

Bosch Motorsport

# Equipment for High Performance Vehicles

Edition 2012/2



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# Engine Control Units

1



**Gasoline Engine Control Units** 10

**Diesel Engine Control Units** 32





## Gasoline Engine Control Units

## Sport Line ECUs

1

Type	Engine Control Unit MS 3 Sport	Engine Control Unit MS 4 Sport	Engine Control Unit MS 4.4 Sport
			
Max. Cyl./bank	6/2	8/2	10/2
Control strategy	Alpha/n	Alpha/n	Alpha/n
Lambda ctrl	Dual	Dual	Dual
Turbo boost ctrl	-	Opt.	Opt.
Knock ctrl	Opt.	Opt.	Opt.
El. Throttle ctrl	Opt.	Opt.	Opt.
Traction ctrl	Opt.	Opt.	Opt.
GDI support	Opt.	Opt.	Opt.
Proposed logger	C 50	C 50	C 50
Proposed display	DDU 7	DDU 7	DDU 7

## Performance Line ECUs

Type	Engine Control Unit MS 5.0	Engine Control Unit MS 5.1	Engine Control Unit MS 5.5	Engine Control Unit MS 5.2
				
Max. Cyl./bank	8/2	8/2	8/2	12/2
Control strategy	Torque-structure based	Torque structure based	Torque structure based	Torque structure based
Lambda ctrl	Dual	Dual	Dualo	Dual
Turbo boost ctrl	+	+	+	+
Knock ctrl	+	+	+	+
El. Throttle ctrl	+	+	+	+
Traction ctrl	+	+	+	+
GDI support	+	+	+	+
Proposed logger	C 60	C 60	Integrated 2 GB logger	C 60
Proposed display	DDU 8	DDU 8	DDU 8	DDU 8

## Engine Control Units Sport Line



The Sport Line introduces a simple and competitive start in the world of engine control units from Bosch Motorsport. In comparison with the Performance Line ECUs from Bosch Motorsport, the Sport Line devices have an optimized function range that make the initial start-up process much simpler.

The Sport Line has three different hardware platforms that vary in their amount of inputs/outputs and functionality that provide the optimal ECU to be selected for a given project's requirements. Additionally, each ECU in the Sport Line can be tailored to support certain project needs through various software options. To complete the entire entry level system, Bosch Motorsport offers the display unit DDU 7 and the external data logger C 50.

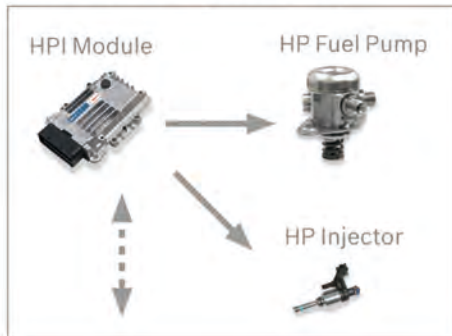
### Example for a typical Sport Line system

Depicted below is an example system layout for the ECUs of the Sport Line. The ECU is calibrated with the Modas Sport software. The communication interface, the MSA-Box II, connects to the PC over USB and to the ECU via a CAN/K-Line link. The display, the DDU 7, is configured over Ethernet with the software WinDarab. The ECU sends the desired measured variables to the display/logger via CAN interface or Ethernet. These variables can be displayed for the driver or logged for analysis. Downloading and analyzing the data is also accomplished over Ethernet with the WinDarab software.

Dimensions

1

Gasoline Direct Injection (GDI)



ECU MS 3 Sport, MS 4 Sport, MS 4.4 Sport



Communication Interface MSA-Box II



Calibration Software Modas Sport



CAN/  
K-Line

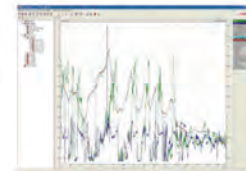
USB

CAN

Display DDU 7 or Logger C 50



Configuration and Analysis Software WinDarab



CAN/Ethernet

**Sport Line ECUs**

Type	Engine Control Unit MS 3 Sport	Engine Control Unit MS 4 Sport	Engine Control Unit MS 4.4 Sport
			
Max. Cyl./bank	6/2	8/2	10/2
Control strategy	Alpha/n	Alpha/n	Alpha/n
Lambda ctrl	Dual	Dual	Dual
Turbo boost ctrl	-	Opt.	Opt.
Knock ctrl	Opt.	Opt.	Opt.
El. Throttle ctrl	Opt.	Opt.	Opt.
Traction ctrl	Opt.	Opt.	Opt.
GDI support	Opt.	Opt.	Opt.
Proposed logger	C 50	C 50	C 50
Proposed display	DDU 7	DDU 7	DDU 7

## Engine Control Unit MS 3 Sport



### Features

- ▶ Full hybrid technology
- ▶ 6 injection output stages
- ▶ 6 ignition output stages
- ▶ 34 data inputs
- ▶ Mating connectors included

The MS 3 Sport is the first Bosch engine management system to be manufactured with full hybrid technology. Therefore it is very small, light and robust against vibrations. The MS 3 Sport is suitable for engines with up to 6 cylinders and has internal ignition output stages. Two sensor inputs are available for vibration knock detection and knock control. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional data logger or dash display.

### Application

Engine layout	Max. 6 cyl., 2 bank
Control strategy	Alpha/n
Lambda control	Dual
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Sequential fuel injection	
Asymmetric injection timing	
Asymmetric ignition timing	
Knock control	Optional

Electronic throttle control	Optional
Traction control	Optional
Interface to Bosch Motorsport ABS M4 kit	
Support of 60-2 and 36-2 ignition trigger wheels	
Max. vibration	Vibration Profile 3 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

### Technical Specifications

#### Mechanical Data

Extremely small and flat aluminum pressure casting housing	
4 mounting points on housing	
2 connectors with high pin density	
Extremely shock and vibration proof hybrid technology	
Size	120 x 90 x 40 mm
Weight	250 g
Temperature range	-40 to 125°C

#### Electrical Data

Max. power consumption	10 W at 14 V
------------------------	--------------

#### Inputs

2 lambda interfaces LSU
4 inputs for Hall-effect wheel speed sensors
1 input for inductive crankshaft sensor
1 input for Hall-effect camshaft sensor
2 knock sensor inputs

#### Outputs

6 injection power stages
6 ignition power stages (7.5 to 8.0 A)
8 power stages (2 A/1 A; low side; PWM)
2 power stages for lambda heater
1 H-bridge (5 A)
2 sensor supplies 5 V/100 mA

#### Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

#### Optional Functionality

Knock control SW upgrade	F 01T A20 053-01
Electronic throttle control SW upgrade	F 01T A20 051-01
Traction control SW upgrade	F 01T A20 052-01



**Environment**

---

MSA-Box II	F 02U V00 327-02
Data logger C 50	F 02U V01 164-01
Display DDU 7	F 02U V01 130-01

---

**Connectors**

---

Mating connector I	D 261 205 139
Mating connector II	D 261 205 140

---

**Communication**

- 
- 1 K-line serial interface
  - 1 CAN interface
- 

**Ordering Information****Engine Control Unit MS 3 Sport**

Please ask for more information before ordering.  
Order number **F 01T A20 067-01**

---

## Engine Control Unit MS 4 Sport



### Features

- ▶ 8 injection output stages
- ▶ 8 ignition drivers
- ▶ 35 data inputs

The MS 4 Sport is an engine management system for high performance engines up to 8 cylinders. 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. There are also versions for Turbo and GDI engines as well as for Turbo GDI engines available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional data logger.

### Application

Control strategy	Alpha/n
Lambda control	Dual
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	
Asymmetric injection timing	
Asymmetric ignition timing	
Ignition trigger wheels	Support of 60-2 and 36-2
Max. vibration	Vibration Profile 3 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Mechanical Data

Sheet-metal housing	
Each connector pin individually filtered	
Vibration damped circuit boards	
Size	180 x 162 x 46 mm
Weight	430 g
Temperature range	-40 to 75°C

#### Electrical Data

Max. power consumption	30 W at 14 V
------------------------	--------------

#### Inputs

2 lambda interfaces LSU
4 inputs for Hall-effect wheel speed sensors
1 input for inductive crankshaft sensor
1 input for Hall-effect camshaft sensor
25 universal inputs 0 to 5 V
2 knock sensor inputs

#### Outputs

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

#### Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

#### Optional Functionality

Advanced Turbo boost control	F 02U V00 781-01
Knock control SW upgrade	F 01T A20 053-01
Electronic throttle control SW upgrade	F 01T A20 051-01
Electronic throttle control incl. shift down (Blipper) SW upgrade, also compatible to MEGA-Line gear box control	F 02U V00 780-01
Traction control SW upgrade	F 01T A20 052-01
Variable valve timing VVT SW upgrade	F 02U V00 395-01

**Environment**

MSA-Box II	F 02U V00 327-02
Data logger C 50	F 02U V01 164-01
Display DDU 7	F 02U V01 130-01
Injection power stage unit HPI 5	F 02U V00 929-01
HP fuel pump HDP 5	Diff. variations available

**Connectors and wires**

Mating connector I	D 261 205 344
Mating connector II	D 261 205 345

**Communication**

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

**Ordering Information****MS 4 Sport**

Order number **F 01T A20 049-02**

**MS 4 Sport GDI**

Only in combination with HPI 5

Order number **F 02U V01 138-01**

**MS 4 Sport Turbo**

Order number **F 01T A20 060-01**

**MS 4 Sport Turbo GDI**

Only in combination with HPI 5






Order number **F 02U V01 000-01**

**MS 4 Sport Motorcycle**

Order number **F 02U V00 024-01**

## ECU MS 4 Sport Variations

1

Type	MS 4 Sport	MS 4 Sport GDI	MS 4 Sport Turbo	MS 4 Sport Turbo GDI	MS 4 Sport Motorcycle
					
Max. Cyl./bank	8/2	8/2	8/2	6/2	4/2
GDI support	-	+	-	+	-
ABS M4 interface	+	+	+	+	-
Turbo boost ctrl	-	-	+	+	-
Advances turbo boost ctrl	-	-	-	Opt.	Opt.
Knock ctrl	Opt.	Opt.	Opt.	Opt.	-
El. Throttle ctrl	Opt.	Opt.	Opt.	Opt.	-
El. Throttle ctrl incl. shift down (Blipper)	Opt.	Opt.	Opt.	Opt.	-
Traction ctrl	Opt.	Opt.	Opt.	Opt.	-
Var. valve timing	Opt.	Opt.	Opt.	Opt.	-

## Engine Control Unit MS 4.4 Sport



### Features

- ▶ 10 injection output stages
- ▶ 10 ignition drivers
- ▶ 50 data inputs

The MS 4.4 Sport is an engine management system for engines with up to 10 cylinders. The robust housing is provided with motorsport connectors. The system contains 10 ignition drivers for external power stages and 10 independent injection power stages. Four vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control. There is also a version for Turbo engines available. The high number of analog channels allows for the logging of numerous engine and chassis parameters. Additionally the MS 4.4 Sport has 20 configurable pull-ups.

### Application

Engine layout	Max. 10 cyl., 2 bank
Control strategy	Alpha/n
Lambda control	Dual
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	Please see Variations
Advanced Turbo boost control	Please see Variations
Knock control	Optional
Electronic throttle control	Optional
Electronic throttle control incl. shift down (Blipper)	Optional

Traction control optional	Optional
Variable valve timing	Optional
Interface to Bosch Motorsport ABS M4 kit	Optional
Asymmetric injection timing	
Asymmetric ignition timing	
Ignition trigger wheels	Support of 60-2 and 36-2 (10-cylinders only 60-2!)
Max. vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Variations

	MS 4.4 Sport	MS 4.4 Sport Turbo
Turbo boost ctrl.	-	+
Advanced Turbo boost ctrl.	-	Optional

#### Mechanical Data

Aluminum housing	
3 high pin density motorsport connectors	
165 pins, each pin individually filtered	
Vibration damped circuit boards	
Size	174 x 133 x 39 (23) mm
Weight	860 g
Temperature range	-40 to 75°C

#### Electrical Data

Max. power consumption	20 W at 14 V
------------------------	--------------

#### Inputs

2 lambda interfaces LSU
4 inputs for Hall-effect wheel speed sensors
1 input for inductive crankshaft sensor
2 inputs for Hall-effect camshaft sensors (opt. 4)
39 inputs 0 to 5 V (20 with configurable pull-ups)
4 knock sensor inputs
8 digital inputs

#### Outputs

10 injection power stages (2.2 A)
10 ignition drivers
21 power stages (2,7 A/0,6 A; low side)
2 power stages for lambda heater
1 H-bridge (7 A)
3 sensor supplies 5 V/600 mA

**Software**

Modas Sport Calibration Software	Inclusive
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WinDarab Analysis Software	On request
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**Optional Functionality**

Knock control SW upgrade	F 01T A20 053-01
--------------------------	------------------

Electronic throttle control SW upgrade	F 01T A20 051-01
--	------------------

Electronic throttle control incl. shift down (Blipper) SW upgrade, also compatible to MEGA-Line gear box control	F 02U V00 780-01
--	------------------

Traction control SW upgrade	F 01T A20 052-01
-----------------------------	------------------

Variable valve timing VVT SW upgrade	F 02U V00 395-01
--------------------------------------	------------------

Advanced turbo boost control (only MS 4.4 Sport Turbo)	F 02U V00 781-01
--	------------------

**Environment**

MSA-Box II	
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Data logger C 50	F 02U V01 164-01
------------------	------------------

Display DDU 7	F 02U V01 130-01
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**Connectors**

Mating connector I AS 6-16-35 SA	F 02U 000 467-01
-------------------------------------	------------------

Mating connector II AS 6-16-35 SC	F 02U 000 469-01
--------------------------------------	------------------

Mating connector III AS 6-16-35 SB	F 02U 000 468-01
---------------------------------------	------------------

**Communication**

1 K-line serial interface
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2 CAN interfaces for external communication
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**Ordering Information****Engine Control Unit MS 4.4 Sport**

Order number <b>F 01T A20 068-01</b>
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**Engine Control Unit MS 4.4 Sport Turbo**

Order number <b>F 01T A20 074-01</b>
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## Engine Control Units Performance Line



The ECUs of the Performance Line offers individual solutions for various motorsport applications. All MS 5 ECUs utilize a new software development process based on MATLAB® & Simulink® to significantly speed algorithm development. They also feature a high-end FPGA (Field Programmable Gate Array) for fast signal processing and flexible signal control. A PowerPC enables highly sophisticated control algorithms. Consistent software structure guarantees easy recognition of all software labels and functions across the complete ECU Performance Line. It is completed by use of the DDU 8 display and the C 60 external data logger.

The ECUs in the Performance Line use torque as the central variable for coordinating all requests (i.e. engine/vehicle speed limiter, traction control, etc.). The actual engine torque value is determined from the correcting variables (air charge, ignition angle, and/or cylinder reduction via fuel cut) by means of a torque model. This is then compared to the desired engine torque value to determine if any modification of the engine torque is needed. This results in a precise and adaptable control of the engine.

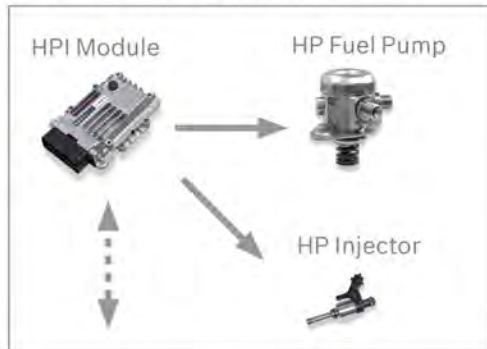
### Example for a typical Performance Line system

Depicted below you see an example system layout for the Performance Line. The ECU is calibrated with the software Modas Sport. The communication interface MSA-Box II connects to the PC over USB and to the ECU via a CAN/Ethernet link. DDU 8 display and C 60 data logger are configured over Ethernet with the software RaceCon. The logger and the ECU communicate over Ethernet. Downloading and analyzing the data is accomplished with the data analysis software WinDarab. The data can be also transmitted over burst or online telemetry.

Dimensions

1

Gasoline Direct Injection (GDI)



ECU MS 5.0, MS 5.1,  
MS 5.5, MS 5.2



Communication Interface  
MSA-Box II



Calibration Software  
Modas Sport



Ethernet/  
CAN

USB

Ethernet/  
CAN

Display DDU 8 or Logger C 60



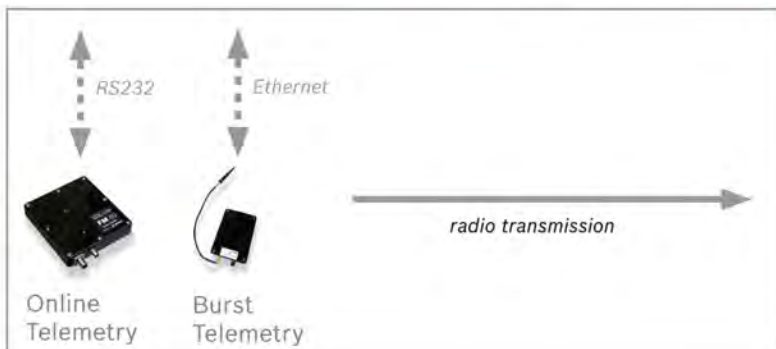
Configuration Software  
RaceCon



Ethernet

Data Analysis Software  
WinDarab





Ethernet



Telemetry



**Performance Line ECUs**

Type	Engine Control Unit MS 5.0	Engine Control Unit MS 5.1	Engine Control Unit MS 5.5	Engine Control Unit MS 5.2
				
Max. Cyl./bank	8/2	8/2	8/2	12/2
Control strategy	Torque-structure based	Torque structure based	Torque structure based	Torque structure based
Lambda ctrl	Dual	Dual	Dualo	Dual
Turbo boost ctrl	+	+	+	+
Knock ctrl	+	+	+	+
El. Throttle ctrl	+	+	+	+
Traction ctrl	+	+	+	+
GDI support	+	+	+	+
Proposed logger	C 60	C 60	Integrated 2 GB logger	C 60
Proposed display	DDU 8	DDU 8	DDU 8	DDU 8

## Engine Control Unit MS 5.0



### Features

- ▶ 8 injection output stages
- ▶ 8 ignition output stages
- ▶ 51 data inputs

The MS 5.0 engine control unit manages gasoline engines up to 8 cylinders. As a member of our MS 5 family, it features a powerful digital processing core with floating point arithmetic and a high-end FPGA for ultimate performance and flexibility. The MS 5 family utilizes a new software development process based on MATLAB/Simulink, which significantly speeds algorithm development by using automatic code and documentation generation. Custom functions can be quickly and easily generated. The flexible hardware design allows the MS 5.0 to support complex or unusual engine or chassis configurations.

### Application

Engine layout	Max. 8 cyl., 2 bank
Control strategy	Torque-structure based
Lambda control	With adaptation function
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	
Knock control	
Electronic throttle control	
Traction control	
Sequential fuel injection	
Asymmetric injection timing	

Asymmetric ignition timing	
Calibration interface	CCP via CAN or XCP via Ethernet
Interface to Bosch Data Logging System	
Max. Vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
2 high pin density motorsport connectors	
132 pins, each pin individually filtered	
Vibration damped circuit boards	
Size	140 x 109 x 40.5 mm
Weight	650 g
Temp. range (at internal sensors)	-20 to 85°C

#### Electrical Data

Approx. power cons. (w/o loads)	9 W at 14 V
<b>Power supply</b>	
Full operation	6.5 to 18 V
Recommended	11 to 14 V
Absolute maximum	6 to 24 V

#### 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)
4 wheel speed sensors (inductive or Hall-effect)
32 universal analog inputs 0 to 5 V, 12 Bit
4 analog inputs (angle synchronous or time synchronous triggering up to 250 ksps, 12 Bit)
2 inputs for vibration knock sensors
1 lap trigger input

#### Outputs

8 injection power stages
8 ignition power stages (up to 10 A)
12 power stages (2 A; low side; PWM)
2 power stages (4 A; low side; PWM)
1 H-bridge (5 A)
2 sensor supplies 5 V/400 mA
1 time based synch-in/out

## Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

## Connectors

Mating connector I AS 6-18-35 SB	F 02U 000 474-01
Mating connector II AS 6-18-35 SN	F 02U 000 472-01

## Installation Notes

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

## Communication

2 x 100 Mbps Ethernet interfaces

2 x 1 Mbps CAN interfaces

## Ordering Information

**Engine Control Unit MS 5.0**  
Order number **F 02U V00 326-03**

## Engine Control Unit MS 5.1



### Features

- ▶ 8 injection output stages
- ▶ 8 ignition output stages
- ▶ 59 data inputs

The MS 5.1 engine control unit manages gasoline engines up to 8 cylinders. As a member of our MS 5 family, it features a powerful digital processing core with floating point arithmetic and a high-end FPGA for ultimate performance and flexibility. The MS 5 family utilizes a new software development process based on MATLAB/Simulink, which significantly speeds algorithm development by using automatic code and documentation generation. Custom functions can be quickly and easily generated. The flexible hardware design allows the MS 5.1 to support complex or unusual engine or chassis configurations.

### Application

Engine layout	Max. 8 cyl., 2 bank
Control strategy	Torque-structure based
Lambda control	With adaptation function
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	
Knock control	
Electronic throttle control	
Traction control	
Sequential fuel injection	
Asymmetric injection timing	Optional

Asymmetric ignition timing	Optional
Calibration interface	CCP via CAN or XCP via Ethernet
Interface to Bosch Data Logging System	
Max. Vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
3 high pin density motorsport connectors	
165 pins, each pin individually filtered	
Vibration suppression via multipoint fixed circuit boards	
Size	180 x 155 x 40 mm
Weight	1,060 g
Temp. range (at internal sensors)	-20 to 85°C

#### Electrical Data

Power cons. (w/o loads)	Approx. 9 W at 14 V
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#### Power supply

Operating range	6.5 to 18 V
Recommended	11 to 14 V
Absolute maximum	6 to 24 V

#### 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)
38 universal analog inputs 0 to 5 V, 12 Bit
4 analog inputs (angle synchronous or time synchronous triggering up to 250 ksps, 12 Bit)
4 inputs for vibration knock sensors
1 lap trigger input

#### Outputs

8 injection power stages (peak & hold)
8 ignition power stages (up to 20 A)
20 power stages (2 A; low side; PWM)
4 power stages (4 A; low side; PWM)
2 H-bridges (5 A)
3 sensor supplies 5 V/400 mA

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1 sensor supply 10 V/100 mA

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1 protected Ubat output 1 A

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6 diagnostic outputs with selectable internal signals

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1 time base reference synch-in/out

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### Software

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Modas Sport Calibration Software	Inclusive
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WinDarab Analysis Software	On request
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### Connectors

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Mating connector I AS 6-16-35 SA	F 02U 000 467-01
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Mating connector II AS 6-16-35 SB	F 02U 000 468-01
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Mating connector IIII AS 6-16-35 SN	F 02U 000 466-01
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### Installation Notes

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Internal battery for data preservation included.

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Required service interval 12 months (internal battery is replaced).

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

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### Communication

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2 x 100 Mbps Ethernet interfaces

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1 x RS232 serial interface

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3 x 1 Mbps CAN interfaces

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1 x LIN interface

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### Ordering Information

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#### Engine Control Unit MS 5.1

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Order number **F 02U V00 995-01**

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## Engine Control Unit MS 5.5



### Features

- ▶ Internal 2 GB datalogger
- ▶ 8 injection output stages
- ▶ 8 ignition output stages
- ▶ 59 data inputs

The MS 5.5 engine control unit manages gasoline engines up to 8 cylinders. As a member of our MS 5 family, it features a powerful digital processing core with floating point arithmetic and a high-end FPGA for ultimate performance and flexibility. The MS 5 family utilizes a new software development process based on MATLAB/Simulink, which significantly speeds algorithm development by using automatic code and documentation generation. Custom functions can be quickly and easily generated. The flexible hardware design allows the MS 5.5 to support complex or unusual engine or chassis configurations.

The MS 5.5 has an internal 2 GB logger, presenting a cost efficient and weight optimized all-in-one solution.

