint
The NTC M6 can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).
Any mounting orientation is possible.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
Temperature Sensor NTC M6	**B 261 209 386-01**


X
O-Ring ø4.47 x 1.78
ø 4.2
14.6
6
35
L
ASL 6-06-05PN-HE
M 2:1
Einzelheit X
detail
SW 10
ø 4.5
ø 8
M 6
9
8

Temperature Sensor NTC M6-H

This sensor is designed to measure high temperatures of air, oil, water, fuel e.g. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC-resistor has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. The NTC-sensor is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to an AWG 24 cable. To achieve a perfect temperature measurement, the thermistor is moulded into a high performance heat past.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design. It is especially designed to measure high temperatures (up to 300 °C).

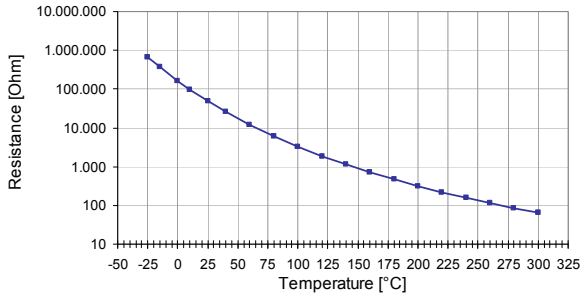
Application	
Application	-25 ... 300 °C
Storage Temperature Range	0 ... 100 °C
Max. Vibration	800 m/s², 5 ... 500 Hz

Electrical Data	
Characteristic	NTC
Max. Power at 25 °C	200 mW
Nominal Resistance @ 25 °C	49,12 kOhm

Mechanical Data	
Male Thread	M6x1
Wrench Size	10 mm
Installation Torque	3 Nm
Weight w/o Cable	8,5 g
Sealing	4,47 mm x 1,78 mm

Characteristic	
Accuracy @ 25 °C	± 1,84 °C
Accuracy @ 100 °C	± 1,5 °C
Relative Resistance Tolerance @ 25 °C	8 %
Response Time τ_{63} in still water	< 7 s

Characteristic Application	
T [°C]	R [Ohm]
-25	657.350
-15	365.040
0	162.210
10	98.322
25	49.120
40	26.065
60	12.140
80	6.119
100	3.300
120	1.885
140	1.132
160	710
180	463
200	312
220	217
240	155
260	113
280	85
300	64



Connectors and Cables	
Connector	ASL 6-06-05PN-HE
Connector Loom	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 50 cm
Please specify the requested cable length with your order.	

Application Hint

The NTC M6-H can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).

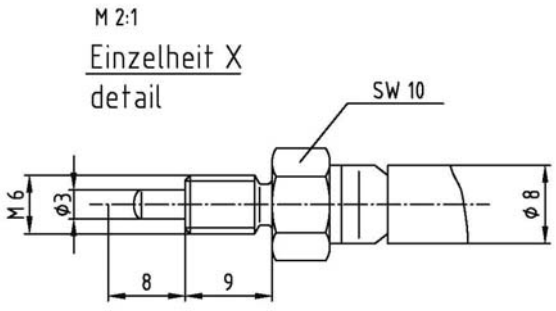
Any mounting orientation is possible.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number

NTC M6-H	**B 261 209 989 01**



Temperature Sensor NTC M8

This sensor is designed to measure the fluid temperatures of oil, water, fuel e.g. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC-resistor has a negative temperature coefficient; this means, that with increasing temperature the conductivity rises and the resistance decreases. The NTC-sensor is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to an AWG 24 cable. To achieve a perfect temperature measurement, the thermistor is moulded into a high performance heat paste.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design.

Application	
Application	-55 ... 125 °C
Storage Temp. Range	0 ... 100 °C
Max. Vibration	800 m/s², 5 ... 500 Hz

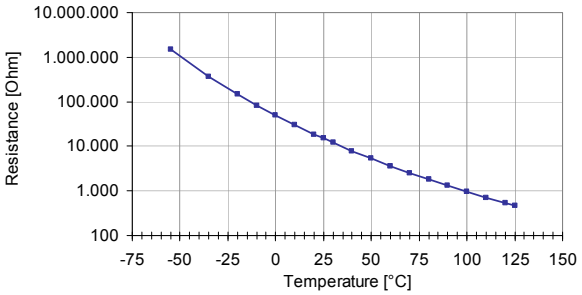
Mechanical Data	
Male Thread	M8x1
Wrench Size	12 mm
Installation Torque	3 Nm
Weight w/o Cable	10 g
Sealing	6,35 x 1,78 mm

Electrical Data	
Characteristic	NTC
Max. Power at 25 °C	200 mW
Nominal Resistance @ 25 °C	15 kOhm

Characteristic	
Accuracy @ 25 °C	± 1,1 °C
Accuracy @ 100 °C	± 4,4 °C
Relative Resistance Tolerance	± 5 %
Response Time T_{63} in still water	< 11 s

Characteristic Application

T [°C]	R[Ohm]
-55	1.493.300
-35	366.720
-20	145.880
-10	83.317
0	49.254
10	29.959
20	18.732
25	15.000
30	12.012
40	7.894
50	5.356
60	3.651
70	2.545
80	1.804
90	1.301
100	945
110	704
120	528
125	460



Connectors and Cables

Connector	ASL 6-06-05PN-HE
Connector Loom	ASL 0-06-05SC-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	15 ... 50 cm
Please specify the requested cable length with your order.	

Application Hint

The NTC M8 can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).

Any mounting orientation is possible.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number

NTC M8	**B 261 209 384-01**

Temperature Sensor NTC M12

This sensor is designed to measure the fluid temperatures of oil, water, fuel e.g. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC-resistor has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The conductive element of the temperature sensor is made of semiconducting heavy metal oxide and oxidized mixed crystals, which are equipped with a protective housing.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design. Furthermore the sensor is available with a series or military spec connector.

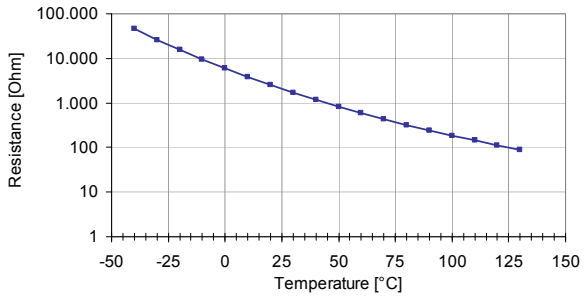
Application	
Application	-40 ... 130 °C
Storage Temp. Range	0 ... 100 °C
Max. Vibration	600 m/s^2

Electrical Data	
Characteristic	NTC
Nominal Resistance @ 20 °C	2,5 kOhm ± 5 %

Mechanical Data	
Male Thread	M12x1,5
Wrench Size	19 mm
Installation Torque	25 Nm
Weight w/o Cable	28,9 g

Characteristic	
Accuracy @ 25 °C	± 1,4 °C
Accuracy @ 100 °C	± 3,4 °C
Response Time τ_{63} in still water	< 15 s

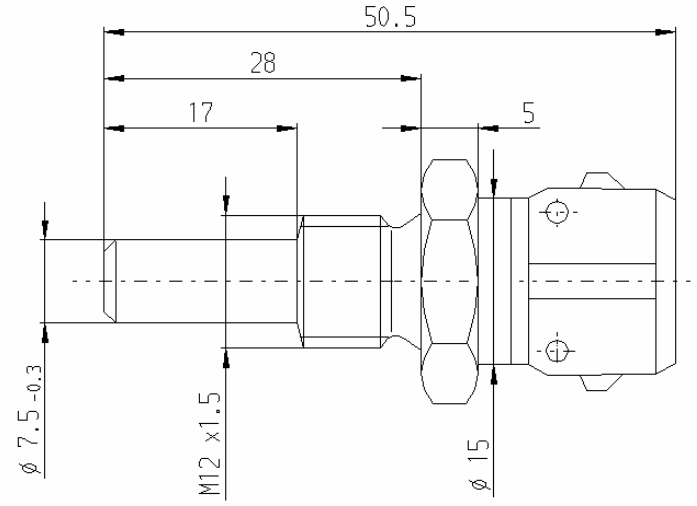
Characteristic Application	
T [°C]	R [Ohm]
-40	45.313
-30	26.114
-20	15.462
-10	9.397
0	5.896
10	3.792
20	2.500
30	1.707
40	1.175
50	834
60	596
70	436
80	323
90	243
100	187
110	144
120	113
130	89



Connectors and Cables	
Connector	Bosch Jetronic
Connector Loom	D 261 205 289
Pin 1	SIG+
Pin 2	SIG-
Pin 3	-
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	

Application Hint
The NTC M12 can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).
Each mounting orientation is possible.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
NTC M12	**0 280 130 026**



Temperature Sensor NTC M12-H

This sensor is designed to measure the temperature of oil, water, fuel, air e.g. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC-resistor has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The conductive element of the temperature sensor is made of semi conducting heavy metal oxide and oxidized mixed crystals, which are equipped with a protective housing.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design. It also provides a short response time.

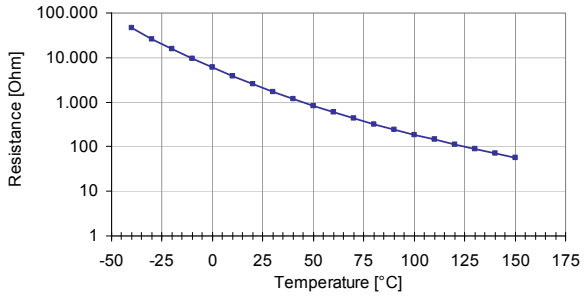
Application	
Application	-40 ... 150 °C
Storage Temperature Range	-30 ... 60 °C
Max. Vibration	300 m/s²

Electrical Data	
Characteristic	NTC
Nominal Resistance ± 5 %	2,5 kOhm @ 20 °C

Mechanical Data	
Male Thread	M12x1,5
Wrench Size	19 mm
Installation Torque	18 Nm
Weight w/o Cable	28,3 g
Sealing	Al-washer

Characteristic	
Accuracy @ 25 °C	± 1,4 °C
Accuracy @ 100 °C	± 0,8 °C
Response Time τ_{63} in still water	< 15 s

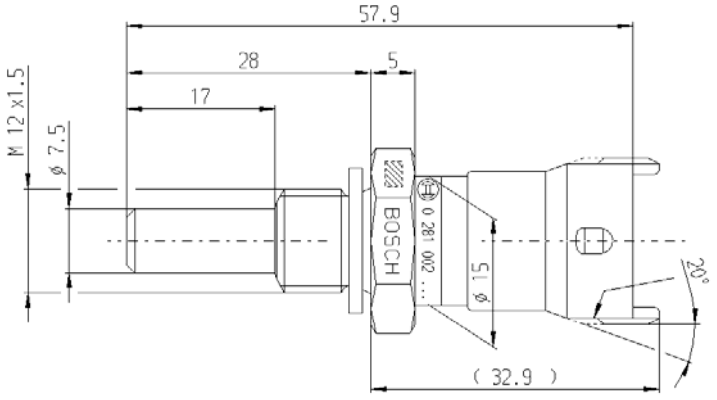
Characteristic Application	
T [°C]	R [Ohm]
-40	45.313
-30	26.114
-20	15.462
-10	9.397
0	5.896
10	3.792
20	2.500
30	1.707
40	1.175
50	834
60	596
70	436
80	323
90	243
100	187
110	144
120	113
130	89
140	71
150	57



Connectors and Cables	
Connector	Bosch Compact
Connector Loom	D 261 205 337
Pin 1	Sig+
Pin 2	Sig-
Pin 3	-
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	

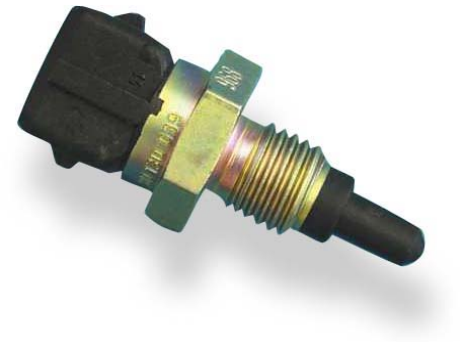
Application Hint
The NTC M12-H can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).
Each mounting orientation is possible.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number	
NTC M12-H	**0 281 002 170**



Temperature Sensor NTC M12-L

This sensor is designed to measure the temperature of air. For example, this signal is used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.



The NTC-resistor has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The conductive element of the temperature sensor is made of semiconducting heavy metal oxide and oxidized mixed crystals, which are equipped with a protective housing.

The main benefit of the sensor is the combination of both high quality production part and a robust, compact design. It also provides a short response time.

Application	
Application	-30 ... 60 °C
Storage Temperature Range	-30 ... 60 °C
Max. Vibration	300 m/s², 50 ... 250 Hz

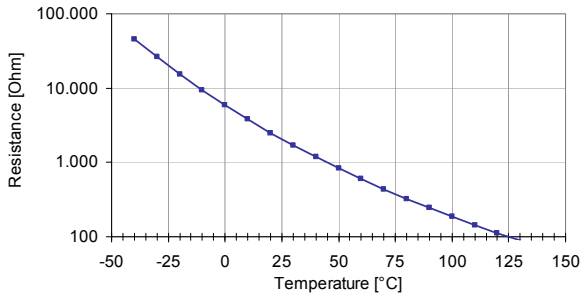
Electrical Data	
Characteristic	NTC
Nominal Resistance @ 20 °C	2,5 kOhm ± 5 %

Mechanical Data	
Male Thread	M12x1,5
Wrench Size	19 mm
Installation Torque	15 Nm
Weight w/o Cable	24,6 g

Characteristic	
Accuracy @ 25 °C	± 1,4 °C
Accuracy @ 100 °C	± 3,4 °C
Response Time τ_{63} in still water	< 10 s

Characteristic Application

T [°C]	R [Ohm]
-40	45.313
-30	26.114
-20	15.462
-10	9.397
0	5.896
10	3.792
20	2.500
30	1.707
40	1.175
50	834
60	596
70	436
80	323
90	243
100	187
110	144
120	113
130	89
140	71



Connectors and Cables

Connector	Bosch Compact
Connector Loom I	D 261 205 289
Pin 1	SIG+
Pin 2	SIG-
Pin 3	-
Pin 4	-
Pin 5	-

Various military and automotive connectors on request.

Application Hint

The NTC M12-L can be connected directly to most control units using a pull-up resistor (typically 1 or 3 kOhm).

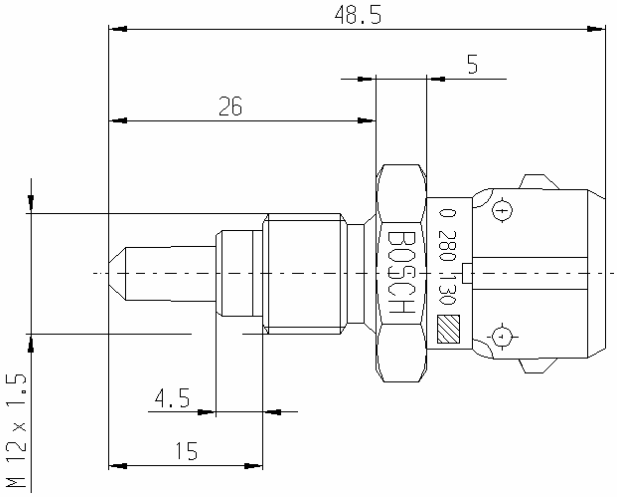
Each mounting orientation is possible.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System (http://www.bosch-motorsport.com).

Part Number

NTC M12-L	**0 280 130 039**



Temperature Sensor PT100 M14

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

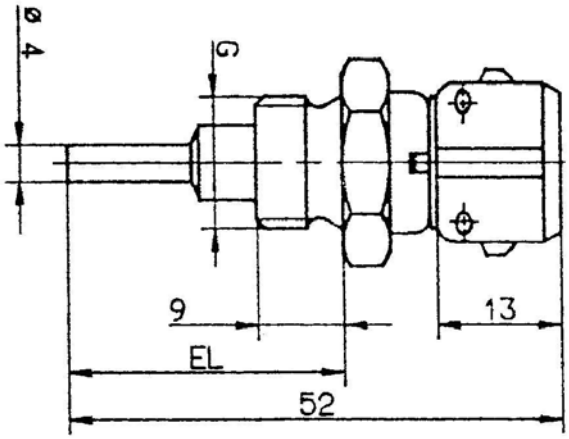
Conditions for use	
Temperature range	-50 ... 300°C
Vibration	40 g/5Hz ... 2kHz

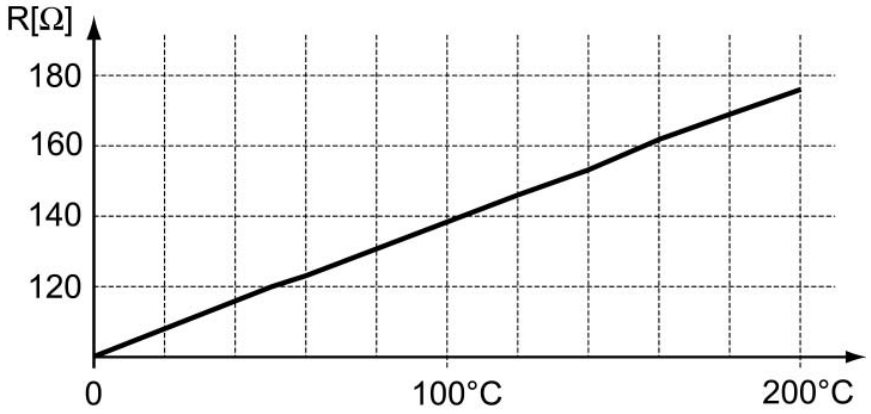
Characteristic
PT 100 DIN/IEC 751

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

Connector	
Cable harness connector	**D 261 205 288**

Part 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 Infrared TI-16

This infrared temperature sensor is designed for a non contact surface temperature measurement of various parts (e.g. tires, brake discs, and cylinder heads) based on IR radiation.

Using ruggedized silicon-coated optics, internal electronics and cabling packaged inside a stainless steel housing, this sensor measures the emitted infrared radiation of an object and calculates its temperature. The output signal has a linear characteristic (temperature vs. output voltage).

The main features of this sensor are its compact size, robust design, and high signal quality at a low cost. In addition, it offers the ability to change the temperature range, the output voltage and emissivity by request.

Application	
Application	0 ... 160 °C
Operating Temp. Range (sensing head)	-20 ... 120 °C
Operating Temp. Range (electronics)	-20 ... 70 °C
Storage Temperature Range	-40 ... 85 °C
Relative Humidity	10 ... 95 %
Max. Vibration any axis	3 m/s^2 @ 11 ... 200 Hz 50 m/s^2, 11 ms shock

Mechanical Data	
Male Thread	M12x1 mm
Wrench Size	14 mm
Length Housing	28 mm
Weight with Cable 1 m	42 g

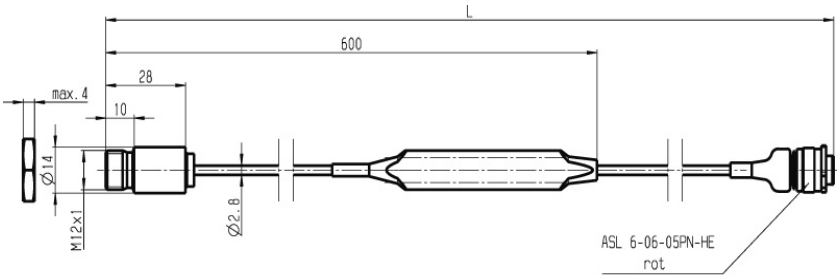
Electrical Data	
Power Supply U_S	5 ... 28 V
Max Power Supply U_S max.	28 V
Full Scale Output U_A	0 ... 5 V
Current I_S	9 mA

Characteristic	
Emissivity (predefined)	[1] 0,95 (rubber) [2] 0,80 (steel)
Optical Resolution	10 : 1
Spectral Range	8 ... 14 µm
Compensated Range	-20 ... 120 °C
Temperature resolution @ T_{obj} < 100 °C	0,1 °C
System Accuracy @ 23 °C t_{amb}, or max. value	± 1,5 °C or 1,5 %
Repeatability @ 23 °C t_{amb}, or max. value	± 0,75 °C or 0,75 %
Sensitivity	31,25 mV/°C
Offset	0 mV

Connectors and Cables	
Connector	ASL 6-06-05PN-HE
Connector Loom	ASL 0-06-05SN-HE
Pin 1	Us
Pin 2	Gnd
Pin 3	Sig
Pin 4	Prg
Pin 5	Scr
Various military and automotive connectors on request.	
Sleeve	Viton
Cable Size	AWG 26
Cable Length L	70 ... 100 cm
Please specify the requested cable length with your order.	

Application Hint
The TI-16 can be connected directly to most control units and data logging systems.
The temperature measurement range can be changed anywhere in the range of -20 °C to 1000 °C per request.
The emissivity can be changed by request.
The predefined emissivity can differ from the real emissivity.
To determine the emissivity, please contact Bosch Motorsport for assistance.
The sensor is protected against reverse polarity and short-circuit.
Sensor can be mounted in any orientation.
Do not disconnect the electronics housing from the sensor.
The sensor meets the EMV qualification 89/336/EWG.
Please avoid abrupt temperature changes.
For mounting please use only the integrated thread.
Please ensure that the environmental conditions do not exceed the sensor specifications.
To clean the lens use only a soft, wet (water or water based glass cleaner) cloth -> NO DISSOLVER cleaner!
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Numbers	
TI-16-r [1]	**F 01T A21 207**
TI-16-s [2]	**F 01T A21 209**



Temperature Sensor Infrared TI-100

This infrared temperature sensor is designed for a non contact surface temperature measurement of various parts (e.g. tires, brake discs, and cylinder heads) based on IR radiation.

Using ruggedized silicon-coated optics, internal electronics and cabling packaged inside a stainless steel housing, this sensor measures the emitted infrared radiation of an object and calculates its temperature. The output signal has a linear characteristic (temperature vs. output voltage).

The main features of this sensor are its compact size, robust design, and high signal quality at a low cost. In addition, it offers the ability to change the temperature range, the output voltage and emissivity by request.

Application	
Application	0 ... 1000 °C
Operating Temp. Range (sensing head)	-20 ... 120 °C
Operating Temp. Range	- 20 ... 70 °C (electronics)
Storage Temperature Range	-40 ... 85 °C
Relative Humidity	10 ... 95 %
Max. Vibration any axis	3 m/s^2 @ 11 ... 200 Hz 50 m/s^2, 11 ms shock

Mechanical Data	
Male Thread	M12x1 mm
Wrench Size	14 mm
Length Housing	28 mm
Weight with Cable 1 m	42 g

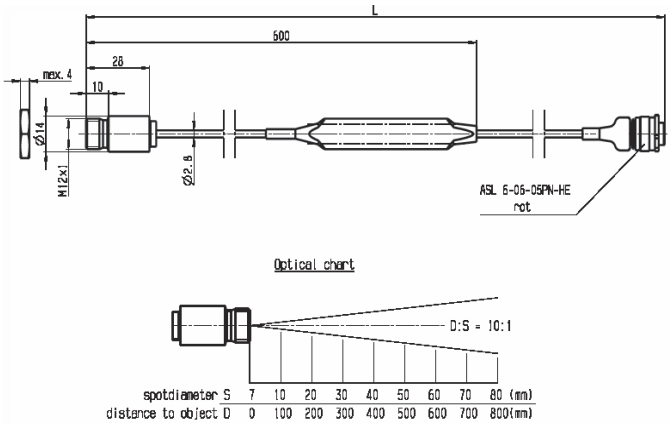
Characteristic	
Emissivity (pre defined)	[1] 0,80 (steel) [2] 0,75 (carbon)
Optical Resolution	10 : 1
Spectral Range	8 ... 14 µm
Compensated Range	-20 ... 120 °C
Temperature resolution @ T_{obj} < 100 °C	0,1 °C
System Accuracy @ 23 °C t_{amb}, or max. value	± 1,5 °C or 1,5 %
Repeatability @ 23 °C t_{amb}, or max. value	± 0,75 °C or 0,75 %
Sensitivity	5 mV/°C
Offset	0 mV

Connectors and Cables	
Connector	ASL 6-06-05PN-HE
Connector Loom	ASL 0-06-05SN-HE
Pin 1	U_S
Pin 2	Gnd
Pin 3	Sig
Pin 4	Prg
Pin 5	Scr
Various military and automotive connectors on request.	
Sleeve	Viton
Cable Size	AWG 26
Cable Length L	70 ... 100 cm
Please specify the requested cable length with your order.	

Electrical Data	
Power Supply U_S	5 ... 28 V
Max Power Supply U_{Smax}	28 V
Full Scale Output U_A	0 ... 5 V
Current I_S	9 mA

Application Hint
The TI-100 can be connected directly to most control units and data logging systems.
The temperature measurement range can be changed anywhere in the range of -20 °C to 1.000 °C per request.
The emissivity can be changed by request.
The predefined emissivity can differ from the real emissivity.
To determine the emissivity, please contact Bosch Motorsport for assistance.
The sensor is protected against reverse polarity and short-circuit.
Sensor can be mounted in any orientation.
Do not disconnect the electronics housing from the sensor.
The sensor meets the EMV qualification 89/336/EWG.
Please avoid abrupt temperature changes.
For mounting please use only the integrated thread.
Please ensure that the environmental conditions do not exceed the sensor specifications.
To clean the lens use only a soft, wet (water or water based glass cleaner) cloth -> NO DISSOLVER cleaner!
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Numbers	
TI-100 s (steel) [1]	**F 01T A21 210**
TI-100 c (carbon) [2]	**F 01T A21 211**



Thermocouple Probes

Thermocouple Probe TCP-K

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

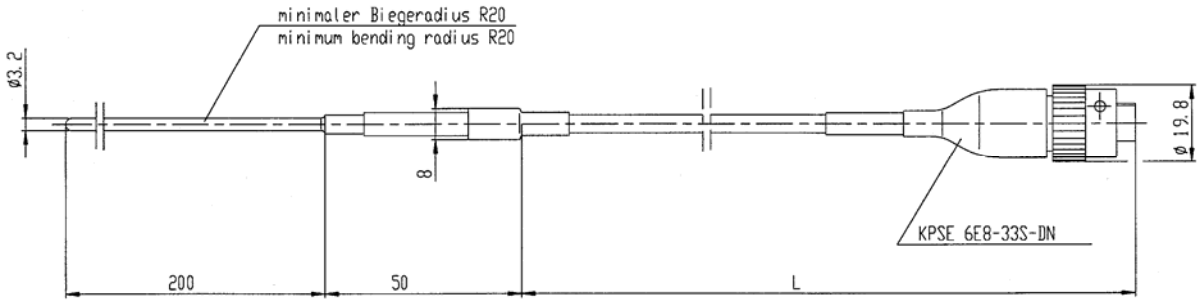
Cutting ring	
Tightening torque	2,5 Nm
Wrench size	11 mm

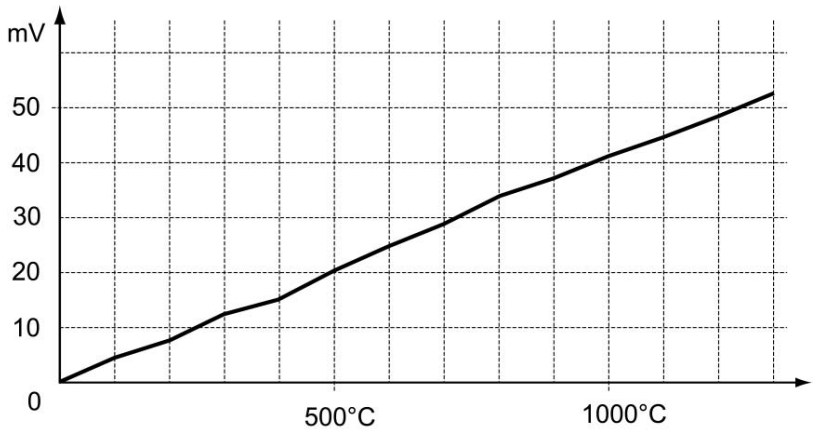
Electrical data	
Thermocouple	NiCr-Ni

Characteristic
DIN IEC 584

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

Part numbers	
KPTA 6E6-4SW-C-DN	**B 261 209 169**
Offer drawing	**A 261 209 169**
AS 6-06-98PN	**B 261 209 179**
Offer drawing	**A 261 209 179**
AS 6-06-05PD-HE	**B 261 209 385**
Offer drawing	**A 261 209 385**
ASU 6-03-03-SD-HE	**B 261 209 979**
Offer drawing	**A 261 209 979**
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

Thermocouple Probe TCP-N / TCP-NF

A flexible N-type thermocouple for measuring of exhaust-gas temperatures.