### Application

Engine layout	Max. 8 cyl., 2 bank
Control strategy	Torque-structure based
Lambda control	With adaptation function
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	
Knock control	
Electronic throttle control	
Traction control	

Sequential fuel injection	
Asymmetric injection timing	Optional
Asymmetric ignition timing	Optional
Calibration interface	CCP via CAN or XCP via Ethernet
Interface to Bosch Data Logging System	
Internal logger 2 GB	
Max. Vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
3 high pin density motorsport connectors	
165 pins, each pin individually filtered	
Vibration suppression via multipoint fixed circuit boards	
Size	180 x 155 x 40 mm
Weight (approx.)	1,270 g
Temp. range (at internal sensors)	-20 to 85°C

#### Electrical Data

Approx. power cons. (w/o loads)	13 W at 14 V
<b>Power Supply</b>	
Full operation	6.5 to 18 V
Recommended	11 to 14 V
Absolute maximum	6 to 24 V

#### 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)
38 universal analog inputs 0 to 5 V, 12 Bit
4 analog inputs (Angle synchronous or time synchronous triggering up to 250 ksps, 12 Bit)
4 inputs for vibration knock sensors
1 lap trigger input

#### Outputs

8 injection power stages
8 ignition power stages (up to 20 A)
20 power stages (2 A; low side; PWM)

4 power stages (4 A; low side; PWM)
2 H-bridges (5 A)
3 sensor supplies 5 V/400 mA and 1 x 10 V/100 mA
1 protected Ubat output 1 A
6 diagnostic outputs with selectable internal signals
1 time based synch-in/out

### Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

### Connectors

Mating connector I AS 6-16-35 SA	F 02U 000 467-01
Mating connector II AS 6-16-35 SB	F 02U 000 468-01
Mating connector III AS 6-16-35 SN	F 02U 000 466-01

### Installation Notes

Internal battery for data preservation included.
Required service interval 12 months (internal battery is replaced).
Depending on your experiences with calibration of ECUs we recommend calibration support from Bosch Motorsport.

### Communication

2 x 100 Mbps Ethernet interfaces
1 x RS232 serial interface
3 x 1 Mbps CAN interfaces
1 x LIN interface

### Ordering Information

<b>Engine Control Unit MS 5.5</b> Order number <b>F 02U V00 285-02</b>
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## Engine Control Unit MS 5.2



### Features

- ▶ 12 injection output stages
- ▶ 12 ignition output stages
- ▶ 78 data inputs

The MS 5.2 engine control unit manages gasoline engines up to 12 cylinders. As a member of our MS 5 family, it features a powerful digital processing core with floating point arithmetic and a high-end FPGA for ultimate performance and flexibility. The MS 5 family utilizes a new software development process based on MATLAB/Simulink, which significantly speeds algorithm development by using automatic code and documentation generation. Custom functions can be quickly and easily generated. The flexible hardware design allows the MS 5.2 to support complex or unusual engine or chassis configurations.

### Application

Engine layout	Max. 12 cyl., 2 bank
Control strategy	Torque-structure based
Lambda control	With adaptation function
Speed limiter	
Gear cut for sequential gear box	
Map switch, 3 positions, each corresponds to different target lambda and spark maps.	
Fuel cut off	
Turbo boost control	
Knock control	
Electronic throttle control	
Traction control	
Sequential fuel injection	
Asymmetric injection timing	Optional
Asymmetric ignition timing	Optional

Calibration interface	CCP via CAN or XCP via Ethernet
Interface to Bosch Data Logging System	
Max. Vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
4 high pin density motorsport connectors	
220 pins, each pin individually filtered	
Vibration resistant circuit board mounting	
Size	200 x 170 x 36.5 mm
Weight (approx.)	1,260 g
Temp. range (at internal sensors)	-20 to 85°C

#### Electrical Data

Power cons. (w/o loads)	Approx. 10 W at 14 V
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#### Power supply

Operating range	6.5 to 18 V
Recommended	11 to 14 V
Absolute maximum	6 to 24 V

#### 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 sensor (Inductive or Hall-effect)
45 universal analog inputs 0 to 5 V, 12 Bit
14 analog inputs (Angle synchronous or time synchronous triggering up to 250 ksp/s, 12 Bit)
4 inputs for vibration knock sensors
1 lap trigger 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 ( $\pm 100$ mA)
2 H-bridges (5 A)



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4 sensor supplies 3 x 5 V/400 mA and 1 x 10 V/100 mA

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6 diagnostic outputs with selectable internal signals

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12 outputs with configurable function (FPGA)

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1 time base reference synch-in/out

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### Software

Modas Sport Calibration Software	Inclusive
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WinDarab Analysis Software	On request
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### Connectors

Mating connector I AS 6-16-35 SA	F 02U 000 467-01
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Mating connector II AS 6-16-35 SB	F 02U 000 468-01
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Mating connector III AS 6-16-35 SC	F 02U 000 469-01
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Mating connector IIII AS 6-16-35 SN	F 02U 000 466-01
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### Installation Notes

Internal battery for data preservation included.

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Required service interval 12 months (internal battery is replaced).

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

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### Communication

2 x 100 Mbps Ethernet interfaces

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1 x RS232 serial interface

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4 x 1 Mbps CAN interfaces

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### Ordering Information





#### Engine Control Unit MS 5.2

Order number **F 01T A20 069-01**

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## Diesel ECUs

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Type	Engine Control Unit MS 15 Sport	Engine Control Unit MS 15.1	Engine Control Unit MS 15.2	Engine Control Unit MS 12
				
Max. Cyl.	6	8	6	12
Injector types	Solenoid injectors	Solenoid injectors	Piezo injectors	Piezo injectors
Control strategy	Quantity based	Quantity based	Quantity based	Quantity based
Injections	1 (2 optional)	Max. 5	Max. 4	Max. 4
Inputs/Outputs	21/15	60/32	60/30	75/52
Turbo boost control system	Single turbo	Single or twin turbo	Single or twin turbo	Single or twin turbo
Lambda measurement	-	+	+	+
Traction control system	-	Optional	Optional	+
Weight	725 g	1,780 g	1,780 g	2,500 g

## Engine Control Unit MS 15 Sport



### Features

- ▶ 6 injection output stages
- ▶ For solenoid injectors
- ▶ 21 data inputs

The MS 15 Sport is an ECU for Diesel engines with up to 6 cylinders. It is developed for use in combination with Bosch solenoid injectors. The MS 15 Sport software is provided with an optimized function range. The MS 15 Sport is able to operate in 12 V or 24 V systems.

### Application

Engine layout	Max. 6 cyl.
Injector type	Solenoid injectors
Control strategy	Quantity based
Injection timing	1 main injection 1 pilot injection opt.
Turbo boost control	Single Turbo
Speed limiter	
Gear cut for sequential gearbox	

### Technical Specifications

#### Mechanical Data

Aluminum housing	
2 connectors with 60 and 94 pins	
6 housing fixation points	
Max. dimensions w/o connectors	203 x 140 x 38 mm
with connectors	203 x 167 x 38 mm
Weight	Approx. 725 g
ECU internal temperature range	-20 to 75°C

#### Electrical Data

Power consumption w/o inj.	Approx. 5 W
Power consumption at full load	Approx. 120 W

#### Inputs

1 input for inductive crankshaft sensor
1 input for Hall-effect camshaft sensor
2 inputs for redundant pedal position sensor
6 analog inputs 0 to 5 V: fuel: low system and rail pressure boost pressure, oil pressure exhaust gas: pressure and temperature
5 NTC temperature inputs: intake and boost air temperature fuel, coolant and oil temperature
1 input for Hall vehicle speed sensor
3 digital inputs: lap beacon, pit speed limiter and fuel reset
1 internal ambient pressure sensor
1 internal ECU temperature sensor

#### Outputs

6 injection power stages for solenoid injectors
9 power stages: main; fuel pump; glow plug and 2 fan relays; fuel metering unit of high pressure pump; turbo actuator (PWM 5.0 Amps); engine speed signal for tachometer; diagnostic lamp

#### Optional Functionality

Pilot injection SW upgrade	F 02U V00 776-01
Pressure control valve PCV SW upgrade	F 02U V00 777-01

#### Environment

Complete SW documentation
Calibration guide
Incl. work base and configuration of Modas Sport
Preconfigured CAN-messages for DDU
Incl. SW tool Race Lab Sport with preconfigured settings

#### Connectors

Connector K (vehicle: 94 pin)	D 261 205 353-01
Connector A (engine: 60 pin)	D 261 205 354-01

#### Communication

2 CAN interfaces	Display / logger Calibration software
1 K-Line	Software download

#### Ordering Information

**Engine Control Unit MS 15 Sport**  
Order number **F 02U V00 350-01**

## Engine Control Unit MS 15.1



### Features

- ▶ 8 injection output stages
- ▶ For solenoid injectors
- ▶ 60 data inputs

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

### Application

Engine layout	Max. 8 cyl.
Injector type	Solenoid injectors
Control strategy	Quantity based
Injection timing	2 pilot injections 2 main injections 1 post injection
Turbo boost control	Single or Bi-Turbo
Lambda measurement	
Traction control	Optional
Speed limiter	
Gear cut for sequential gearbox	
Speed limiter	
Optional function packages available	
Interface to Bosch Data Logging System	
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
4 connectors in motorsport technology with high pin density, 187 pins	
Vibration damped circuit boards	
8 housing fixation points	
Size	210 x 199 x 36 mm
Weight	1,780 g
Temperature range	-40 to 75°C

#### Electrical Data

Power consumption w/o inj.	Approx. 5 W at 14 V
Power consumption	Approx. 140 W at 14 V

#### Inputs

2 inputs for thermocouple exhaust gas temperature 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 to 5 V
13 universal inputs 0 to 5, fixed pull-up
27 universal inputs 0 to 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-bridges
2 sensor supplies 5 V/system use
3 sensor supplies 5 V/300 mA
3 sensor supplies 10 V/100 mA

#### Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

#### Optional Functionality

Traction control SW upgrade	F 02U V00 778-01
Chassis SW upgrade	F 02U V00 779-01
Two bank hydraulic control SW upgrade	F 02U V00 949-01

**Environment**

MSA-Box II	F 02U V00 327-01
Data logger C 55	F 01E B01 630-01
Data logger C 60	F 02U V00 875-01
Display DDU 7	F 02U V01 130-01
Display DDU 8	F 02U V00 873-05
Modular sensor interface MSI 55	F 01T A20 024-01

**Connectors**

Mating connector I AS 6-16-35 SN	F 02U 000 466-01
Mating connector II AS 6-16-35 SB	F 02U 000 468-01
Mating connector III AS 6-16-35 SC	F 02U 000 469-01
Mating connector IV AS 6-12-35 SD	F 02U 000 445-01

**Installation Notes**

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

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

**Communication**

3 CAN interfaces (dash, application, customer use)

2 FireWire interfaces for external communication

**Ordering Information**

**Engine Control Unit MS 15.1**  
Order number **F 01T A20 022-01**

## Engine Control Unit MS 15.2



### Features

- ▶ 6 injection output stages
- ▶ For Piezo injectors
- ▶ 60 data inputs

The MS 15.2 is an ECU for Diesel engines with up to 6 cylinders. It is developed for use with Bosch Piezo injectors.

### Application

Engine layout	Max. 6 cyl.
Injector type	Piezo injectors
Control strategy	Quantity based
Injection timing	2 pilot injections 1 main injection 1 post injection
Turbo boost control	Single or Bi-Turbo
Lambda measurement	
Traction control	Optional
Speed limiter	
Gear cut for sequential gearbox	
Speed limiter	
Optional function packages available	
Interface to Bosch Data Logging System	
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Mechanical Data

Aluminum housing	
4 connectors in motorsport technology with high pin density, 187 pins	
Vibration damped circuit boards	
8 housing fixation points	
Size	210 x 199 x 36 mm
Weight	1,780 g
Temperature range	-40 to 75°C

#### Electrical Data

Power consumption w/o inj.	Approx. 5 W at 14 V
Power consumption	Approx. 140 W at 14 V

#### Inputs

2 inputs for thermocouple exhaust gas temperature 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 to 5 V
13 universal inputs 0 to 5, fixed pull-up
27 universal inputs 0 to 5 V, switchable pull-up
3 digital inputs

#### Outputs

6 injection power stages
12 power stages (low side)
2 power stages for lambda heater
2 H-bridges
2 sensor supplies 5 V/system use
3 sensor supplies 5 V/300 mA
3 sensor supplies 10 V/100 mA

#### Software

Modas Sport Calibration Software	Inclusive
WinDarab Analysis Software	On request

#### Optional Functionality

Traction control SW upgrade	F 02U V00 778-01
Chassis SW upgrade	F 02U V00 779-01
Two bank hydraulic control SW upgrade	F 02U V00 949-01

**Environment**

MSA-Box II	F 02U V00 327-01
Data logger C 55	F 01E B01 630-01
Data logger C 60	F 02U V00 875-01
Display DDU 7	F 02U V01 130-01
Display DDU 8	F 02U V00 873-05
Modular sensor interface MSI 55	F 01T A20 024-01

**Connectors**

Mating connector I AS 6-16-35 SA	F 02U 000 467-01
Mating connector II AS 6-16-35 SB	F 02U 000 468-01
Mating connector III AS 6-16-35 SC	F 02U 000 469-01
Mating connector IV AS 6-12-35 SD	F 02U 000 445-01

**Piezo Specific Functions****Voltage Control**

Rail pressure dependent precontrol of the voltage difference between cut off voltage and stationary actuator voltage.

Closed-loop voltage control, injector individual.

Voltage precontrol to improve dynamic behavior.

**Discharging Time Control**

Voltage dependent precontrol of discharging current.

Closed-loop discharging time control, injector individual.

Discharging time precontrol to improve dynamic behavior.

**IVA Injector Voltage Adjustment**

Determination of injector voltage demand at reference rail pressure during injector inspection in plant before IQA-measurement.

Injector assignment of voltage setpoint curves within the ECU according to injector's IVA class.

**Temperature Compensation**

Determination of the temperature dependent changes of voltage demand.

Definition of a temperature dependent correction factor.

Multiplicative correction of the voltage setpoint.

**Installation Notes**

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

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

**Communication**

3 CAN interfaces (dash, application, customer use)

2 FireWire interfaces for external communication

**Ordering Information**

**Engine Control Unit MS 15.2**

Order number **F 01T A20 023-01**

## Engine Control Unit MS 12



### Features

- ▶ 12 injection output stages
- ▶ For piezo injectors
- ▶ 78 data inputs

The MS 12 is the high-end ECU for Diesel engines. This ECU offers 12 Piezo injection power stages for use in up to a 12 cylinder engine. Various engine and chassis parameters can be measured with a high number of input channels. All measured data can be transferred via Fire-Wire interface to an optional flash card data logger. Additional MSI 55 (Modular Sensor Interfaces) can be connected to increase the number of inputs. Gear box control strategies are optional.

### Application

Engine layout	Max. 12 cyl.
Injector type	Piezo injectors
Control strategy	Quantity based
Injection timing	2 pilot injections 1 main injection 1 post injection
Turbo boost control (incl. VTG)	Single or Twin-Turbo
Lambda measurement	
Traction control	
Launch control	
Gear cut for sequential gearbox	
Gearbox control	
Speed limiter	
Optional function packages available	

Interface to Bosch Data Logging System

Max. vibration Vibration profile 1 (see Appendix or [www.bosch-motorsport.com](http://www.bosch-motorsport.com))

### Technical Specifications

#### Mechanical Data

Aluminum housing

5 connectors in motorsport technology with high pin density, 242 pins

Each connector individually filtered.

Vibration damped circuit boards

8 housing fixation points

Size 240 x 200 x 57 mm

Weight 2,500 g

Temperature range -20 to 85°C

#### Electrical Data

Power consumption w/o inj. Approx. 5 W at 14 V

Power consumption at 6.500 rpm Max. 160 W at 14 V

#### Inputs

6 inputs for thermocouple sensors (e.g. exhaust gas temperature)

2 lambda interfaces LSU

4 inputs for wheel speed sensors; basic design for inductive sensors

2 gear box speeds

4 inputs for turbo speed sensors; basic design for inductive sensors

2 inputs for inductive crankshaft sensor

1 input for Hall-effect camshaft sensor

3 system inputs 0 to 5 V

16 PT1000

32 universal inputs 0 to 5 V, switchable pull-up

3 digital inputs

2 LVDT sensor interfaces

1 SSI interface

#### Outputs

12 injection power stages

24 power stages low side

2 power stages for lambda heater

6 H-bridges

2 sensor supplies 5 V/system use

3 sensor supplies 5 V/300 mA

3 sensor supplies 5 V/300 mA or 10 V/100 mA



**Software**

WinDarab Analysis Software	On request
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**Environment**

Data logger C 55	F 01E B01 630-01
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Data logger C 60	F 02U V00 875-01
------------------	------------------

Display DDU 7	F 02U V01 130-01
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Display DDU 8	F 02U V00 873-05
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Modular sensor interface MSI 55	F 01T A20 024-01
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**Connectors**

Mating connector I AS 6-18-35 SA	F 02U 000 473-01
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Mating connector II AS 6-18-35 SB	F 02U 000 474-01
--------------------------------------	------------------

Mating connector III AS 6-18-35 SC	F 02U 000 475-01
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Mating connector IV AS 6-18-35 SN	F 02U 000 472-01
--------------------------------------	------------------

Mating connector V AS 6-12-35 SD	F 02U 000 445-01
-------------------------------------	------------------

**Piezo Specific Functions****Voltage Control**

Rail pressure dependent precontrol of the voltage difference between cut off voltage and stationary actuator voltage.

Closed-loop voltage control, injector individual.

Voltage precontrol to improve dynamic behavior.

**Discharging Time Control**

Voltage dependent precontrol of discharging current.

Closed-loop discharging time control, injector individual.

Discharging time precontrol to improve dynamic behavior.

**IVA Injector Voltage Adjustment**

Determination of injector voltage demand at reference rail pressure during injector inspection in plant before IQA-measurement.

Injector assignment of voltage setpoint curves within the ECU according to injector's IVA class.

**Temperature Compensation**

Determination of the temperature dependent changes of voltage demand.

Definition of a temperature dependent correction factor.

Multiplicative correction of the voltage set point.

**Installation Notes**

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

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

**Communication**

2 K-line serial interfaces

5 CAN interfaces (dash, application, customer use, switchable CAN load resistor)

2 FireWire interfaces for external communication

**Ordering Information****Engine Control Unit MS 12**

Order number **on request**

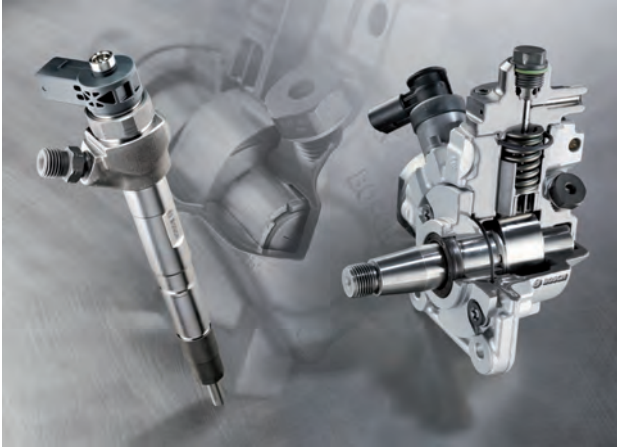


<b>Diesel System Components</b>	<b>42</b>
<b>Injection Valves</b>	<b>45</b>
<b>HP Injection Power Stages</b>	<b>61</b>
<b>Fuel Pumps</b>	<b>64</b>
<b>Fuel Pressure Regulators</b>	<b>77</b>
<b>Ignition Coils</b>	<b>89</b>
<b>Ignition Modules</b>	<b>137</b>

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## Diesel System Components

2



- The base output level and the desired output level for the engine
- If it is originally equipped with Bosch components: the part numbers of the Bosch components
- Alternatively the car / engine manufacturer part number of the original injection system.



### Notice

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



### Notice

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

### Features

- ▶ Modification of Common Rail systems
- ▶ Different modification levels available
- ▶ All hydraulic parts available

The geometry and characteristics of Diesel engine components are more dependent upon the application than those 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 Common Rail technology for racing that was developed for production vehicle applications. This includes both solenoid (magnetic) technology 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 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:

### Installation Notes

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

**Dimensions**



Common Rail Pumps



Rails

Pressure Sensors



Injectors



Pressure Control Valves

Common Rail Pumps	CP1H, CP3, CP4	
Rails		Max. 6 cyl./bank
Pressure Sensors	RDS	Max. 2,400 bar
Injectors	CRI 2 (Solenoid), CRI 3 (Piezo)	
Pressure Control Valves	DRV	Max. 2,400 bar

## Technical Specifications

	1st Level	2nd Level	3rd Level
Description	Series components with minor modifications (e.g. series components from a bigger engine plus series injector with sample nozzle)	Series components with modifications (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 (Prices will be finalized in your personal offer once part numbers are defined)
High pressure pump	1,250.00 €	3,000.00 €	
Fuel rail	Ca. 500.00 €	Ca. 1,000.00 €	
System price	4,350.00 €	12,400.00 €	

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.

## Injection Valve EV 6



Bent angle $\gamma$	0 to 20°
Coil resistance	1.2 to 16 $\Omega$

### Electrical Data

Power supply	6 to 16.5 V
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### Connectors and Wires

Connectors	Jetronic, Sumitomo, Motorsport connectors
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### Features

- ▶ Single beam or twin beam
- ▶ Flow rate at 3 bar: up to 962 cm<sup>3</sup>/min (N-heptane)
- ▶ Spray angle 15 to 70°

EV 6 injection valves are designed to inject the fuel as efficiently as possible into the intake manifold runner to achieve a homogeneous distribution of fuel in air flow. EV 6 injection valves feature high corrosion resistance and excellent engine start characteristics. The hydraulic connections of the Bosch injection valves EV 6, EV 12 and EV 14 are compatible.

### Installation Notes

Please ask for more information before ordering.

Injectors with low resistance are only supplied with a peak and hold power stage.

### Communication

#### Mechanical Data

System pressure	Max. 8 bar
Weight	≤ 55 g
Fuel input	Top-feed injector
Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤ 70°C
Climate-proof corresponding to saline fog test DIN 50 021	
Housing design	Standard (S), Long (L)
Spray type	C (Conical Spray) or E (2-Spray)
Flow rate at 3 bar (n-heptane)	134 to 962 cm <sup>3</sup> /min 92 to 658 g/min
Spray angle $\alpha$	15 to 70°

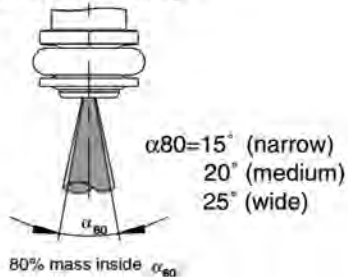
Dimensions

2

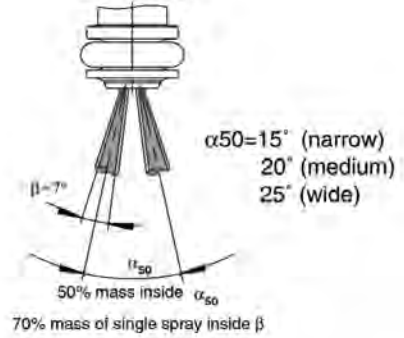


Housing Variations

C: Conical Spray

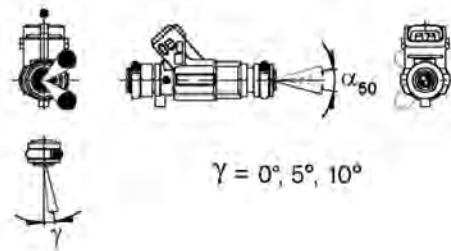
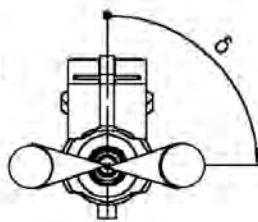


E: 2-Spray



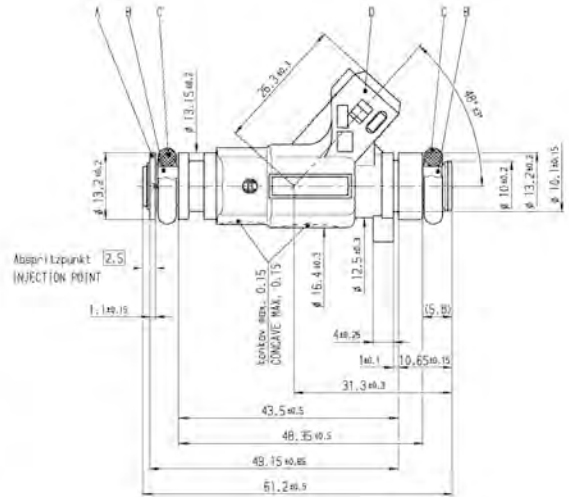
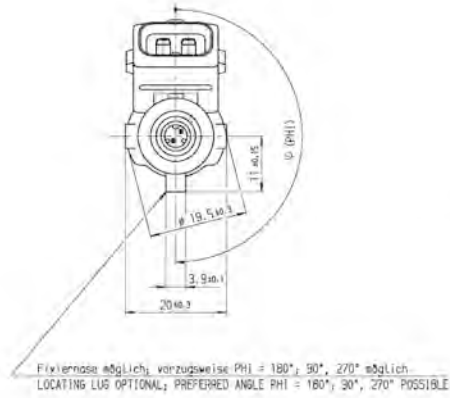
Angle between connection and spray level ( $\delta = \text{delta}$ ):  
 (only 2-spray preparation)

$\delta = 0^\circ - 360^\circ$  possible

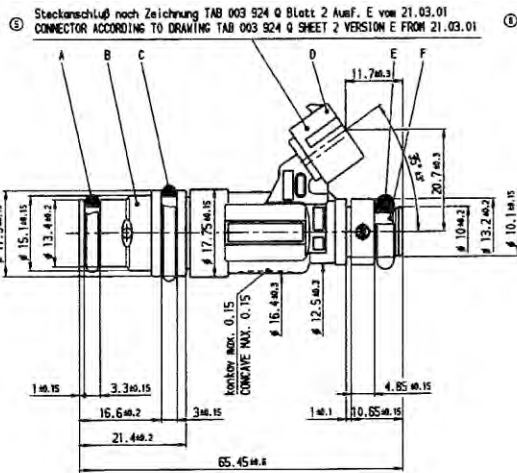


Spray Illustrations





EV6 Standard



EV6 Long

## EV 6 Variations

## Variations of production type valves

Part Nr.	0 280 156 194	0 280 155 868	0 280 155 830	0 280 156 063	0 280 156 012
Flow rate/min	116 g/170 cm <sup>3</sup>	261 g/382 cm <sup>3</sup>	261 g/382 cm <sup>3</sup>	269 g/393 cm <sup>3</sup>	310 g/453 cm <sup>3</sup>
Type	C	C	E	E	C
Housing	S	L	L	L	S
$\alpha_{80}$	15°	15°	20°	15°	20°
$\gamma$	0°	0°	0°	10°	5°
Resistance	14.5 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$

Further variations are available on request

## Variations of Motorsport valves

Part Nr.	B 280 431 127-07	B 280 431 128-04	, B 280 431 129-03	B 280 431 131-02	B 280 434 499-02
Flow rate/min	261 g/382 cm <sup>3</sup>	364 g/533 cm <sup>3</sup>	364 g/533 cm <sup>3</sup>	493 g/721 cm <sup>3</sup>	658 g/962 cm <sup>3</sup>
Type	C	C	C	C	C
Housing	S	S	S	S	S
$\alpha_{80}$	70°	25°	70°	70°	25°
$\gamma$	0°	0°	0°	0°	0°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$	1.2 $\Omega$	12 $\Omega$

Further variations are available on request.

## Injection Valve EV 12



### Connectors and Wires

Connectors	Jetronic, Sumitomo, Motorsport connectors
------------	---

### Installation Notes

Please ask for more information before ordering.

2

### Features

- ▶ Single beam or twin beam
- ▶ Flow rate at 3 bar: up to 1,023 cm<sup>3</sup>/min (N-heptane)
- ▶ Spray angle 5 to 60°
- ▶ With extension

EV 12 injection valves are EV 6 injection valves with an extended tip.

There is only one injector body size for the EV 12. Various delivery rates and spray-angles are available. The injection valves EV 6, EV 12 and EV 14 are compatible.

### Technical Specifications

#### Mechanical Data

System pressure	Max. 8 bar
Weight	40 g
Installation length	48 mm (total 81 mm)
Fuel input	Top-feed injector
Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤ 70°C
Climate-proof corresponding to saline fog test DIN 50 021	
Housing design	Standard with extension
Spray type	C (Conical Spray) or E (2-Spray)
Flow rate at 3 bar (n-heptane)	146 to 1,023 cm <sup>3</sup> /min 59 to 670 g/min
Spray angle $\alpha$	5 to 60°
Bent angle $\gamma$	0 to 17°
Coil resistance	11 to 16 $\Omega$

#### Electrical Data

Power supply	6 to 16.5 V
--------------	-------------

Dimensions

2



EV 12 E 0 280 155 892



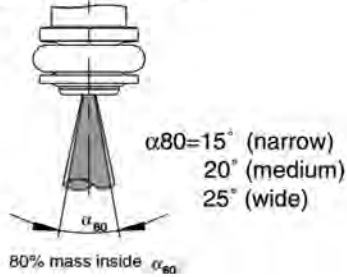
EV 12 E 0 280 155 897



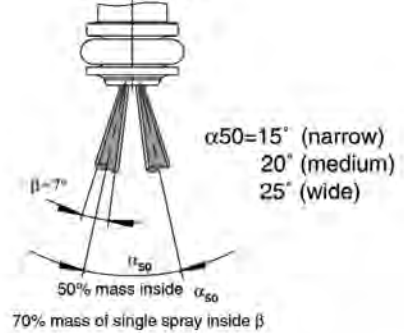
EV 12 E 0 280 157 000

Housing Variations

C: Conical Spray

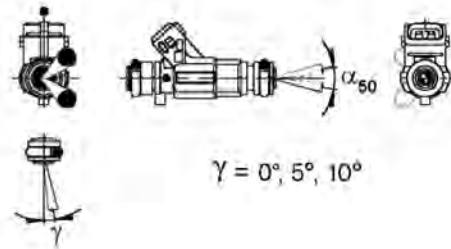
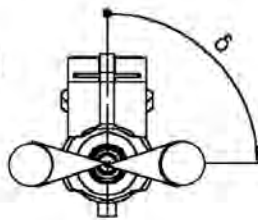


E: 2-Spray

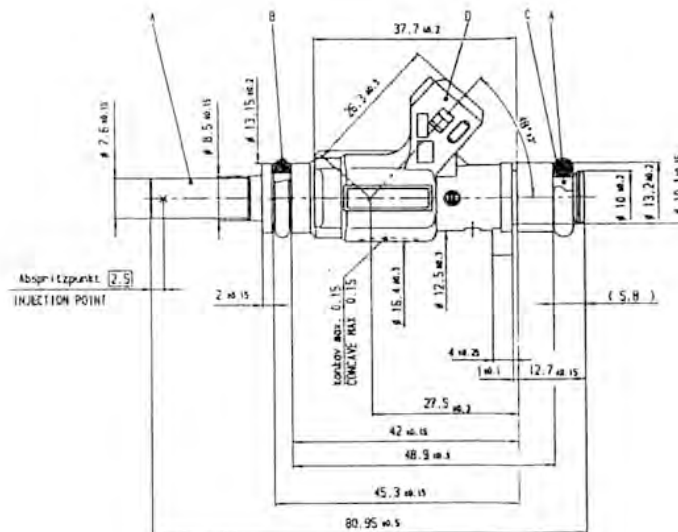


Angle between connection and spray level ( $\delta = \text{delta}$ ):  
 (only 2-spray preparation)

$\delta = 0^\circ - 360^\circ$  possible



Spray Illustrations



## EV 12 Variations

## Variations of production type valves

Part Nr.	0 280 157 002	0 280 157 012	0 280 155 897	0 280 155 892	0 280 157 000
Flow rate/min	120 g/175 cm <sup>3</sup>	193 g/282 cm <sup>3</sup>	217 g/317 cm <sup>3</sup>	269 g/393 cm <sup>3</sup>	310 g/453 cm <sup>3</sup>
Type	E	E	E	E	E
Housing	S	S	S	S	S
$\alpha$	15°	15°	15°	15°	15°
$\gamma$	10°	10°	10°	10°	10°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$

Further variations are available on request.

## Injection Valve EV 14



2

### Electrical Data

Power supply	6 to 16.5 V
--------------	-------------

### Connectors and Wires

Connectors	Jetronic, Sumitomo, Motorsport connectors
------------	---

### Installation Notes

Please ask for more information before ordering.

### Features

- ▶ Conical spray or 2-spray
- ▶ Flow rate at 3 bar: up to 1,023 cm<sup>3</sup>/min (N-heptane)
- ▶ Spray angle 15 to 85°
- ▶ With or without extension

EV 14 injection valves are the latest revision of the EV 6 injection valve technology.

EV 14 is designed for a wide range of flow rates and spray patterns. Compact size and three standard versions simplify mounting in a variety of applications.

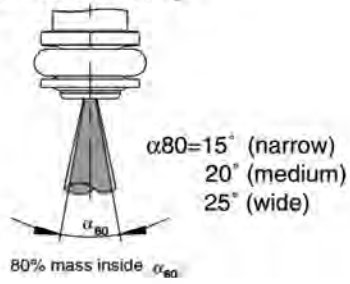
### Technical Specifications

#### Mechanical Data

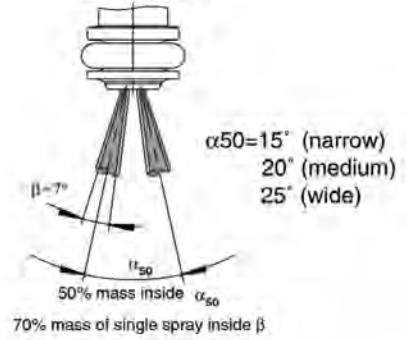
System pressure	Max. 8 bar
Weight	≤ 30 g
Installation lengths	33.6, 48.65 or 60.65 mm
Fuel input	Top-feed injector
Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤ 70°C
Climate-proof corresponding to saline fog test DIN 50 021	
Housing design	Compact (C), Standard (S), Long (L)
Spray type	C (Conical Spray) or E (2-Spray)
Flow rate at 3 bar (N-heptane)	146 to 1,023 cm <sup>3</sup> /min 100 to 700 g/min
Spray angle α	15 to 85°
Bent angle γ	0 to 15°
Coil resistance	12 Ω

Dimensions

**C: Conical Spray**

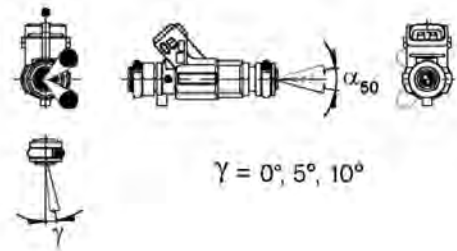
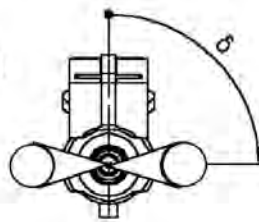


**E: 2-Spray**

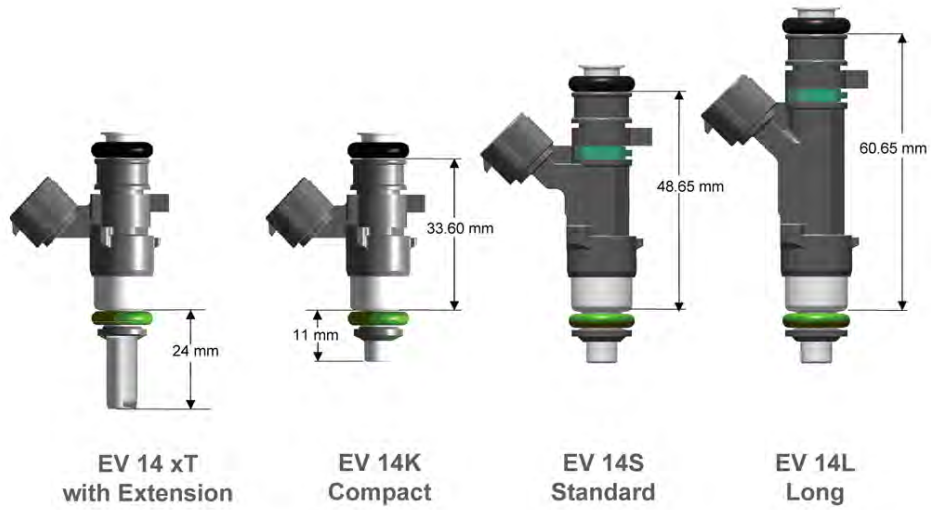


Angle between connection and spray level ( $\delta = \text{delta}$ ):  
(only 2-spray preparation)

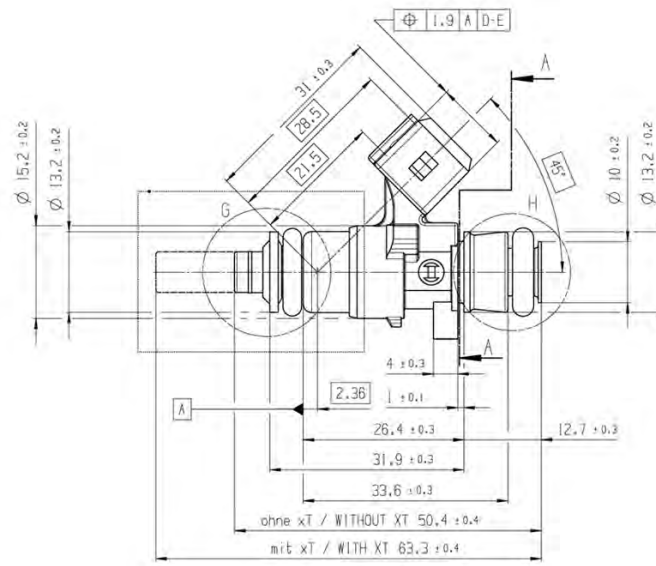
$\delta = 0^\circ - 360^\circ$  possible



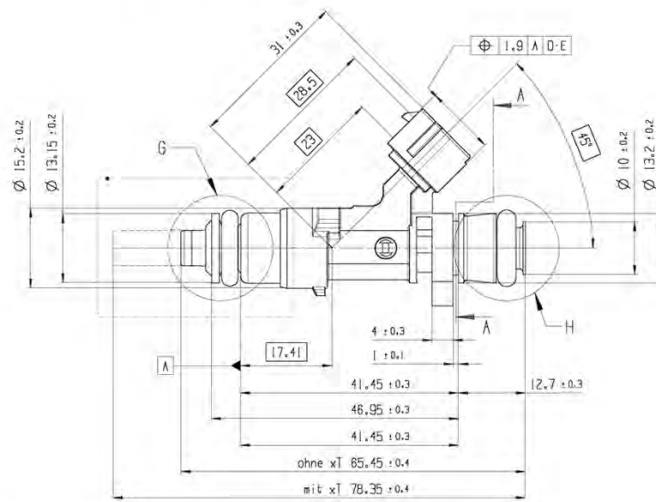
Spray Illustrations



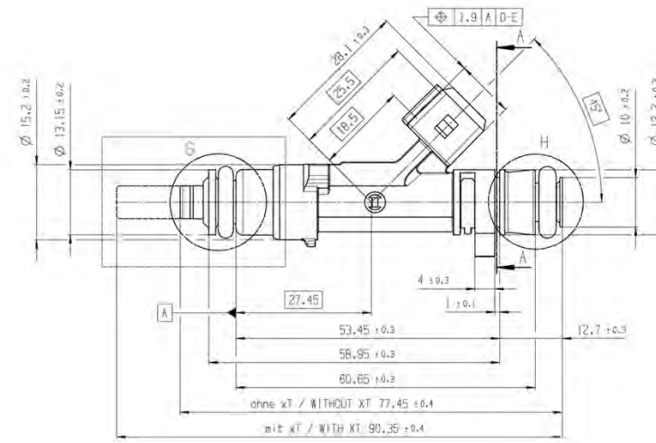
Housing Variations



EV 14 Compact



EV 14 Standard



EV 14 Long



## EV 14 Variations

## Variations of production type valves

Part Nr.	0 280 158 110	0 280 158 200	0 280 158 107	0 280 158 013	0 280 158 038
Flow rate/min	116 g/170 cm <sup>3</sup>	116 g/170 cm <sup>3</sup>	150 g/219 cm <sup>3</sup>	150 g/219 cm <sup>3</sup>	237 g/347 cm <sup>3</sup>
Type	C	E	C	E	C
Housing	L	S	L	S	KxT
$\alpha$	15°	15°	20°	19°	20°
$\gamma$	0°	0°	0°	0°	0°
$\delta$	0°	90°	0°	90°	0°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$

Part Nr.	0 280 158 116	0 280 158 123	0 280 158 040
----------	---------------	---------------	---------------

Flow rate/min	237 g/347 cm <sup>3</sup>	429 g/627 cm <sup>3</sup>	670 g/980 cm <sup>3</sup>
Type	E	E	C
Housing	L	SxT	KxT
$\alpha$	22°	25°	30°
$\gamma$	5°	0°	0°
$\delta$	90°	90°	0°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$

Further variations are available on request

## Variations of Motorsport valves

Part Nr.	B 280 436 038-07	B 280 436 038-08	B 280 436 038-09	B 280 436 038-10	B 280 436 469-01
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Flow rate/min	503 g/736 cm <sup>3</sup>	503 g/736 cm <sup>3</sup>	387 g/566 cm <sup>3</sup>	387 g/566 cm <sup>3</sup>	697 g/1,019 cm <sup>3</sup>
Type	C	C	C	C	E
Housing	S	S	S	S	S
$\alpha$	70°	25°	70°	25°	20°
$\gamma$	0°	0°	0°	0°	0°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$

Further variations are available on request.

## Injection Valve EV 14i



2

### Electrical Data

Power supply	6 to 16.5 V
--------------	-------------

### Connectors and Wires

Connectors	Div. motorsports connectors
------------	-----------------------------

### Installation Notes

Please ask for more information before ordering.

Injectors with low resistance are only supplied with a peak and hold power stage.

### Features

- ▶ Flow rate at 3 bar: up to 1,023 cm<sup>3</sup>/min (N-heptane)
- ▶ Spray angle 15 to 85°
- ▶ Extremely small housing
- ▶ Very low weight
- ▶ Special development for motorsports

EV 14i injection valves are especially developed for motorsport applications.

The valve is designed for a wide range of flow rates and spray patterns. Very compact size simplifies mounting in a variety of applications.

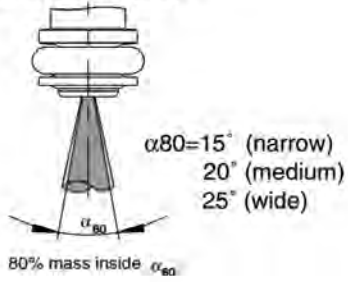
### Technical Specifications

#### Mechanical Data

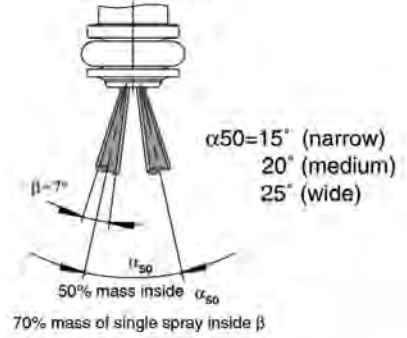
System pressure	Max. 8 bar
Weight	≤20 g
Installation lengths	26.9 mm
Fuel input	Top-feed injector
Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤70°C
Climate-proof corresponding to saline fog test DIN 50 021	
Housing design	Very compact
Spray type	C (Conical Spray) or E (2-Spray)
Flow rate at 3 bar (N-heptane)	Max. 1,023 cm <sup>3</sup> /min Max. 700 g/min
Spray angle α	15 to 85°
Bent angle γ	0 to 15°
Coil resistance	12 Ω

Dimensions

**C: Conical Spray**

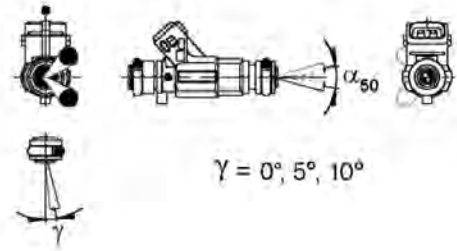
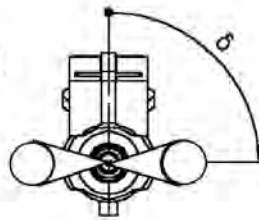


**E: 2-Spray**

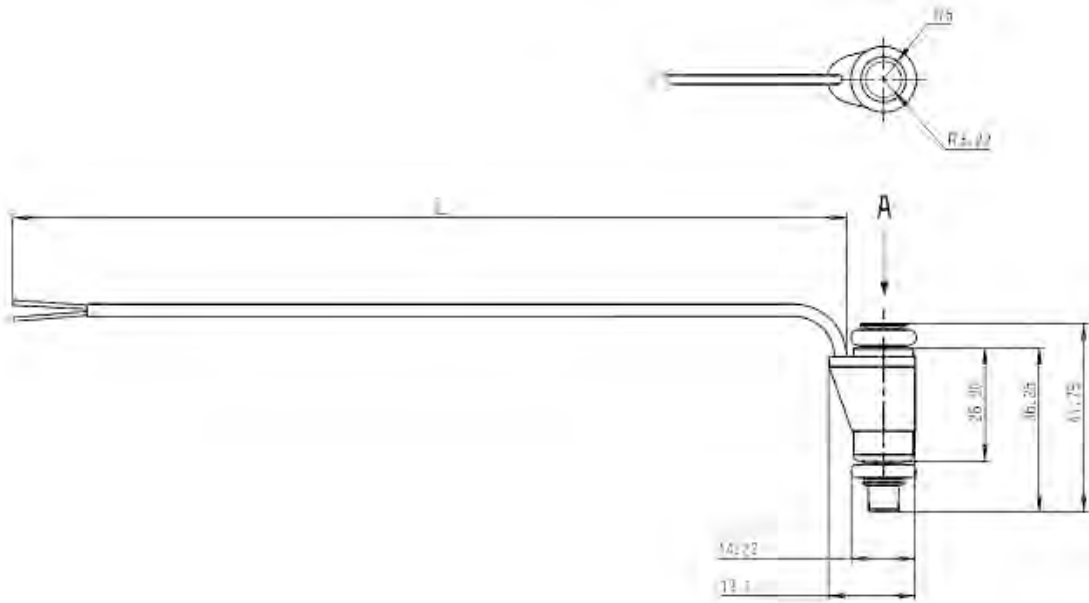


Angle between connection and spray level ( $\delta = \text{delta}$ ):  
(only 2-spray preparation)

$\delta = 0^\circ - 360^\circ$  possible



Spray Illustrations



## EV 14i Variations

## Variations of production type valves

Part Nr.	B 280 436 323-03	B 280 436 270-03	B 280 436 548-01	F02U V00 718-01	F02U V00 724-01
Flow rate/min	213 g/311 cm <sup>3</sup>	263 g/385 cm <sup>3</sup>	261 g/382 cm <sup>3</sup>	261 g/382 cm <sup>3</sup>	261 g/382 cm <sup>3</sup>
Type	C	C	E	C	E
Housing	i	i	ixT	i	i
$\alpha$	85°	25°	20°	35°	20°
$\gamma$	0°	0°	15°	0°	0°
$\delta$	0°	0°	90°	0°	0°
Resistance	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$	12 $\Omega$

Part Nr.	B 280 436 470-01
----------	------------------

Flow rate/min	310 g/453 cm <sup>3</sup>
Type	C
Housing	i
$\alpha$	50°
$\gamma$	0°
$\delta$	0°
Resistance	12 $\Omega$

Further variations are available on request.

## HP Injection Valve HDEV 5.2



### Features

- ▶ Max. 200 bar
- ▶ Multi hole
- ▶ Flow rate at 100 bar: up to 1,500 cm<sup>3</sup>/min (N-heptane)
- ▶ Spray angle 8 to 20°

The HDEV 5.2 is a high pressure injector, which is developed to be used as a port or a direct injector.

The function of the HDEV 5.2 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 optimized regarding very short opening and closing times which ensures a very stable linearity at short injection times.

The 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. Bosch offers the spray targeting design according to the individual customer requirements. If your application conditions will not match the listed performance data, please ask for consultancy at Bosch Motorsport. In addition to the specific designed sample, Bosch offers cost effective production HDEV 5.2 on request.

### Application

Application	308 to 1,026 g/min at 100 bar (typical)
Fuel input	Top-feed injector
Fuel	Gasoline
Operating pressure	200 bar
Operating temperature range	-31 to 130°C
Storage temperature range	-40 to 70°C
Max. vibration	600 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Weight w/o wire	68 g
Diameter	20.7 mm
Length	87 mm
Spray type	Multi hole
Number of holes	4 to 7 holes (typical)
Spray angle overall	110° (typical)
Spray angle single beam	8 to 20°
Static flow tolerance	±5 %
Dynamic flow tolerance	±6 % at $t_i = 1.5$ ms
Leakage	≤2.5 mm <sup>3</sup> /min at 23°C

#### Electrical Data

Booster supply	65 to 90 V
Booster current	13.2 A
Booster time	500 μs
Power supply	12 V
Pick up current	9.6 A
Pick up time	800 μs
Hold power supply	12 V
Hold current	3.0 A hysteresis 0.8 A
Coil resistance	1,500 mΩ (ambient temp.)