TCP-NF is used in FIA F3 since 2005.

Mechanical data	
Thread	M12 x 1
Tightening torque	15 Nm
Wrench size	17 mm
Length	630 mm
Weight	60 g

Conditions for use	
Vibration	80 g/5 ... 500 Hz
DIN EN 60584	
Temperature range	-40 ... 115 °C

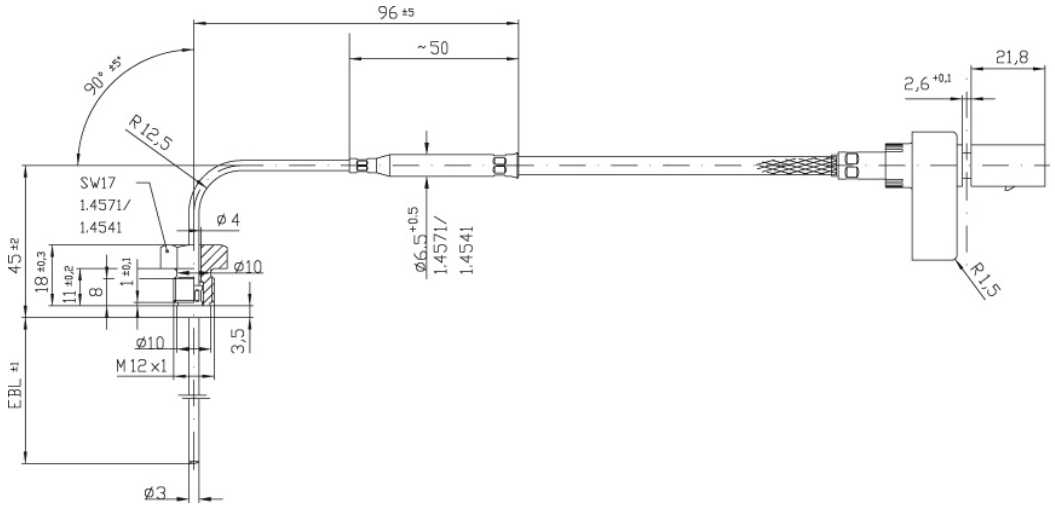
Characteristic
DIN IEC 584

Electrical data	
Power supply	12 V
Full scale output	0,5 ... 4,5 V
Thermocouple	NiCrSi-NiSi
Measuring range	-40 ... 1100 °C
Response time:	
TCP-N	20 s
TCP-NF	33 s

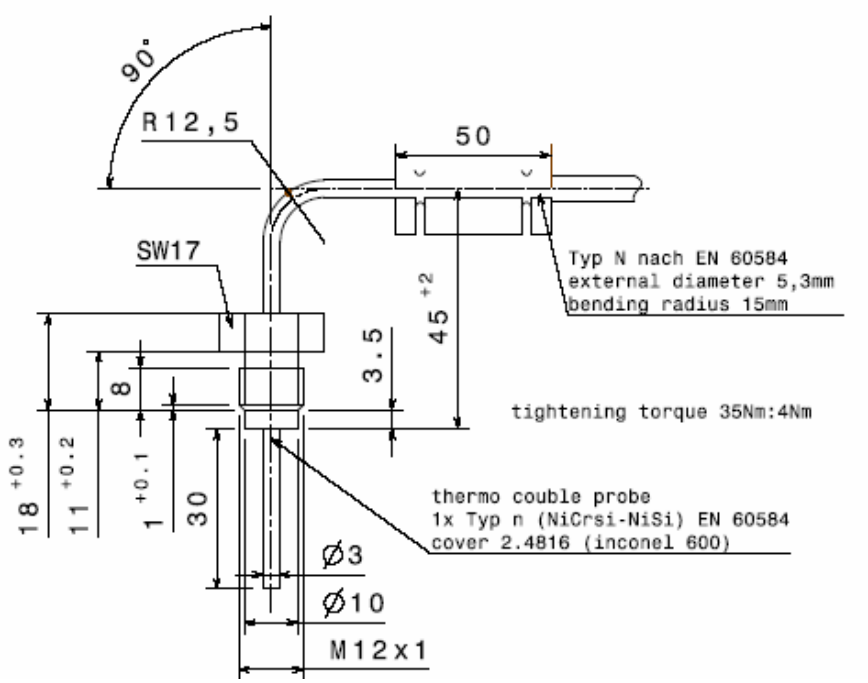
Connector	
TCP-N	1-J0973-70
TCP-NF	D 261 205 276

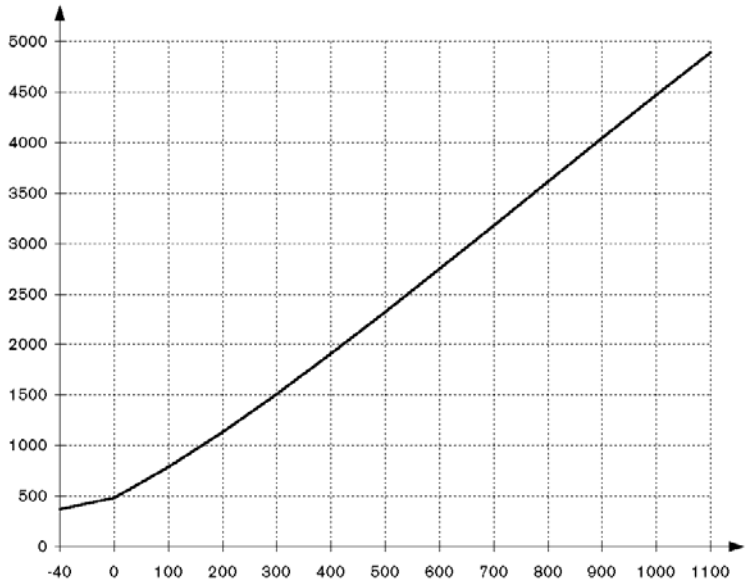
Part numbers	
TCP-N	**B 261 209 387**
TCP-NF	**B 261 209 821**

Design TCP-N



Design TCP-NF





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 Speed Sensor IA

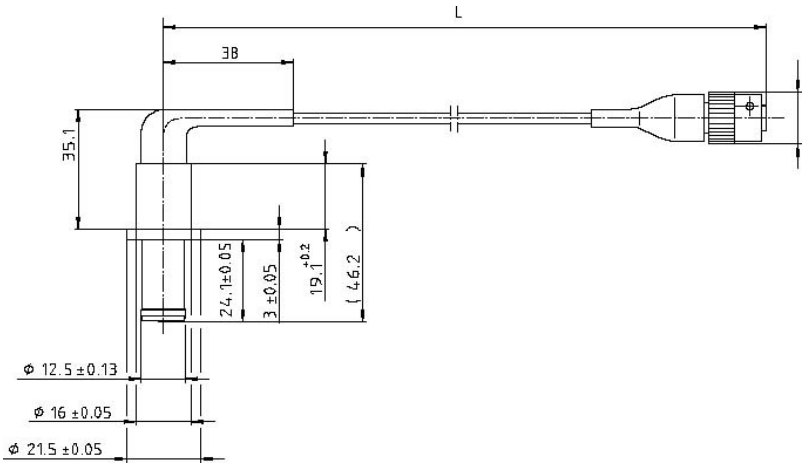
This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

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

Electrical data	
Electrical strength	1200 V/max. 3 sec.
Resistance	Ri = 1200 Ω
Inductance	max. 400 mH

Part 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	
AS 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.

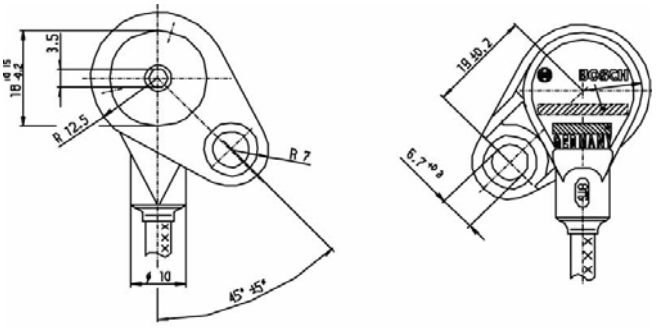
Mechanical data	
Magnetic pole	round
Fixing	M6 x 12
Length	510 mm
Tightening torque	8 Nm
Weight	80 g
Installation depth	24 mm

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

Electrical data	
Resistance	860 Ω/20° ± 10 %
Inductance	370 ± 60 mH/1 kHz

Connector	
Cable harness connector	**D 261 205 334**

Part number	
IA-C	**0 261 210 136**



Inductive Speed Sensor IS

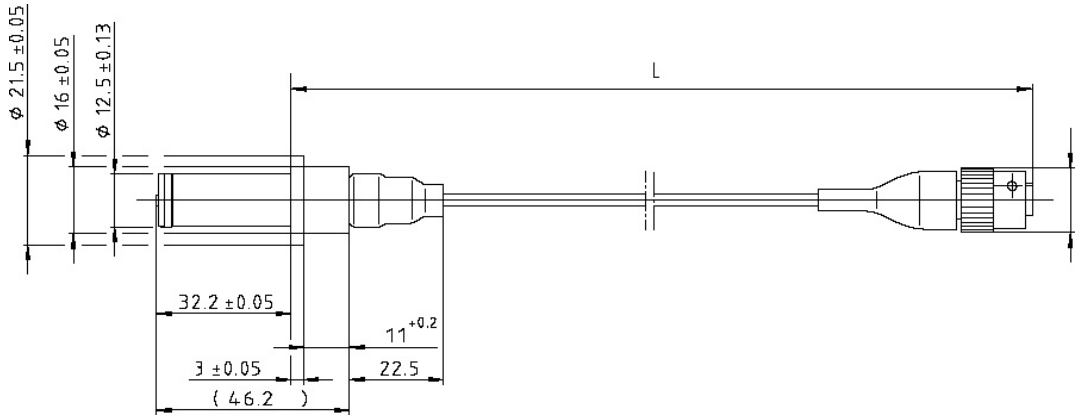
This sensor is designed for incremental measurements of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

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

Electrical data	
Electrical strength	1200 V/max. 3 sec.
Resistance	Ri = 1200 Ω
Inductance	max. 400 mH

Part numbers	
L2: 24,1 mm	
KPTA 6E6-4SW-C-DN	**B 261 209 509**
Offer drawing	**A 261 209 509**
L2: 32,2 mm	
AS6-06-05SN-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

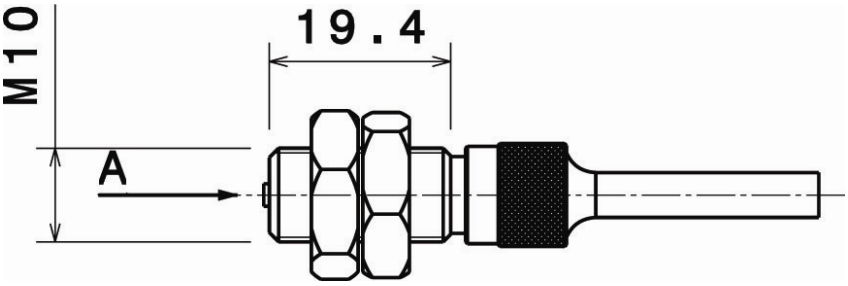
This sensor is designed for incremental measurement of revolutions at chassis applications. We manufacture one version with a metric thread and a second version with an inch thread. The sensor is available in a DR-25 sleeve with various connector options.

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

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

Electronic data	
Resistance	Ri = 340 Ω ± 20 %
Inductance	64 mH ± 20 %

Order numbers	
M10 x 1	
KPTA 6E6-4SW-C-DN	**B 261 209 624**
Offer drawing	**A 261 209 624**
3/8-24 UNF-2A THD	
AS 6-06-05 SN-HE	**B 261 209 609**
Offer drawing	**A 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 kΩ load, 0,75 V pk-pk

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

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

Part number	
AS 6-06-05SN-HE	**B 261 209 662**
Offer drawing	**A 261 209 662**
ASU 603 03-SB-HE	**B 261 209 665**
Offer drawing	**A 261 209 665**

Speed Sensor HA-M

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

Due to the rotation of a ferromagnetic target wheel in front of the HA-M the magnetic field is modulated at the place of the Hall probe. We offer two different types of sensor signal outputs: active-low and active-high.

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

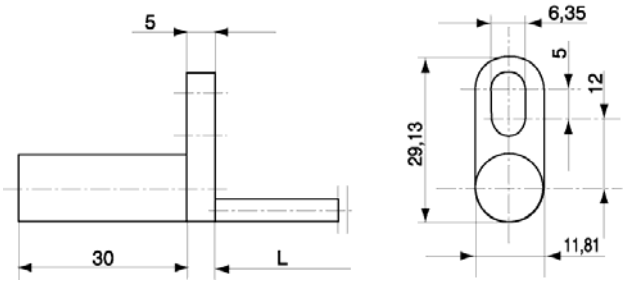
Conditions for use	
Temperature range	-40 ... 160 °C
N min	0 rpm (CAM)
N max	6.000 rpm (CAM)
Target wheel: air gap	0,5 ... 1,5 mm

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

Electrical data	
Power supply	5 ... 18 V
Input current	5,6 mA
Signal output high level	4,2 V
Signal output low level	0,52 V

Connectors and Cables	
Sleeve	DR-24
Connector	ASU 6-03-03PN-HE
Various military and automotive connectors on request.	

Part numbers	
Active-low	**B 261 209 283**
Active-high	**B 261 209 295**



Speed Sensor HA-P

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

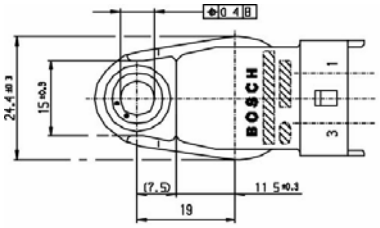
Mechanical data	
Fixing	M6
Drill hole	18 mm
Max. distance	1,52 mm
Tightening torque	6 Nm
Weight	70 g
Installation dimensions	30 mm

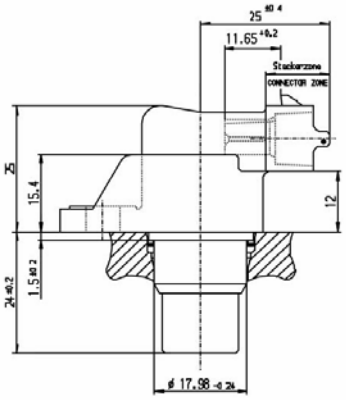
Conditions for use	
Temperature range	-30 ... 130 °C
Vibration	100 g/10 Hz ... 2 kHz
Air gap	max. 1,5 mm

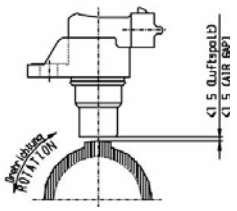
Electrical data	
Power supply	4,5 ... 24 V
Input current	10 mA typ., 20 mA max.
Signal output (active)	0,4 V max.
Output current	20 mA max.

Connector	
Cable harness connector	**D 261 205 335**

Part number	
HA-P	**0 232 103 037**
Offer drawing	A 232 090 314







Lambda Sensors

Lambda Sensor LSM 11

A lambda LSM 11 standard production sensor, manufactured in a DR-25 sleeve with a series connector.

Mechanical data	
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

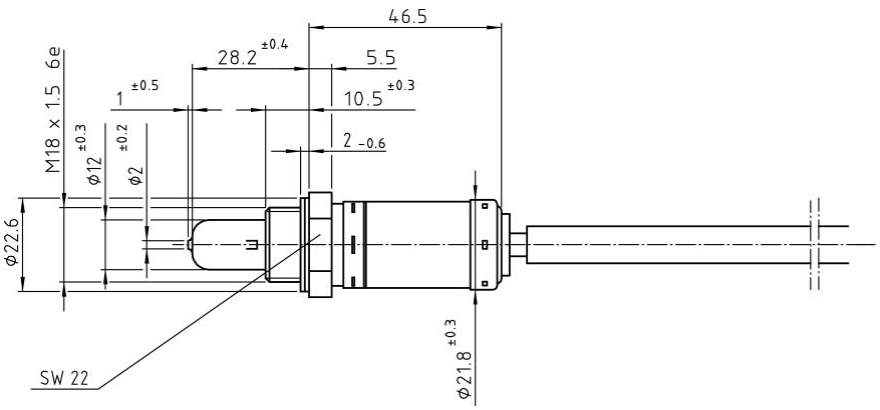
Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

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

Electrical data	
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 %

Connectors
1 284 485 110
1 224 485 018

Part number	
	0 258 104 002
Offer drawing	**A 258 104 002**



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 sensor receives the reference air through the connection cable. This means that the connector must be clean and dry. Contact spray, and anti-corrosion agents etc. are forbidden.

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

Lambda Sensor LSM 11-PM

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

Mechanical data	
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

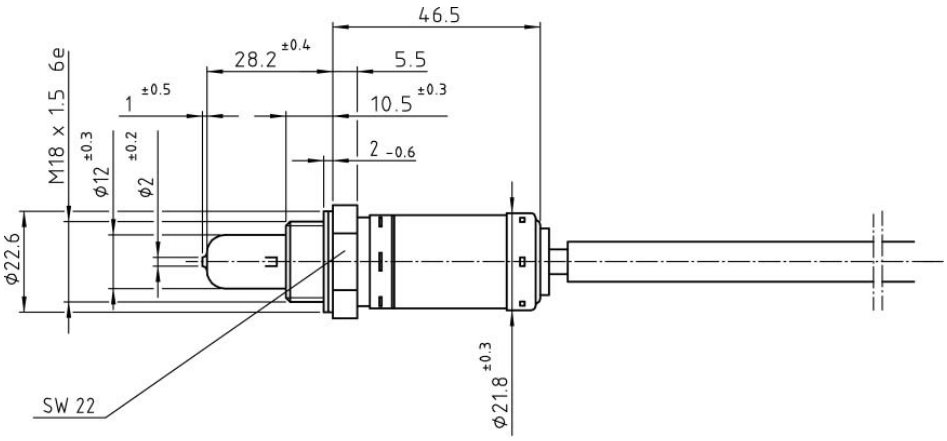
Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

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

Electrical data	
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 %

Installation instructions
Please observe the installation instructions of Lambda Sensor LSM 11.

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



Lambda Sensor LSM 11-RM

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.

Mechanical data	
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

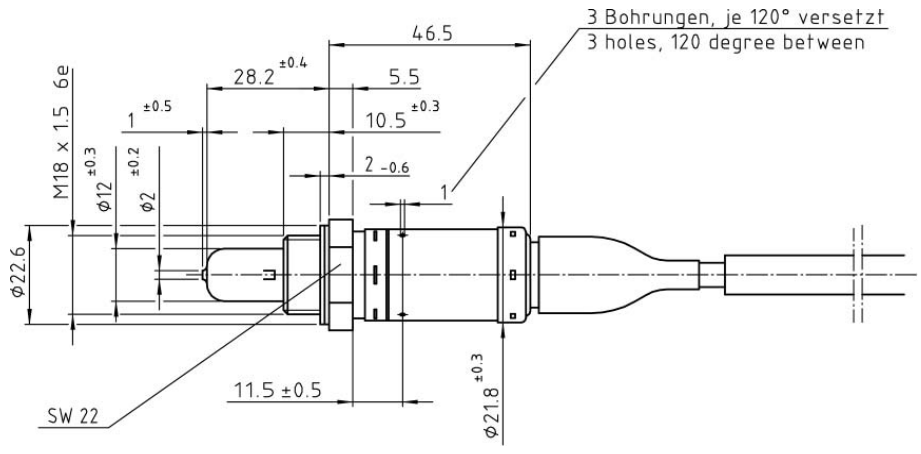
Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

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

Electrical data	
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 %

Installation instructions
Please observe the installation instructions of Lambda Sensor LSM 11.

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



Lambda Sensor LSU 4.2

The wide-band lambda sensor LSU 4.2 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 incl. cable	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.

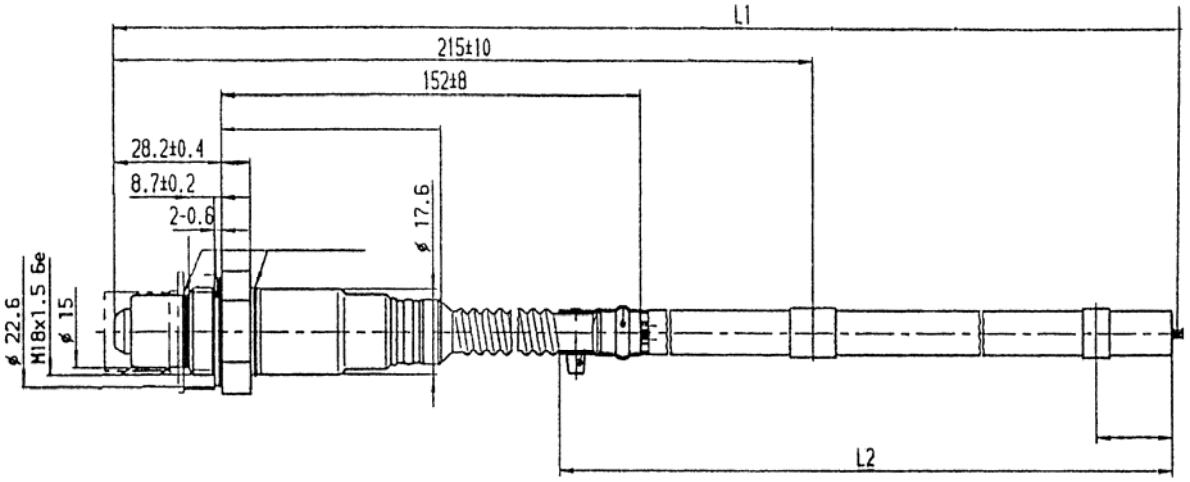
Temperature ranges	
Exhaust gas at sensor element	850 °C
Hexagon of the sensor housing	< 570 °C
Cable grommet (PTFE formed house) -Sensor side -Cable side	 < 250 °C < 200 °C
Cable and protection sleeve	< 250 °C
Connector	< 120 °C

Electrical 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 of Lambda Sensor LSM 11.

Connector	
Cable harness connector	**D 261 205 138**

Part numbers	
L: 460 mm	**0 258 006 066**
L: 600 mm	**0 258 006 065**
Offer drawing	**A 258 400 021**


L1
215±10
152±8
28.2±0.4
8.7±0.2
2-0.6
ø 17.6
ø 22.6
M18x1.5 6e
ø 15
L2

Lambda Sensor LSU 4.9

This sensor is designed to measure the oxygen content and λ-value of exhaust gases in automotive engines (gasoline or Diesel).

The wide band lambda sensor LSU 4.9 is a planar ZrO_2 dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of λ = 0,65 to air makes the LSU capable of being used as an universal sensor for λ = 1 measurement as well as for other λ ranges. The connector module contains a trimming resistor, which defines the characteristic of the sensor. The LSU operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control boxes (LT4).

Application	
Application	0,65 ... ∞
Fuel	Fuel/Diesel
Exhaust Gas Pressure	< 4 bar
Exhaust Gas Temperature Range (Operating)	< 930 °C
Exhaust Gas Temperature Range (Maximum)	< 1030 °C
Hexagon Temperature	< 600 °C
Cable and protective Sleeve Temperature	< 250 °C
Connector Temperature	< 140 °C
Storage Temperature Range	-40 ... 100 °C
Max. Vibration (stochastic peak level)	< 100 g

Mechanical data	
Weight w/o Cable	120 g
Length	84 mm
Thread	M18 x 1,5
Wrench Size	22 mm
Tightening Torque	40 ... 60 Nm

Electrical data	
Power Supply H+ Nominal	7,5 V
System Supply Voltage H+ (min)	10,8 V
Heater Power steady state	7,5 W
Heater Control Frequency	>= 100 Hz
Nominal Resistance of Nernst Cell	300 Ohm
Max Current load for Nernst Cell	250 µA

Connectors and Cables	
Connector	AS 6-07-35PN
Connector Loom	AS 6-07-35SN
Pin 1	Uh+
Pin 2	Uh-
Pin 3	APE
Pin 4	IPN
Pin 5	RE
Pin 6	R
Sleeve	Fiber Glas / Silicon coated
Cable Size	22
Cable Length L	30 ... 100 cm

Application Hint

The LSU4.9 can be connected to all Bosch Motorsport ECUs (MS 4, MS 5, MS 15) and lambda control units (AWS) like LT4.

The lambda sensor should be installed at point which permits the measurement of a representative exhaust-gas mixture, which does not exceed the maximum permissible temperature.

Install at a point where the gas is as hot as possible.

Observe the maximum permissible temperature.

As far as possible install the sensor vertically (cable upwards).

The sensor is not to be fitted near to the exhaust pipe 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.

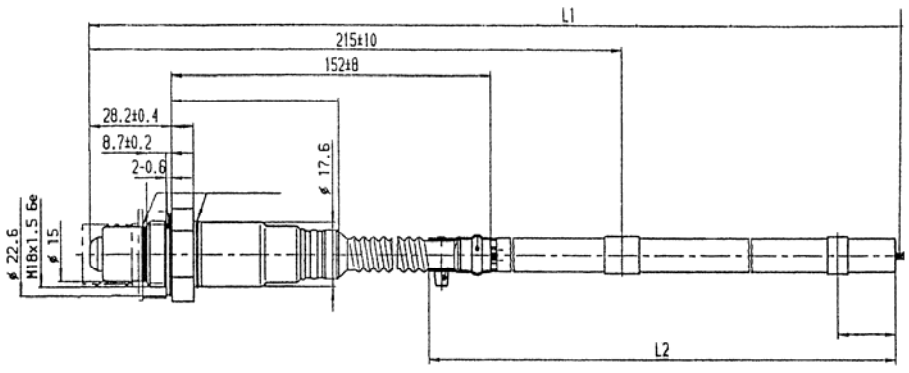
The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Use only the recommended grease for lubricating the thread.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Characteristic	
Signal Output	Ip meas / Ua (AWS)
Accuracy @ lambda = 1	1,016 +/- 0,007
Accuracy @ lambda = 0,8	0,80 +/- 0,01
Accuracy @ lambda = 1,7	1,70 +/- 0,05

IP	UA [V]	Lambda
-1,243	0,192	0,750
-0,927	0,525	0,800
-0,800	0,658	0,822
-0,652	0,814	0,850
-0,405	1,074	0,900
-0,183	1,307	0,950
-0,106	1,388	0,970
-0,040	1,458	0,990
0,000	1,500	1,003
0,015	1,515	1,010
0,097	1,602	1,050
0,193	1,703	1,100
0,250	1,763	1,132
0,329	1,846	1,179
0,671	2,206	1,429
0,938	2,487	1,701
1,150	2,710	1,990
1,385	2,958	2,434
1,700	3,289	3,413
2,000	3,605	5,391
2,150	3,762	7,506
2,250	3,868	10,119

Part number	
LSU 4.9	**B 261 209 356**



Lambda Sensor Mini-LSU 4.9

This sensor is designed to measure the oxygen content and λ-value of exhaust gases in automotive engines (gasoline or Diesel).