#### Connectors and Wires

Mating connector Compact	D 261 205 359-01
Connector Jetronic (wire)	D 261 205 288-01
Connector motorsports (wire)	On request
Pin 1	Pos
Pin 2	Gnd

### Installation Notes

The injector has to be supplied by a Bosch Motorsport Power Stage Unit (e.g. HPI 5 or HPI 1.16).

Listed electrical values may vary according to the application.

The injector can be cleaned (mechanically or chemically), if the tip will not be damaged.

Do not use supersonic cleaning.

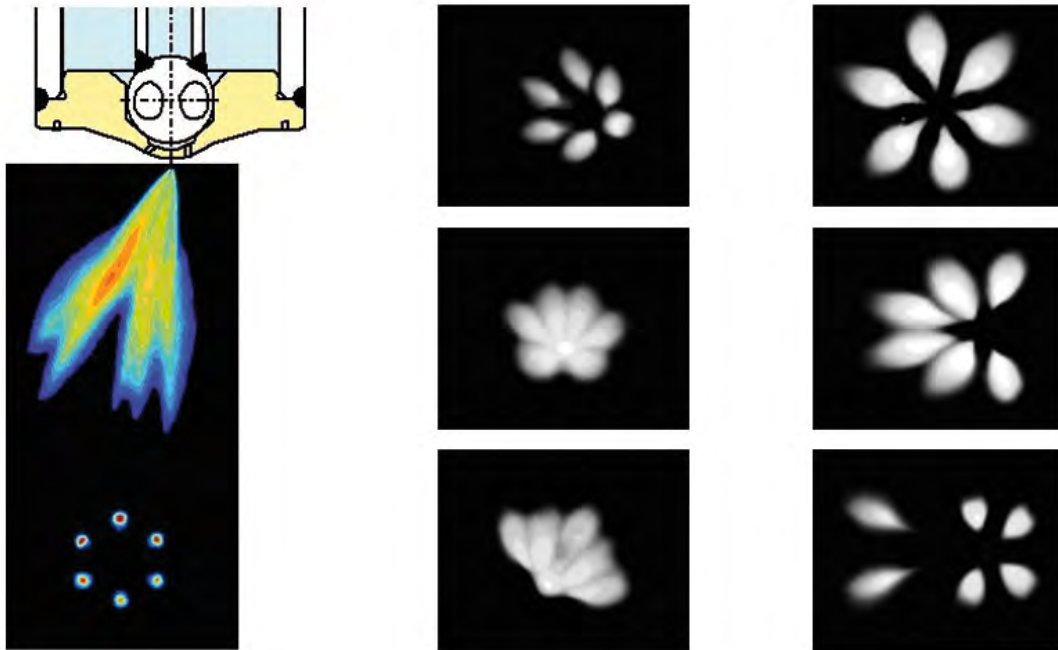
### Ordering Information

#### HP Injection Valve HDEV 5.2

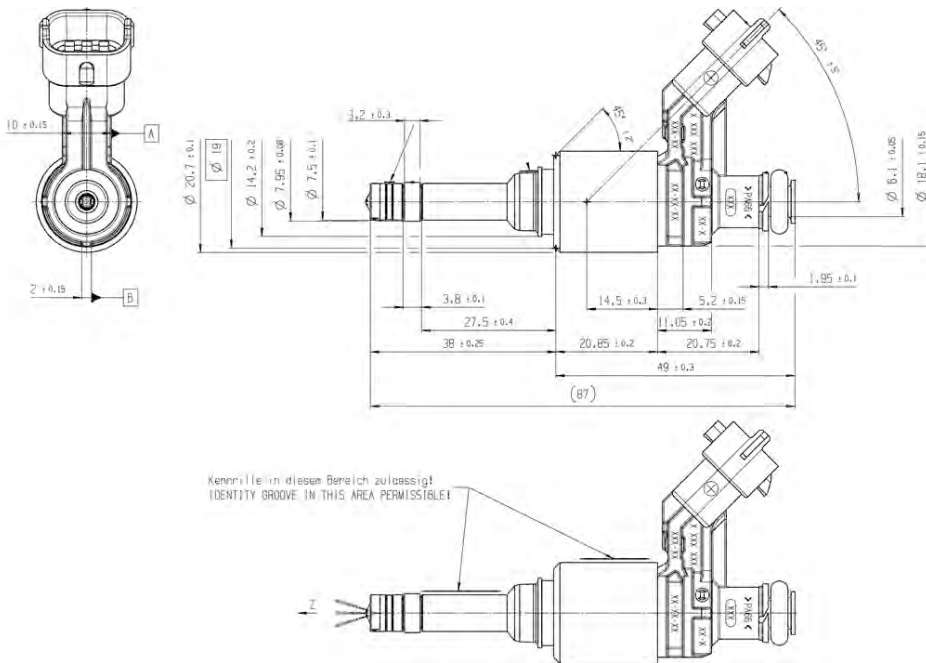
Order number **on request**

Dimensions

2



Spray Variations, further Variations on request



## HPI 1.1



### Features

- ▶ Max. 6 cylinders
- ▶ Max. 9,000 rpm (4 cyl. operation)
- ▶ 430 g

The injector power stage HPI 1.1 is a device for driving injectors for gasoline direct injection. Combined with a suitable ECU up to 6 injectors can be driven. The injectors are gathered in 3 groups of 2 injectors each. Within a group only one injector can be switched on at the same time. The 3 groups are totally independent, so that overlapping injection of injectors of different groups is possible. Communication between main ECU and the HPI 1.1 is realized via CAN interface.

### Application

Max. number of cylinders	6
Max. rpm (4 cyl. operation)	9,000
Max. rpm (6 cyl. operation)	6,000
Optimized for Bosch high pressure injection valves HDEV 1 and HDEV 5	
Max. vibration	Vibration profile 2 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

### Technical Specifications

#### Variations

	HPI 1.1 Active low	HPI 1.1 Active high
Injection control inputs	Inverting (Low = "ON") for operation with standard lowside power stages of automotive ECUs	Non-inverting (High = "ON")

#### Mechanical Data

Sheet-metal housing
Each connector pin individually filtered

Vibration damped circuit boards	
Housing temperature	-25 to 85°C
Size	180 x 162 x 46 mm
Weight	430 g

#### Electrical Data

Power supply	14 V
Operating voltage (normal operation)	11 to 16 V
Operating voltage (engine start)	6 to 18 V
Nominal voltage	14 V

#### Communication

1 CAN (500 kBaud)
1 K-Line

#### Ordering Information

**HPI 1.1 Active low for HDEV 1**  
Order number **F 01T A20 000-01**

**HPI 1.1 Active low for HDEV 5**  
Order number **F 02U V00 030-01**

**HPI 1.1 Active high for HDEV 1**  
Order number **F 01E B01 645-01**

**HPI 1.1 Active high for HDEV 5**  
Order number **F 02U V00 036-01**

## HPI 1.16 HV/HVD



2

### Features

- ▶ Max. 10 cylinders
- ▶ Max. 12,500 rpm
- ▶ 725 g

In combination with a Bosch Motorsport ECU the HPI 1.16 enables the running of high pressure injection valves. The injector current is realized by a switched current regulation with boost period, pick-up period, holding period and recharging period. This HPI can be used for example in racing series like DTM, 24h Le Mans, etc.

### Application

Max. number of cylinders	10
Max. rpm	12,500
Optimized for Bosch HP injection valves HDEV 1 and HDEV 5	
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

### Technical Specifications

#### Variations

	HPI 1.16 HV	HPI 1.16 HVD
Voltage support	External supply of booster voltage (90 V) is required	Internal voltage regulator 65 to 90 V
Housing temperature	-25 to 85°C	-25 to 70°C
Weight	575 g	725 g

#### Mechanical Data

Aluminum housing  
Filtered connectors in motorsport technology with high pin density

Vibration damped printed circuit boards	
Flexible housing fixation points	
Housing temperature	Please see Variations
Size without connectors	135 x 101 x 43 mm
Weight	Please see Variations

#### Electrical Data

Operating voltage	8 to 18 V
Nominal voltage	14 V

#### Communication

1 CAN  
1 K-Line

#### Ordering Information

##### HPI 1.16 HV

Order number **F 01T A20 019**

##### HPI 1.16 HVD

With internal voltage regulator 65 to 90 V

Order number **F 01T A20 018**



## HPI 5



### Features

- ▶ Max. 8 cylinders
- ▶ Max. 14,000 rpm (4 cyl. operation)
- ▶ 550 g

The injector power stage HPI 5 is a device for driving injectors and high pressure pumps for gasoline direct injection. Combined with a suitable ECU up to 8 injectors can be driven. The injectors are gathered in 4 groups of 2 injectors each. Within a group only one injector can be switched on at the same time. The 4 groups are totally independent, so that overlapping injection of injectors of different groups is possible. The high pressure pump power stage is designed to drive the Bosch high pressure pump HDP 5. Communication between main ECU and the HPI 5 is realized via CAN interface.

### Application

Max. number of cylinders	8
Max. rpm (8 cyl. operation)	7,000
Max. rpm (4 cyl. operation)	14,000

Optimized for Bosch high pressure injection valve HDEV 5 and Bosch high pressure pump HDP 5

Further HDEV and HDP on request

### Technical Specifications

#### Mechanical Data

Aluminum housing	
Each connector pin individually filtered	
Housing temperature	-25 to 85°C
Size (incl. connectors)	190 x 123 x 36 mm
Weight	550 g

#### Electrical Data

Voltage supply	14 V
Operating voltage	10 to 16 V
Operation voltage (engine start)	6.5 to 16 V
Nominal voltage	14 V

#### Connectors and Wires

Mating connector	D 261 205 353-01
------------------	------------------

#### Communication

1 CAN (1 MBaud)

#### Ordering Information

##### HPI 5

Order number **F 02U V00 929-01**

## Fuel Pump FP 100



2

### Features

- ▶ >100 l/h
- ▶ 725 g
- ▶ Max. 5 bar
- ▶ Fuel line screwed

The FP 100 is an inline roller cell pump for the installation outside the fuel tank.

It is capable of providing 100 l/h at 5 bar. Bio-fuel can be delivered up to E85.

The main benefit of the FP 100 over a production type pump is the high delivery rate at high pressure.

### Application

Fuel pressure	5 bar
Delivery rate at 5 bar and 22°C	118 ± 3 l/h
Pressure limiting valve	7 to 12.5 bar rel.
Fuel compatibility	E85
Operating temperature range	-20 to 90°C
Storage temperature range	-40 to 70°C
Max. vibration	3 mm at 10 to 18 Hz ≤40 m/s <sup>2</sup> at 18 to 60 Hz

### Technical Specifications

#### Mechanical Data

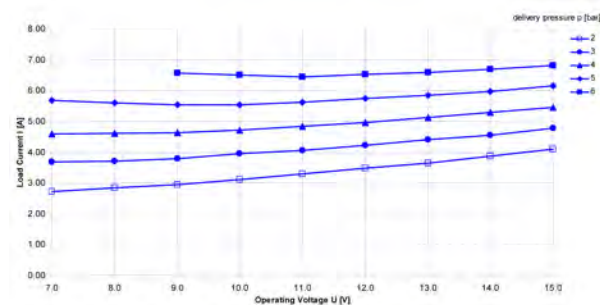
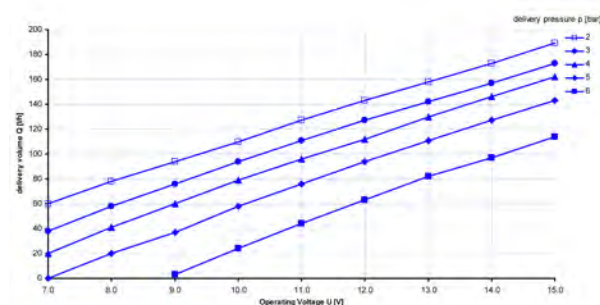
Diameter	54 mm
Length	185 mm
Weight	725 g
Mounting	Clamping

#### Electrical Data

Supply voltage	6 to 16.5 V
Operating voltage	13.8 V
Load current at 5 bar and 22°C	6.0 ± 0.5 A

#### Characteristic

Surface coating	None
Color	Silver
Non-return valve	External
Fuel filtering	External, on pressure side



#### Connectors and Wires

Electrical connector	+M4/-M5
Electrical matting connector	With ring wire M4 and M5
Mechanical connector intake side	M16x1.5
Mechanical connector pressure side	M12x1.5

#### Installation Notes

With E26/E85 or Diesel fuel run-time max. 500 h.

For technical reasons the values may vary.

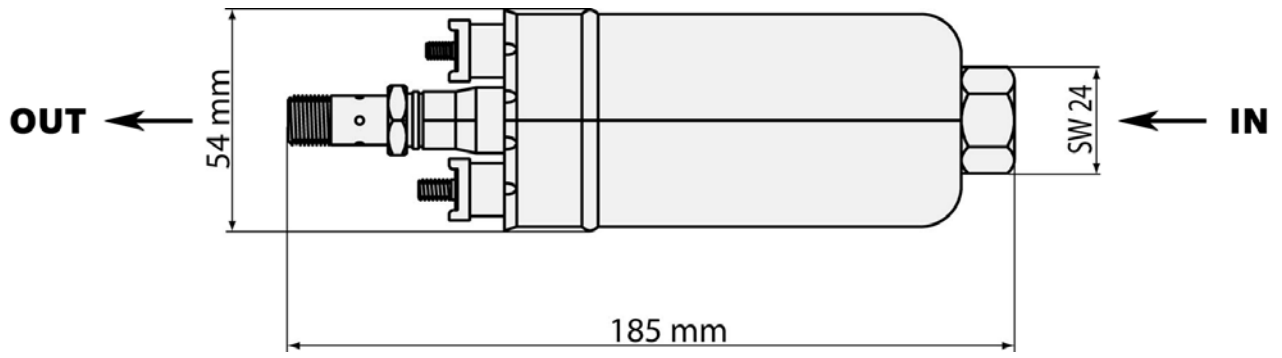
Please use within the specified limit values only.

Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

**Fuel Pump FP 100**  
Order number **Y 580 701 456-03**

Dimensions



## Fuel Pump FP 165



2

### Features

- ▶ >165 l/h
- ▶ 980 g
- ▶ Max. 5 bar
- ▶ Fuel lines screwed

The FP 165 is an inline roller cell pump for the installation outside the fuel tank. It is capable of providing 165 l/h at 5 bar. Bio-fuel can be delivered up to E85. The FP 165 is a production type fuel pump, combining good quality at a low price.

### Application

Fuel pressure	5 bar
Delivery rate at 5 bar and 22°C	205 ± 5 l/h
Pressure limiting valve	7 to 12.5 bar rel.
Fuel compatibility	E85
Operating temperature range	-20 to 90°C
Storage temperature range	-40 to 70°C
Max. vibration	3 mm at 10 to 18 Hz ≤40 m/s <sup>2</sup> at 18 to 60 Hz

### Technical Specifications

#### Mechanical Data

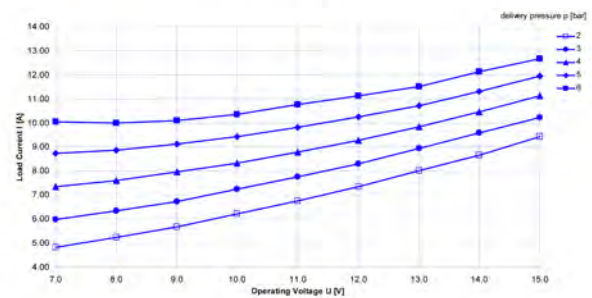
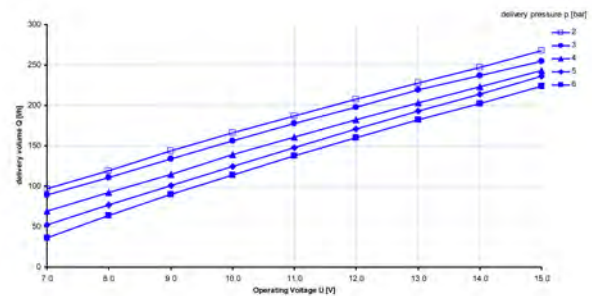
Diameter	60 mm
Length	168 mm
Weight	980 g
Mounting	Clamping

#### Electrical Data

Supply voltage	6 to 16.5 V
Operating voltage	13.8 V
Load current at 5 bar and 22 °C	11.0 ± 2 A

#### Characteristic

Surface coating	None
Color	Silver
Non-return valve	Internal
Fuel filtering	External, on pressure side



#### Connectors and Wires

Electrical connector	+M4/-M5
Electrical matting connector	with ring wire M4 and M5
Mechanical connector intake side	M14x1.5
Mechanical connector pressure side	M12x1.5

#### Installation Notes

With E26/E85 or Diesel fuel run-time max. 500 h.

For technical reasons the values may vary.

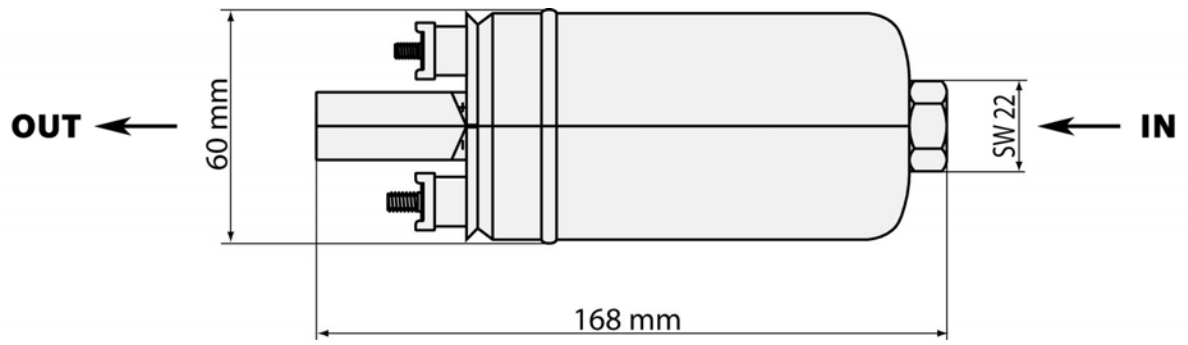
Please use within the specified limit values only.

Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

**Fuel Pump FP 165**  
Order number **0 580 254 979**

Dimensions



## Fuel Pump FP 200



2

### Features

- ▶ >200 l/h
- ▶ 1,030 g
- ▶ Max. 5 bar/8 bar
- ▶ Fuel lines screwed

The FP 200 is an inline roller cell pump for the installation outside or inside the fuel tank. It is capable of providing 200 l/h at 5 bar (8 bar). Bio-fuel can be delivered up to E85. The FP 200 is one of the most popular aftermarket fuel pumps and has an excellent price.

### Application

Fuel pressure	5 bar or 8 bar
Delivery rate at 5 bar and 22°C	260 ± 5 l/h
Delivery rate at 8 bar and 22°C	220 ± 5 l/h
Pressure limiting valve	10 to 12.5 bar rel.
Fuel compatibility	E85
Operating temperature range	-20 to 90°C
Storage temperature range	-40 to 70°C
Max. vibration	3 mm at 10 to 18 Hz ≤40 m/s <sup>2</sup> at 18 to 60 Hz

### Technical Specifications

#### Mechanical Data

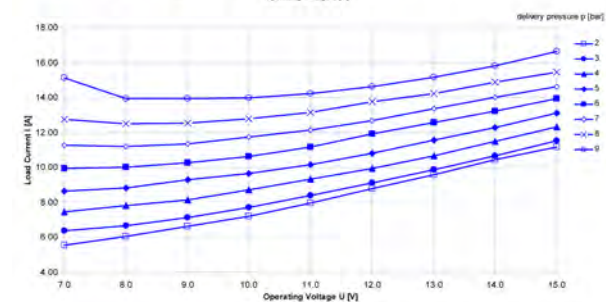
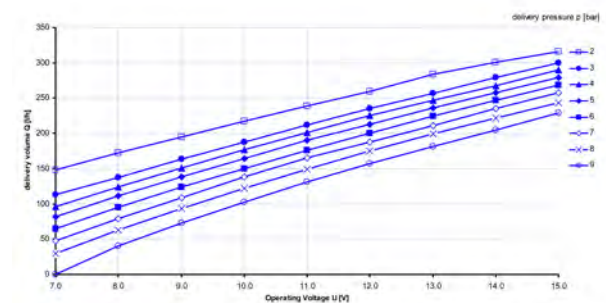
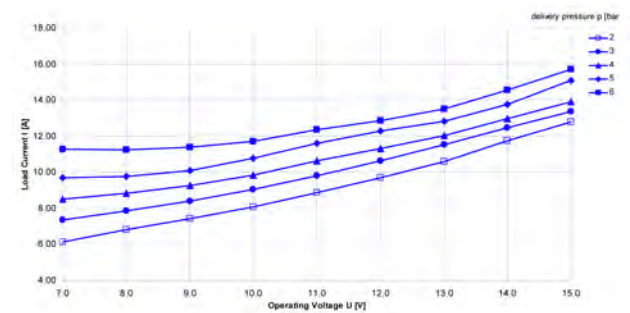
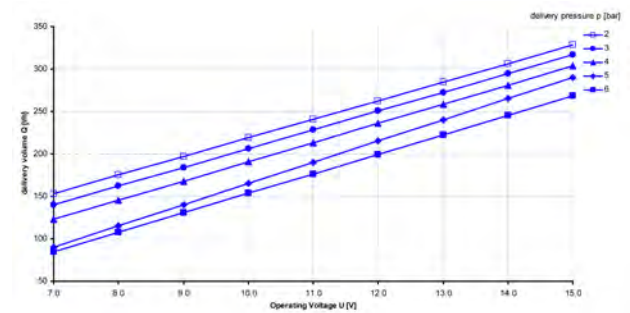
Diameter	60 mm
Length	196 mm
Weight	1,030 g
Mounting	Clamping

#### Electrical Data

Supply voltage	6 to 16.5 V
Operating voltage	13.8 V
Load current at 5 bar and 22°C	14 ± 1 A
Load current at 8 bar and 22°C	15 ± 1 A

#### Characteristic

Surface coating	None
Color	Silver
Non-return valve	External
Fuel filtering	External, on pressure side



### Connectors and Wires

Electrical connector	+M6/-M5
Electrical matting connector	With ring wire M6 and M5
Mechanical connector intake side	M18x1.5
Mechanical connector pressure side	M12x1.5

### Installation Notes

With E26/E85 or Diesel fuel run-time max. 500 h.

For technical reasons the values may vary.

Please use within the specified limit values only.

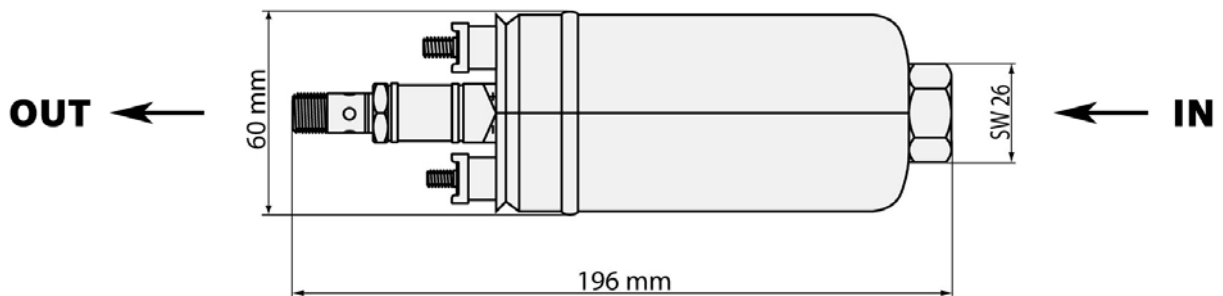
Please find further application hints in the offer drawing at our home-page.

### Ordering Information

**Fuel Pump FP 200, 5 bar**  
Order number **0 580 254 044**

**Fuel Pump FP 200, 8 bar**  
Order number **B 261 205 413-01**

### Dimensions



## Fuel Pump FP 300

2



### Features

- ▶ >300 l/h
- ▶ 714 g
- ▶ Max. 8 bar
- ▶ Fuel lines screwed

The FP 300 represents the next generation of low-pressure inline fuel pumps. The internals in the pump are designed specifically for motorsport applications.

Higher fuel deliveries from modified rotor design, as well as an improved power-to-weight ratio are two of the advantages of this pump.

The pump can be used for gasoline, Diesel and Bio-fuels.

### Application

Fuel pressure	8 bar
Delivery rate at 8 bar and 22°C	340 ± 5 l/h
Pressure limiting valve	8.5 bar rel.
Fuel compatibility	Gasoline E85/M100 Diesel
Operating temperature range	-20 to 90°C
Storage temperature range	-40 to 70°C
Max. vibration	3 mm at 10 to 18 Hz ≤40 m/s <sup>2</sup> at 18 to 60 Hz

### Technical Specifications

#### Mechanical Data

Diameter	50 mm
Length	174 mm
Weight FP 300	714 g
Mounting	Clamping

#### Electrical Data

Supply voltage	10 to 16.5 V
Operating voltage	13.8 V
Load current at 5 bar and 22°C	17.3 ± 1 A

#### Characteristic

Surface coating	Anodized
Color	Red
Non-return valve	Internal
Fuel filtering	Internal

#### Connectors and Wires

Electrical connector	+M6/-M5
Electrical matting connector	with ring wire M6 and M5
Mechanical connector intake side	M18x1.5
Mechanical connector pressure side	M12x1.5

#### Installation Notes

Integrated pre-filter allows cleaning of filter by user.

With E26/E85 or M100 fuel run-time max. 500 h.

For technical reasons the values may vary.

Please use within the specified limit values only.

Please flush the pump with gasoline after use with Methanol fuel.

Please find further application hints in the offer drawing at our homepage.

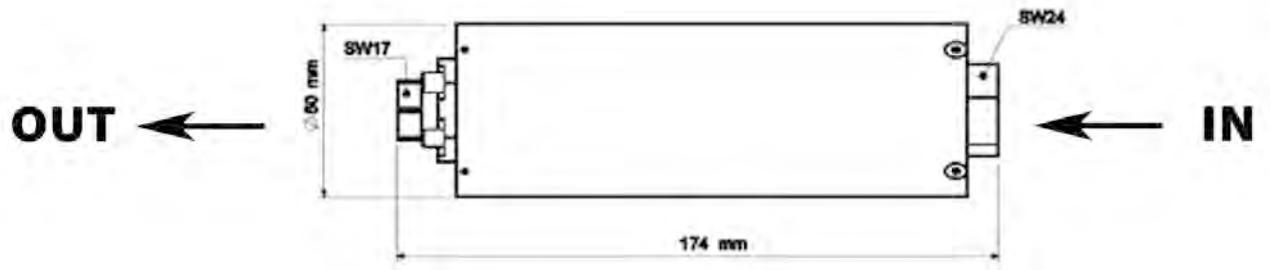
#### Ordering Information

##### Fuel Pump FP 300

Order number **B 261 205 366-01**



## Dimensions



## Fuel Pump FP 300L

2



### Features

- ▶ >300 l/h
- ▶ 670 g
- ▶ Max. 8 bar
- ▶ Fuel lines screwed

The FP 300L represents the next generation of low-pressure inline fuel pumps. The internals of the pump are designed specifically for motorsport applications. Higher fuel delivery from modified rotor design, as well as an improved power-to-weight ratio are two of the advantages of this pump. The pump can be used for gasoline, Diesel and Bio-fuels. The FP 300L has further weight reduction measures.

### Application

Fuel pressure	8 bar
Delivery rate at 8 bar and 22°C	340 ± 5 l/h
Pressure limiting valve	8.5 bar rel.
Fuel compatibility	Gasoline E85/M100 Diesel
Operating temperature range	-20 to 90°C
Storage temperature range	-40 to 70°C
Max. vibration	3 mm at 10 to 18 Hz ≤40 m/s <sup>2</sup> at 18 to 60 Hz

### Technical Specifications

#### Mechanical Data

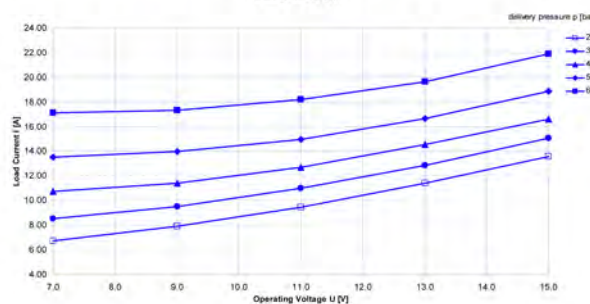
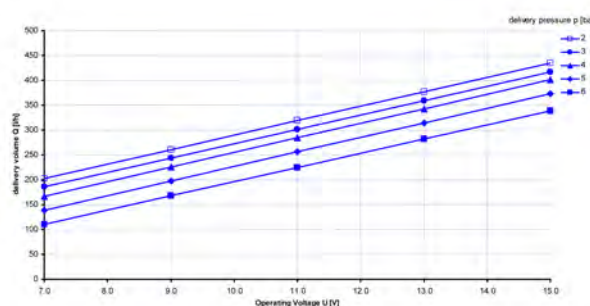
Diameter	50 mm
Length	174 mm
Weight	670 g
Mounting	Clamping

### Electrical Data

Supply voltage	6 to 16.5 V
Operating voltage	13.8 V
Load current at 5 bar and 22°C	17.3 ± 1 A

### Characteristic

Surface coating	Anodized
Color	Red
Non-return valve	Internal
Fuel filtering	Internal



### Connectors and wires

Electrical connector	+M6/-M5
Electrical matting connector	with ring wire M6 and M5
Mech. connector intake side	M18x1.5
Mech. connector pressure side	M12x1.5

### Installation Notes

Integrated pre-filter allows cleaning of filter by user.

With E26/E85 or M100 fuel run-time max. 500 h.

For technical reasons the values may vary.

Please use within the specified limit values only.

Please flush the pump with gasoline after use with methanol fuel.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Fuel Pump FP 300L**  
Order number **F 02U V00 636-01**

## Dimensions



## HP Fuel Pump HDP 5-FCV/-FCV HP



2

### Features

- ▶ 200 bar or more
- ▶ Max.  $1.1 \text{ cm}^3/\text{rot}_{\text{cam}}$
- ▶ Integrated control valve
- ▶ 780 g

The HDP 5 FCV is a compact high pressure single piston pump. The design allows achieving a big delivery volume as well as high efficiency, as needed in motorsport applications. Modifications in the number of cam lobes and cam lifts allow different flow requirements to be addressed.

We offer two variations of the HDP 5 FCV: one is equipped with an internal pressure relief valve to limit the maximum fuel pressure (HDP 5-FCV). This variation does not require a fuel return line into the fuel tank.

The other variation (HDP 5-FCV HP) is not equipped with an internal pressure relief valve and therefore requires a pressure regulation valve in the common rail to avoid overload pressure.

Both variations have an integrated demand control for metering the amount of fuel supplied into the high pressure fuel system. Both variations can be ordered with a compact connector or a motorsport connector.

Depending on the requirements of your engine (e.g. fuel consumption over rotation ratio) we recommend different types of tappets, piston springs and cam profiles.

Please notice: Fuel delivery and maximum driveshaft speed depend on cam profile and type of tappet.

### Application

For high pressure manifold injection or gasoline direct injection

### Technical Specifications

#### Variations

Model	Max. pressure	Connector
HDP 5-FCV	200 bar	Compact
HDP 5-FCV	200 bar	Motorsports
HDP 5-FCV HP	Over 200 bar	Compact
HDP 5-FCV HP	Over 200 bar	Motorsports

#### Mechanical Data

Theoretical fuel delivery	$0.5 \text{ to } 1.1 \text{ cm}^3/\text{rot}_{\text{cam}}$
Nominal pressure	Please see variations
Weight	Approx. 780 g
Max. speed at pump driveshaft	Depends on cam profile and type of tappet
Supply pressure	4 to 7 bar
Operating temperature	-40 to 120°C
Storage temperature	-40 to 70°C
Compatible fuels	Unleaded fuels, E22, E85, M15
Fuel temperature	80°C, short term 130°C
Max. vibration	600 m/s <sup>2</sup>

#### Connectors and Wires

Electrical connector compact	D 261 205 359-01
Electrical connector motorsports	F 02U 000 426-01
Mechanical connector intake side	M14x1.5
Mechanical connector pressure side	M14x1.5

### Installation Notes

Mounting on cylinder head or adapter flag.

Available cam profiles on request.

Please notice: Fuel delivery and maximum driveshaft speed depends on cam profile and type of tappet.

### Ordering Information

#### HDP 5-FCV

Compact connector, max. 200 bar  
Order number **F 02U V00 912-01**

#### HDP 5-FCV

Motorsports connector, max. 200 bar  
Order number **F 02U V01 114-01**

#### HDP 5-FCV HP

Compact connector, over 200 bar  
Order number **F 02U V01 128-01**

#### HDP 5-FCV HP

Motorsports connector, over 200 bar  
Order number **F 02U V01 115-01**

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**Accessories**

**Flat tappet (26 mm)**

Order number **F 02U V01 156-01**

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**Roller tappet (26 mm)**

Order number **F 02U V01 163-01**

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## HP Fuel Pump HDP 5-FD



2

### Features

- ▶ Max. 200 bar
- ▶ Max. 1.1 cm<sup>3</sup>/rot<sub>cam</sub>
- ▶ 780 g

The HDP 5-FD is a compact high pressure single piston pump. The design allows achieving a big delivery. Variations in the number of cam lobes and cam lifts allow different flow requirements to be addressed.

This type of high pressure fuel pump is not equipped with an internal pressure relief valve and therefore recommends a pressure regulation valve in the common rail to control the rail pressure and to avoid overload pressure.

Depending on the requirements of your engine (e.g. fuel consumption over rotation ratio) we recommend different types of tappets, piston springs and cam profiles. Please notice: Fuel delivery and maximum driveshaft speed depend on cam profile and type of tappet.

### Application

For high pressure manifold injection or gasoline direct injection

### Technical Specifications

#### Mechanical Data

Theoretical fuel delivery	0.5 to 1.1 cm <sup>3</sup> /rot <sub>cam</sub> (typical)
Nominal pressure	Max. 200 bar
Weight	Approx. 780 g
Max. speed at pump driveshaft	Depends on cam profile and type of tappet
Supply pressure	4 to 7 bar
Operating temperature	-40 to 120°C
Storage temperature	-40 to 70°C

Compatible fuels	Unleaded fuels, E22, E85, M15
Fuel temperature	80°C, short term 130°C
Max. vibration	600 m/s <sup>2</sup>

#### Connectors and Wires

Mechanical connector intake side	M14x1.5
Mechanical connector pressure side	M14x1.5

#### Installation Notes

Mounting on cylinder head or adapter flag.

Available cam profiles on request.

Please notice: Fuel delivery and maximum driveshaft speed depends on cam profile and type of tappet.

#### Ordering Information

##### HP Fuel Pump HDP 5-FD

Order number **0 261 B11 223-02**

##### Accessories

##### Flat tappet (26 mm)

Order number **F 02U V01 156-01**

##### Roller tappet (26 mm)

Order number **F 02U V01 163-01**

## Fuel Pressure Regulator Mini/ Mini M



### Features

- ▶ 2,5 to 10 bar
- ▶ Methanol version available from 6 to 10 bar
- ▶ 30 to 400 l/h reflow
- ▶ Adjusted at 105 l/h
- ▶ Aluminum housing

Fuel pressure regulators are used to maintain constant fuel pressure at the injection valves. We offer this regulator for gasoline as well as for methanol applications. The main benefit of this regulator includes a higher pressure range and a higher return flow rate in comparison to the production type regulators.

### Application

Pressure range	See ordering information
Reflow quantity	30 to 400 l/h
Fuel compatibility Mini	Gasoline, E85, M22
Fuel compatibility Mini M	Gasoline, E85, M100
Operating temperature	-40 to 120°C
Storage temperature	-40 to 100°C
Max. vibration	<600 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Variations

Please see Ordering Information

### Mechanical Data

Diameter	37.9 mm
Weight	60 g
Mounting	Fastening with a clip

### Connectors and Wires

Connector supply	Diam. 25 mm, O-ring
Connector reflow	Diam. 9.15 mm, O-ring

### Installation Notes

Never run the regulator without the integrated filter.

Please oil O-rings lightly before you install the regulator.

Please make a leak test after you have installed the regulator.

When the pressure regulator is removed and will be reused, the O-rings must be tested for fractures.

Operation with air is not allowed.

### Ordering Information

#### Standard version 2.5 bar

Order number **B 261 208 101-01**

#### Standard version 3 bar

Order number **B 261 208 102-01**

#### Standard version 3.5 bar

Order number **B 261 208 103-01**

#### Standard version 4 bar

Order number **B 261 208 104-01**

#### Standard version 5 bar

Order number **B 261 208 105-01**

#### Standard version 6 bar

Order number **B 261 208 106-01**

#### Standard version 7 bar

Order number **B 261 208 107-01**

#### Standard version 8 bar

Order number **B 261 208 108-01**

#### Standard version 10 bar

Order number **B 261 208 109-01**

#### Methanol version 6 bar

Order number **B 261 208 121-01**

#### Methanol version 8 bar

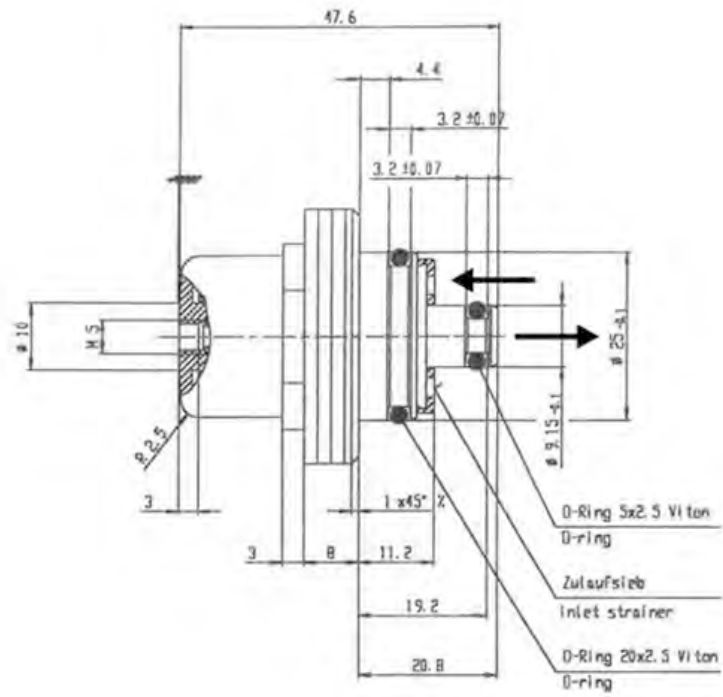
Order number **B 261 208 122-01**

#### Methanol version 10 bar

Order number **B 261 208 123-01**

Dimensions

2





## Fuel Pressure Regulator Mini A



### Features

- ▶ 2.2 to 3.5 bar/3.5 to 5 bar
- ▶ Pressure adjustable
- ▶ 15 to 220 l/h reflow
- ▶ Sheet steel housing

Fuel pressure regulators are used to maintain constant fuel pressure at the injection valves. This regulator based on a production type regulator was specially designed for motorsport applications. The main benefit of this regulator is the adjustability of the fuel pressure.

### Application

Pressure range	2.2 to 3.5 bar 3.5 to 5.0 bar
Reflow quantity	15 to 220 l/h
Reference pressure connector	Diam. 5 mm, tube connector
Fuel compatibility	Gasoline, E85, M15
Operating temperature	-40 to 120°C
Storage temperature	-40 to 100°C
Max. vibration	<400 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Diameter	34.9 mm
Weight	58 g
Mounting	Fastening with a clip

#### Connectors and Wires

Connector supply	Diam. 25 mm, O-ring
Connector reflow	Diam. 9.15 mm, O-ring

### Installation Notes

The tube connector at the housing can be used to supply reference pressure to the regulator. This can be atmospheric pressure, air box pressure or manifold pressure.

Never run the regulator without the integrated filter. Please oil O-rings lightly before you install the regulator. Please make a leak test after you have installed the regulator.

When the pressure regulator is removed and will be reused, the O-rings must be tested for fractures. Operation with air is not allowed.

### Ordering Information

#### 2.2 to 3.5 bar

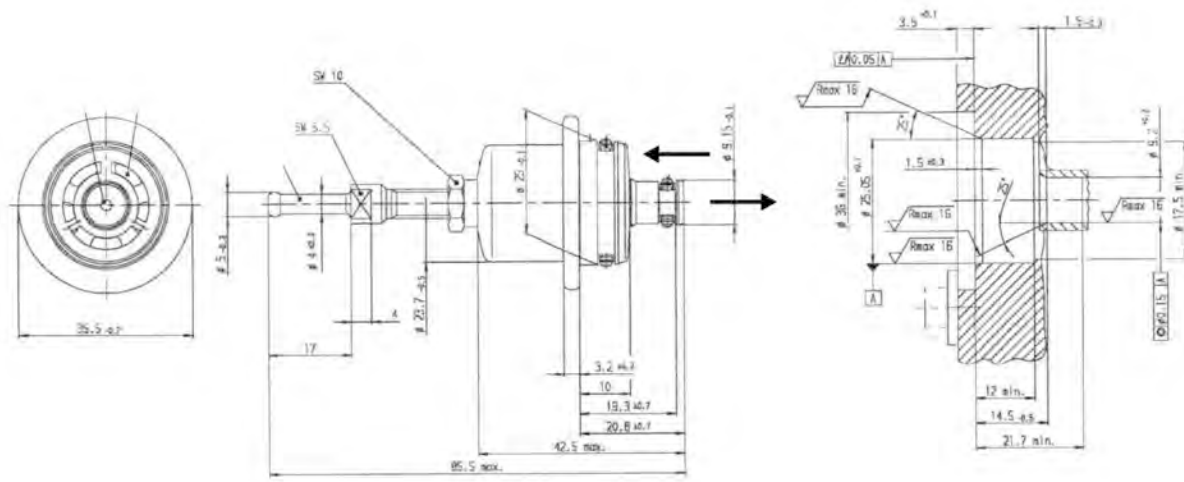
Order number **B 280 550 340-03**

#### 3.5 to 5 bar

Order number **B 280 550 341-03**

## Dimensions

2



## Fuel Pressure Regulator Mini 38



### Features

- ▶ 3.8 bar
- ▶ 15 to 220 l/h reflow
- ▶ Adjusted at 105 l/h
- ▶ Sheet steel housing

Fuel pressure regulators are used to maintain constant fuel pressure at the injection valves.

This production type fuel pressure regulator is designed for the integration into the full rail.

The main benefits of this regulator include the competitively priced high quality and a high return flow rate.

### Application

Pressure range	3.8 bar
Reflow quantity	15 to 220 l/h
Reference pressure connector	Diam. 5 mm, tube connector
Fuel compatibility	Gasoline, E10
Operating temperature	-40 to 120°C
Storage temperature	-40 to 100°C
Max. vibration	<600 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Diameter	34.9 mm
Weight	48 g
Mounting	Fastening with a clip

### Characteristic

Set pressure accuracy	±2 % at 105 l/h
-----------------------	-----------------

### Connectors and Wires

Connector supply	Diam. 25 mm, O-ring
Connector reflow	Diam. 9.15 mm, O-ring

### Installation Notes

The tube connector at the housing can be used to supply reference pressure to the regulator. This can be atmospheric pressure, air box pressure or manifold pressure.

Never run the regulator without the integrated filter.

Please oil O-rings lightly before you install the regulator.

Please make a leak test after you have installed the regulator.

When the pressure regulator is removed and will be reused, the O-rings must be tested for fractures.

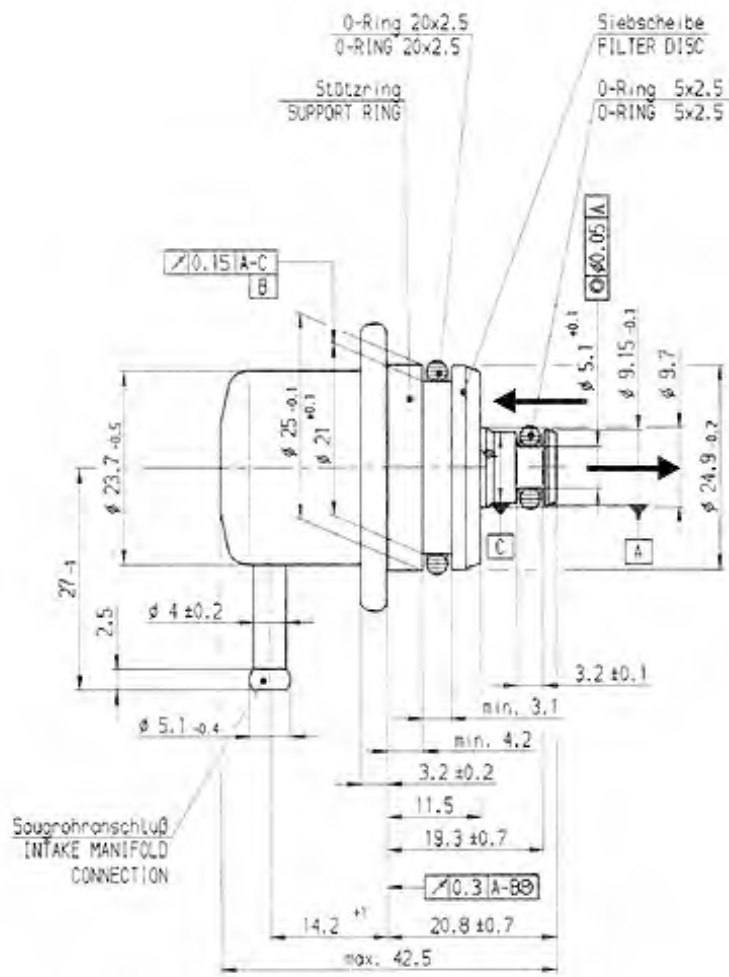
Operation with air is not allowed.

### Ordering Information

#### Fuel Pressure Regulator Mini 38

Order number **0 280 160 616**

## Dimensions



## Fuel Pressure Regulator Mini 5



### Features

- ▶ 5 bar
- ▶ 15 to 220 l/h reflow
- ▶ Adjusted at 105 l/h
- ▶ Sheet steel housing

Fuel pressure regulators are used to maintain constant fuel pressure at the injection valves.

We modified this production type based regulator especially for motorsport use and increased the pressure level.

The main benefit of this regulator include the competitively priced high quality and the high return flow rate.

### Application

Pressure range	5 bar
Reflow quantity	15 to 220 l/h
Reference pressure connector	Diam. 5 mm, tube connector
Fuel compatibility	Gasoline, E85, M15
Operating temperature	-40 to 120°C
Storage temperature	-40 to 100°C
Max. vibration	<600 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Diameter	34.9 mm
Weight	48.5 g
Mounting	Fastening with a clip

#### Characteristic

Set pressure accuracy	±2 % at 105 l/h
-----------------------	-----------------

### Connectors and Wires

Connector supply	Diam. 25 mm, O-ring
Connector reflow	Diam. 9.15 mm, O-ring

### Installation Notes

The tube connector at the housing can be used to supply reference pressure to the regulator. This can be atmospheric pressure, air box pressure or manifold pressure.

Never run the regulator without the integrated filter.

Please oil O-rings lightly before you install the regulator.

Please make a leak test after you have installed the regulator.

When the pressure regulator is removed and will be reused, the O-rings must be tested for fractures.