The wide band lambda sensor Mini-LSU 4.9 is a planar ZrO_2 dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of λ = 0,65 to air makes the LSU capable of being used as an universal sensor for λ = 1 measurement as well as for other λ ranges. The connector module contains a trimming resistor, which defines the characteristic of the sensor. The LSU operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control boxes (LT4, AWS_LSU 4.9 e.g.).

The main benefit of the Mini-LSU 4.9 is the very compact design combined with the high Bosch production quality standard.

Application	
Application	0,65 ... ∞ lambda
Fuel	Gasoline / Diesel
Exhaust Gas Pressure	< 4 bar
Exhaust Gas Temperature Range (Operating)	< 930 °C
Exhaust Gas Temperature Range (Maximum)	< 1.030 °C
Hexagon Temperature	< 1.050 °C
Cable and Protective Sleeve Temperature	< 250 °C
Connector Temperature	< 150 °C
Storage Temperature Range	-40 ... 100 °C
Max. Vibration (stochastic peak level)	< 100 m/s^2

Mechanical data	
Weight w/o Cable	28 g
Length	60 mm
Thread	M16 x 1,5
Wrench Size	17 mm
Tightening Torque	60 Nm

Electrical data	
Power Supply H+ Nominal	7,5 V
System Supply Voltage H+ (min)	10,8 V
Heater Power steady state	7,5 W
Heater Control Frequency	>= 100 Hz
Nominal Resistance of Nernst Cell	300 Ohm
Max. Current Load for Nernst Cell	250 µA

Characteristic	
Signal Output	Ip meas / Ua (AWS)
Accuracy @ lambda = 1	1,016 +/- 0,007
Accuracy @ lambda = 0,8	0,80 +/- 0,01
Accuracy @ lambda = 1,7	1,70 +/- 0,05

IP	UA [V]	Lambda
-1,243	0,192	0,750
-0,927	0,525	0,800
-0,800	0,658	0,822
-0,652	0,814	0,850
-0,405	1,074	0,900
-0,183	1,307	0,950
-0,106	1,388	0,970
-0,040	1,458	0,990
0,000	1,500	1,003
0,015	1,515	1,010
0,097	1,602	1,050
0,193	1,703	1,100
0,250	1,763	1,132
0,329	1,846	1,179
0,671	2,206	1,429
0,938	2,487	1,701
1,150	2,710	1,990
1,385	2,958	2,434
1,700	3,289	3,413
2,000	3,605	5,391
2,150	3,762	7,506
2,250	3,868	10,119

Connectors and Cables	
Connector	1 928 404 682
Connector Loom	09 4421 01
Pin 1	IP
Pin 2	VM
Pin 3	UH-
Pin 4	UH+
Pin 5	RT
Pin 6	UN
Sleeve	Fiber Glas / Silicon coated
Cable Size	22
Cable Length L	30-100 cm

Application Hint

The Mini-LSU 4.9 can be connected to all Bosch Motorsport ECUs (MS 4, MS 5, MS 15) and Lambda Control Units like LT4 or AWS_LSU 4.9.

The lambda sensor should be installed at point which permits the measurement of a representative exhaust-gas mixture, which does not exceed the maximum permissible temperature.

Install at a point where the gas is as hot as possible.

Observe the maximum permissible temperature.

As far as possible install the sensor vertically (cable upwards).

The sensor is not to be fitted near to the exhaust pipe outlet, so that the influence of the outside air can be ruled out.

The exhaust-gas passage opposites the sensor must be free of leaks in order to avoid the effects of leak-air.

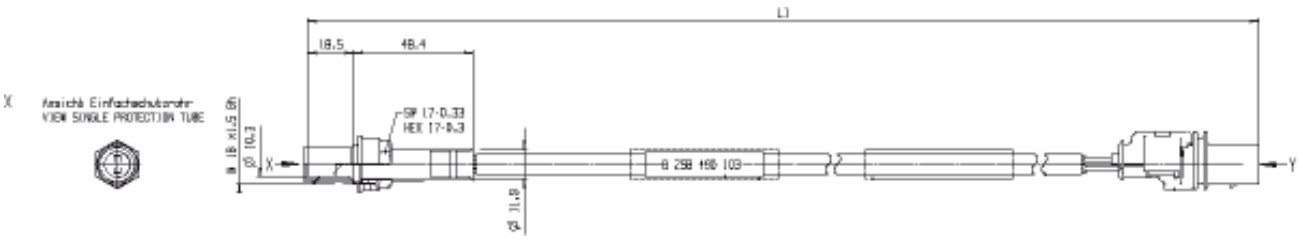
Protect the sensor against condensation water.

The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Use only the recommended grease for lubricating the thread.

Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part number

Lambda Sensor Mini-LSU 4.9	**B 258 490 103_20**



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.

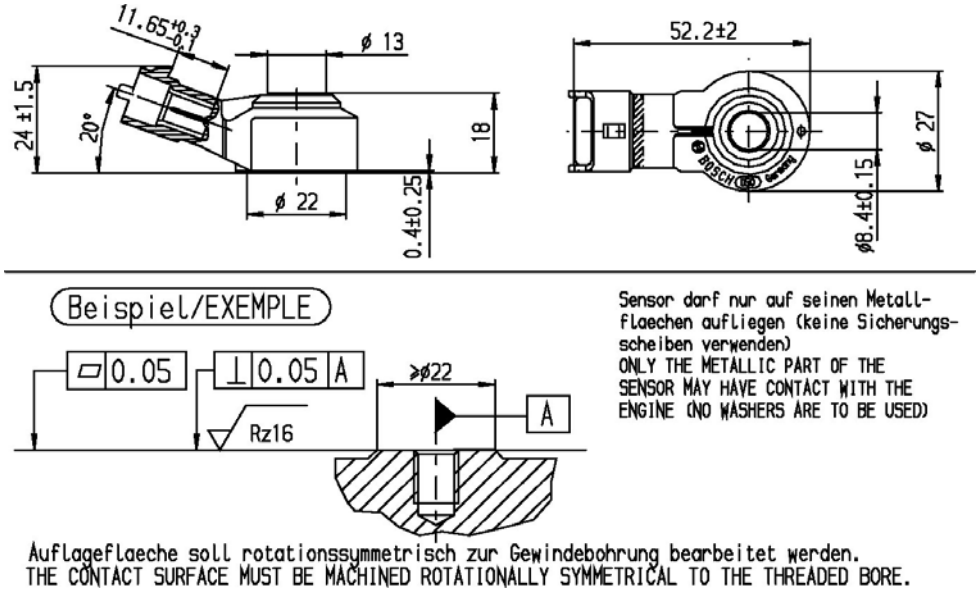
Mechanical data	
Thread	M8 x 30 (aluminium engine block) M8 x 25 (cast iron engine block)
Weight	48 g
Tightening torque	15 ... 25 Nm
Mounting position	random

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

Electrical 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	**D 261 205 337**

Part number	
	0 261 231 120
Offer drawing	**A 261 230 170**



Knock Sensor KS-R

The sensor is used for detecting structure-borne vibration occurring in motor-vehicle engines due to irregular combustion.

The robust sensor is suitable for use under extreme conditions. Due to its inertia, a mass is moving according to the vibration of the engine e.g. and causes a compression force to a piezo ceramic. As a result, a voltage between the upper and lower end of the ceramic can be measured. This voltage is a value for the acceleration.

The main benefit of this sensor is the precise determination of structure-borne noise in a robust mechanical design and small size. Furthermore the connector is decoupled from the sensor by a cable.

Application	
Application	1 ... 20 kHz
Operating temperature range	-40 ... 130 °C
Storage temperature range	0 ... 100 °C
Max. vibration	≤ 800 m/s²

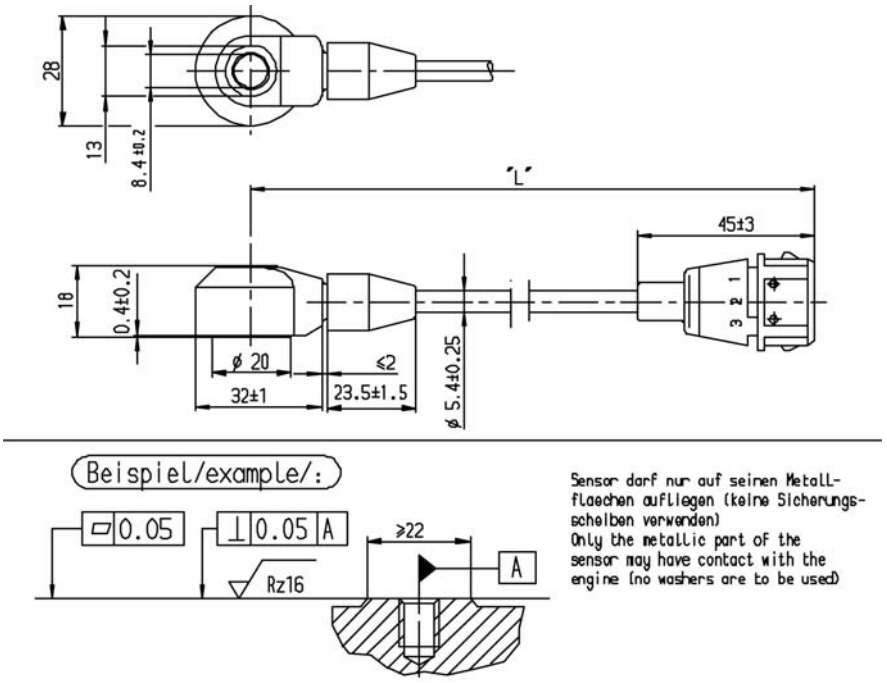
Mechanical Data	
Male thread (for cast)	M8 x 25
Male thread (for Al)	M8 x 30
Installation torque	20 ± 5 Nm
Weight w/o cable	82 g
Protection	IP 54

Electrical Data	
Range of Frequency	1 ... 20 kHz
Sensitivity @ 5 kHz	26 ± 8 mV/g
Max. Sensivity Changing (life time)	-17 %
Linearity between 5 ... 15 kHz (from 5 kHz value)	-10 ... 20 %
Linearity between 15 ... 20 kHz (linear increasing with freq)	20 ... 50 %
Main Resonance Frequency	> 25 kHz
Impedance	> 1 MΩ
Temperature dependance of sensitivity	-0,06 mV/g °C
Capacity Field	800 ... 1400 pF

Connectors and Cables	
Connector	A 261 230 076
Connector loom	D 261 205 289
Pin 1	Sig +
Pin 2	Sig -
Pin 3	Scr
Various military and automotive connectors on request.	
Sleeve	Elastomer
Cable size	AWG 24
Cable length L	50 cm
Please specify the requested cable length with your order.	

Application Hint
The KS-R sensor can be connected to all Bosch Motorsport ECU featuring knock control.
Please make sure, that only the metallic part of the sensor (D = 22 mm) may have contact with the engine.
The sensor should be mounted at a location where it is exposed to liquids such as gasoline, antifreeze, oil brake fluid e.g. only for a short time.
The wire of the sensor should be routed in such a way, that resonance vibrations can not occur.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Number	
Knock Sensor KS-R	**0 261 231 047**



Rotary Potentiometers

Rotary Potentiometer RP 55

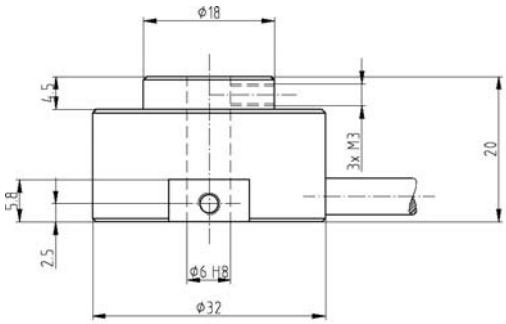
This sensor is designed to measure throttle position, chassis data acquisition and more. The sensor is manufactured in aluminium housing. Various range and connector options are available on request.

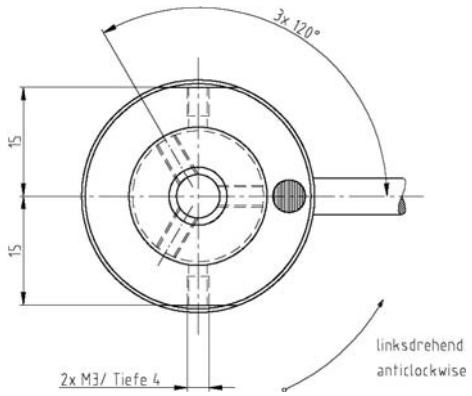
Mechanical data	
Mounting	2 x M3
Standard shaft	6 mm
Length	160 ... 300 mm
Mech. range	360°
Tightening torque	0,5 Nm
Weight	41 g
Life expectancy	> 50 x 10^6 rotations

Electrical 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

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





Rotary Potentiometer RP 86

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

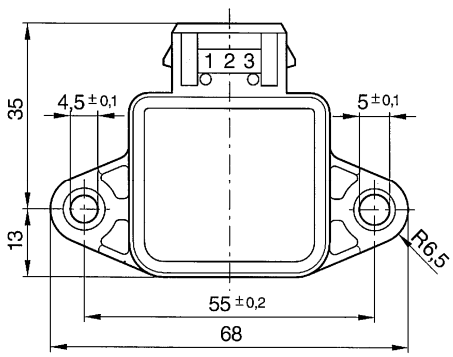
Mechanical data	
Mounting	2 x M4
Length	160 ... 300 mm
Mech. range	< 86°
Max. rotation speed	120 x 1/min
Tightening torque	1,5 ... 2,5 Nm
Weight	60 g
Life expectancy	> 2 x 10^5 rotations

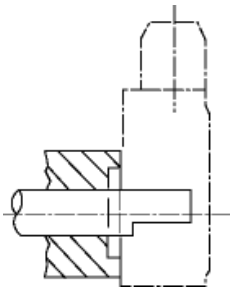
Conditions for use	
Temperature range	-40 ... 130°C
Vibration	40 g/5 Hz ... 2 kHz

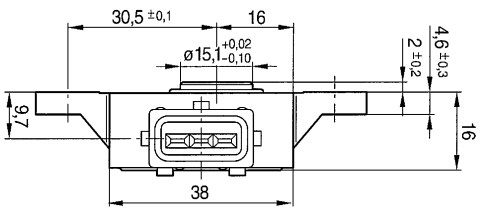
Electrical data	
Nominal resistance	2,5 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Connector	
Cable harness connector	**D 261 205 334**

Part number	
	0 280 122 016
Offer drawing	**A 280 121 252**







Rotary Potentiometer RP 100

This sensor is designed to measure rotational movement, especially the throttle position e.g. very precisely and in a wide range.

Picking up an internal resistant and collector ring a rotation angle can be converted into an angle proportional output voltage. The housing and the bearings are made of high temperature resistant plastic. The mounting plate is protected with a metal cover to ensure a good fixation.

The main benefit of this sensor is the combination of both high quality production part and military spec connection. Furthermore it has a good cost-performance ratio.

Application	
Application	0 ... 100°
Angle Between Intern Mechanical Stops	no stops
Operating Temperature Range	-40 ... 150 °C
Storage Temperature Range	0 ... 100 °C
Max. Vibration	200 m/s^2 @ 5 ... 2000 Hz

Electrical Data	
Power Supply Us	5 V
Maximal Power supply	42 V
Total Resistance	3 kΩ ±20 %
Current Is	1 µA
Max. allowable Contact Current	10 mA

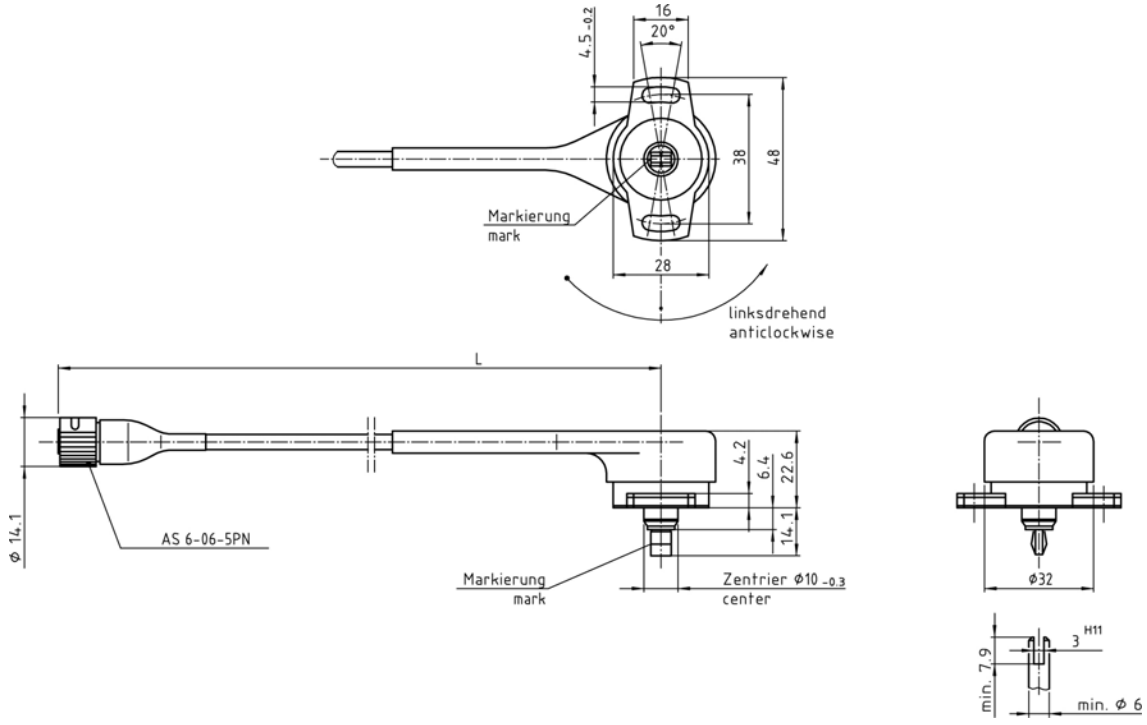
Mechanical Data	
Weight w/o Cable	32 g
Sealing / Protection Class	IP65
Mounting	2 x M4
Lifetime	50 x 10^6 Rotation
Housing	synthetic material

Characteristic	
Max. rotation speed	120 min^{-1}
Temp. Coefficient	5 ppm/°K
Direction of Rotation	Anti-Clockwise
Both rotation directions are available on request	
Redundancy	No

Connectors and Cables	
Connector	ASL 6-06-05PA-HE
Connector Loom	ASL 0-06-05SA-HE
Pin 1	U_S
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Various military and automotive connectors on request.	
Sleeve	DR-25
Cable Size	AWG 20
Cable Length L	16 ... 30 cm
Please specify the requested cable length with your order.	

Application Hint
The products of the RP series can be connected directly to most control units.
The sensor has no internal stops so it is endless pivotable.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Number	
Rotary Potentiometer RP 100	**B 261 209 127**



Rotary Potentiometer RP 100 twin

The Rotary Potentiometer RP 100 twin is used in applications where redundant signals are necessary to ensure that the system runs failsafe. A typical field of application are electronic throttle control systems where angle movement is measured by the RP 100 twin.

The sensor 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 w/o cable	32 g
Lifetime	> 50 x 10^5 rotations
Protection	IP 65

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

Electrical data	
Nominal resistance	3 kΩ
Resistance tolerance	20 %
Non-linearity	±1 %
Repetitive accuracy	≤ 0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Part numbers	
Anticlockwise	
AS 6-07-35PN	**B 261 209 588**
Offer drawing	**A 261 209 588**
Clockwise	
AS 6-07-35PN	**B 261 209 592**
Offer drawing	**A 261 209 592**

Rotary Potentiometer RP 130

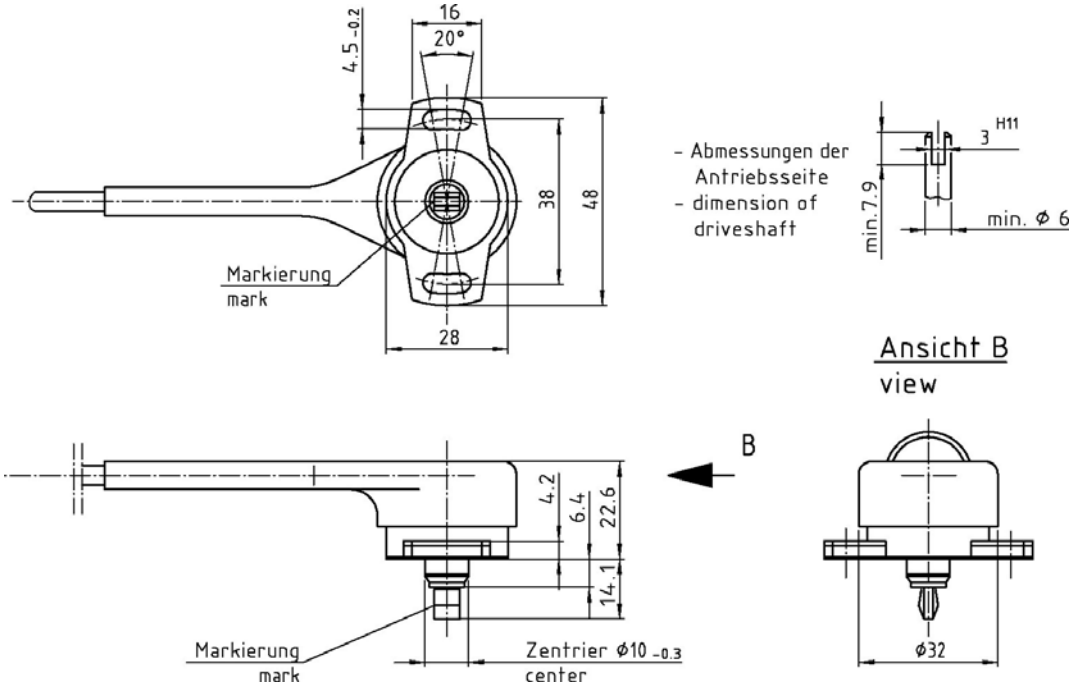
This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

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

Electrical 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

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



Rotary Potentiometer RP 130-M

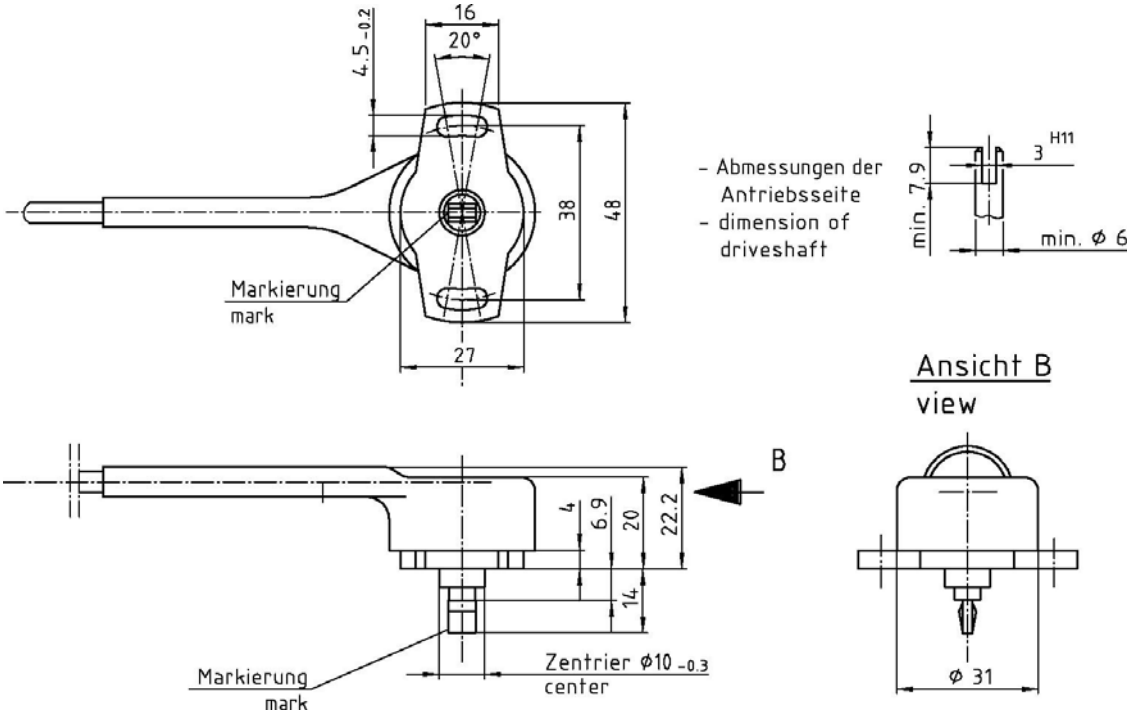
This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

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

Electrical 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	-55 ... 125°C
Vibration	40 g/5 Hz ... 2 kHz

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



Rotary Potentiometer RP 308

This sensor is designed to measure rotational movement, especially the throttle position e. g. very precisely and in a big range.

Picking up an internal resistant and collector ring a rotation angle can be converted into an angle proportional output voltage. The housing and the bearings are made of high temperature resistant plastic. The mounting plate is protected with a metal cover to ensure a good fixation.

The main benefit of this sensor is the combination of both high quality production part and military spec connection. Furthermore it has a good cost-performance ratio.

Application	
Application	0 ... 308 °
Angle between internal mechanical Stops	no stops
Operating Temperature Range	-40 ... 150 °C

Mechanical Data	
Weight w/o Cable	32 g
Fixation	M4x2
Lifetime	50 x 10^6 Rotation
Max. Vibration	20 g @ 5 ... 2.000 Hz

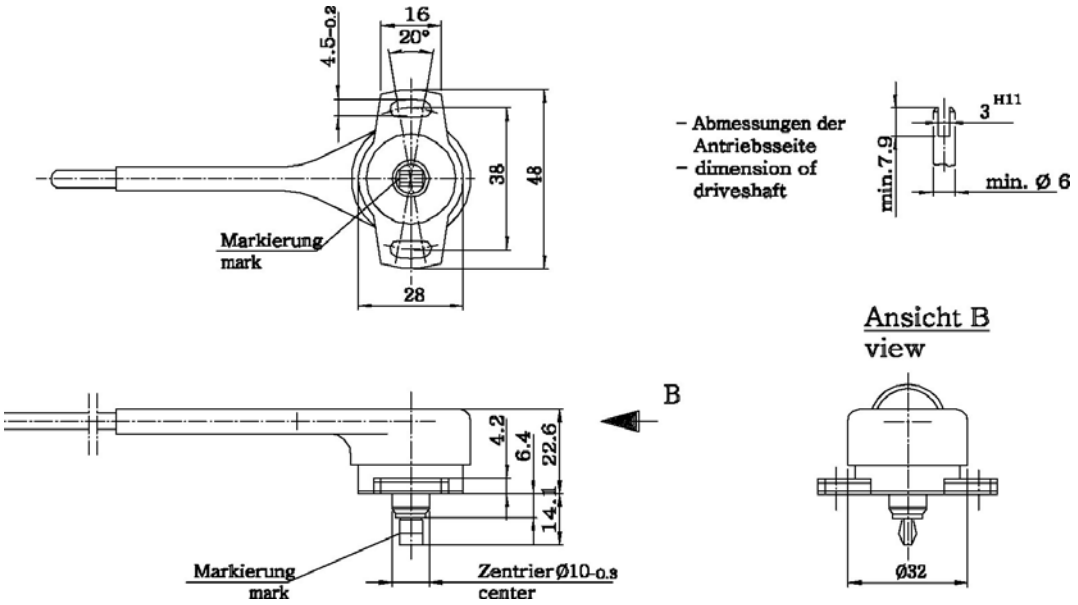
Electrical Data	
Power Supply U_S	5 V
Maximal Power supply	42 V
Total Resistance	5 kΩ +/-20 %
Current I_S	1 µA
Max. allowable Contact Current	10 mA

Characteristic	
Max. Rotation Speed	120 min^1
Temp. Coefficient	5 ppm/°K

Connectors and Cables	
Connector I	ASL 6-06-05PA-HE
Connector Loom I	ASL 0-06-05SA-HE
Pin 1	U_S
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Pin 6	n. a.
Sleeve	DR-25
Cable Size	AWG 24
Cable Length L	16-30 cm

Application Hint
The products of the RP series can be connected directly to most control units.
The sensor has no internal stops so it is endless pivotable.
Each mounting orientation is possible.
The sensor meets all EMV, EMC and ESD automotive standards.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part Number	
RP 308	**B 261 209 570**



Rotary Potentiometer RP 350-M

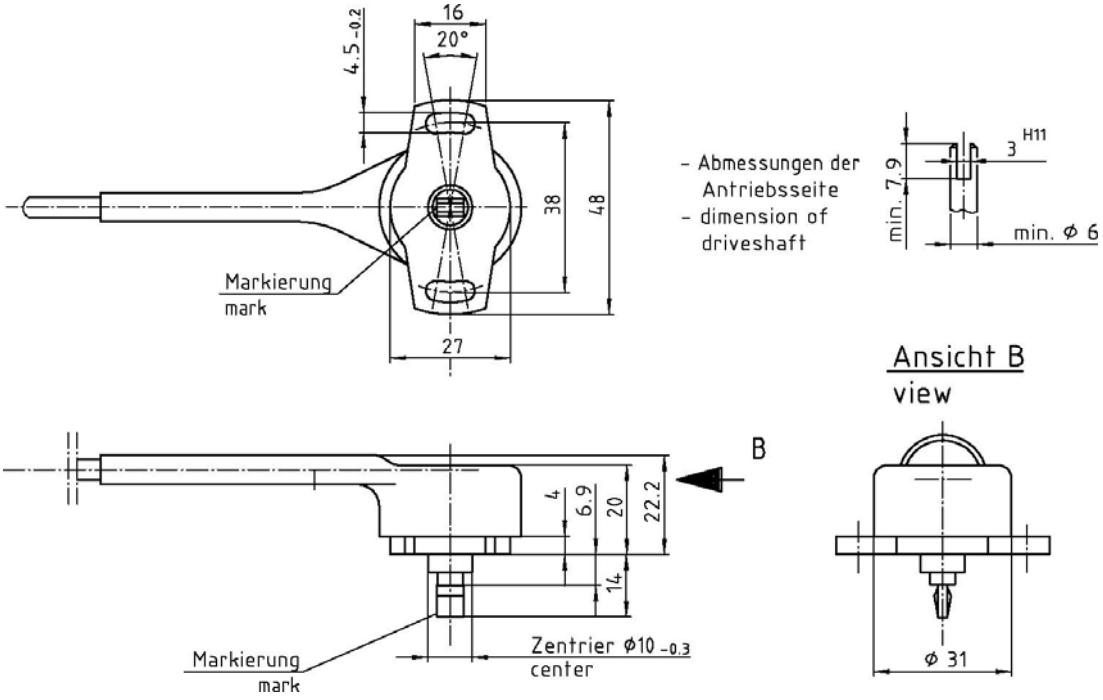
This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

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

Electrical 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

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



Linear Potentiometers

Linear Potentiometer LP 10

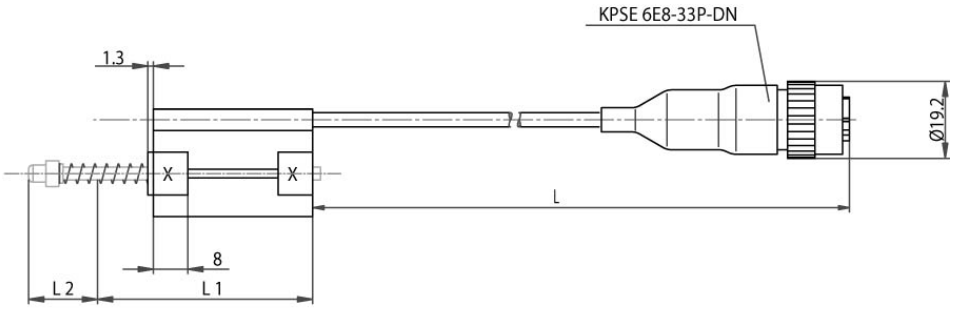
This sensor is designed to measure stabilizer movement. It is manufactured in a DR-25 sleeve. Various connector options are available.

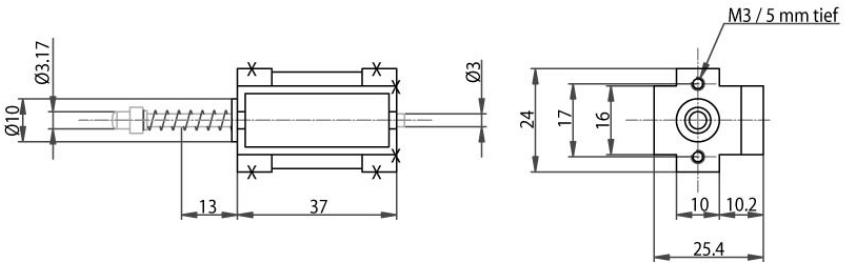
Mechanical data	
Mounting	2 x M3
Cable length	150 ... 1000 mm
Weight	70 g

Conditions for use	
Temperature range	-25 ... 75°C

Electrical data	
Nominal resistance	1 kΩ ± 20 %
Max. current	1 mA
Non-linearity	1 %
Usual power supply	5 V
Power consumption	0,3 W

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





Linear Potentiometer LP 25 twin

The Linear Potentiometer LP 25 twin is used in applications where redundant signals are necessary to ensure that the system runs failsafe. A typical field of application are electronic throttle control systems. Various connector options are available.

Mechanical data	
Possible mech. range [L2]	50 mm
Min. length [L1]	120 mm
Cable length [L]	150 ... 1000 mm
Mounting hole	∅ 3 mm
Protection	IP 66
Max. shaft velocity	10 m/sec
Weight	approx. 50 g

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

Electrical data	
Nominal resistance [25 ... 50 mm]	1 kΩ
Non-linearity	0,25 %
Usual power supply	5 V
Max. power supply	45 V

Part number	
AS 6-07-35PN	**B 261 209 858**
Offer drawing	**A 261 209 858**

Linear Potentiometer LP 50

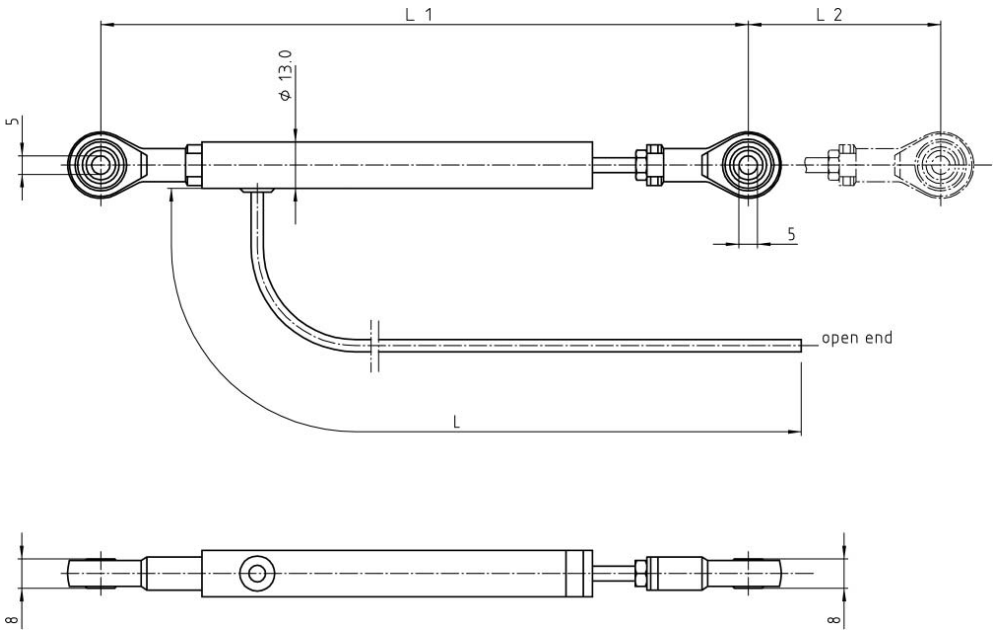
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

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

Electrical data	
Nominal resistance [25 ... 150 mm]	2 kΩ
Max. current	< 1 mA
Non-linearity	0,25 %
Usual power supply	5 V
Max. power supply	42 V

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



Linear Potentiometer LP 50 twin

The Linear Potentiometer LP 50 twin is used in applications where redundant signals are necessary to ensure that the system runs failsafe. A typical field of application are electronic throttle control systems. Various connector options are available.

Mechanical data	
Possible mech. range [L2]	50 mm
Min. length [L1]	120 mm
Cable length [L]	150 ... 1000 mm
Mounting hole	∅ 3 mm
Protection	IP 66
Max. shaft velocity	10 mm/sec
Weight	approx. 60 g

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

Electrical data	
Nominal resistance [25 ... 50 mm]	2 kΩ
Non-linearity	0,25 %
Usual power supply	5 V
Max. power supply	45 V

Part numbers	
AS 6-07-35N	**B 261 209 859**
Offer drawing	**A 261 209 859**

Linear Potentiometer LP 75

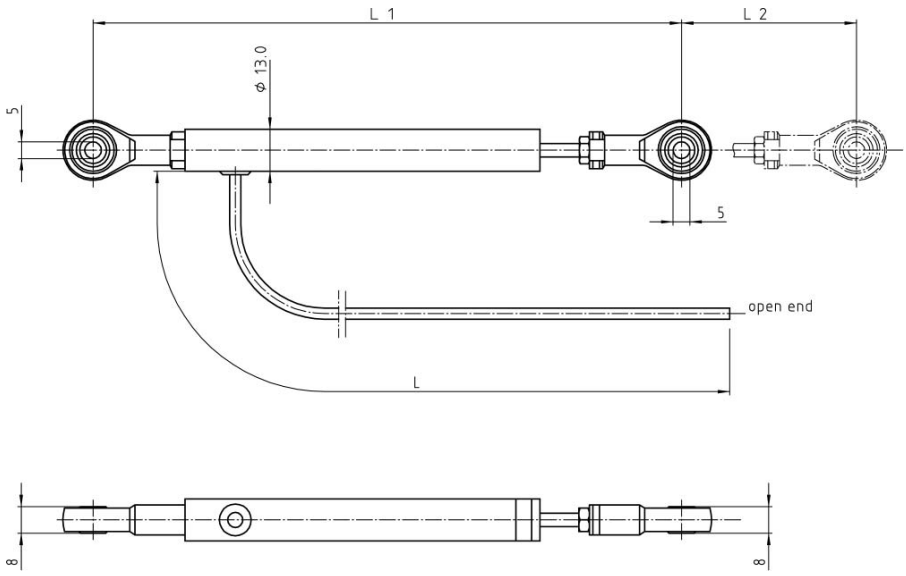
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

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/s
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

Electrical data	
Nominal resistance [25 ... 150 mm]	3 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Part number	
KPSE 6E8-33P-DN	**B 261 209 530**



Linear Potentiometer LP 75F

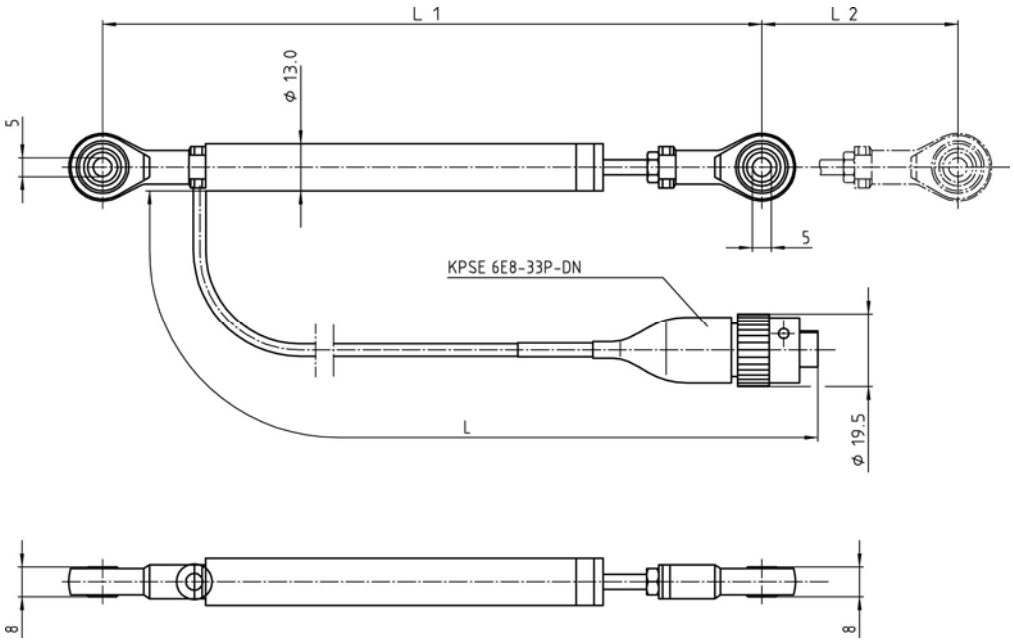
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available. Optionally a protective sleeve for the telescopic shaft can be ordered.

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

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

Part number	
KPSE 6E8-33P-DN	**B 261 209 852**
Offer drawing	**A 261 209 852**



Linear Potentiometer LP 100

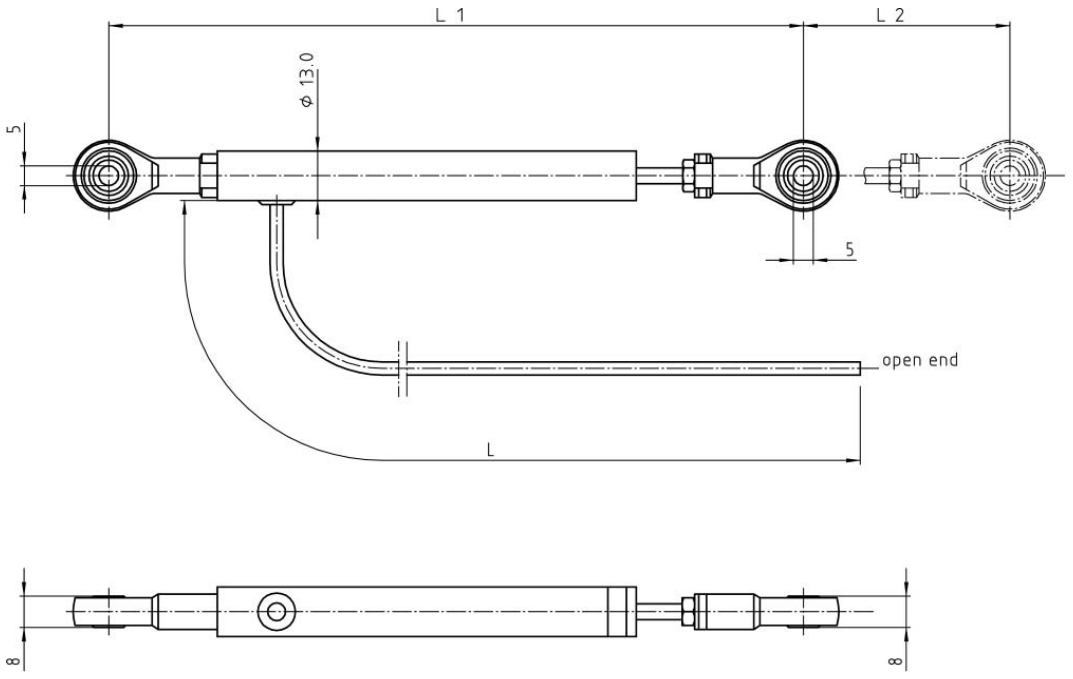
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

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/s
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

Electrical data	
Nominal resistance [25 ... 150 mm]	4 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Part number	
KPSE 6E8-33P-DN	**B 261 209 134**
KPTA 6E6-4P-C-DN	**B 261 209 137**



Linear Potentiometer LP 100F

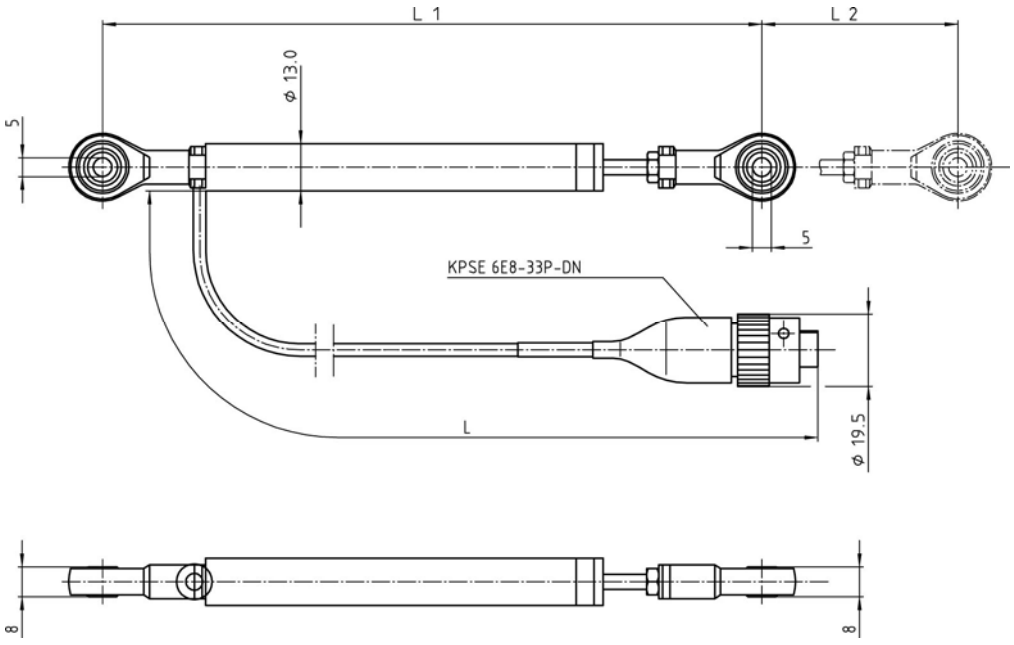
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available. Optionally a protective sleeve for the telescopic shaft can be ordered.

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

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

Part number	
KPSE 6E8-33P-DN	**B 261 209 853**
Offer drawing	**A 261 209 853**



Linear Potentiometer LP 150

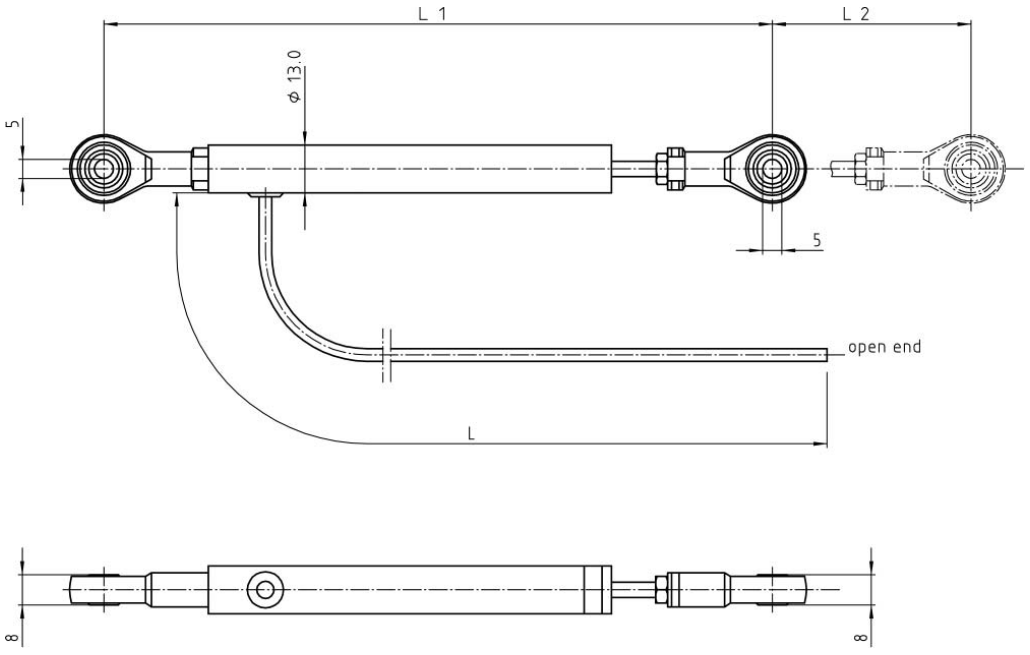
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

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

Electrical data	
Nominal resistance [25 ... 150 mm]	6 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

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



Wire Potentiometers

Wire Potentiometer WP 35

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

Accessories
Holder

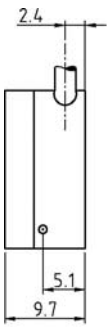
Electrical data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

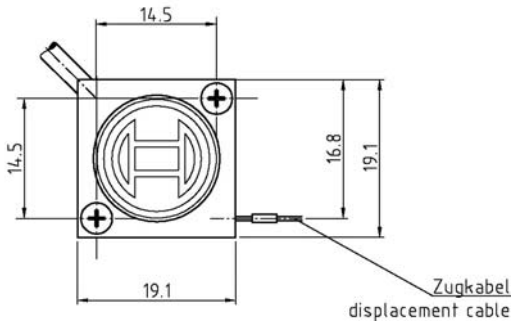
Part number	
ASL 6-06-05PA-HE	**B 261 209 541**
Offer drawing	A 261 209 541
Holder	**B 261 209 864**

! 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

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. We offer repair service for this product.

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

Accessories
Holder

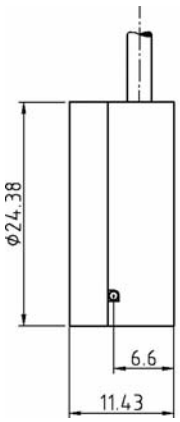
Electrical data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

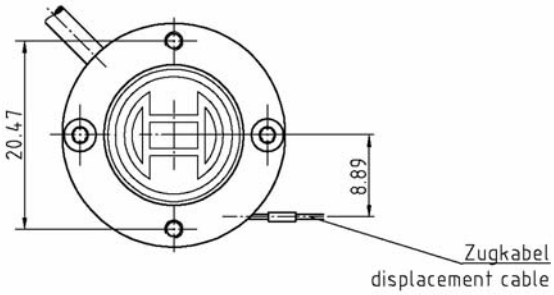
Part number	
ASL 6-06-05PA-HE	**B 261 209 542**
Offer drawing	**A 261 209 542**
Holder	**B 261 209 864**

! 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

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. We offer repair service for this product.

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

Accessories
Holder

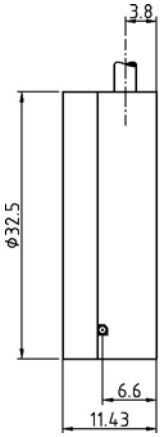
Electrical data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

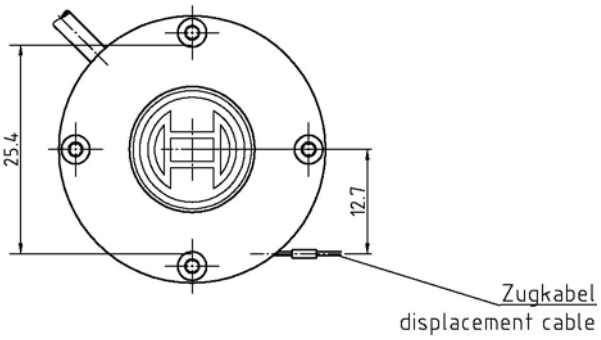
Part numbers	
ASL 6-06-05PA-HE	**B 261 209 543**
Offer drawing	**A 261 209 543**
Holder	**B 261 209 865**

! 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

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. We offer repair service for this product.

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

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

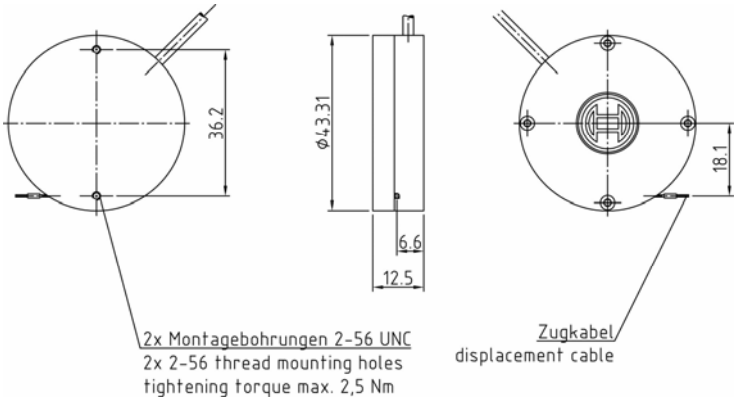
Electrical data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

Part number	
KPTA 6E6-4P-C-DN	**B 261 209 863**
Offer drawing	**A 261 209 863**
Holder	**B 261 209 866**

! 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

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

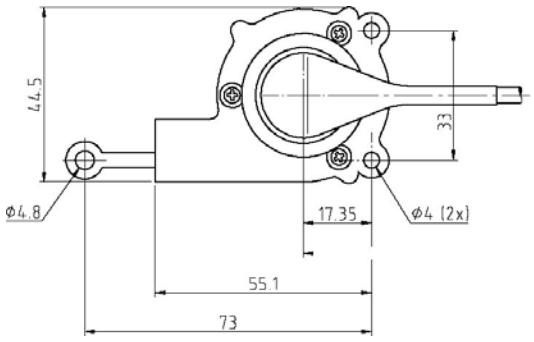
Electrical data	
Nominal resistance	1,0 kΩ
Non-linearity	± 1 %
Usual power supply	5 V
Max. power supply	25 V

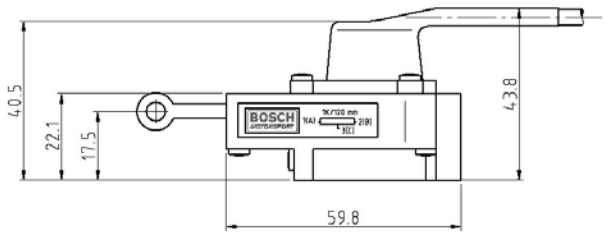
Part number	
120 mm	
KPTA 6E6-4P-C-DN	**B 261 209 536**
Offer drawing	**A 261 209 536**
96 mm	on request

! 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

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. We offer repair service for this product.