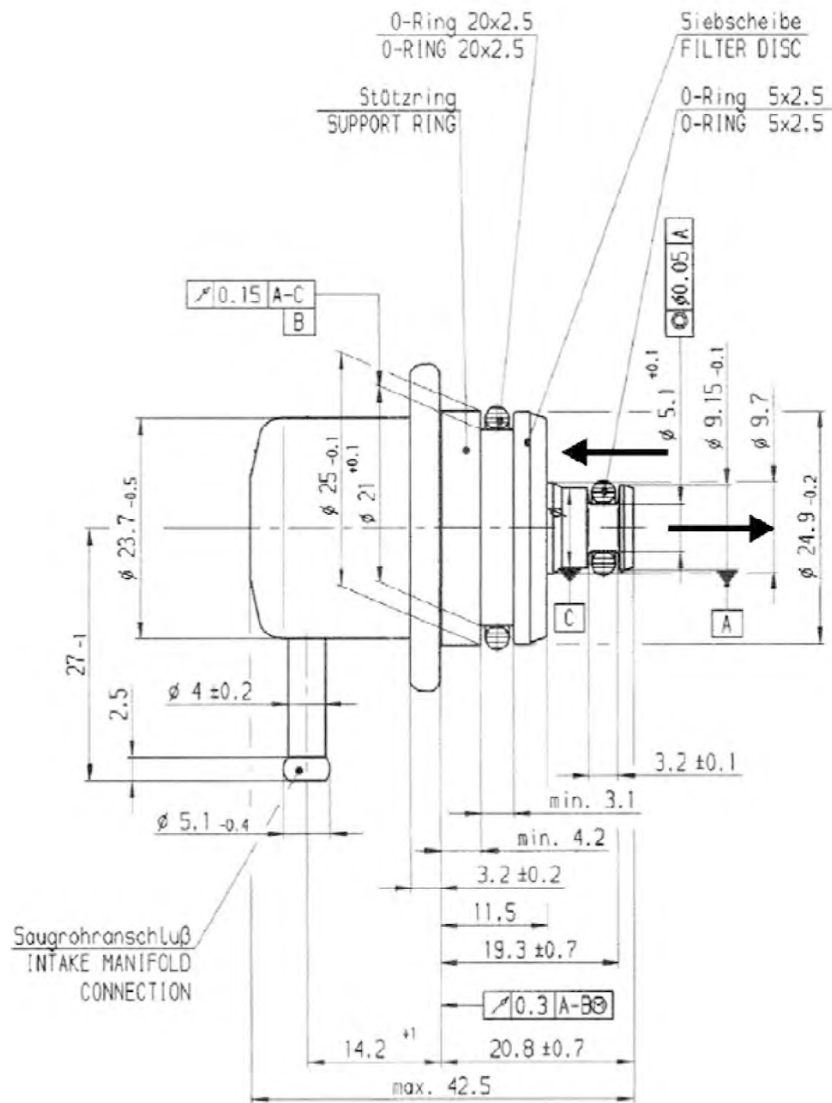
Operation with air is not allowed.

### Ordering Information

#### Fuel Pressure Regulator Mini 5

Order number **0 280 B02 722-02**

## Dimensions



## FPR Adaptor



### Features

- ▶ Aluminum housing
- ▶ Fits to production type regulators and Motorsport regulators

This adaptor offers the opportunity to convert a rail pressure regulator into an inline pressure regulator. The adaptor is able to hold a production type regulator as well as a motorsport regulator. Delivery without regulator.

### Application

Fuel compatibility	Gasoline, E85/M100
Operating temperature range	-40 to 120°C
Storage temperature range	-40 to 100°C
Max. vibration	<600 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Diameter	50 mm
Length	100 mm
Weight	170 g
Mounting	Screw fastening with M6 screws

#### Connectors and Wires

Connector supply	2 x M14 x 1.5
Connector reflow	M14 x 1.5

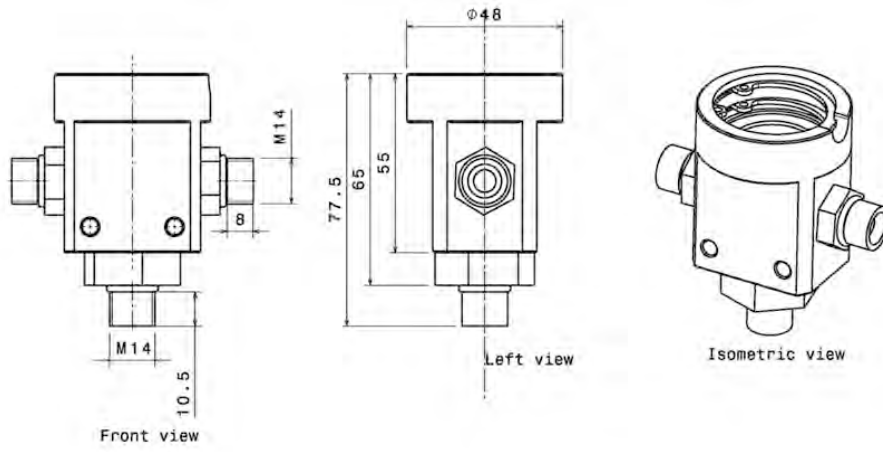
### Ordering Information

#### FPR Adaptor

Order number **F 02U V00 735-01**

Dimensions

2





## HP Control Valve DSV



**HP Control Valve DSV**  
Connector ASL 1-06-05SB-HE  
Order number **B 261 209 805-02**

**HP Control Valve DSV**  
Without connector  
Order number **B 261 209 806-02**

2

### Features

- ▶ Working range 10 to 200 bar
- ▶ Aluminum housing

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

### Application

Pressure range	10 to 200 bar
Flow quantity	Max. 220 l/h
Operating temperature range	-20 to 130°C
Max. temperature of location	140°C (max. 5 min)

### Technical Specifications

#### Mechanical Data

Weight	135 g
Size	32 x 54 x 56 mm
Housing	Aluminum

#### Electrical Data

Operating voltage	6.5 to 18 V
Operation current	$I_{\max} = 2.2 \text{ A}$

#### Connectors and Wires

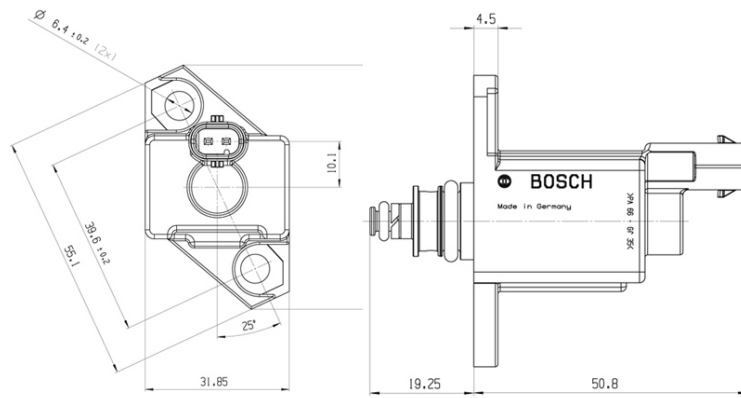
Connector	Please see Ordering Information
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### Ordering Information

**HP Control Valve DSV**  
Connector Bosch Compact  
Order number **0 261 540 011**

Dimensions

2



## Single Fire Coil C90i-pro



### Features

- ▶ Max. 40 kV
- ▶ Max. 90 mJ
- ▶ Max. 5.0 kV/μs
- ▶ Especially developed for Turbo-GDI engines
- ▶ Max. 15,000 1/min

This single fire coil was developed for the use e.g. in GDI (turbocharged) high performance engines. It is designed for direct cylinder head mounting. The C90i-pro provides the possibility of ionic current measurement. The design of the upper part (wire side) and the lower part (spark plug side) can be designed per customer specification.

The main benefits of this high performance coil are its high energy capability and a very good provided high voltage.

### Application

Spark energy	≤ 90 mJ
Primary current	≤ 16 A
Operating temperature range outer core	0 to 160°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 480 m/s <sup>2</sup> at 50 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Length	168 mm
Weight w/o wire	< 230 g
Mounting	screw fastening

#### Electrical Data

Primary resistance	185 mΩ
Secondary resistance	incapable of measurement
High voltage rise time	≤ 5.0 kV/μs

Max. high voltage at 1 MΩ    10 pF	≤ 40 kV
Spark current	≤ 160 mA
Spark duration at 1 kV    1 MΩ	≤ 1.1 ms
Noise suppression	inductive
Suppression diode / EFU	internal

#### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> =600 V)
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#### Connectors and Wires

Connector	On request
Mating connector	On request
Pin 1	U <sub>batt</sub> red
Pin 2	ECU collector blue
Pin 3	Engine GND black
Pin 4	Ionic current signal white
Wire length	75 cm
Wire size	AWG 20/22
For spark plugs	ceramic diameter d = 8 mm

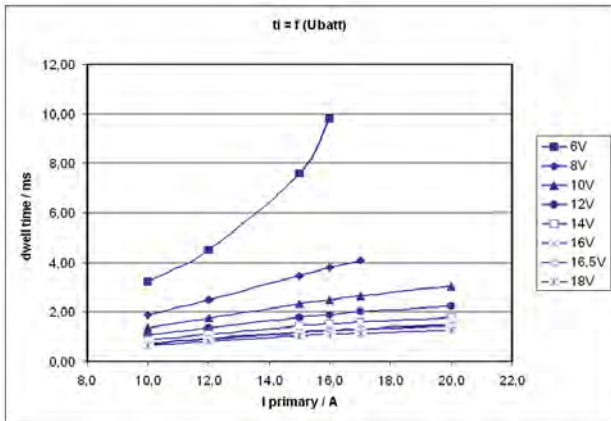
Various motorsport and automotive connectors are available on request.

Please specify the required wire length and the length of the spark plug connector with your order

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I primary					
	10A	12A	15A	16A	17A	20A
6V	3.2	4.5	7.6	9.8		
8V	1.88	2.49	3.47	3.79	4.10	
10V	1.35	1.76	2.34	2.51	2.67	3.05
12V	1.06	1.35	1.77	1.89	2.00	2.24
14V	0.87	1.11	1.43	1.52	1.60	1.79
16V	0.74	0.93	1.20	1.28	1.34	1.49
16.5 V	0.71	0.90	1.15	1.23	1.29	1.43
18V	0.64	0.81	1.03	1.10	1.15	1.27

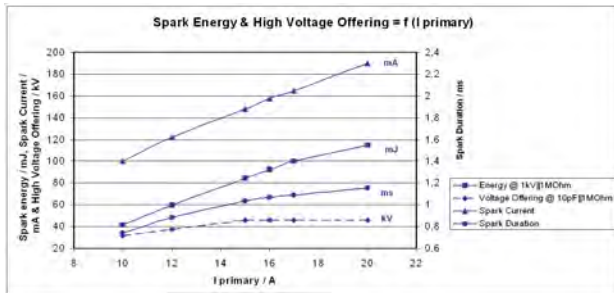
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
10 A	41.4 mJ	0.74 ms	100 mA	31.6 kV
12 A	59.5 mJ	0.882 ms	122 mA	37.4 kV
15 A	84.4 mJ	1.034 ms	148 mA	45.7 kV
16 A	92.6 mJ	1.07 ms	158 mA	46 kV
17 A	100 mJ	1.09 ms	165 mA	46 kV
20 A	115 mJ	1.16 ms	190 mA	46 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

This coil is only for use with engine control units having an integrated ignition power stage, e.g. IGBT IRG4BC40S or BIP.

For technical reasons the values of the coils may vary.

Please regard the specified limit values (see "Electrical Data").

Usage above Iprim = 16 A may reduce the lifetime.

Please find further application hints in the offer drawing at our homepage.

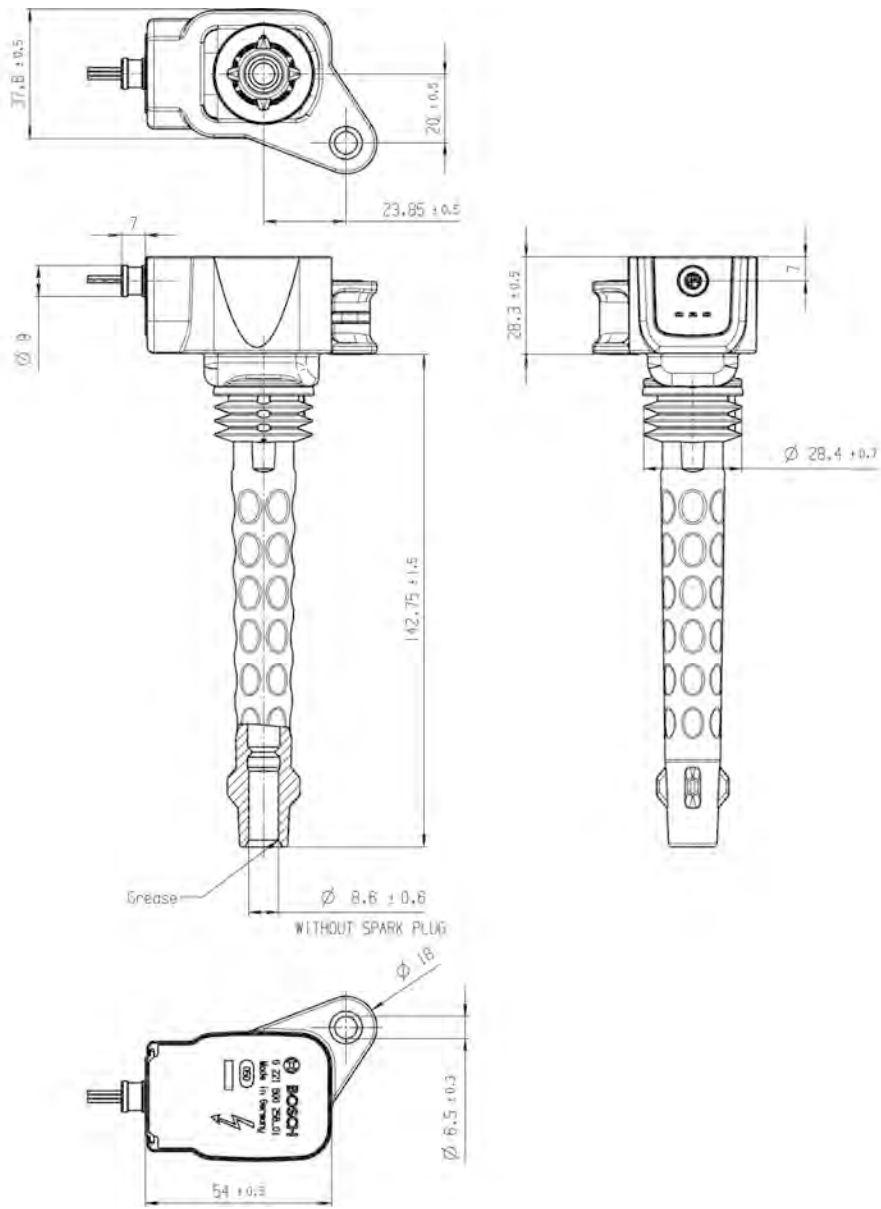
In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Single Fire Coil C90i-pro**

Order number **0 221 B00 256-01**

Dimensions



## Single Fire Coil P35



2

### Features

- ▶ Max. 34 kV
- ▶ Max. 38 mJ
- ▶ Max. 2.0 kV/μs
- ▶ Max. 10,000 1/min

This single fire coil is a low cost concept designed for direct mounting to the cylinder head. The P35 has no integrated transistor and requires an ECU with internal ignition power stages with 10 mA to 20 mA current output. The single fire coil benefits from series production ensuring robustness and low cost.

### Application

Spark energy	≤ 38 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Variations

	P35	P35-T
Primary resistance with wire	760 mΩ	Incapable of measurement
Integrated power stage	-	+
Pin 1	ECU ignition power stage	ECU ignition signal
Measured with power stage	IGBT IRG4BC40S	BIP 373

### Mechanical Data

Length	140.5 mm
Weight	194 to 205 g
Mounting	Screw fastening

### Electrical Data

Primary resistance with wire	Please see Variations
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 2.0 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 34 kV
Spark current	≤ 90 mA
Spark duration at 1 kV    1 MΩ	≤ 1.13 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
Integrated power stage	Please see Variations

### Characteristic

Measured with power stage	Please see Variations
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### Connectors and Wires

Connector	Sumitomo
Mating connector	D 261 205 367
Pin 1	Please see Variations
Pin 2	ECU <sub>Gnd</sub>
Pin 3	U <sub>batt</sub>

Various motorsport and automotive connectors are available on request.

For spark plugs with a ceramic diameter d=10 mm

Spark plug connector	140.5 mm
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Please specify the required wire length with your order.

### Characteristic dwell times [ms]

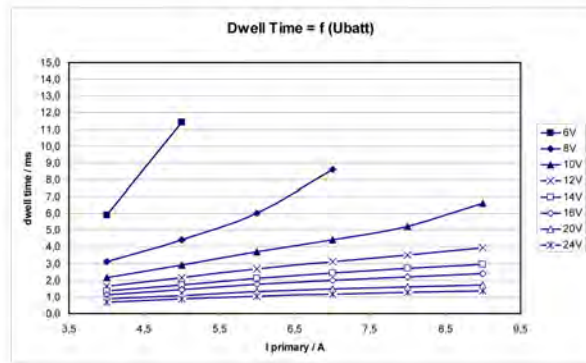
U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	5.9	11.4				
8V	3.1	4.4	6.0	8.6		
10V	2.2	2.9	3.7	4.4	5.2	6.6
12V	1.6	2.1	2.7	3.1	3.5	3.9
14V	1.4	1.7	2.1	2.4	2.7	3.0
16V	1.1	1.4	1.8	2.0	2.2	2.4
18V	1.0	1.2	1.5	1.7	1.9	2.0
20V	0.9	1.1	1.3	1.5	1.6	1.7
22V	0.8	1.0	1.2	1.3	1.4	1.5

24V 0.7 0.9 1.0 1.2 1.3 1.4

Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement

**Ordering Information**

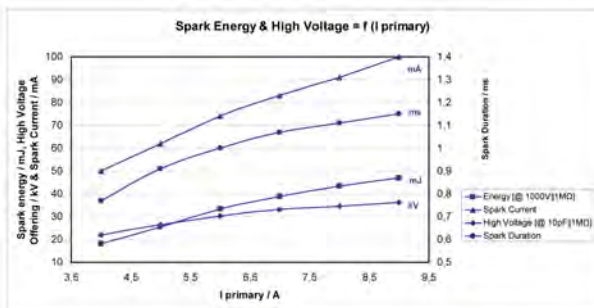
**Single Fire Coil P35**  
Order number **0 221 504 030**



*Dwell time*

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	18 mJ	0.77 ms	50 mA	22 kV
5 A	25.4 mJ	0.91 ms	62 mA	26.5 kV
6 A	33.4 mJ	1 ms	74 mA	30.3 kV
7 A	38.8 mJ	1.07 ms	83 mA	33 kV
8 A	43.3 mJ	1.11 ms	91 mA	34.5 kV
9 A	47 mJ	1.15 ms	100 mA	36.2 kV



*Spark energy*

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P35-T has an integrated transistor and requires an ECU with internal ignition drivers.

The P35 has no integrated transistor and requires an ECU with internal ignition power stages with 10 mA to 20 mA current output.

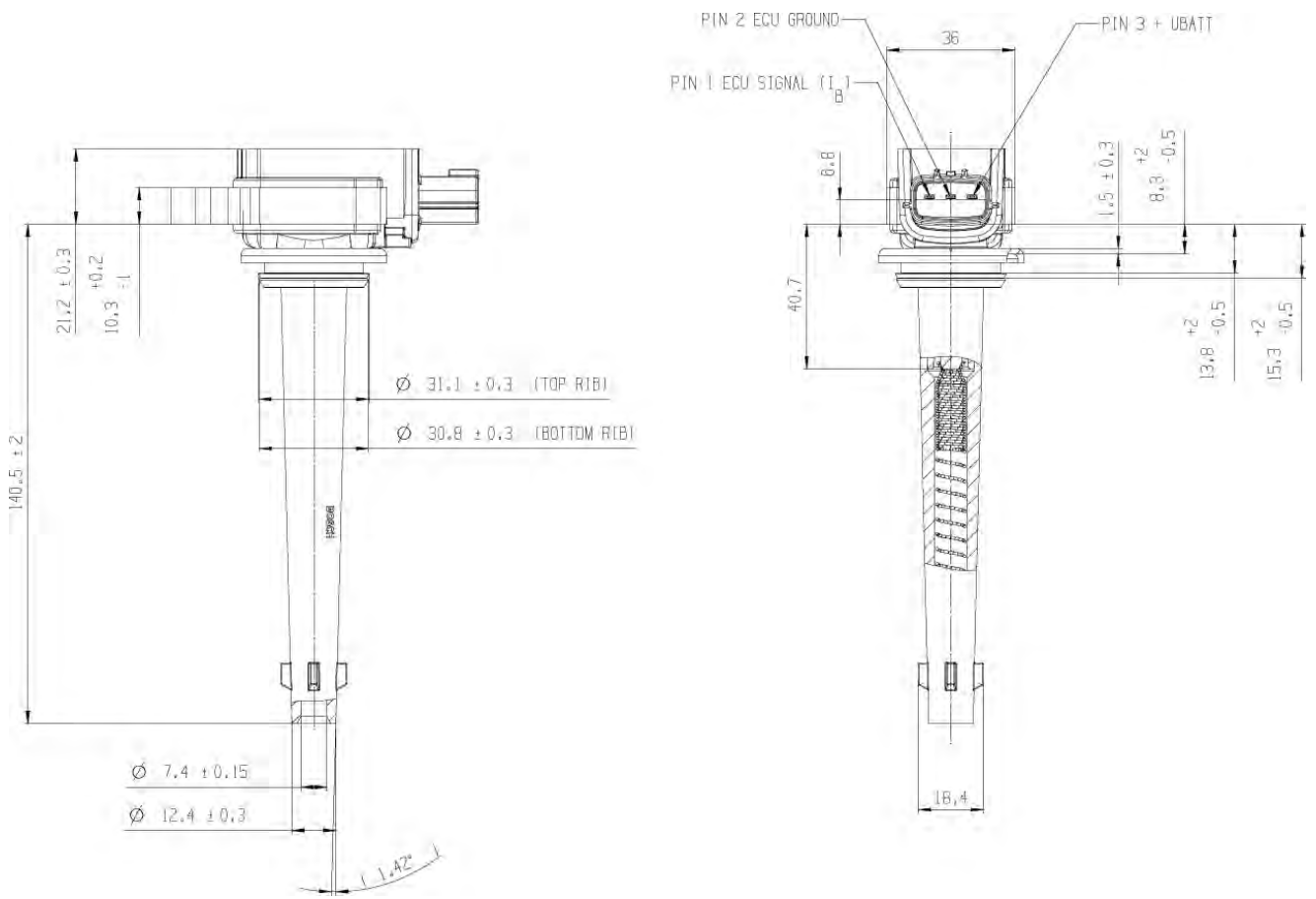
For technical reasons the values of the coils may vary.

Please regard the specified limit values.

In case of ignition-caused malfunctions, please use screened sensor wires.

Dimensions

2





## Single Fire Coil P35-E



### Features

- ▶ Max. 34 kV
- ▶ Max. 38 mJ
- ▶ Max. 2.0 kV/μs
- ▶ Connector length on customer requirement
- ▶ Max. 10,000 1/min

For this single fire coil the customer can define the length of the spark plug connector.

The P35-E has no integrated transistor and requires an ECU with internal ignition power stages.

The P35-E is for spark plugs with ceramic diameter  $d = 8 \text{ mm}$  or  $d = 10 \text{ mm}$ .

The single fire coil benefits from series production ensuring robustness.

### Application

Spark energy	≤ 38 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Variations

	P35-E8	P35-E10
Plug ceramic diameter	8 mm	10 mm
Length (L)	85 to 225 mm	110 to 225 mm

Please specify the required wire and spark plug connector length with your order.

### Mechanical Data

Length	Please see Variations
Weight	194 to 250 g
Mounting	Screw fastening

### Electrical Data

Primary resistance with wire	760 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 2.0 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 34 kV
Spark current	≤ 90 mA
Spark duration at 1 kV    1 MΩ	≤ 1.13 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated

### Characteristic

Measured with power stage	IGBT IRG4BC40S
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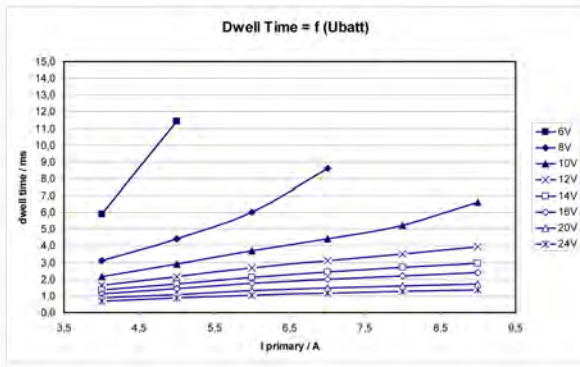
### Connectors and Wires

Connector	Sumitomo
Mating connector	D 261 205 367
Pin 1	ECU ignition power stage
Pin 2	ECU <sub>Gnd</sub>
Pin 3	U <sub>batt</sub>

### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	5.9	11.4				
8V	3.1	4.4	6.0	8.6		
10V	2.2	2.9	3.7	4.4	5.2	6.6
12V	1.6	2.1	2.7	3.1	3.5	3.9
14V	1.4	1.7	2.1	2.4	2.7	3.0
16V	1.1	1.4	1.8	2.0	2.2	2.4
18V	1.0	1.2	1.5	1.7	1.9	2.0
20V	0.9	1.1	1.3	1.5	1.6	1.7
22V	0.8	1.0	1.2	1.3	1.4	1.5
24V	0.7	0.9	1.0	1.2	1.3	1.4

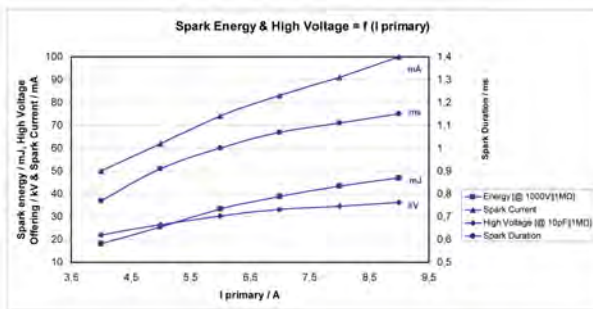
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	18 mJ	0.77 ms	50 mA	22 kV
5 A	25.4 mJ	0.91 ms	62 mA	26.5 kV
6 A	33.4 mJ	1 ms	74 mA	30.3 kV
7 A	38.8 mJ	1.07 ms	83 mA	33 kV
8 A	43.3 mJ	1.11 ms	91 mA	34.5 kV
9 A	47 mJ	1.15 ms	100 mA	36.2 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

Please pay attention to your spark plug, if it has a ceramic diameter of 8 or 10 mm.

The P35-E has no integrated transistor and requires an ECU with internal ignition power stages.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**P35-E8**

Please specify the required wire and spark plug connector length with your order.

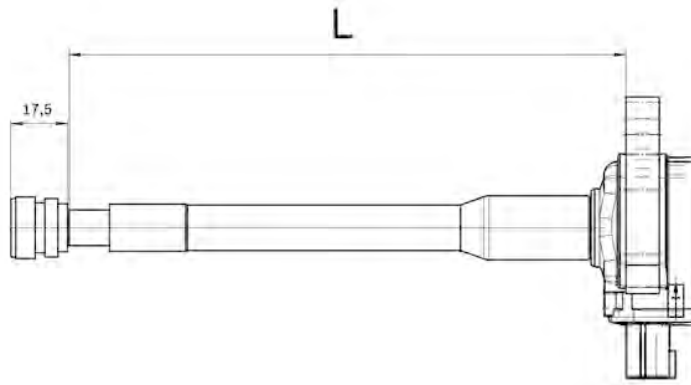
Order number **F 02U V00 235-01**

**P35-E10**

Please specify the required wire and spark plug connector length with your order.

Order number **F 02U V00 440-01**

Dimensions



## Single Fire Coil P35-T



2

### Features

- ▶ Max. 34 kV
- ▶ Max. 38 mJ
- ▶ Max. 2.0 kV/μs
- ▶ Max. 8,000 1/min

This single fire coil is a low cost concept designed for direct mounting to the cylinder head. The P35-T has an integrated transistor and requires an ECU with internal ignition drivers. The single fire coil benefits from series production ensuring robustness and low cost.

### Application

Spark energy	≤ 38 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Variations

	P35	P35-T
Primary resistance with wire	760 mΩ	Incapable of measurement
Integrated power stage	-	+
Pin 1	ECU ignition power stage	ECU ignition signal
Measured with power stage	IGBT IRG4BC40S	BIP 373

### Mechanical Data

Length	140.5 mm
Weight	194 to 205 g
Mounting	Screw fastening

### Electrical Data

Primary resistance with wire	Please see Variations
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 2.0 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 34 kV
Spark current	≤ 90 mA
Spark duration at 1 kV    1 MΩ	≤ 1.13 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
Integrated power stage	Please see Variations

### Characteristic

Measured with power stage	Please see Variations
---------------------------	-----------------------

### Connectors and Wires

Connector	Sumitomo
Mating connector	D 261 205 367
Pin 1	Please see Variations
Pin 2	ECU <sub>Gnd</sub>
Pin 3	U <sub>batt</sub>

Various motorsport and automotive connectors are available on request.

For spark plugs with a ceramic diameter d=10 mm

Spark plug connector	140.5 mm
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Please specify the required wire length with your order.

### Characteristic dwell times [ms]

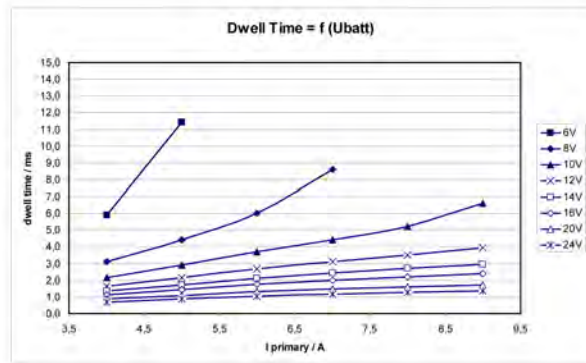
U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	5.9	11.4				
8V	3.1	4.4	6.0	8.6		
10V	2.2	2.9	3.7	4.4	5.2	6.6
12V	1.6	2.1	2.7	3.1	3.5	3.9
14V	1.4	1.7	2.1	2.4	2.7	3.0
16V	1.1	1.4	1.8	2.0	2.2	2.4
18V	1.0	1.2	1.5	1.7	1.9	2.0
20V	0.9	1.1	1.3	1.5	1.6	1.7
22V	0.8	1.0	1.2	1.3	1.4	1.5

24V 0.7 0.9 1.0 1.2 1.3 1.4

Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement

**Ordering Information**

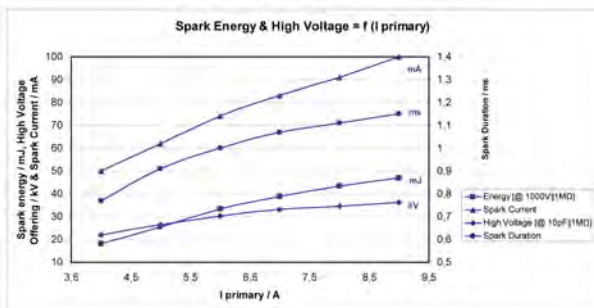
**Single Fire Coil P35-T**  
Order number **0 221 604 014**



*Dwell time*

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	18 mJ	0.77 ms	50 mA	22 kV
5 A	25.4 mJ	0.91 ms	62 mA	26.5 kV
6 A	33.4 mJ	1 ms	74 mA	30.3 kV
7 A	38.8 mJ	1.07 ms	83 mA	33 kV
8 A	43.3 mJ	1.11 ms	91 mA	34.5 kV
9 A	47 mJ	1.15 ms	100 mA	36.2 kV



*Spark energy*

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P35-T has an integrated transistor and requires an ECU with internal ignition drivers.

The P35 has no integrated transistor and requires an ECU with internal ignition power stages with 10 mA to 20 mA current output.

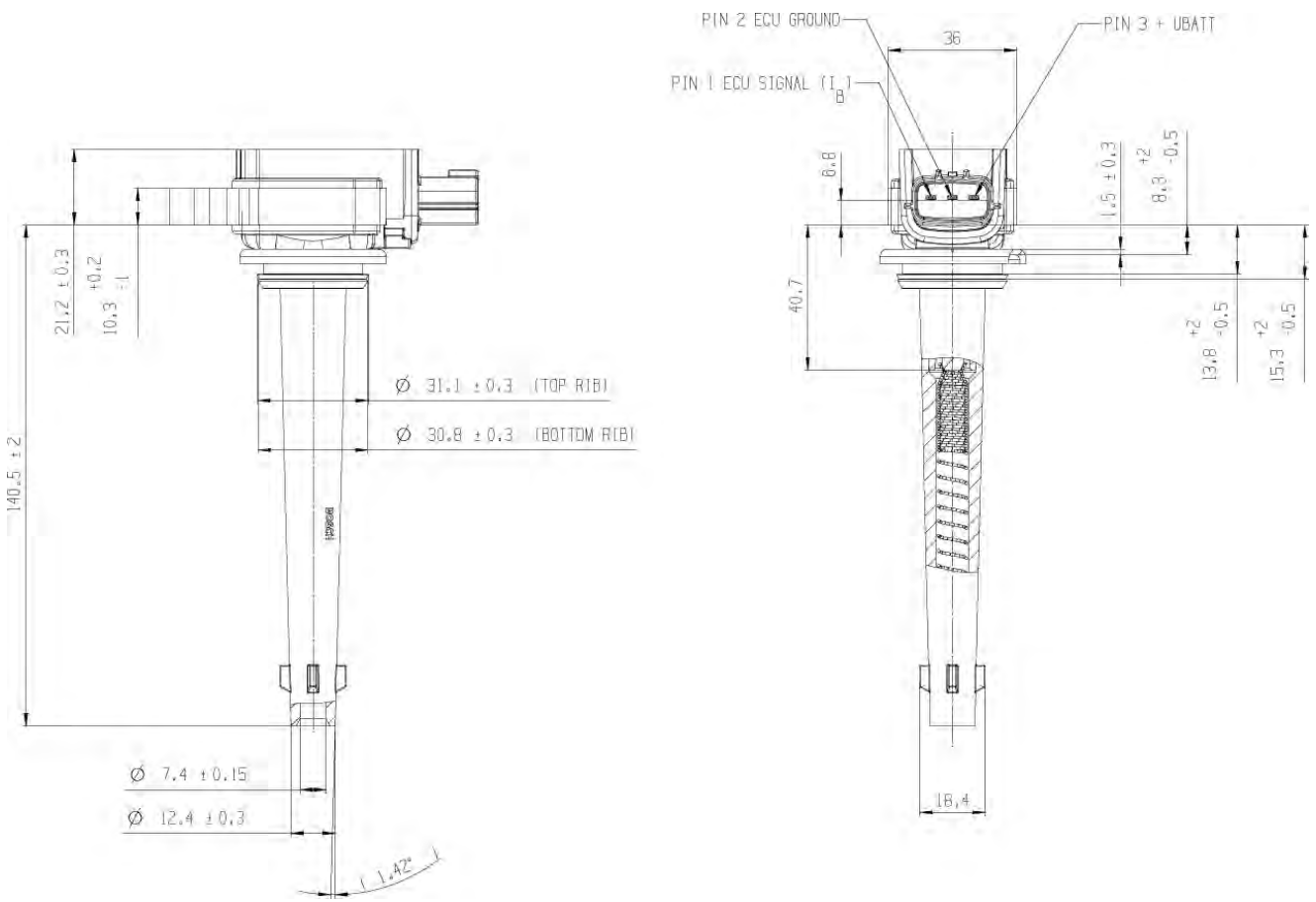
For technical reasons the values of the coils may vary.

Please regard the specified limit values.

In case of ignition-caused malfunctions, please use screened sensor wires.

Dimensions

2



## Single Fire Coil P35-TE



### Features

- ▶ Max. 34 kV
- ▶ Max. 38 mJ
- ▶ Max. 2.0 kV/μs
- ▶ Connector length on customer requirement
- ▶ Max. 8,000 1/min

For this single fire coil the customer can define the length of the spark plug connector. The P35-TE has an integrated transistor and requires an ECU with internal ignition drivers with 10 mA to 20 mA current output. The P35-TE is for spark plugs with ceramic diameter  $d = 8 \text{ mm}$  or  $d = 10 \text{ mm}$ . The single fire coil benefits from series production ensuring robustness.

### Application

Spark energy	$\leq 38 \text{ mJ}$
Primary current	$\leq 7.5 \text{ A}$
Operating temperature range at outer core	$-20 \text{ to } 140^\circ\text{C}$
Storage temperature range	$-40 \text{ to } 100^\circ\text{C}$
Max. vibration	$\leq 400 \text{ m/s}^2$ at 5 to 2,500 Hz

### Technical Specifications

#### Variations

	P35-TE8	P35-TE10
Plug ceramic diameter	8 mm	10 mm
Length (L)	85 to 225 mm	110 to 225 mm

Please specify the required wire and spark plug connector length with your order.

### Mechanical Data

Length	Please see Variations
Weight	194 to 250 g
Mounting	Screw fastening

### Electrical Data

Primary resistance with wire	Incapable of measurement
Secondary resistance	Incapable of measurement
High voltage rise time	$\leq 2.0 \text{ kV}/\mu\text{s}$
Max. high voltage at $1 \text{ M}\Omega \parallel 10 \text{ pF}$	$\leq 34 \text{ kV}$
Spark current	$\leq 90 \text{ mA}$
Spark duration at $1 \text{ kV} \parallel 1 \text{ M}\Omega$	$\leq 1.13 \text{ ms}$
Noise suppression	Inductive
Suppression diode / EFU	
Integrated power stage	

### Characteristic

Measured with power stage	BIP 373
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### Connectors and Wires

Connector	Sumitomo
Mating connector	D 261 205 367
Pin 1	ECU ignition signal
Pin 2	ECU <sub>Gnd</sub>
Pin 3	U <sub>batt</sub>

Various motorsport and automotive connectors are available on request.

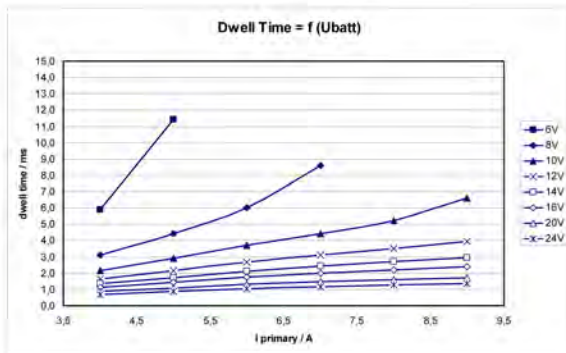
Please specify the required wire length with your order.

### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	5.9	11.4				
8V	3.1	4.4	6.0	8.6		
10V	2.2	2.9	3.7	4.4	5.2	6.6
12V	1.6	2.1	2.7	3.1	3.5	3.9
14V	1.4	1.7	2.1	2.4	2.7	3.0
16V	1.1	1.4	1.8	2.0	2.2	2.4
18V	1.0	1.2	1.5	1.7	1.9	2.0
20V	0.9	1.1	1.3	1.5	1.6	1.7
22V	0.8	1.0	1.2	1.3	1.4	1.5

24V 0.7 0.9 1.0 1.2 1.3 1.4

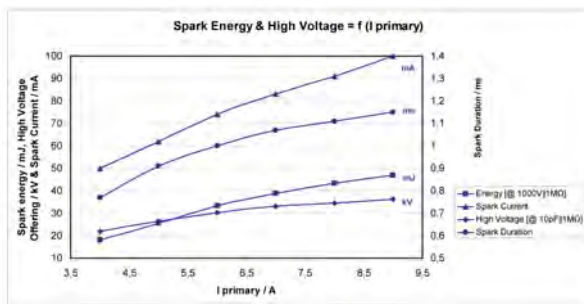
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	18 mJ	0.77 ms	50 mA	22 kV
5 A	25.4 mJ	0.91 ms	62 mA	26.5 kV
6 A	33.4 mJ	1 ms	74 mA	30.3 kV
7 A	38.8 mJ	1.07 ms	83 mA	33 kV
8 A	43.3 mJ	1.11 ms	91 mA	34.5 kV
9 A	47 mJ	1.15 ms	100 mA	36.2 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

Please pay attention to your spark plug, if it has a ceramic diameter of 8 or 10 mm.

The P35-TE has an integrated transistor and requires an ECU with internal ignition drivers with 10 mA to 20 mA current output.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Single Fire Coil P35-TE8**

Please specify the required wire and spark plug connector length with your order.

Order number **F 02U V00 234-01**

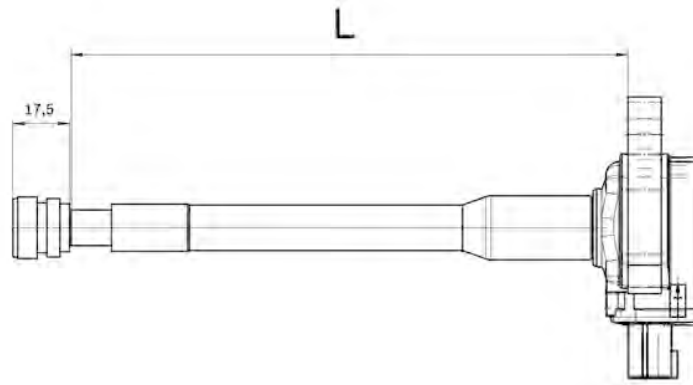
**Single Fire Coil P35-TE10**

Please specify the required wire and spark plug connector length with your order.

Order number **F 02U V00 439-01**



Dimensions



## Single Fire Coil P50/P50-M

2



### Features

- ▶ Max. 35 kV
- ▶ Max. 50 mJ
- ▶ Max. 3.0 kV/μs
- ▶ High voltage contacting via high voltage wire and spark plug connector possible
- ▶ Max. 10,000 1/min

The single fire coil P50 is a low cost concept designed for direct mounting to the cylinder head. A high voltage ignition wire can optionally be connected to the secondary output terminal.

The P50 has no integrated transistor and requires an ECU with internal ignition power stages.

The coil P50-M is specifically for motorsport applications. This coil is operable in higher vibration environments.

### Application

Spark energy	≤ 50 mJ
Primary current	≤ 8.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	Please see Variations

### Technical Specifications

#### Variations

	P50	P50-M
Max. vibration	≤ 400 m/s <sup>2</sup> at 5 to 2,000 Hz	≤ 800 m/s <sup>2</sup> at 5 to 2,000 Hz
Weight	223 g	265 g
Spark plug connector	-	+

### Mechanical Data

Weight	Please see Variations
Mounting	Pluggable

### Electrical Data

Primary resistance with wire	370 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 3.0 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 35 kV
Spark current	≤ 92 mA
Spark duration at 1 kV    1 MΩ	≤ 1.15 ms
Noise suppression	With spark plug connector
Suppression diode / EFU	Integrated

### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> = 600 V)
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### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 335-01
Pin 1	ECU Ignition power stage
Pin 2	Gnd
Pin 3	U <sub>batt</sub>

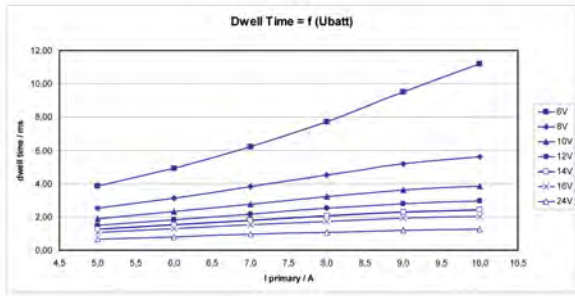
Various motorsport and automotive connectors are available on request.

For spark plugs	Ceramic diameter d=10 mm
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### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	5.0A	6.0A	7.0A	8.0A	9.0A	10.0A
6V	3.84	4.93	6.2	7.7	9.5	11.2
8V	2.54	3.14	3.81	4.51	5.17	5.61
10V	1.9	2.33	2.76	3.21	3.62	3.87
12V	1.51	1.84	2.17	2.51	2.8	2.97
14V	1.26	1.52	1.79	2.06	2.29	2.42
16V	1.07	1.3	1.53	1.74	1.93	2.04
18V	0.94	1.13	1.32	1.51	1.67	1.77
24V	0.68	0.81	0.95	1.08	1.19	1.26
30V	0.53	0.63	0.74	0.84	0.93	0.98

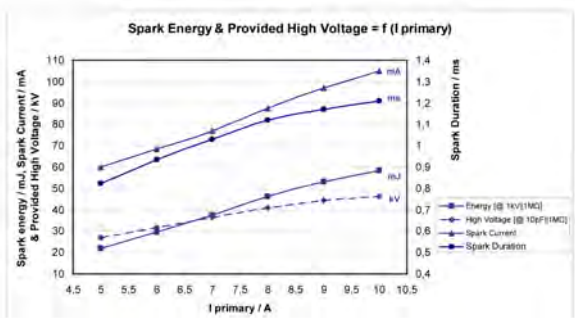
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	22 mJ	0.82 ms	60 mA	26.8 kV
6 A	29.7 mJ	0.93 ms	68.5 mA	31.6 kV
7 A	37.5 mJ	1.03 ms	77 mA	36.4 kV
8 A	46.3 mJ	1.12 ms	87.5 mA	40.9 kV
9 A	53 mJ	1.17 ms	97 mA	44.4 kV
10 A	58.4 mJ	1.21 ms	105 mA	46.3 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P50 has no integrated transistor and requires an ECU with internal ignition power stages, e.g. IGBT IRG4BC40S or BIP.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

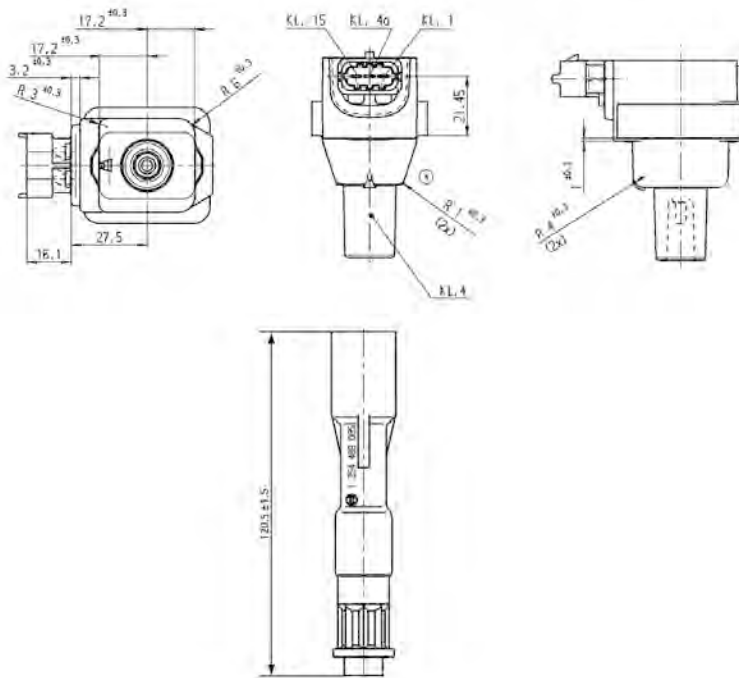
**Ordering Information**

**Coil P50**  
Order number **0 221 504 001**

**Coil P50-M**  
Motorsport version  
Order number **F 02U V00 869-01**

Dimensions

2



## Single Fire Coil P65



### Features

- ▶ Max. 35 kV
- ▶ Max. 65 mJ
- ▶ Developed for GDI engines
- ▶ Max. 10,000 1/min

This single fire coil is a low cost concept designed for direct mounting to the cylinder-head. The P65 has no integrated transistor and requires an ECU with internal ignition power stages.