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

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

Accessories
Holder

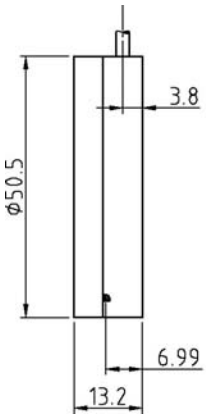
Electrical data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

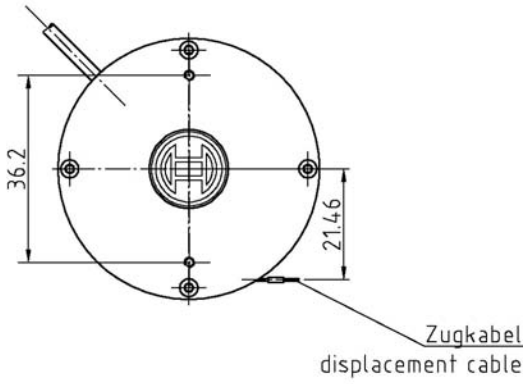
Part number	
ASL 6-06-05PA-HE	**B 261 209 545**
Offer drawing	**A 261 209 545**
Holder	**B 261 209 866**

! 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 Sensor

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 2 axes	30 g
3 axes	50 g
Length	150 ... 1000 mm
Measuring range	± 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

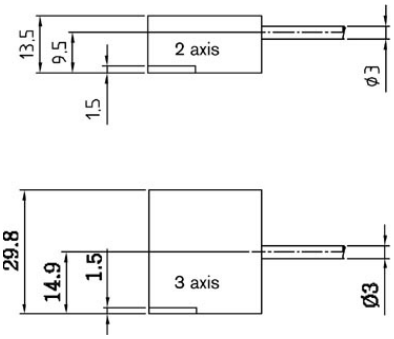
Conditions for use	
Temperature range	-40 ... 85°C

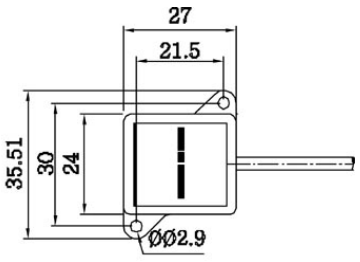
Characteristic	
Offset x, y, z	2,5 V at 0 g
Sensitivity x, y, z	440 mV/g

Electrical 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

Part 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**





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.

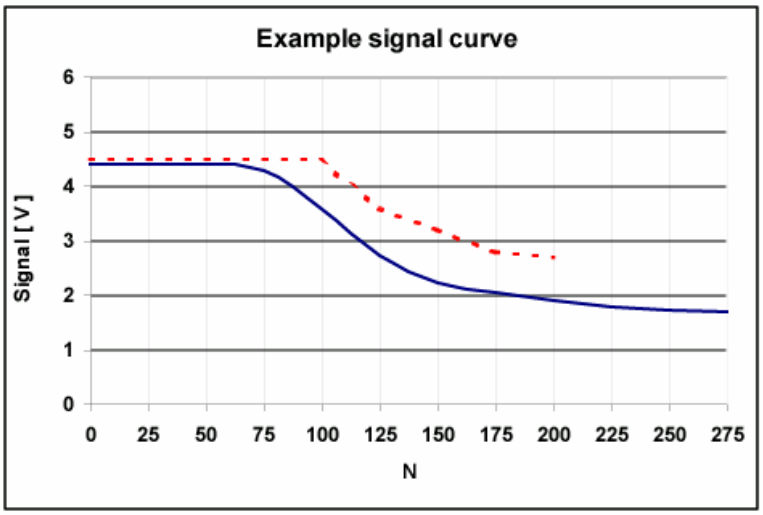
Mechanical data	
Weight	90 g
Max. deviation	± 10°
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	22 x 22 x 50 mm
Mech. Range	programmable up to 150 N

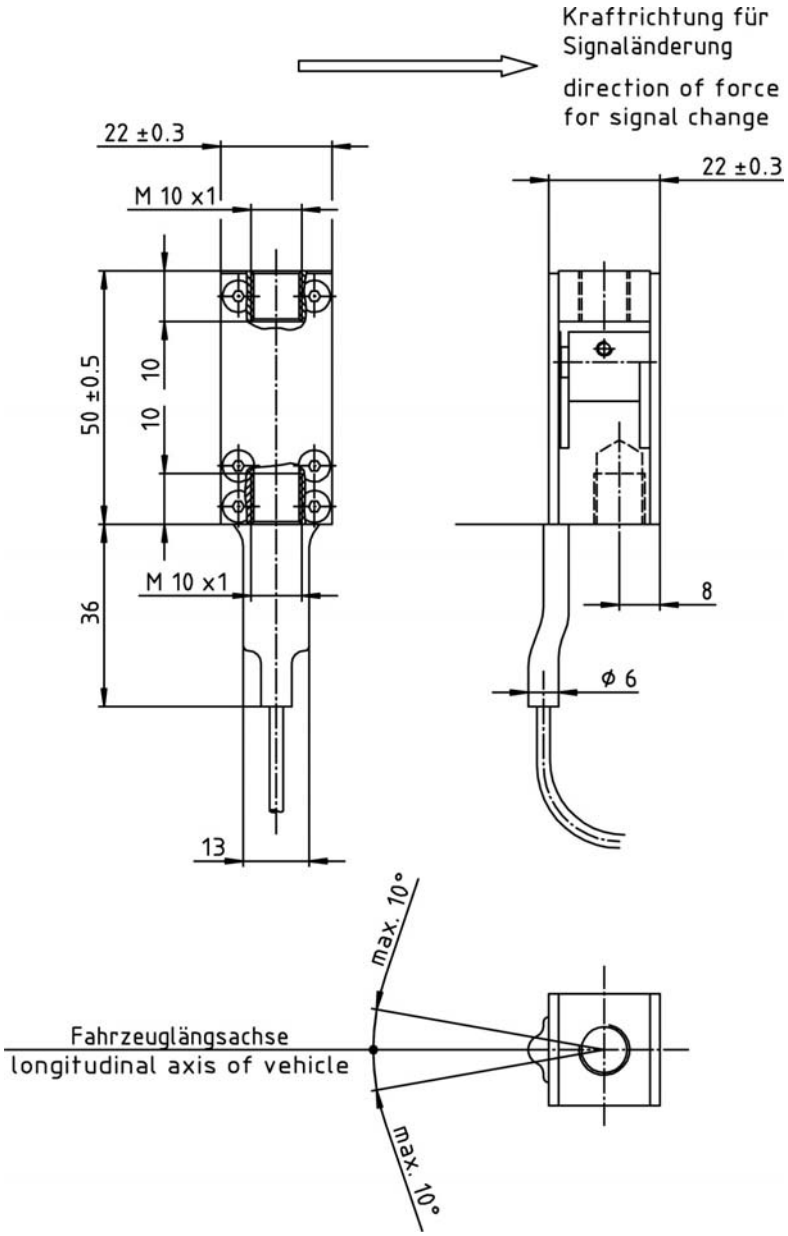
Conditions for use	
Temperature range	0 ... 80°C
Vibration	80 g/5 Hz ... 2 kHz

Characteristic
Individual characteristic will be delivered with each sensor.

Electrical data	
Supply voltage	10 V
Input current	< 1 mA
Signal output	1 ... 4 V ± 0,5 V
Zero output	4 V ± 0,3 V

Part 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**
AS-6-06-05PC-HE	**B 261 209 225**
Offer drawing	**A 261 209 225**




Kraftrichtung für
Signaländerung
direction of force
for signal change
22 ±0.3
M 10 x1
50 ±0.5
10
10
M 10 x1
36
13
22 ±0.3
8
ϕ 6
max. 10°
Fahrzeuglängsachse
longitudinal axis of vehicle
max. 10°

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	± 10°
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	65 x 16 x 16 mm
Mech. range	programmable up to 450 N
Fmax	800 N
Mech. load limit	1800 N

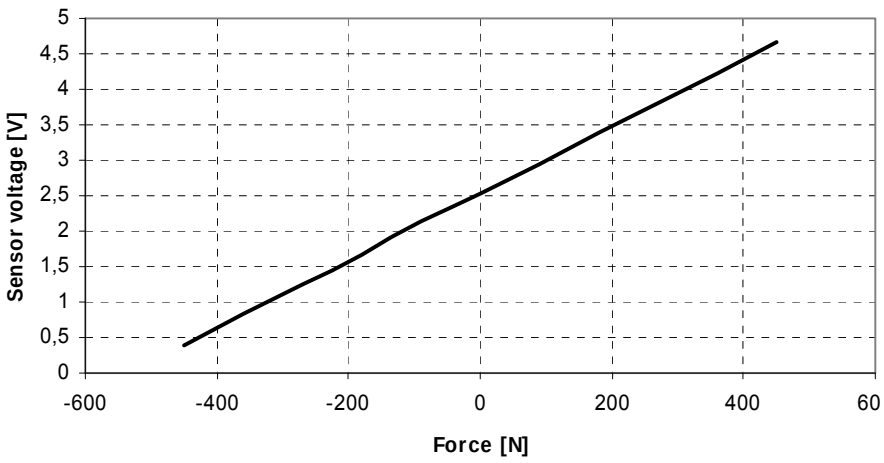
Electrical data	
Supply voltage	12 V
Signal output	0,5 ... 4,5 V
Zero output	2,5 V

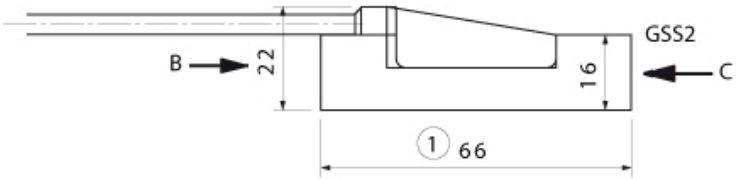
Conditions for use	
Temperature range	0 ... 80°C
Vibration	80 g/5 Hz ... 2 kHz

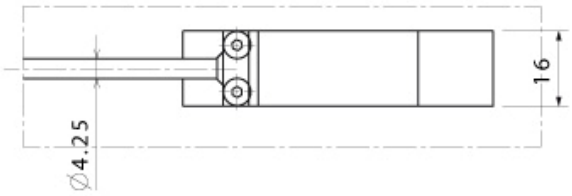
Characteristic
Individual characteristic will be delivered with each sensor.

Part number	
ASL-6-06-05PC-HE	**B 261 209 227**
Offer drawing	**A 261 209 227**

Force [N]	Voltage [V]
450	4,673
360	4,225
270	3,797
180	3,397
90	2,941
0	2,538
-90	2,141
-180	1,672
-270	1,255
-360	0,820
-450	0,402





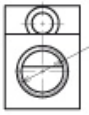


(Spannungsanstieg)
(Increasing Voltage)

Kraftrichtung für Signaländerung
Direction of signal altering force

(Spannungsabfall)
(Decreasing Voltage)

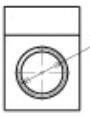
Ansicht B
view



M10 x1

Gewindetiefe
threath length 11,7mm
max. Anzugsmoment
max. fastening torque 22 Nm

Ansicht C
view



M10 x1

Gewindetiefe
threath length 11,7mm
max. Anzugsmoment
max. fastening torque 22 Nm

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.

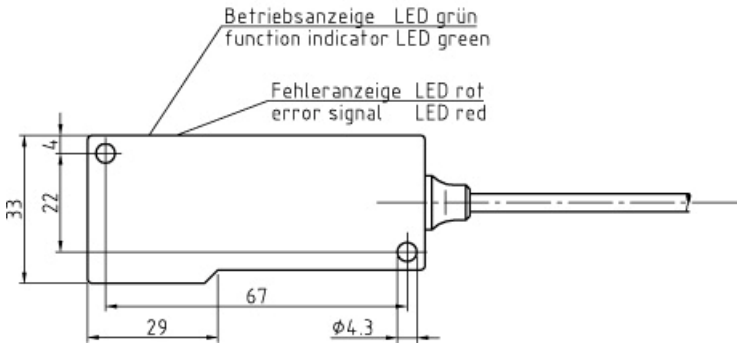
Mechanical data	
Weight	105 g
Measuring range	60 ... 140 mm
Dimensions	75 x 33 x 18 mm
Housing	plastic, fibreglass
Protection class	IP 67

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

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

Electrical 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

Part numbers	
KPTA 6E6-4P-C-DN	**B 261 209 671**
Offer drawing	**A 261 209 671**
ASL 6-06-05PD-HE	**B 261 209 672**
Offer drawing	**A 261 209 672**



Yaw Rate Sensor

Yaw Rate Sensor YRS 2

This sensor is designed to measure the yaw rate and lateral acceleration of the vehicle. In order to achieve this, the sensor features both a measuring element for yaw rate and one for lateral acceleration, with one appropriate circuit. The measuring element for yaw rate is built using surface and bulk micromachining technology. Two surface micromachined accelerometers are located on two out of phase oscillating seismic masses.

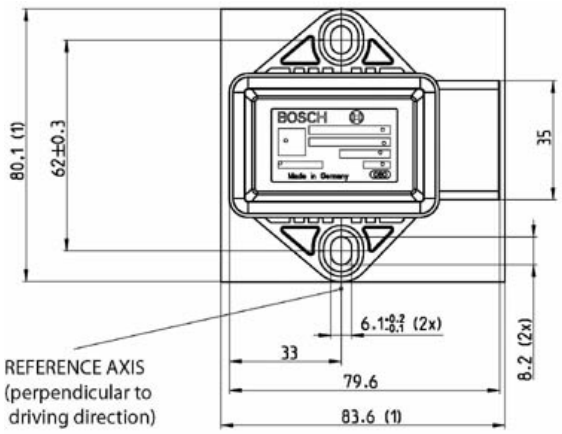
Mechanical data	
Measuring range	100°/s
Overload	1000°/s
Weight	90 g

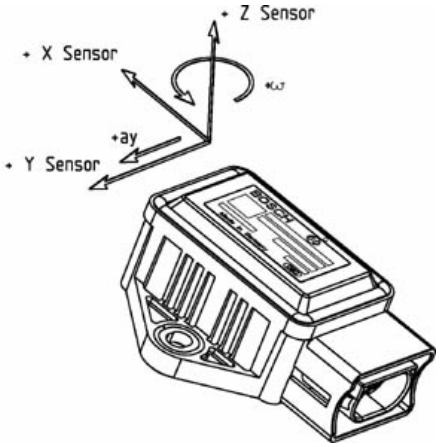
Conditions for use	
Temperature range	-40 ... 85°C
Shock	300 g

Connector	
Cable harness connector	D 261 205 358

Electrical data	
Supply voltage	8,0 ... 16 V
Current consumption	< 75 mA
Output range	0,5 ... 4.5 V
Reference voltage	2,5 V
Sensitivity	18 mVs/° [-100 ... 100°/s]
Non linearity	< 4 %

Part number	
YRS 2	**0 265 005 262**
Offer drawing	**0 274 A00 005**





Vehicle Components

Chassis Control

ABS M4

Hydraulic modulator with integrated ECU

The ABS M4 is especially developed for motorsport use and contains all necessary functions for a four-channel ABS system. Reprogramming and diagnostic options are realized via K-line. An optional data logger connected via CAN can be used.

Mechanical Data	
Dust and splash waterproof production based housing	
Vibration damped circuit board	
38 pin connector	
2 hydraulic valves per ABS channel	
2 brake circuits – front and rear	
2 circuit hydraulic high pressure pump	
2 hydraulic accumulators 3 ccm/each	
Standard fittings, master cylinder M12x1, brake cylinders M10x1	
Size	125 x 80.3 x 129.6 mm (ECU plus hydraulic unit)
Weight	approx. 2.200 g

ABS Outputs and Communication
Programming of individual car parameters via K-line
Diagnosis via K-line VSO
EEPROM programming via K-line
CAN link to external data logger
ABS warning light

ABS Inputs
4 active wheel speed sensors DF11
Brake light switch
Pressure sensor
Longitudinal acceleration
Lateral acceleration
Yaw rate
12 position function switch for different setups
2 switch positions programmable with support from Bosch Motorsport

Conditions for Use	
Supply voltage	8 ... 16 V, max. 26 V for 5 min
Max. peak voltage	35 V for 200 ms
Temperature	-30 ... +130 °C
Shock vibrations	50 g less than 6 ms
Programming of individual car parameters via K-line	
Power consumption	8 W in idle, 230 W in operation

Basic System Package
ABS M4 module (hydraulic and ECU) (incl. connector and contacts)
Pressure sensor (incl. connector and contacts)
Yaw/acceleration sensor (incl. connector and contacts)
ABS function switch 12 positions
4 speed sensors DF11
ABS warning light
Vibrations decoupling boards
Cable harness on request
Optional
Memory C Sport
Cable harness for C Sport additional channels
Accessories for diagnosis and programming

Notes
Currently there is no 4-wheel-drive software available.

Part Number	
ABS M4 System	**F 02U V00 113 01**

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

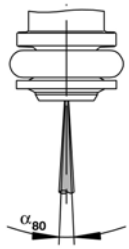
Conditions for use	
Fuel input	axial (top-feed)
Operating temperature	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Climate proofness corresponds to saline DIN 53 167	fog test

Technical data

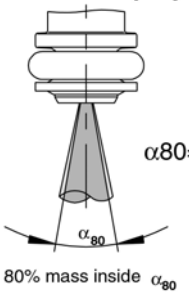
Part numbers	Design	Fuel type	Spray type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
0 280 155 737	Long	Gasoline	C	261,2 g/min	15°	12 Ω
B 280 431 126	Standard	Gasoline	C	261,2 g/min	25°	12 Ω
B 280 431 127	Standard	Gasoline	C	261,2 g/min	70°	12 Ω
0 280 156 012	Standard	Gasoline	C	310,1 g/min	20°	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
B 280 434 499-02	Standard	Gasoline	C	658 g/min	25°	12 Ω

Please request the availability before ordering. Alternatively you can order one of our EV 14 injection valves. Please refer to our data sheet of EV 14.

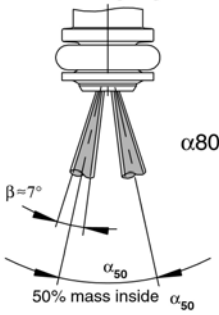
B: Pencil Beam



C: Conical Spray

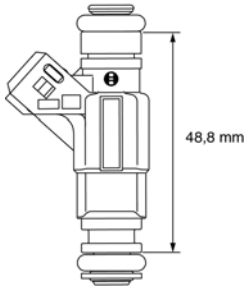


E: 2-Spray

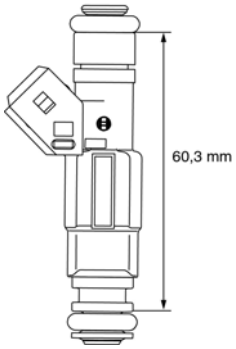


70% mass of single spray inside β

standard

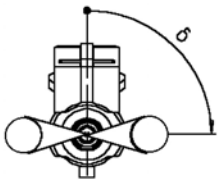


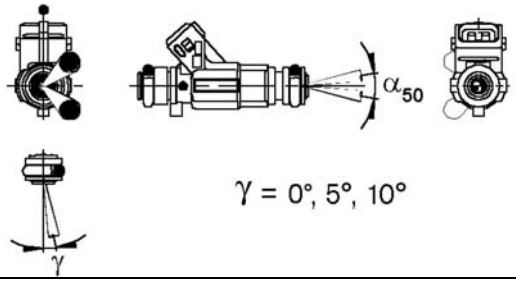
long



Angel between connection and spray level (δ = delta):
(only 2-spray preparation)

δ = 0°- 360° possible





γ = 0°, 5°, 10°

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

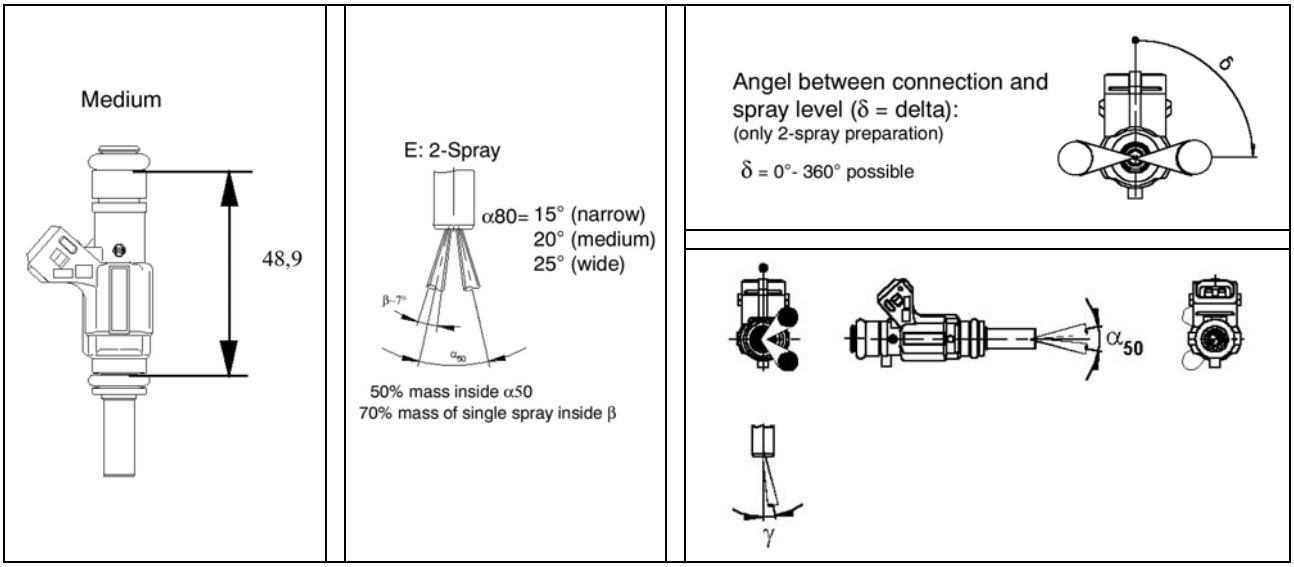
Electronic data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

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

Technical data

Part numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	α	Spray β	angle γ	δ	Impedance
0 280 155 897	Medium	E	217 g/min	15°	7°	10°	270°	12 Ω
0 280 155 892	Medium	E	269 g/min	15°	7°	10°	270°	12 Ω

Further special versions on request



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°

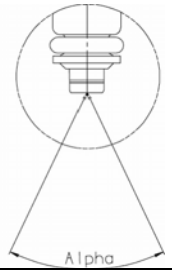
Electrical data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

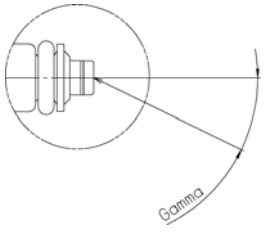
Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-40 ... 110 °C
Permissible fuel temperatures	≤ 70 °C
Installation lengths	48,65 mm
Climate proofness corresponds to saline DIN 50 021	fog test

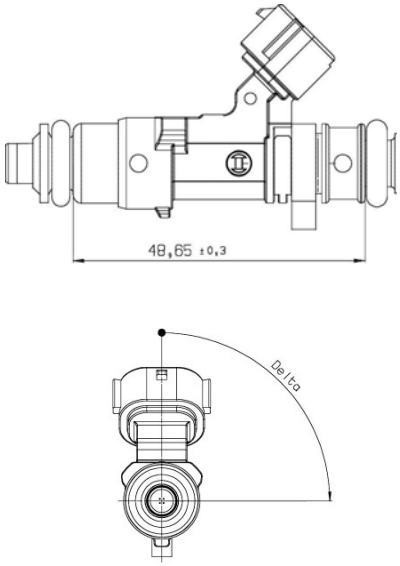
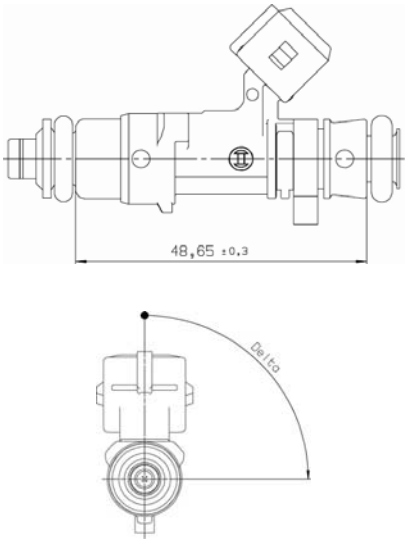
Technical data

Part numbers	Design	Connector	Type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
B 280 436 038-06	Standard	Sumitomo	C	387,3 g/min	25°	12 Ω
B 280 436 038-10	Standard	Jetronic	C	387,3 g/min	25°	12 Ω
B 280 436 038-05	Standard	Sumitomo	C	387,3 g/min	70°	12 Ω
B 280 436 038-09	Standard	Jetronic	C	387,3 g/min	70°	12 Ω
B 280 436 038-02	Standard	Sumitomo	C	503,5 g/min	25°	12 Ω
B 280 436 038-08	Standard	Jetronic	C	503,5 g/min	25°	12 Ω
B 280 436 038-01	Standard	Sumitomo	C	503,5 g/min	70°	12 Ω
B 280 436 038-07	Standard	Jetronic	C	503,5 g/min	70°	12 Ω

Further special versions on request.





Top view	Side View
 Connector Sumitomo	 Connector Jetronic

HP Injection Valves

HP Injection 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.

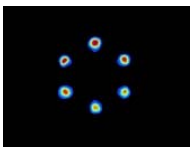
Mechanical data	
System pressure	max. 200 bar
Flow rate	e.g. 1350 g/min at 100 bar
Weight	78 g
Length	85 mm

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

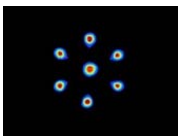
Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-30 ... 120 °C
Permissible fuel temperatures	< 80 °C

Part number	
HDEV 1.2	**on request**

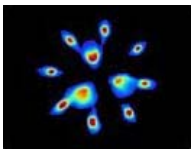
Examples of variations, further variations on request



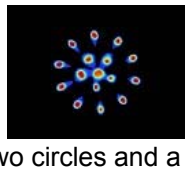
Jets on a circle



Jets on a circle and a middle jet

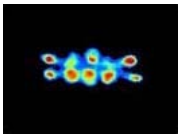


Jets on two circles



Jets on two circles and a middle jet

Jet configuration regarding the spark plug position



Flat jet configuration

HP Injection Valve Mini-HDEV 1.2

The Mini HDEV 1.2 can be used 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.

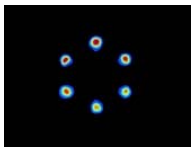
Mechanical data	
System pressure	max. 200 bar
Flow rate	e.g. 1350 g/min at 100 bar
Weight	48 g
Length	51 mm

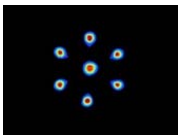
Electrical data	
Resistance	1,1 Ω
Voltage	14 V
Peak current	13,2 A

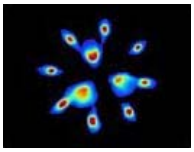
Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-30 ... 120 °C
Permissible fuel temperatures	< 80 °C

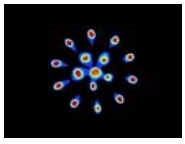
Part number	
Mini-HDEV 1.2	**on request**

Examples of variations, further variations on request

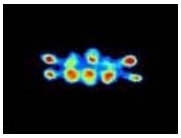

Jets on a circle


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

HP Injection Valve Mini-HDEV LV

The Mini-HDEV LV can be used 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.

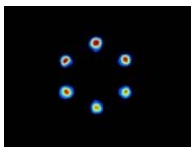
Mechanical data	
System pressure	max. 100 bar
Flow rate	e.g. 1350 g/min at 100 bar
Weight	48 g
Length	51 mm

Electrical data	
Resistance	< 0,2 Ω
Voltage	14 V
Peak current	26 A

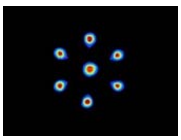
Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-30 ... 120 °C
Permissible fuel temperatures	< 80 °C

Part number	
HPI Valve Mini-HDEV LV	**on request**

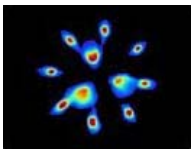
Examples of variations, further variations on request



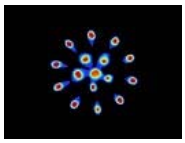
Jets on a circle



Jets on a circle and a middle jet

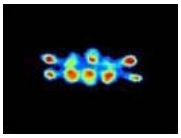


Jets on two circles



Jets on two circles and a middle jet

Jet configuration regarding the spark plug position



Flat jet configuration

HP Injection Valve Mini-HDEV LV 8A

The Mini-HDEV LV 8A is a high pressure injector, which is developed to be used in high performance gasoline engines with a manifold injection system.

The function of the Mini-HDEV LV 8A is both to meter out the fuel and to obtain a well-defined mixture of fuel and air. It is an inward opening solenoid injector which is optimised regarding very short opening and closing times, which ensures a very stable linearity at short injection times. It is suitable for a standard peak and hold power stage based on 12 V.

Its most remarkable features are the small size and weight. Another benefit of this injector is a high spray variability concerning spray angle and spray shape. Also the flow rate can be defined in a big range. An additional advantage of this injector is a high accuracy regarding leakage and linearity.

Application	
Application	335 ... 2000 g/min @ 100 bar
Fuel Input	Top-Feed Injector
Fuel	Gasoline
Fuel Input	Top-Feed Injector
Operating Pressure	100 bar
Operating Temperature Range	-20 °C ... 140 °C
Storage Temperature Range	-20 °C ... 70 °C

Mechanical Data	
Weight w/o cable	48 g
Diameter	20,7 mm
Length	51,6 mm
Max. Vibration	600 m/s² (guide value)

Electrical Data	
Peak Power Supply Us	12 V
Peak Current	7,5 A
Peak Sustain Time	800 µs
Hold Power Supply	12 V
Hold Current	3,5 A
Coil Resistance	270 mΩ

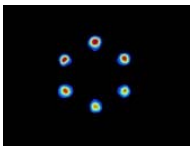
Connectors and Cables	
Cable Size	AWG18
Cable Length	< 100 cm
Sleeve	DR 25
Various military and automotive connectors on request.	

Application Hint
The injector can be supplied by a peak and hold power stage with maximum 8 A @ 12 V.
If your application conditions will not match the listed performance data, please ask for consultancy at Bosch Motorsport.
The injector can be cleaned (mechanically or chemically) if the tip will not be damaged.
Do not use supersonic cleaning.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

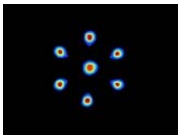
Characteristic	
Spray Type	Multihole
Number of Holes	6 ... 16
Spray Angle Overall	< 100°
Spray Angle Single Beam	8° ... 18°
Static Flow Tolerance	+/- 4 %
Dynamic Flow Tolerance	+/- 4 % @ ti = 1,5 ms
Leakage	< 2,0 mm³/min @ 23 °C
Fly Time (t_on)	220 µs
Closing Time (t_off)	250 µs
Droplet Size SMD	15 µm
Example Spray Pattern	
Static Flow	335 ... 2000 g/min @ 100 bar

Part Number	
Mini-HDEV LV 8A	on request

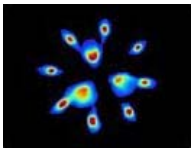
Examples of variations, further variations on request



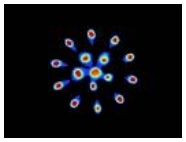
Jets on a circle



Jets on a circle and a middle jet

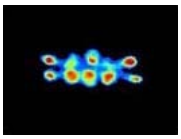


Jets on two circles



Jets on two circles and a middle jet

Jet configuration regarding the spark plug position



Flat jet configuration

Power Stage Units

HPI 1.16 LV / LVD

In combination with a Bosch Motorsport ECU the HPI 1.16 Box enables the running of high pressure injection valves. The injector current is realised by a switched current regulation with booster period, pick-up period, holding period and recharging period. This HPI Box can be used for example in Formula 1 race cars.

HPI 1.16 LV

Mechanical data	
Max. number of cylinders	10
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size without connectors	135 x 101 x 43 mm
Weight	560 g
Communication interfaces	1 CAN, 1 K-Line

Conditions for use	
Housing temperature	-25 ... 85 °C
Operating voltage	8 ... 18 V
Nominal voltage	14,0 V
Max. vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*

Electrical data	
Optimised for Bosch injection valves Mini-HDEV LV	
Max. rpm	20.000
Internal voltage regulator	-

Part number	
HPI 1.16 LV	**F 01T A20 017**

HPI 1.16 LVD

In addition the HPI 1.16 LVD has an internal voltage regulator.

Mechanical data	
Max. number of cylinders	10
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size without connectors	135 x 101 x 43 mm
Weight	710 g
Communication interfaces	1 CAN, 1 K-Line

Conditions for use	
Housing temperature	-25 ... 70 °C
Operating voltage	8 ... 18 V
Nominal voltage	14,0 V
Max. vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*

Electrical data	
Optimised for Bosch injection valves Mini-HDEV LV	
Max. rpm	20.000
Internal voltage regulator	14 ... 17 V

Part number	
HPI 1.16 LVD	**F 01T A20 016**

HPI 1.16 HV / HVD

In combination with a Bosch Motorsport ECU the HPI 1.16 Box enables the running of high pressure injection valves. The injector current is realised by a switched current regulation with booster period, pick-up period, holding period and recharging period. This HPI Box can be used for example in racing series like DTM, 24 h Le Mans, etc.

HPI 1.16 HV

Mechanical data	
Max. number of cylinders	10
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size without connectors	135 x 101 x 43 mm
Weight	575 g
Communication interfaces	1 CAN, 1 K-Line

Conditions for use	
Housing temperature	-25 ... 85 °C
Operating voltage	8 ... 18 V
Nominal voltage	14,0 V
Max. vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*

Electrical data	
Optimised for Bosch injection valves	Mini-HDEV 1.2
Max. rpm	12.500
Internal voltage regulator	-

Part number	
HPI 1.16 HV	**F 01T A20 019**

HPI 1.16 HVD

In addition the HPI 1.16 HVD has an internal voltage regulator.

Mechanical data	
Max. number of cylinders	10
Dust and waterproof aluminium housing	
Filtered connectors in military technology with high pin density	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size without connectors	135 x 101 x 43 mm
Weight	725 g
Communication interfaces	1 CAN, 1 K-Line

Conditions for use	
Housing temperature	-25 ... 70 °C
Operating voltage	8 ... 18 V
Nominal voltage	14,0 V
Max. vibration	*Vibration profile 1 (see Appendix or www.bosch-motorsport.com)*

Electrical data	
Optimised for Bosch injection valves	Mini-HDEV 1.2
Max. rpm	12.500
Internal voltage regulator	65 ... 90 V

Part number	
HPI 1.16 HVD	**F 01T A20 018**

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 kΩ
Spark energy	33 mJ
U prim. (clamp.)	500 V
Voltage gradient	3,3 kV/µs

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

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

Part number
B 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.

Electrical 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 kΩ
Spark energy	45 ... 55 mJ
U prim. (clamp.)	260 V
Voltage gradient	1,6 kV/µs

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

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

Connector	
Cable harness connector	**D 261 205 334**

Part 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 Coil PT

This single fire coil PT is a low cost concept for cylinder head installation with an integrated transistor for use in combination with ECUs without internal ignition power stage.

During the current feed on the primary side of the coil, energy is stored in the magnetic circuit. A quick turn off of the primary supply occurs a reloading on the secondary side. There the stored energy at the spark plug is reduced in the form of a high voltage spark. The spark ignites the fuel-air-ratio.

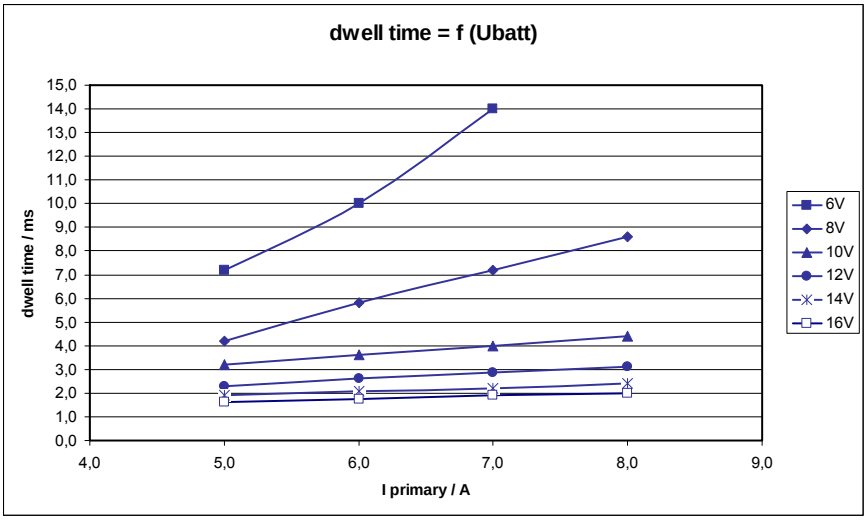
Application	
Spark Energy	≤ 38 mJ
Primary Current	≤ 8,0 A
Operating Temperature Range Outer Core	-20 ... 140 °C
Storage Temperature Range	-40 ... 100 °C
Max Vibration	400 m/s² @ 5 ... 2500 Hz

Mechanical data	
Weight w/o cable	194 g
Fixation	screw on

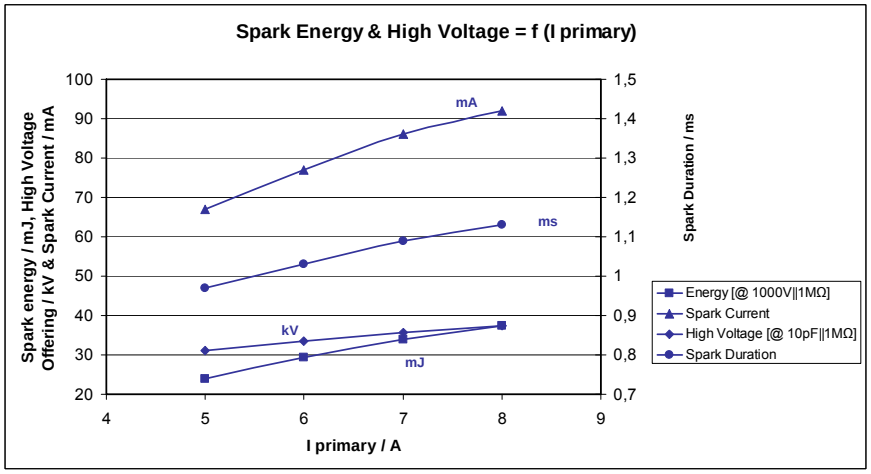
Electrical data	
Primary Resistance with/without Cable	incapable of measurement
Secondary Resistance without Noise Suppression	incapable of measurement
Voltage Supply	6 ... 16,5 V
Dwell Time	see Primary Characteristic Diagram
High Voltage	≥ 34 kV [@8 pF||1MOhm]
High Voltage Rise Time	≤ 2,8 kV / µs
Spark Current	≤ 78 mA
Spark Duration	see Secondary Characteristic Diagram
Noise Suppression	1 kOhm integrated
Suppressure- / EFU-Diode	Yes
Integrated Power Stage	Yes
Ion-Current-Signal	No

Characteristic	
Measure with Power Stage	BIP 373

Primary Characteristic Diagram						
I pri [A]	U batt [V]					
	6 V	8 V	10 V	12 V	14 V	16 V
5,0	7,2	4,2	3,2	2,3	1,9	1,6
6,0	10,0	5,8	3,6	2,6	2,1	1,8
7,0	14,0	7,2	4,0	2,9	2,2	1,9
8,0	-	8,6	4,4	3,1	2,4	2,0



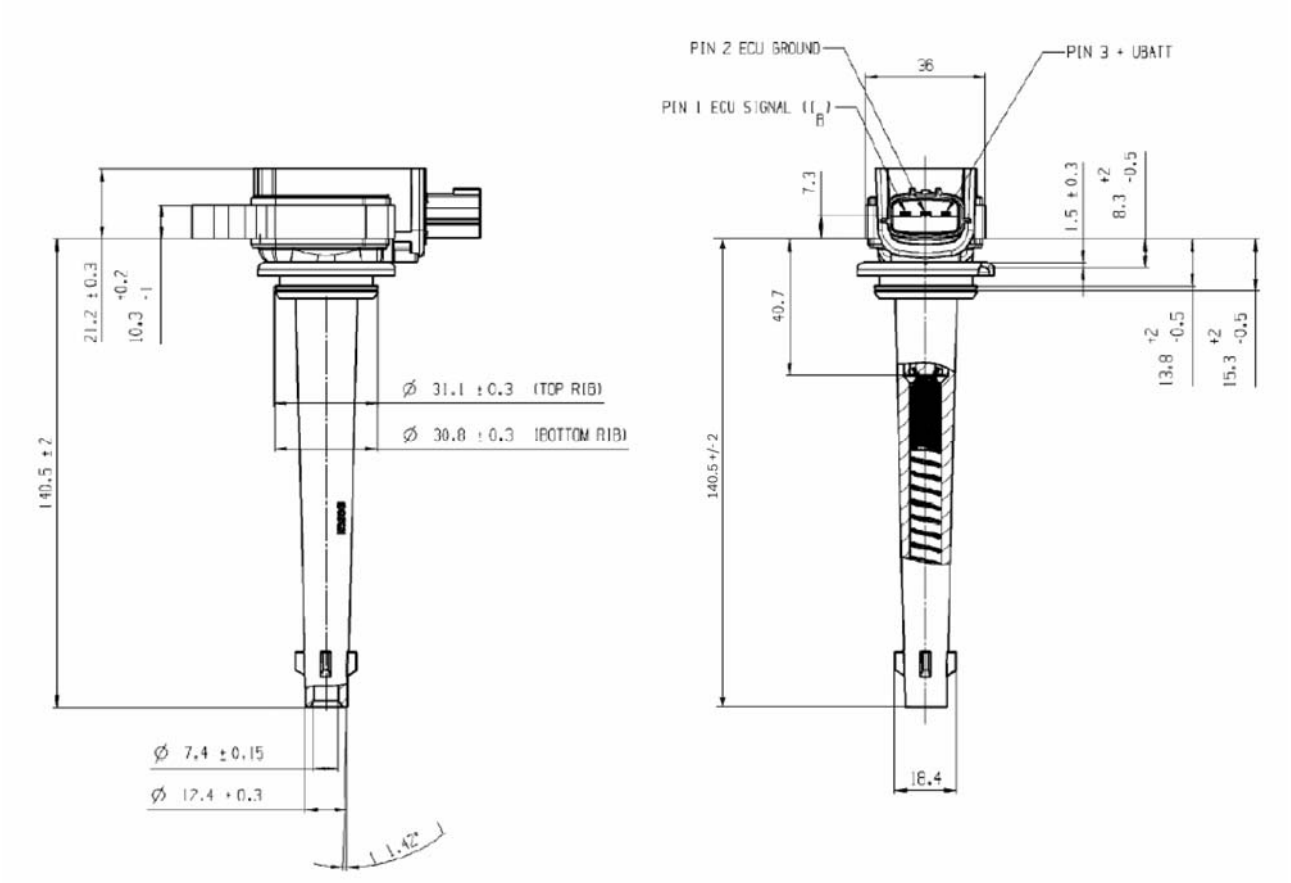
Secondary Characteristic Diagram				
	I pri [A]			
	5 A	6 A	7 A	8 A
Spark Energy [mJ]	24	29,3	34	37,3
Spark Duration [ms]	0,97	1,03	1,09	1,13
Spark Current [mA]	67	77	86	92
High Voltage [kV]	31	33,5	35,7	37,4



Connections and Cable	
Pin 1	Control [ECU]
Pin 2	Ground [ECU]
Pin 3	Ubatt [Power Supply]
Various military and automotive connectors on request.	
Please specify the requested cable length with your order.	

Application Hint
During the mounting in the spark plug shaft please pay attention that the clamping and contacting is completed exactly to realize a safe connection between coil and spark plug.
This coil is with a integrated Power Stage (BIP 373). Use only with engine control units having an output current driver about 10 mA.
Please regard the specified limit values.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Design



Part number	
Single Fire Coil PT	**0 221 604 014**

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.
Electric data and dimensions can be individually adapted to customer's requirements.
This coil is part of the higher performance segment.

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

Electrical 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

Part number	
Single Fire Coil S	**B 221 141 834_02**

Single Fire Coil S16

This single fire coil was exclusively developed for the use in Formula 1 high performance engines. It is designed for the direct mounting on the spark plug.

During the current feed on the primary side of the coil, energy is stored in the magnetic circuit. A quick turn off of the primary supply occurs a reloading on the secondary side. There the stored energy at the spark plug is reduced in the form of a high voltage spark. The spark ignites the fuel-air ratio.

The main feature and benefit of this high performance coil is his robustness in hard racing applications, the high energy efficiency and the optional ion current measure capability. The design of the upper (cable side) and the lower part (spark plug side) can be designed according to customer requirements.

Application	
Spark Energy	≤ 40 mJ
Primary Current	≤ 30 A
Operating Temperature Range Outer Core	0 ... 160 °C
Storage Temperature Range	-40 ... 100 °C
Max. Vibration	800 m/s²

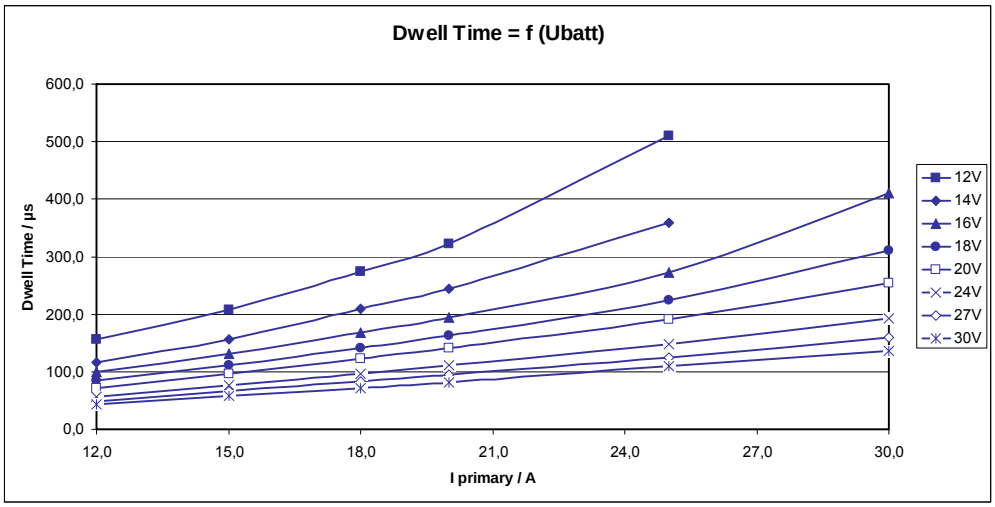
Mechanical Data	
Diameter	16 mm
Length L	min. 90 mm
Weight w/o Cable	approx. 48 g
Fixation	Pluggable / Pressed

Electrical Data	
Primary Resistance	approx. 230 mΩ
Secondary Resistance without Noise Suppression	incapable in measurement
Voltage Supply	12 ... 30 V
Dwell Time	200 ... 400 µs (14 V)
High Voltage	≤ 30 kV [@1MΩ||8pF]
High Voltage Rise Time	8 ... 12 kV/µs
Spark Current	250 ... 600 mA
Spark Duration	80 ... 300 µs [@1kV||1MΩ]
Noise Suppression	Yes
Suppressure-/EFU-Diode	Yes
Integrated Power Stage	No
Ion Current Signal	Possible

Characteristic	
Measure with Power Stage	IGBT IRF_S Uce=600 V

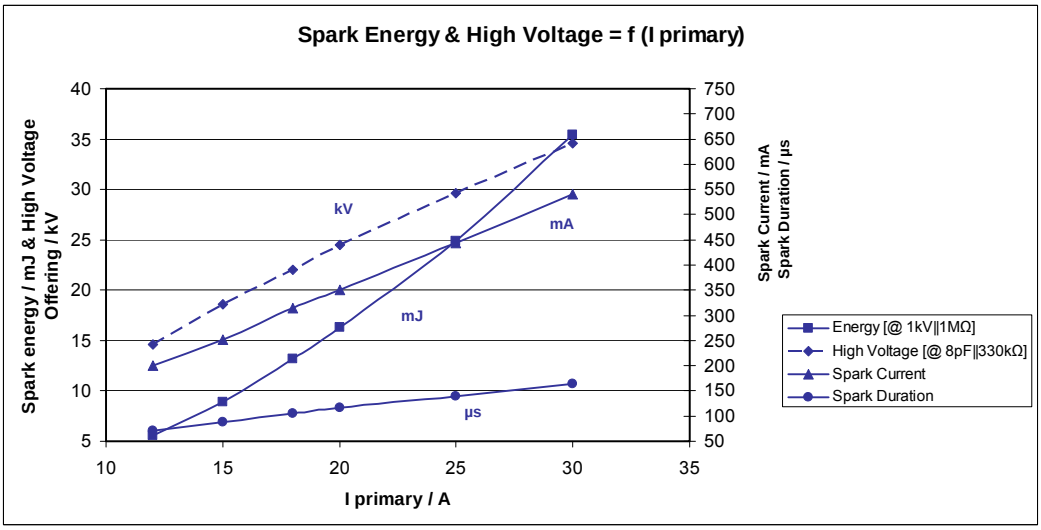
Characteristic Dwell Time

I pri [A]	U batt [V]							
	12 V	14 V	16 V	18 V	20 V	24 V	27 V	30 V
12,0	155,5	117,0	99,0	84,0	72,0	57,0	49,0	43,0
15,0	208,5	157,0	132,0	112,0	97,0	77,0	66,0	58,0
18,0	274,0	209,0	168,0	142,0	123,0	97,0	83,0	72,0
20,0	322,0	244,0	194,0	163,0	141,0	111,0	95,0	82,0
25,0	511,0	359,0	273,0	225,0	191,0	148,0	125,0	109,0
30,0	-	-	410,0	310,0	255,0	192,0	160,0	137,0



Characteristic Output

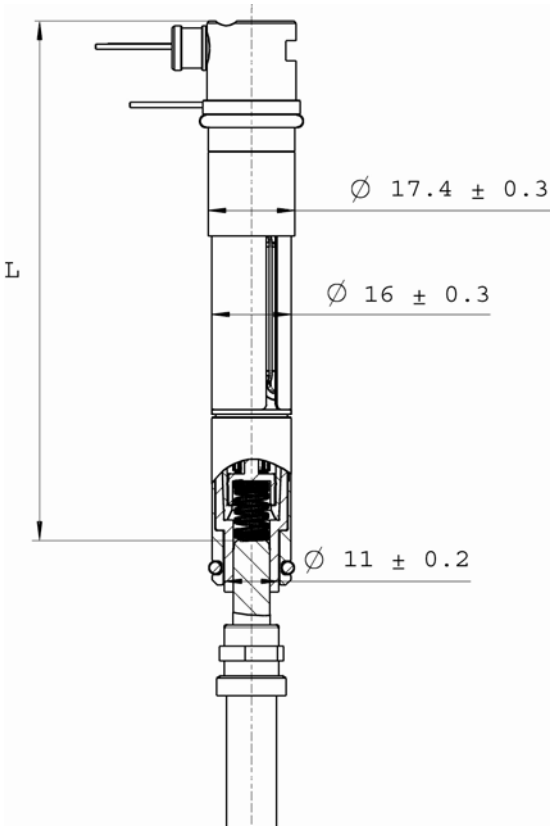
	I primary [A]					
	12 A	15 A	18 A	20 A	25 A	30 A
Spark Energy [mJ]	5,6	8,9	13,2	16,3	24,9	35,4
Spark Duration [µs]	70	88,4	105	116	140	164
Spark Current [mA]	200	252	314	350	444	540
High Voltage [kV]	14,6	18,6	22	24,5	29,6	34,6



Connectors and Cables	
Cable Size	AWG 18
Cable Length	< 1000 mm
Various military and automotive connectors on request.	

Part Number	
Single Fire Coil S16	on request

Application Hint
During the mounting in the spark plug shaft please pay attention that the clamping and contacting is completed exactly to realize a safe connection between coil and spark plug.
The coil is only for usage with engine control units having an integrated output stage, i. e. IGBT IRF5036S.
Please regard the specified limit values.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).



Double Fire Coil 2x2

2 x 2 Sparks

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

During the current feed on the primary side of the coil, energy is stored in the magnetic circuit. A quick turn off of the primary supply occurs a reloading on the secondary side. There the stored energy at the spark plug is reduced in the form of a high voltage spark. The spark ignites the fuel-air-ratio.

The advantage of this coil is that the ECU needs only two internal power stage for supplying a 4-cylinder engine.

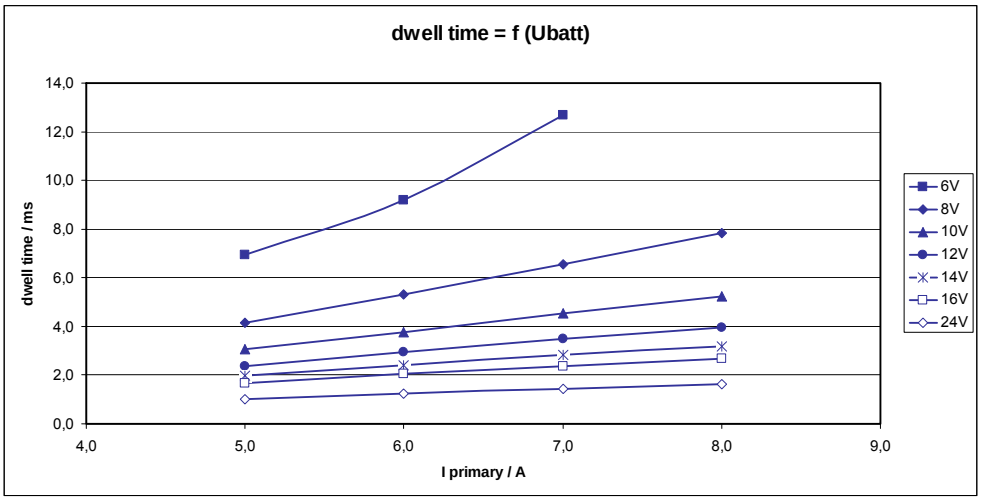
Application	
Spark Energy	≤ 100 mJ
Primary Current	≤ 8 A
Operating Temperature Range Outer Core	-20 ... 120 °C
Storage Temperature Range	-40 ... 100 °C
Max Vibration	200 m/s² [@ 5 ... 250 Hz]

Mechanical Data	
Weight w/o Cable	920 g
Fixation	screw on

Electrical Data	
Primary Resistance with/without Cable	500 mΩ
Secondary Resistance without Noise Suppression	13,3 kΩ
Voltage Supply	6 ... 24 V
High Voltage	≥ 33 kV [@ 1 MΩ||10 pF]
High Voltage Rise Time	≤ 1,1 kV / µs
Spark Current	≤ 74 mA
Noise Suppression	No
Suppressure- / EFU-Diode	No
Integrated Power Stage	No
Ion-Current-Signal	No

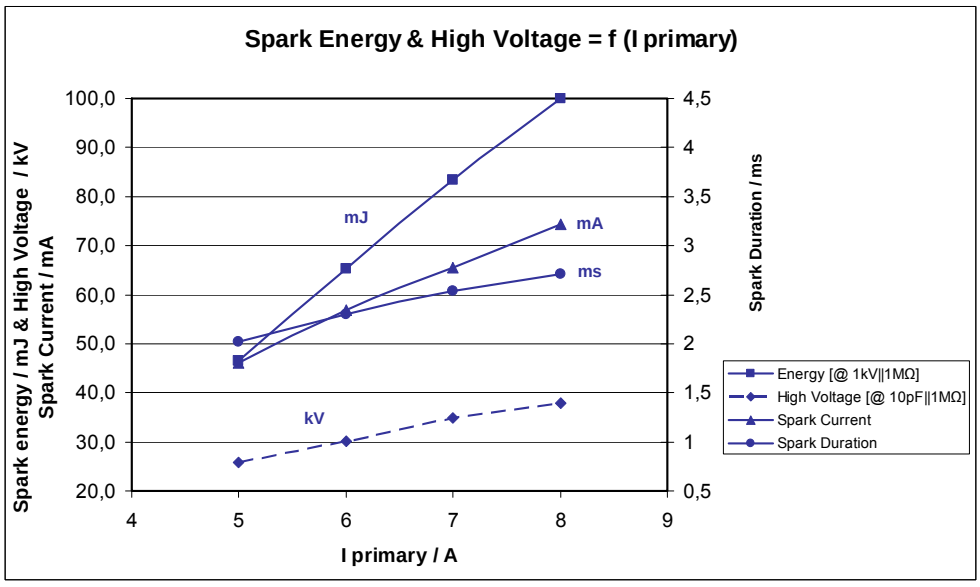
Primary Characteristic Diagram

I pri [A]	U batt						
	6 V	8 V	10 V	12 V	14 V	16 V	24 V
5,0	7,0	4,2	3,1	2,4	2,0	1,7	1,0
6,0	9,2	5,3	3,8	2,9	2,4	2,0	1,2
7,0	12,7	6,6	4,5	3,5	2,8	2,4	1,5
8,0	-	7,9	5,3	4,0	3,2	2,7	1,6



Secondary Characteristic Diagram

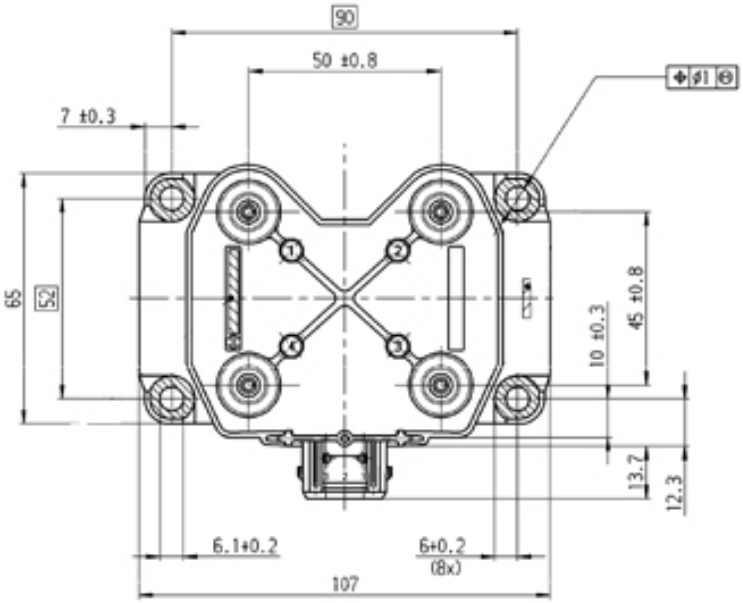
	I primary			
	5 A	6 A	7 A	8 A
Spark Energy [mJ]	46,5	65,3	83,3	99,9
Spark Duration [ms]	2,02	2,3	2,54	2,71
Spark Current [mA]	46	56,8	65,6	74,4
High Voltage [kV]	25,8	30,2	34,8	37,8

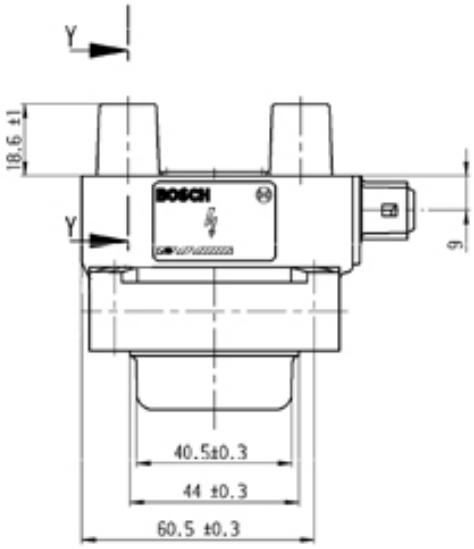


Connectors and Cables	
Pin 1	ZS 2 [Kl. 1]
Pin 2	U_{batt} [Kl. 15]
Pin 3	ZS 1 [Kl. 1]
Various military and automotive connectors on request.	
Please specify the requested cable length with your order.	

Application Hint
The coil can screw on the engine.
Ignition cables are needed to connect the coil with the spark plug.
The ECU must have two internal power stages.
Please regard the specified limit values.
Please find further application hints in the offer drawing (http://www.bosch-motorsport.com).

Part number	
Double Fire Coil 2x2	**0 221 503 407**





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

Primary connector	
Offer drawing	**1 284 485 118**

Electrical 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

Part 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

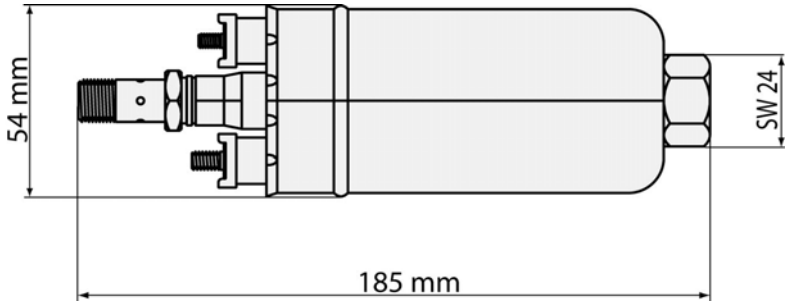
Fuel delivery: >100 l/h, 5 bar

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

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

Accessories
Primary connector

Part number
Y 580 701 456



Fuel Pump FP 165

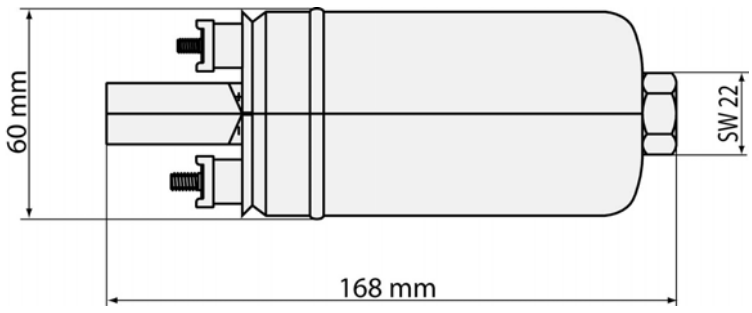
Fuel delivery: >165 l/h, 5 bar

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

Connections	
Intake side	M14 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M4 / -: M5

Accessories
Primary connector

Part number	
	0 580 254 979
Offer drawing	**A 580 152 325**



Fuel Pump FP 200

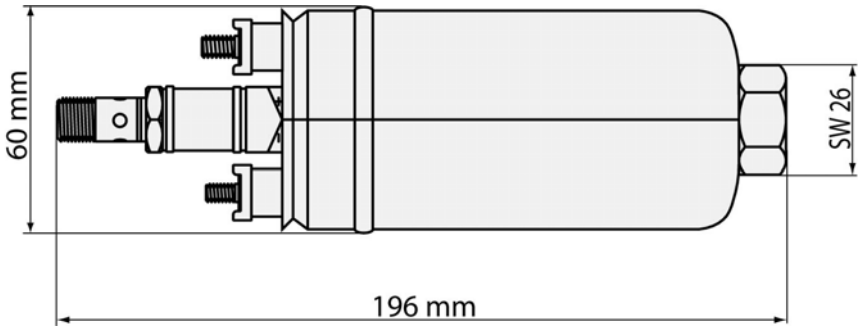
Fuel delivery: >200 l/h, 5/8 bar after a break-in period of 20 h

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

Part 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



Diesel Fuel Pump DFP 300

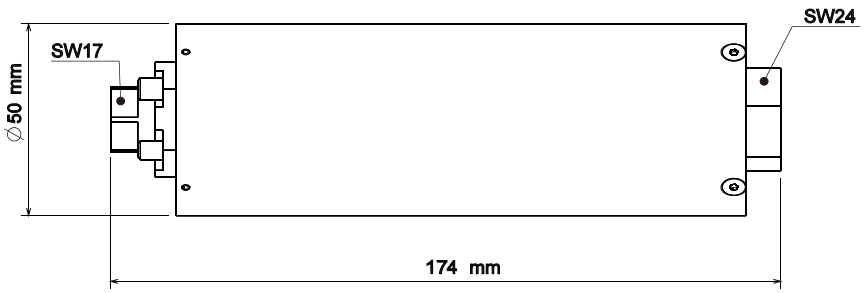
Fuel delivery: >300 l/h, 5 bar relative

This electrical diesel fuel pump without non-ferrous metal is especially designed for diesel applications. A modified rotor provides higher fuel delivery than the series version. Its tight housing with screwed connectors fits to any intank or inline fuel circuit. This pump results in an excellent weight-to-power ratio.

Description	
Fuel delivery at fuel temp. < 90 °C	>300 l/h
Fuel delivery increase after break-in period of 20 h	20 l/h
Supply voltage	13,5 V
Current consumption	17,2 A
Weight	700 g
Non return valve	internal
Housing version	inline
Allowed diesel spec.	EN590

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

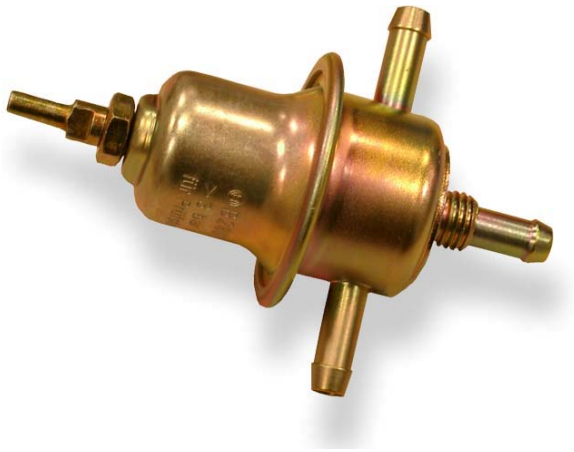
Part numbers	
DFP 300l/h	**B 261 205 366**



Fuel Pressure Regulators

Fuel Pressure Regulator 05-40 A

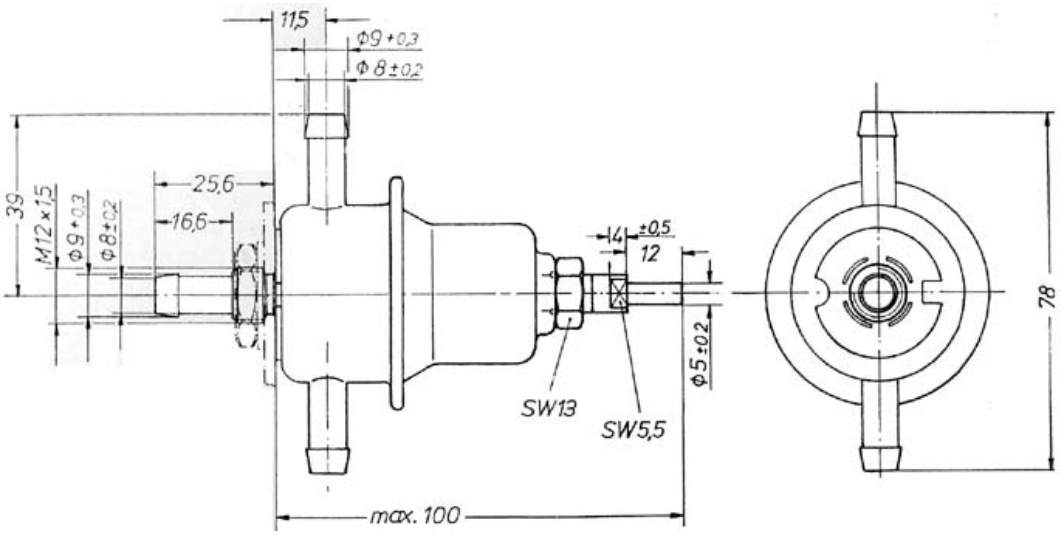
Pressure range: 0,5 ... 4 bar



Mechanical data	
Supply	8 mm, tube connector
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

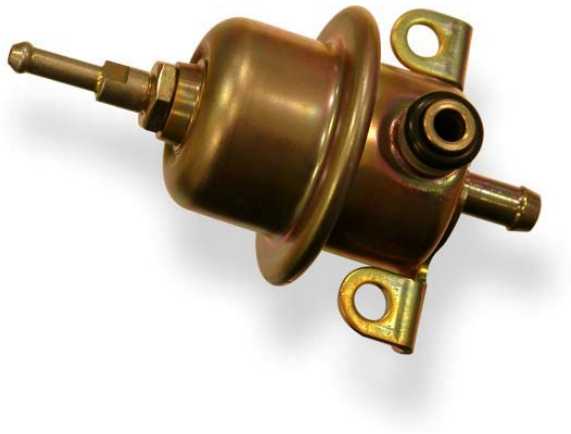
Part number	
	B 280 500 139
Offer drawing	**A 280 500 104**

Description
Sheet steel housing with manifold connection



Fuel Pressure Regulator 14-50

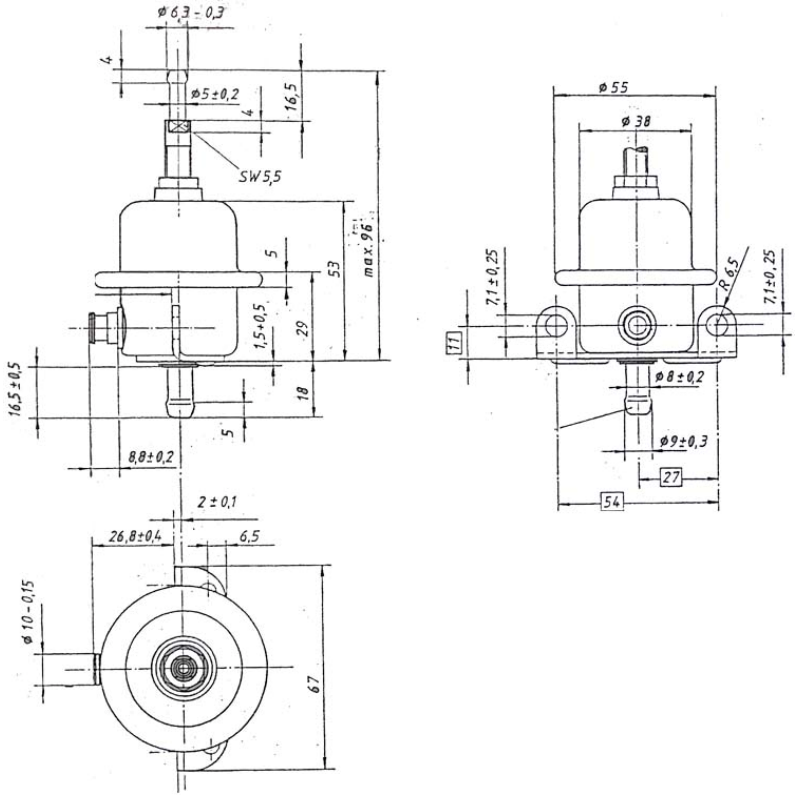
Pressure range: 1,4 ... 5 bar



Mechanical data	
Supply	10 mm, O-ring
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

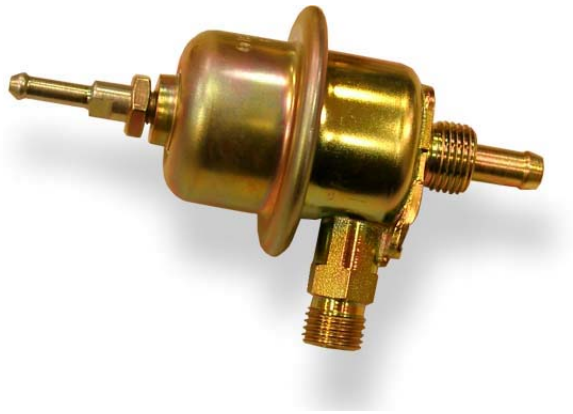
Part number	
1,4 ... 5 bar	**B 280 500 701**

Description
Sheet steel housing with manifold connection



Fuel Pressure Regulator 15-50

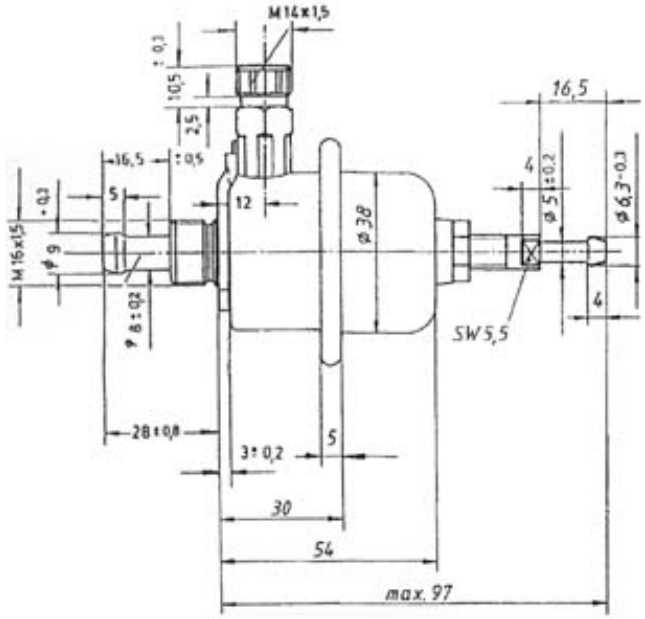
Pressure range: 1,5 ... 5 bar

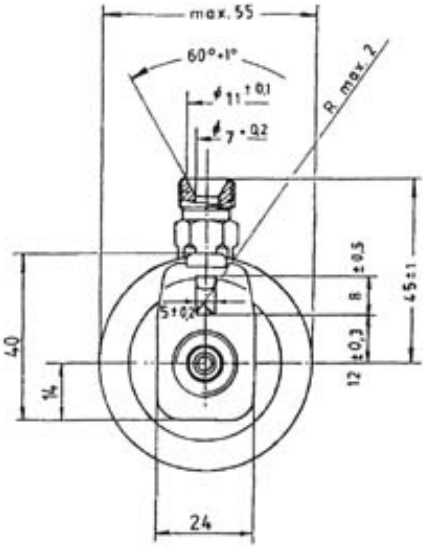


Mechanical data	
Supply	8 mm, O-ring
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

Part number	
	B 280 500 743
Offer drawing	**A 280 500 743**

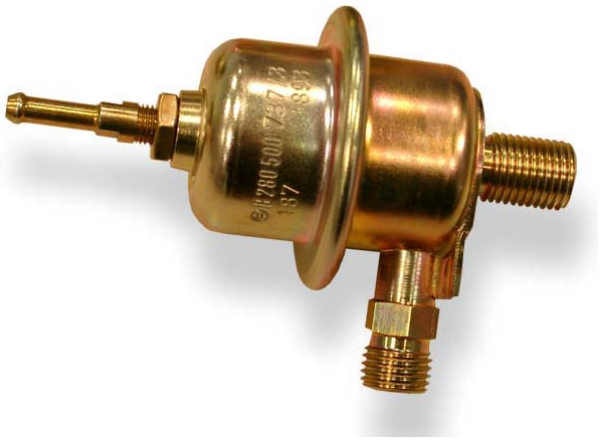
Description
Sheet steel housing with manifold connection





Fuel Pressure Regulator 19-50

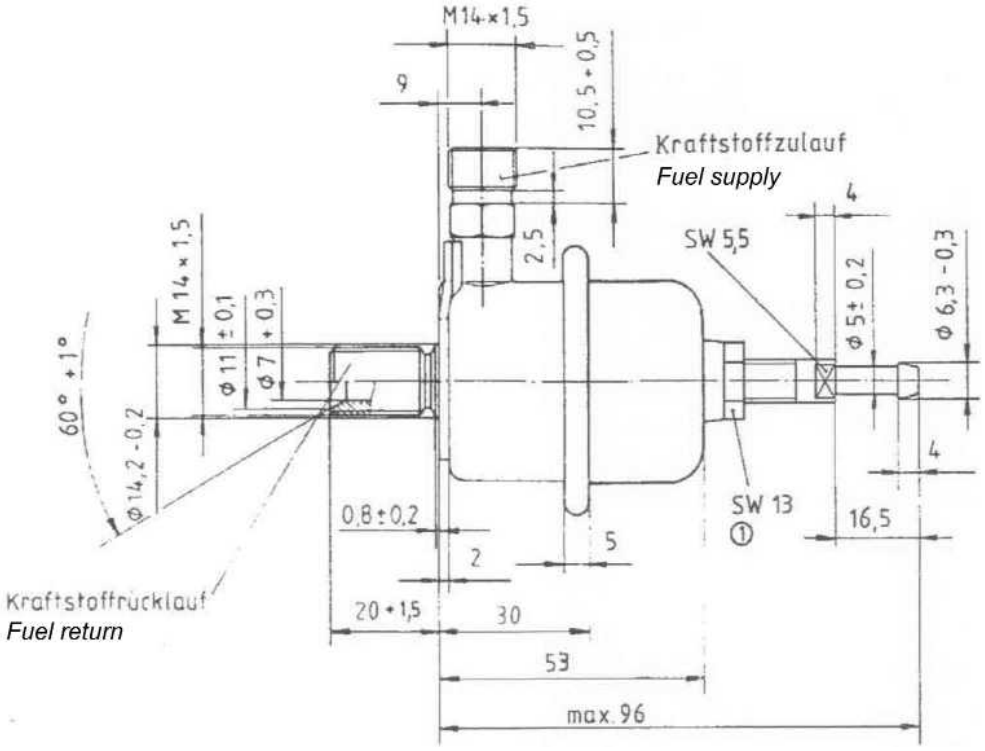
Pressure range: 1,9 ... 5 bar



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

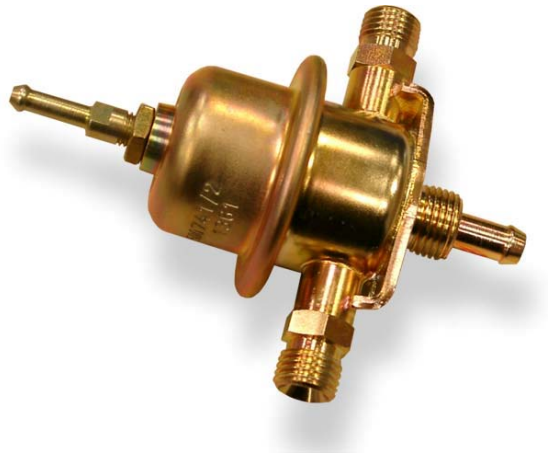
Part number	
	B 280 500 737
Offer drawing	**A 280 500 662**

Description
Sheet steel housing with manifold connection



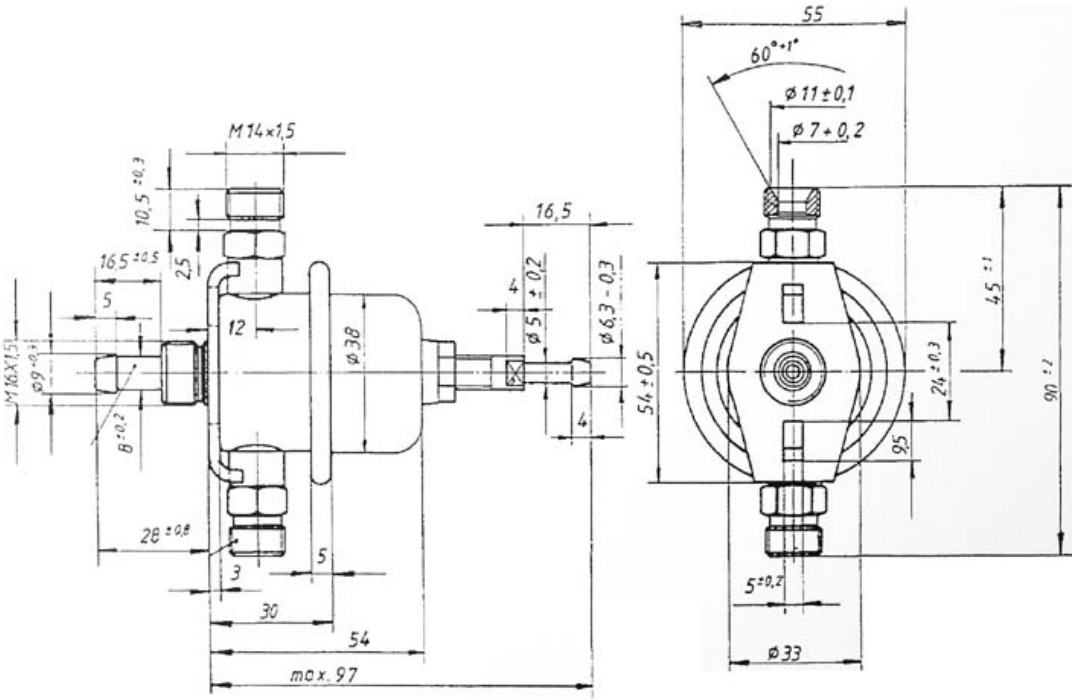
Fuel Pressure Regulator 20x120

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



Mechanical data	
Supply	2 x M14x1,5
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h
Housing	sheet steel

Part numbers	
2 ... 5 bar	**B 280 500 741**
3 ... 6 bar	**B 280 500 714**
3 ... 12 bar (without manifold connection)	**B 280 500 742-02**



Fuel Pressure Regulators Mini/Mini M

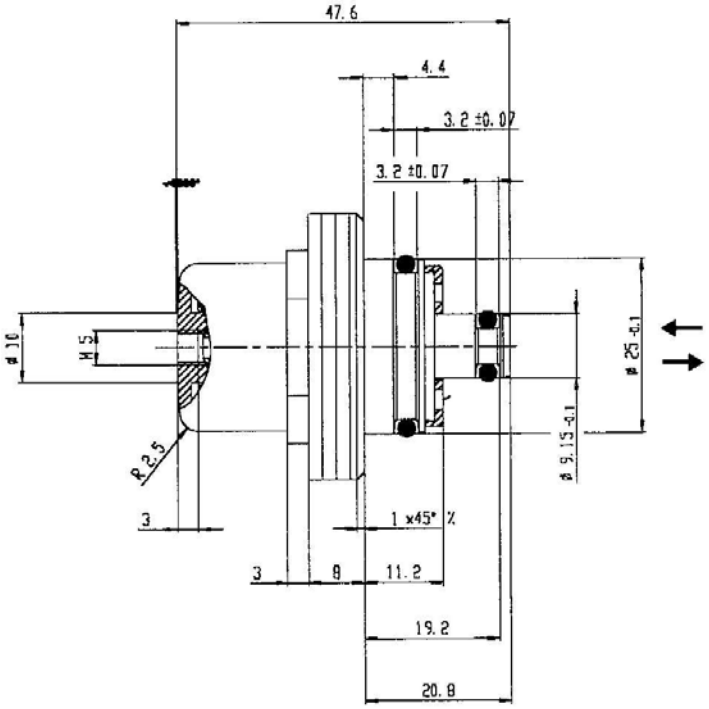
Pressure range: 6/8/10 bar

We offer this mini pressure regulator in two fuel-specific versions: the standard version for use with petrol and a M-version for use with methanol.

Mechanical data	
Supply	25 mm, O-ring
Reflow	9,15 mm, O-ring
Reflow quantity	min. 30 l/h, max. 400 l/h

Description
Light weight aluminium housing
No manifold connection

Part numbers	
Standard version	
6 bar	**B 261 208 106**
8 bar	**B 261 208 108**
10 bar	**B 261 208 109**
Methanol version	
6 bar	**B 261 208 121**
8 bar	**B 261 208 122**
10 bar	**B 261 208 123**



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

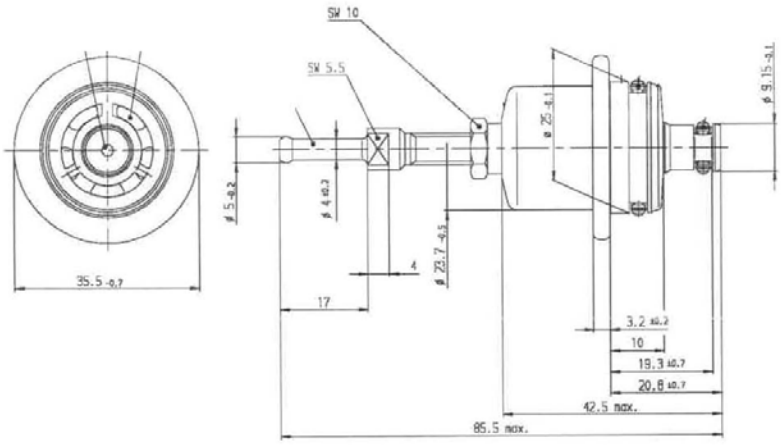
Pressure ranges: 2,2 ... 3,5 bar/3,5 ... 5 bar

Mechanical data	
Supply	24,6 mm, O-ring
Reflow	9,15 mm, O-ring
Reflow quantity	min. 15 l/h, max. 220 l/h
Weight	58 g

Description
Light weight aluminium housing
No manifold connection

Accessories	
Pre-filter	**1 287 431 008**

Part 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 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

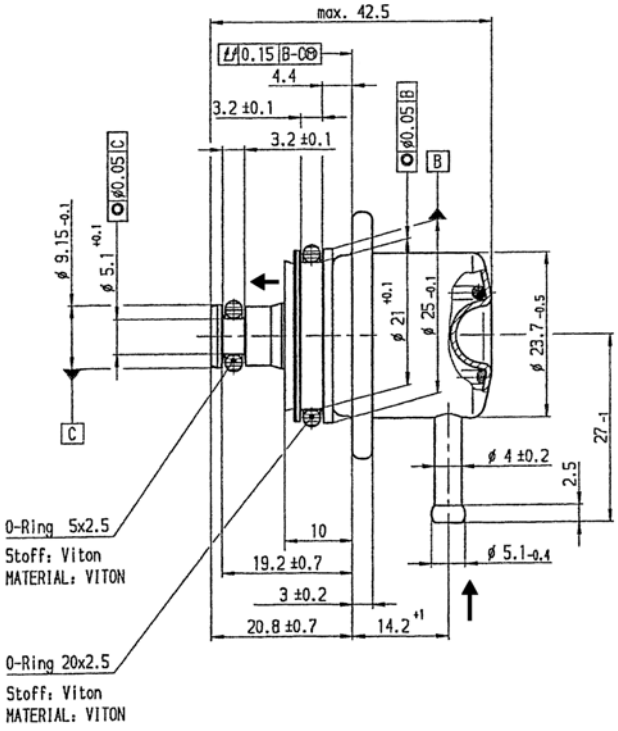
Fuel Pressure Regulator Mini 38

Pressure range: 3,8 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
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/s²
Weight	45 g

Part number	
	0 280 160 616
Offer drawing	**A 280 160 616**



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

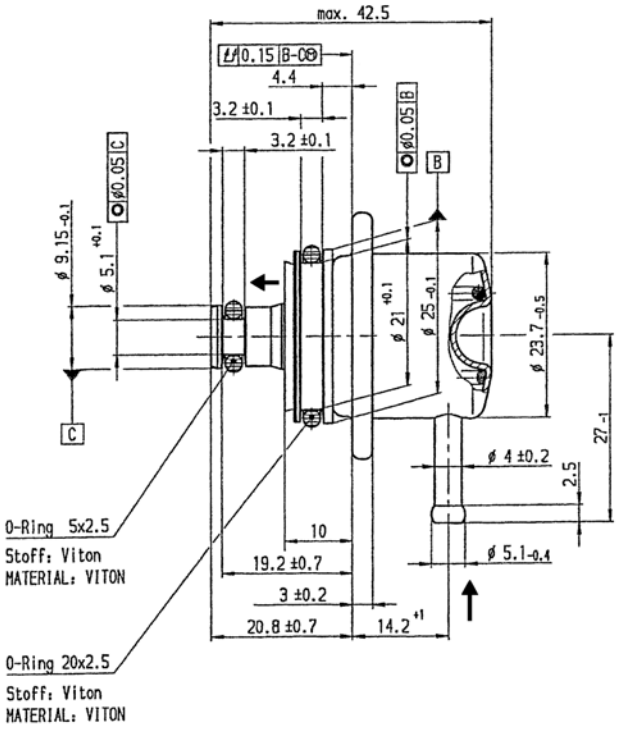
Fuel Pressure Regulator Mini 50

Pressure range: 5,0 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
Set pressure	500 kPa
Set pressure accuracy	2 %
Linearity	1 %
External leak	no fuel leakage at 500 kPa
Bust pressure	> 1500 kPa

Description
Sheet steel housing with manifold connection

Part 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

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
Housing	Aluminium
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 A

Part number	
HPI Control Valve DSV	**B 261 209 568**

Starters

Starter 1,4 kW

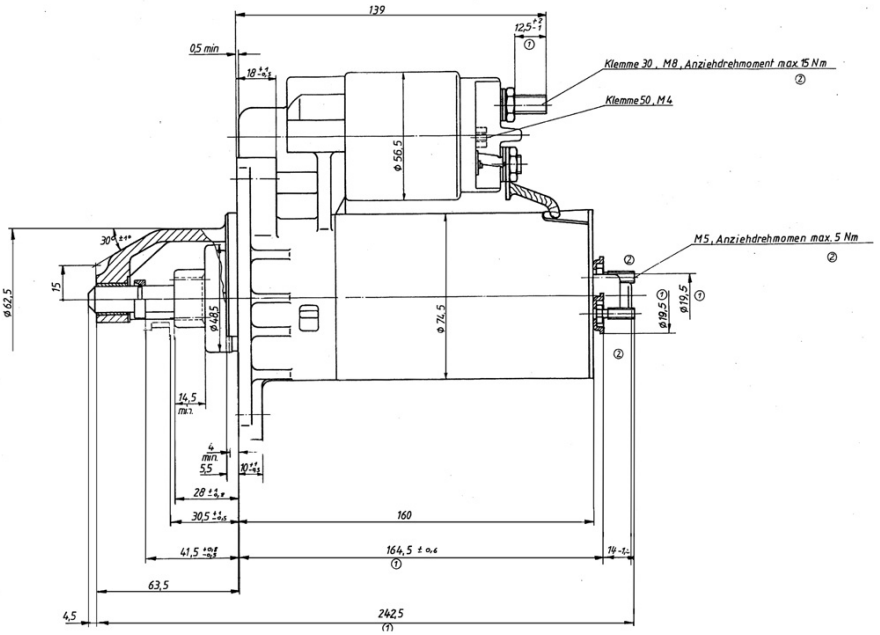
This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter in clockwise version.

Mechanical data	
Weight	3200 g
Revolutions	3600 x 1/min
Modul	2/11

Conditions for use	
Max. temperature	150°C
Vibration	high protection

Electrical data	
Performance	1,4 kW

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



Further special versions on request.

Starter 1,7 kW

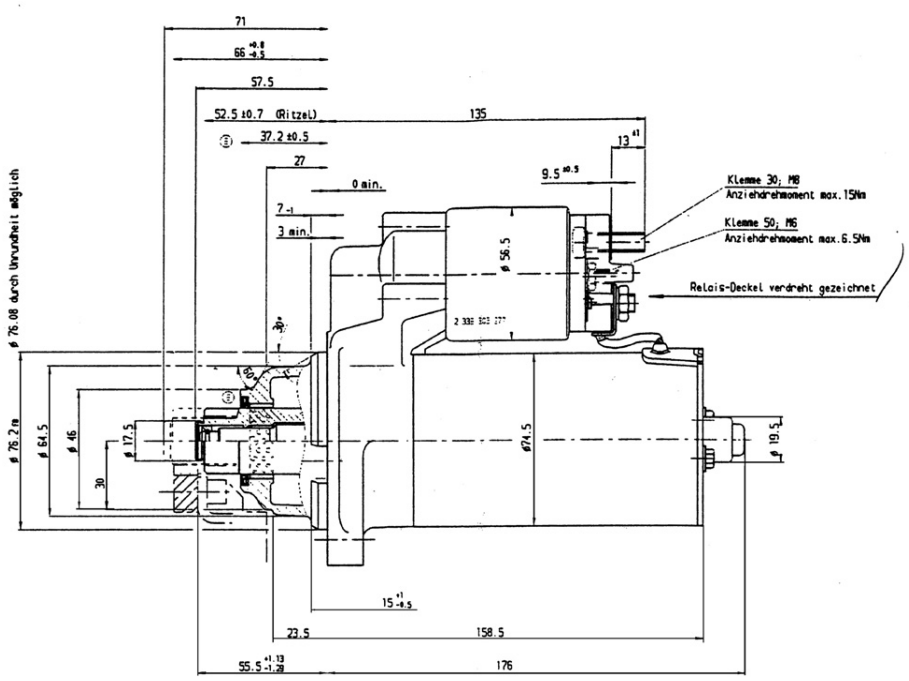
This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter, we offer it in clockwise and anticlockwise version on request.

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

Electrical data	
Performance	1,7 kW

Part number	
	B 261 208 186
Offer drawing	**A 261 208 186**

Conditions for use	
Max. temperature	150°C
Vibration	high protection



Further special versions on request.

Starter 2,0 kW

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

Mechanical data	
Weight	4050 g
Revolutions	4700 x 1/min
Transmission ratio	i 5,0
Modul	2/11

Conditions for use	
Max. temperature	150 °C
Vibration	high protection

Electrical data	
Performance	2,0 kW

Part number	
Starter 2,0 kW	**B 001 116 174**

Alternators

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	

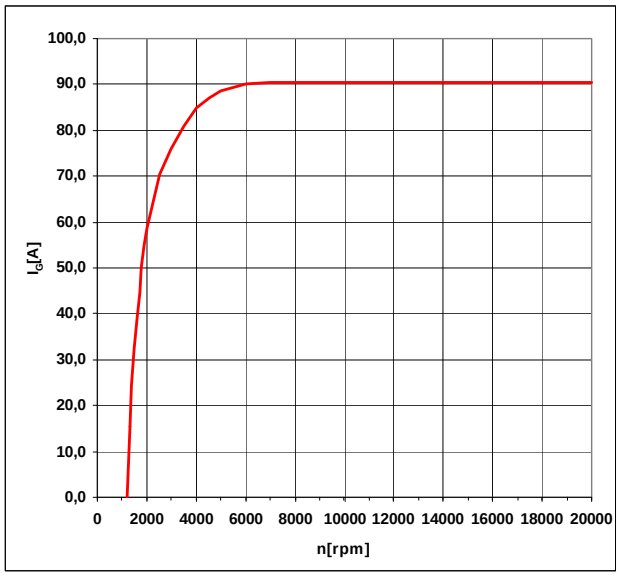
Electric connections	
Battery B+	M8
Control lamp D+	flat-pin connector, see drawing

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

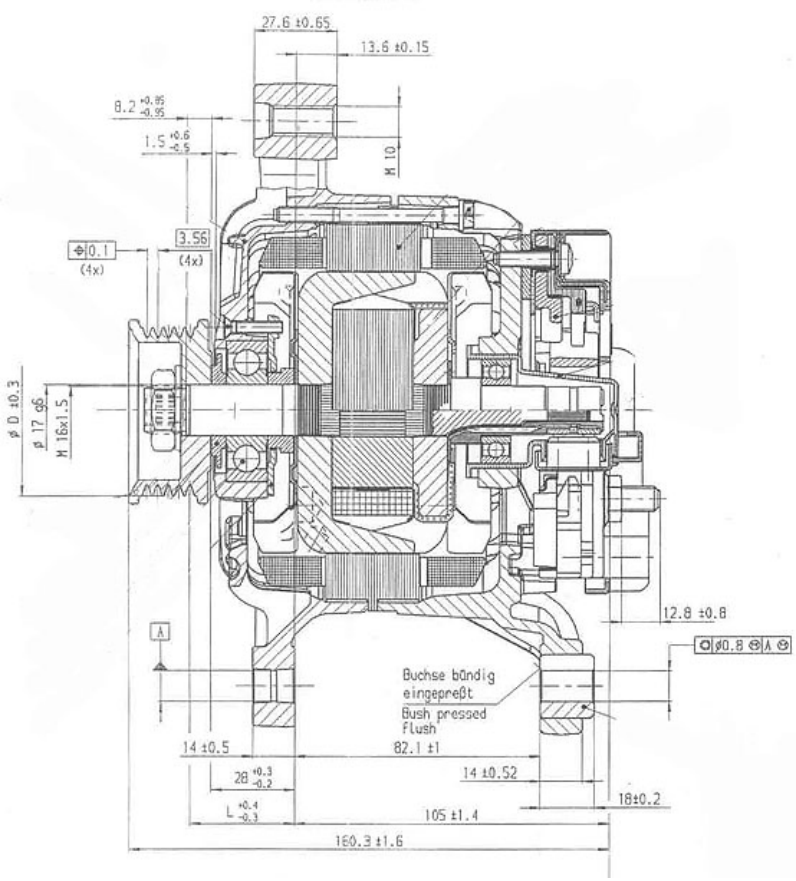
Part numbers	
Alternator 90 A	**0 124 B00 160**

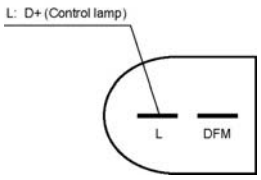
Characteristic

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



Design





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

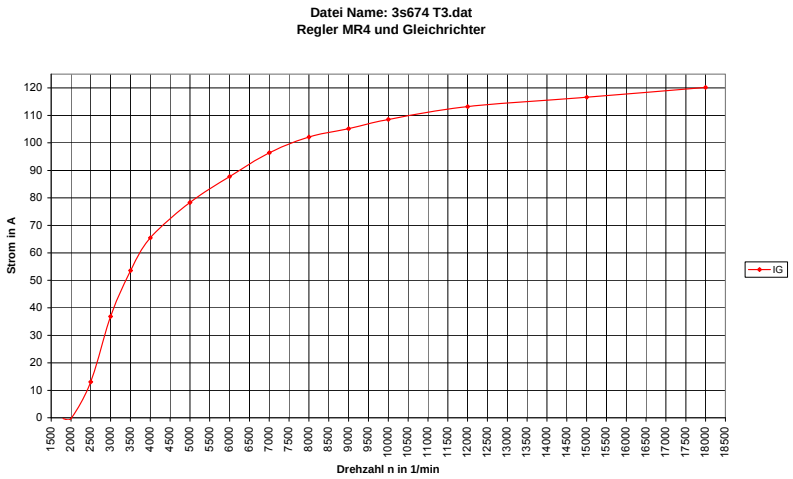
Conditions for use	
Temperature range	-30 ... 90 °C
Vibration	high protection
Installation without rubber mounting	

Electrical data	
Rated current	110/130/140 A
Supply voltage	13,5 V
Cut-in speed	3000 x 1/min
Coupling	screws
Battery B+	M6
Control lamp D+	flat-pin connector, see drawing

Part numbers	
110 A	
Anticlockwise rotation	**B 261 208 606-02**
Clockwise rotation	**B 261 208 607-02**
130 A	
Anticlockwise rotation	**B 261 208 604-02**
Clockwise rotation	**B 261 208 605-02**
140 A	
Anticlockwise rotation	**F 01E B01 857-02**
Clockwise rotation	**B 261 208 603-02**

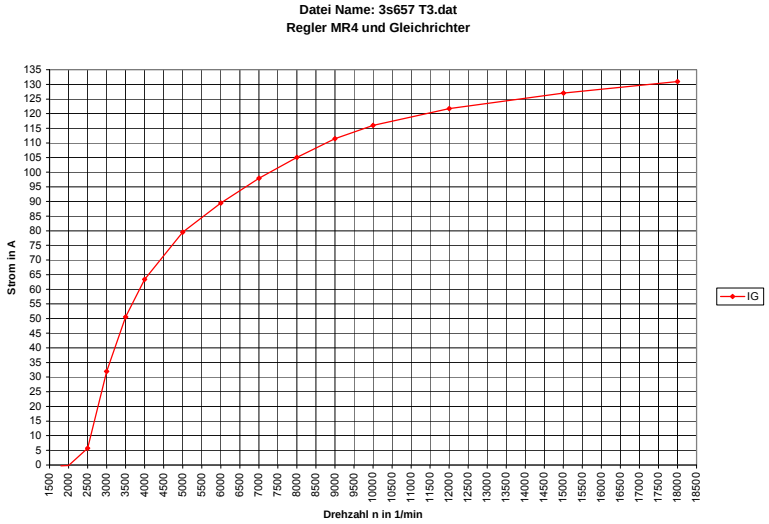
Characteristic 110 A

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



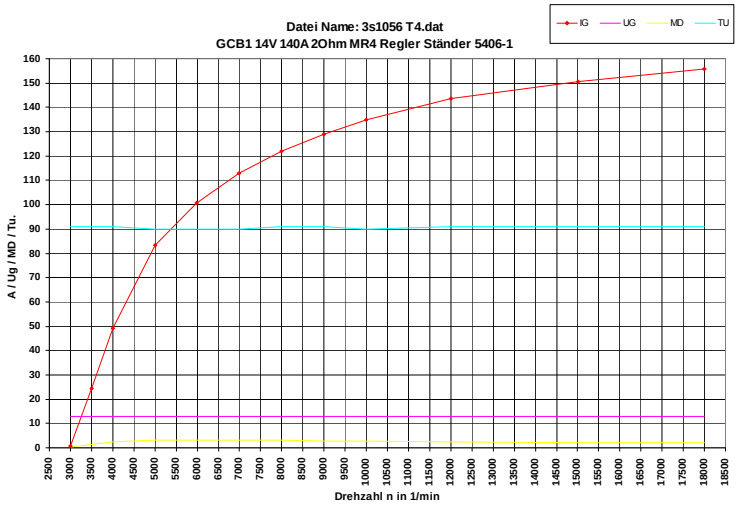
Characteristic 130 A

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

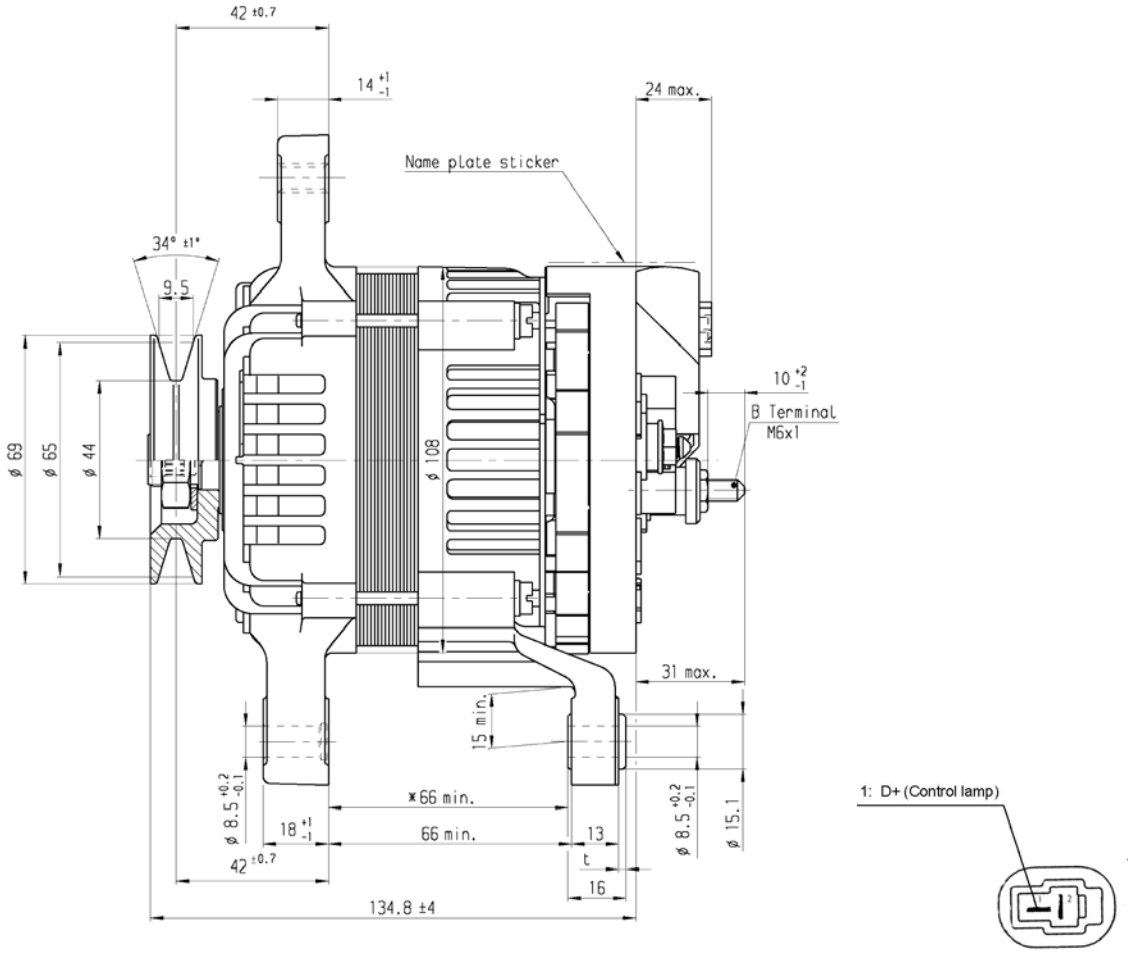


Characteristic 140 A

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



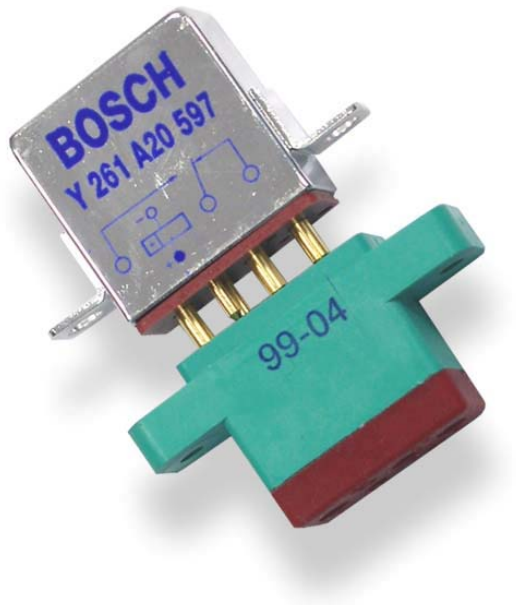
Design



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

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

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

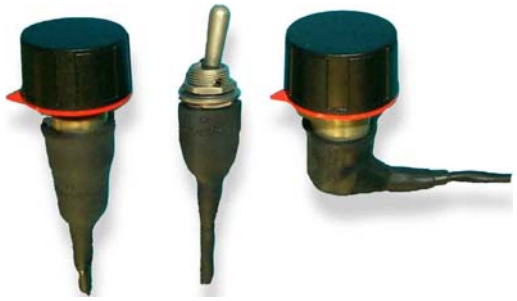
Part numbers	
Relay	**Y 261 A20 597**
Base	**Y 261 A20 598**

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 functions
Dashboard functions
Display switch over
Display dimmer

Design
Straight
90° angled

Part 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 01**
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 01**
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 01**
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 01**
6 steps display dimmer and switch over DDU	straight	ASL 6-06-05PN-HE	**B 261 209 659**

Appendix

Vibration Profile 1

Broadband noise: 8h/Direction	
Frequency (Hz)	**Acceleration density [(m/s²)²/Hz]**
20	50,4
55	26,0
180	1,0
300	1,0
360	0,56
1.000	0,6
2.000	0,6
Effective Value a_{Eff}	55,4 m/s²

Sinus: 8h/Direction	
Frequency (Hz)	**Acceleration [m/s²]**
100	50
180	200
250	200
350	60
2.000	60

Vibration Profile 2

Broadband noise: 8h/Direction	
Frequency (Hz)	**Acceleration density [(m/s²)²/Hz]**
10	10
50	10
66,7	1
100	1
1.000	0,1
Effective Value a_{Eff}	26,9 m/s^2

Vibration Profile 3

Sinus		
Alteration rate of frequency: 1 oct./min		
Frequency [Hz]	**Amplitude of acceleration [m/s²]**	**Amplitude of oscillation lane [µm]**
20	50	
85	50	
85		175
200		175
200	280	
220	280	
300	125	
440	125	

Broadband noise	
Frequency [Hz]	**Acceleration density [(m/s²)²/Hz]**
10	14,0
50	7,0
60	3,5
300	0,51
500	45,6
1.500	15,26
Effective Value a_{Eff}	168 m/s²

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