### Application

Spark energy	≤ 65 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 250 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Length	180 mm
Weight w/o wire	< 222 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance	570 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.9 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 35 kV
Spark current	≤ 74 mA
Spark duration at 1 kV    1 MΩ	≤ 2.0 ms
Noise suppression	Inductive and 2 kΩ resistance
Suppression diode / EFU	Integrated

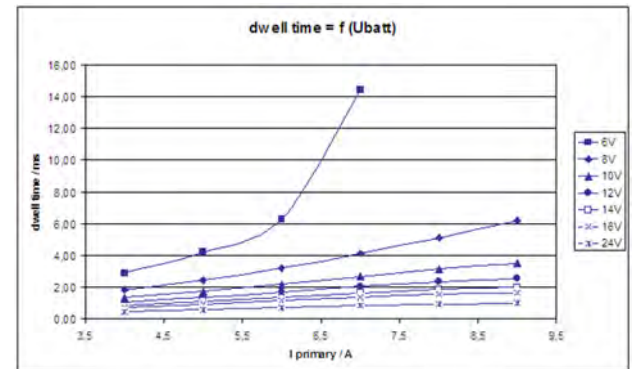
### Characteristic

Measured with power stage IGBT IRG4BC40S ( $U_{ce} = 600$  V)

### Connectors and Wires

Connector	Tyco AMP
Mating connector	D 261 205 350-01
Pin 1	Engine GND
Pin 2	$U_{batt}$
Pin 3	ECU
For spark plugs	Ceramic diameter $d = 10$ mm

### Characteristic dwell times [ms]

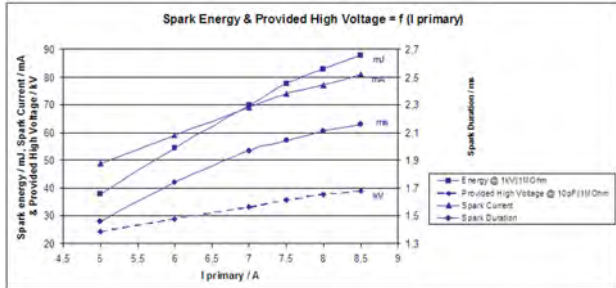


### Dwell time

$U_{batt}$	I <sub>primary</sub>					
	4.0 A	5.0 A	6.0 A	7.0 A	8.0 A	9.0 A
6V	2.90	4.20	6.30	14.40		
8V	1.83	2.45	3.17	4.10	5.10	6.20
10V	1.33	1.74	2.18	2.68	3.16	3.49
12V	1.05	1.35	1.68	2.02	2.33	2.53
14V	0.86	1.11	1.35	1.62	1.85	1.99
16V	0.73	0.93	1.14	1.35	1.54	1.65
18V	0.64	0.82	0.98	1.16	1.32	1.41
20V	0.56	0.71	0.86	1.02	1.15	1.23
22V	0.50	0.64	0.77	0.91	1.02	1.09
24V	0.46	0.58	0.70	0.82	0.92	0.98

Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement

**Spark energy and provided high voltage**



*Spark energy*

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	37.8 mJ	1.46 ms	49 mA	24.3 kV
6 A	54.5 mJ	1,74 ms	59 mA	28.9 kV
7 A	69.8 mJ	1.97 ms	69 mA	33.2 kV
7.5 A	77.6 mJ	2.04 ms	74 mA	35.8 kV
8 A	83.0 mJ	2.11 ms	77 mA	37.7 kV
8.5 A	88.0 mJ	2.16 ms	81 mA	39.0 kV

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P65 has no integrated transistor and requires an ECU with internal ignition power stages, e.g. IGBT IRG4BC40S or BIP.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

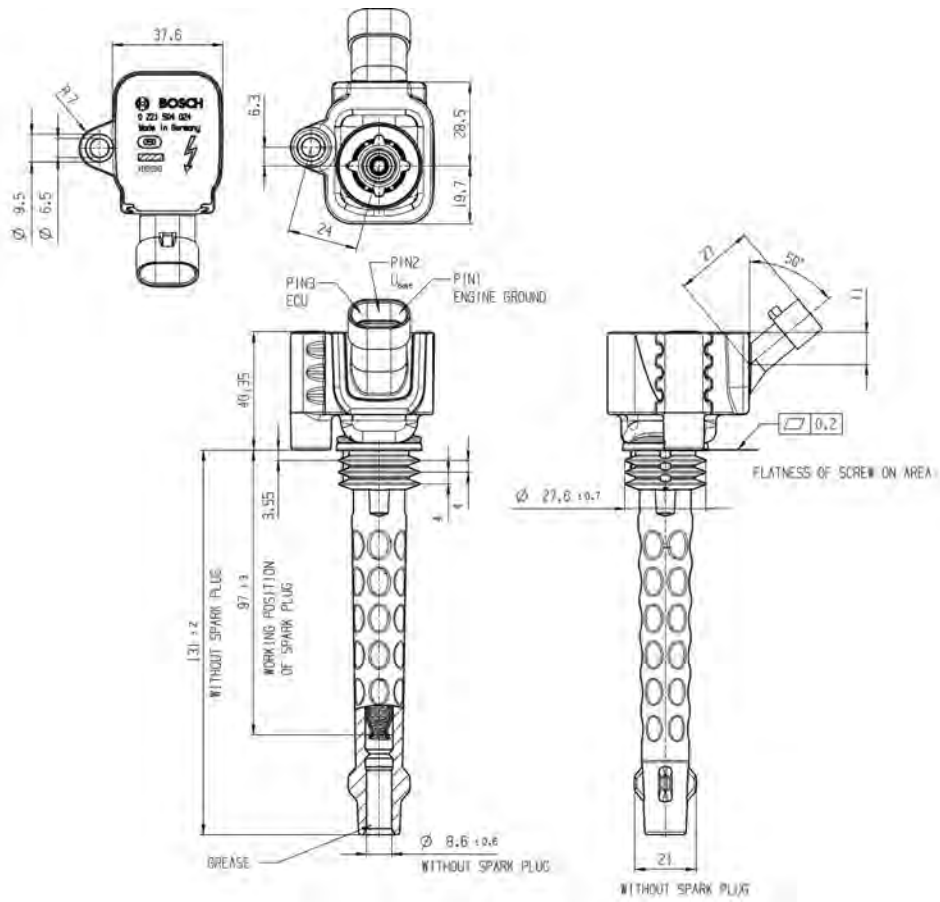
In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Single Fire Coil P65**

Order number **0 221 504 024**

Dimensions



## Single Fire Coil P65-T



2

### Features

- ▶ Max. 33 kV
- ▶ Max. 65 mJ
- ▶ Developed for GDI engines
- ▶ Max. 10,000 1/min (with reduced dwell time)

This single fire coil is a low cost concept designed for direct mounting on the cylinder head. The P65-T has an integrated transistor and requires an ECU with internal ignition drivers.

### Application

Spark energy	≤ 65 mJ
Primary current	≤ 7.0 A
Operating temperature range at outer core	-40 to 140°C
Storage temperature range	-40 to 140°C
Max. vibration	≤ 200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Length	143 mm
Weight	222 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	Incapable of measurement
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.4 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 33 kV

Spark current	≤ 70 mA
Spark duration at 1 kV    1 MΩ	≤ 1.85 ms
Noise suppression	Inductive and 2 kΩ resistance
Integrated suppression diode / EFU	
Integrated power stage	

#### Characteristic

Measured with power stage	BIP 385
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#### Connectors and Wires

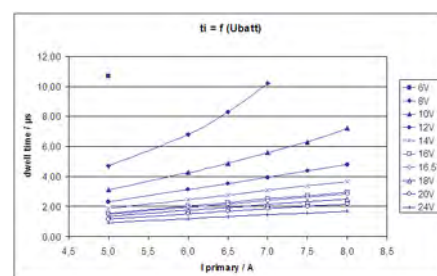
Connector	Tyco 0-1488991-1
Mating connector	F 02U B00 555-01
Pin 1	ECU ignition signal
Pin 2	GND
Pin 3	U <sub>batt</sub>

For spark plugs with a ceramic diameter d=10 mm

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	5.0 A	5.5 A	6.0 A	6.5 A	7.0 A	7.5 A
<b>Max. 1/mi n</b>	10.000	9.000	8.000	7.000	6.000	5.000
<b>6V</b>	10.7	11.6				
<b>8V</b>	4.7	5.4	6.8	8.3	10.2	
<b>10V</b>	3.1	3.55	4.25	4.87	5.6	6.3
<b>12V</b>	2.32	2.66	3.12	3.51	3.94	4.36
<b>14V</b>	1.86	2.1	2.45	2.75	3.07	3.36
<b>16V</b>	1.55	1.77	2.03	2.26	2.51	2.73
<b>16.5 V</b>	1.49	1.7	1.95	2.17	2.40	2.61
<b>18V</b>	1.34	1.51	1.73	1.92	2.13	2.31
<b>20V</b>	1.16	1.33	1.51	1.67	1.85	2.0
<b>24V</b>	0.93	1.05	1.19	1.32	1.45	1.57

Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement

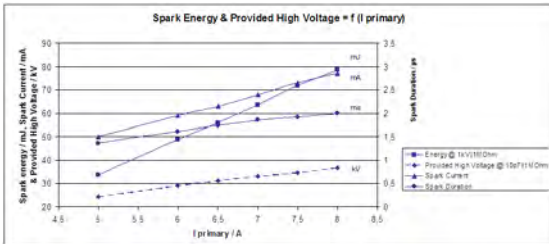


Dwell time



**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	33.7 mJ	1.37 ms	50 mA	24.4 kV
5.5 A	42 mJ	1.54 ms	54 mA	27.0 kV
6 A	48.9 mJ	1.62 ms	59 mA	29.1 kV
6.5 A	55.9 mJ	1.74 ms	63 mA	31.2 kV
7 A	63.6 mJ	1.85 ms	68 mA	33.2V
7.5 A	71.9 mJ	1.92 ms	73 mA	34.7 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P65-T has an integrated transistor and requires an ECU with internal ignition drivers.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

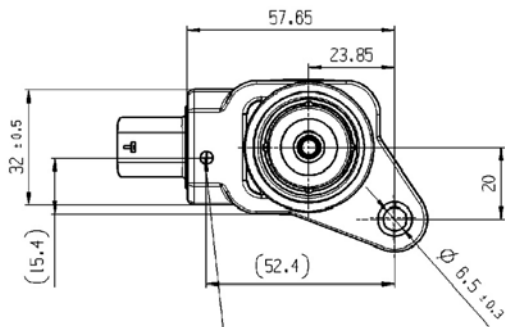
**Ordering Information**

**Single Fire Coil P65-T**

Order number **0 221 604 024**

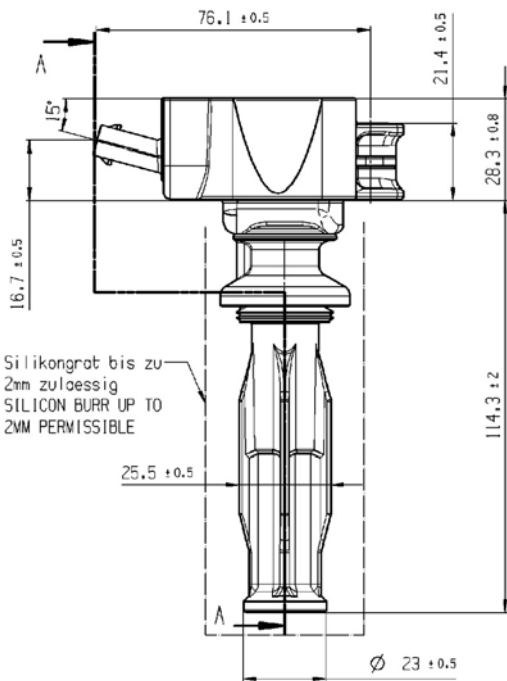
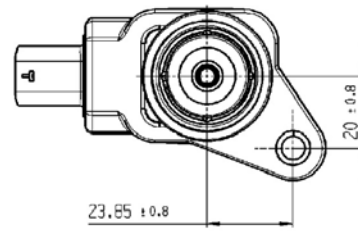
Dimensions

2



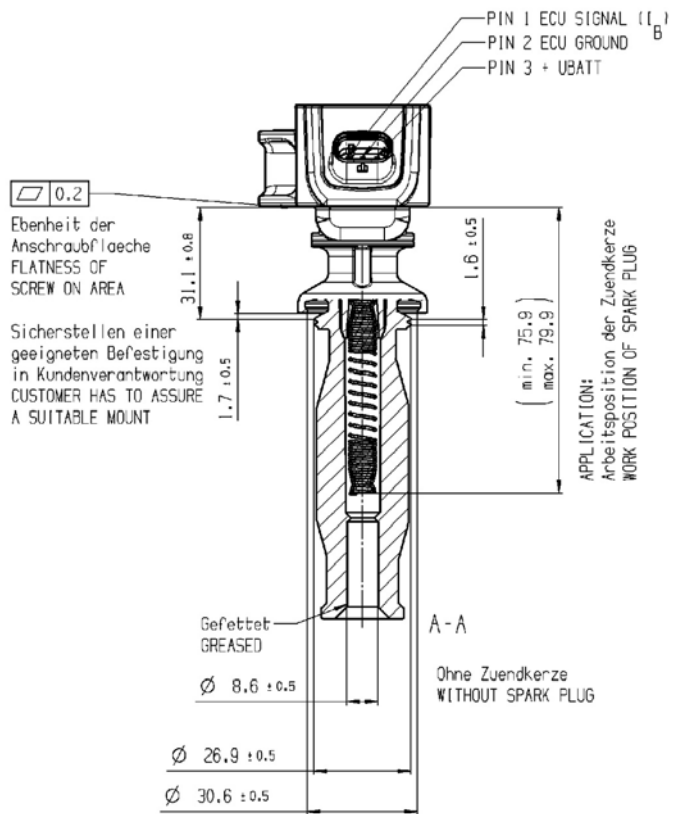
Temperatur-Messpunkt  
Endstufe  
TEMPERATURE MEASURING  
POINT POWER STAGE

Darstellung ohne Kerzenmantel und Feder  
EXPOSITION WITHOUT SPARK PLUG CONNECTOR  
AND SPRING

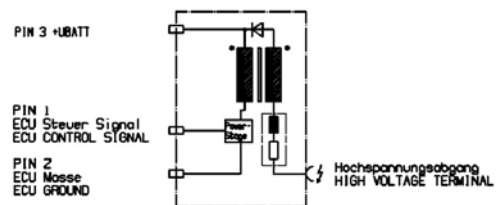


Silikongrat bis zu  
2mm zulässig  
SILICON BURR UP TO  
2MM PERMISSIBLE

Ohne Zündkerze  
WITHOUT SPARK PLUG



Schaltbild  
CIRCUIT DIAGRAM:



## Single Fire Coil P100-T



### Features

- ▶ Max. 30 kV
- ▶ Max. 100 mJ
- ▶ Max. 1.7 kV/μs
- ▶ High energy coil
- ▶ Max. 8,000 1/min

The P100-T is a transistorized coil (integrated power stage BIP 355) developed for engines needing immense spark energy and long sparks duration.

The P100-T has an integrated transistor and requires an ECU with internal ignition drivers.

The coil is designed for direct cylinder head mounting.

The coil benefits from series production ensuring robustness and low cost.

### Application

Spark energy	≤ 100 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Weight	353 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	Incapable of measurement
Secondary resistance	Incapable of measurement

High voltage rise time	≤ 1.7 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 30 kV
Spark current	≤ 110 mA
Spark duration at 1 kV    1 MΩ	≤ 1.9 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
power stage	Integrated

#### Characteristic

Measured with power stage	BIP 355
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#### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 336-01
Pin 1	ECU Ignition signal
Pin 2	ECU <sub>Gnd</sub>
Pin 3	Engine <sub>Gnd</sub>
Pin 4	U <sub>batt</sub>

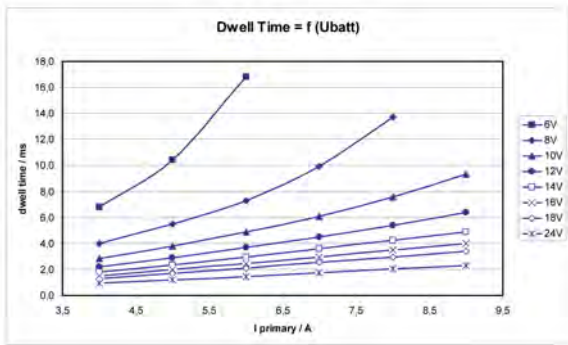
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	6.8	10.4	16.8			
8V	4.0	5.5	7.3	9.9	13.7	
10V	2.9	3.8	4.9	6.1	7.6	9.3
12V	2.2	2.9	3.7	4.5	5.4	6.4
14V	1.8	2.4	2.9	3.6	4.2	4.9
16V	1.5	2.0	2.5	3.0	3.5	4.0
18V	1.3	1.7	2.1	2.5	3.0	3.4
20V	1.2	1.5	1.8	2.2	2.6	2.9
22V	1.0	1.3	1.6	2.0	2.3	2.6
24V	0.9	1.2	1.5	1.8	2.0	2.3

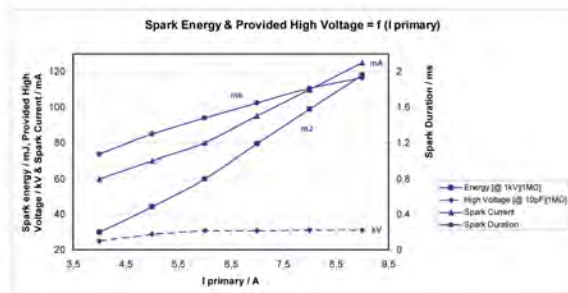
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	29.8 mJ	1.07 ms	60 mA	24.9 kV
5 A	44.2 mJ	1.3 ms	70 mA	28.6 kV
6 A	60 mJ	1.48 ms	80 mA	30.7 kV
7 A	79.5 mJ	1.65 ms	95 mA	30.9 kV
8 A	98.9 mJ	1.81 ms	110 mA	31 kV
9 A	118 mJ	1.93 ms	125 mA	31 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The P100-T has an integrated transistor and requires an ECU with internal ignition drivers with 10 to 20 mA current output.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

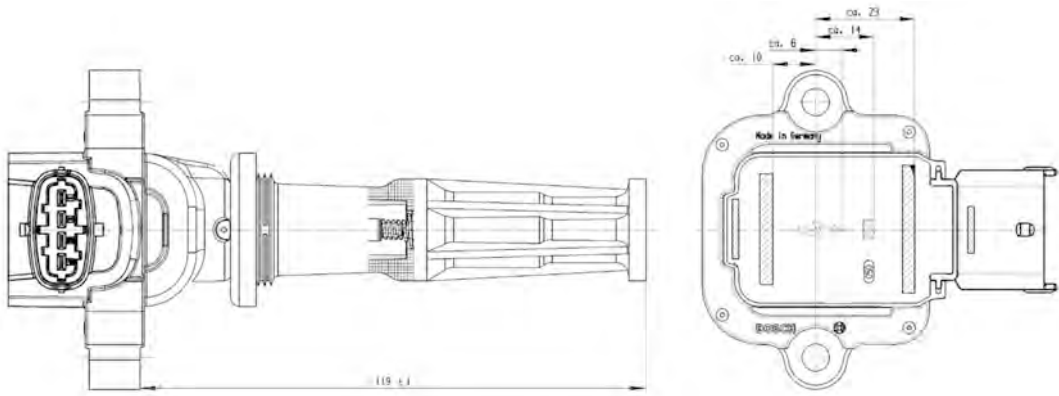
Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Single Fire Coil P100-T**  
Order number **0 221 604 006**

Dimensions



## Single Fire Coil PS



2

### Features

- ▶ Max. 30 kV
- ▶ Max. 42 mJ
- ▶ Max. 1.5 kV/μs
- ▶ Max. 10,000 1/min

This pencil coil is a basic low cost concept designed for cylinder head installation. The PS has no integrated transistor and requires an ECU with internal ignition power stages. The coil is only designed for spark plug shaft mounting. It is a basic concept for ignition applications.

### Application

Spark energy	≤ 42 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Diameter	22 mm
Weight	189 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	570 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.5 kV/μs

Max. high voltage at 1 MΩ    10 pF	≤ 30 kV
Spark current	≤ 80 mA
Spark duration at 1 kV    1 MΩ	≤ 1.1 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated

#### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> =600 V) respectively BIP372
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#### Connectors and Wires

Connector	AMP C-O-28 44 25
Mating connector	D 261 205 350-01
Pin 1	ECU collector
Pin 2	Engine Gnd
Pin 3	U <sub>batt</sub>
Pin 4	N.a.

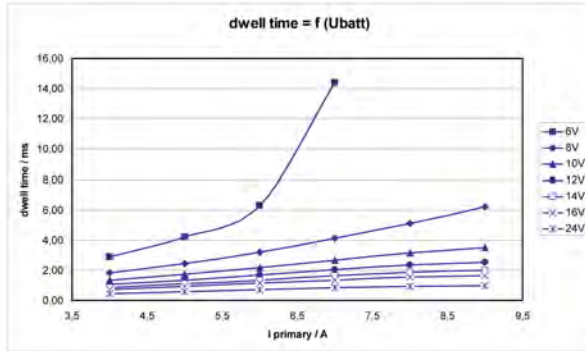
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	2.90	4.20	6.30	14.4 0	-	-
8V	1.83	2.45	3.17	4.10	5.10	6.20
10V	1.33	1.74	2.18	2.68	3.16	3.49
12V	1.05	1.35	1.68	2.02	2.33	2.53
14V	0.86	1.11	1.35	1.62	1.85	1.99
16V	0.73	0.93	1.14	1.35	1.54	1.65
20V	0.56	0.71	0.86	1.02	1.15	1.23
22V	0.50	0.64	0.77	0.91	1.02	1.09
24V	0.46	0.58	0.70	0.82	0.92	0.98

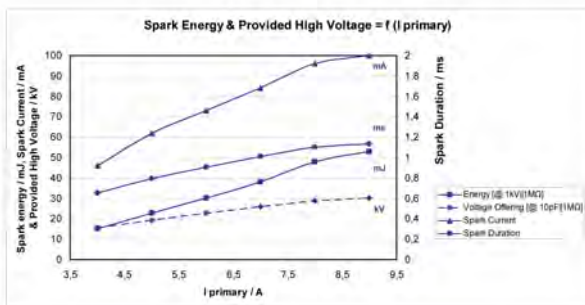
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-currant	Hi voltage
4 A	15.0 mJ	0.650 ms	46 mA	15.6 kV
5 A	22.8 mJ	0.793 ms	62 mA	19.3 kV
6 A	30.2 mJ	0.904 ms	73 mA	22.7 kV
7 A	38.2 mJ	1.010 ms	84 mA	26.0 kV
8 A	47.9 mJ	1.101 ms	96 mA	28.8 kV
9 A	52.9 mJ	1.130 ms	100 mA	30.2 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The PS has no integrated transistor and requires an ECU with internal ignition power stages.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

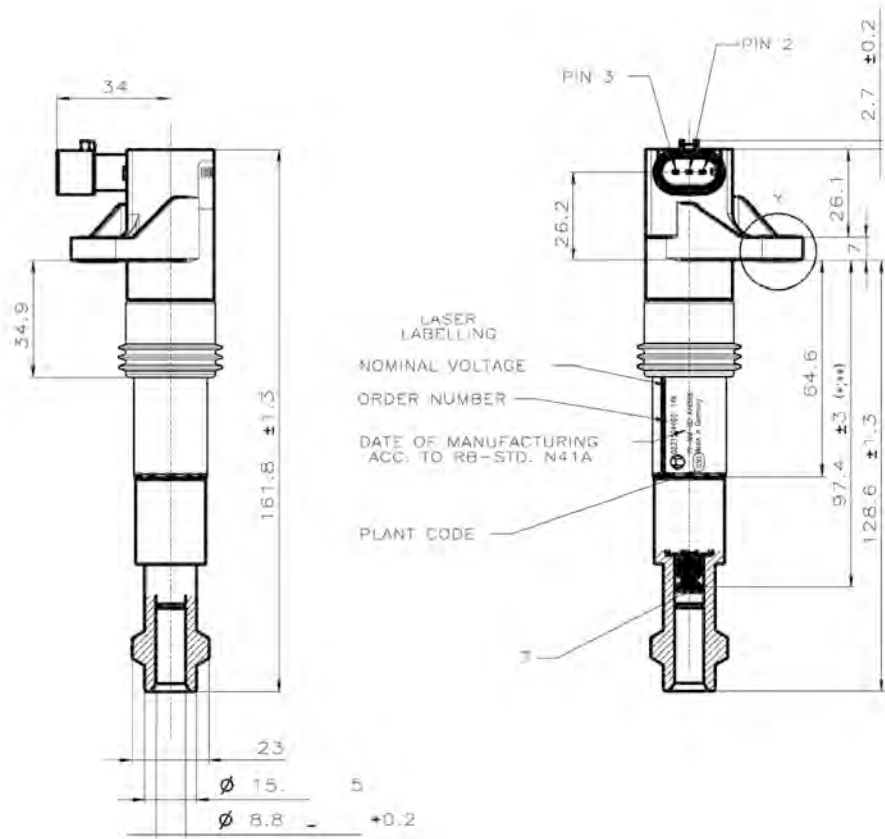
**Ordering Information**

**Single Fire Coil PS**

Order number **0 221 504 460**

Dimensions

2





## Single Fire Coil PS-T



### Features

- ▶ Max. 27 kV
- ▶ Max. 42 mJ
- ▶ Max. 1.5 kV/μs
- ▶ Max. 10,000 1/min

This pencil coil is a basic low cost concept designed for cylinder head installation.

The PS-T has an integrated transistor and requires an ECU with internal ignition drivers.

The coil is only designed for spark plug shaft mounting. It is a basic concept for ignition applications.

### Application

Spark energy	≤ 42 mJ
Primary current	≤ 7.5 A
Operating temperature range at outer core	-20 to 140°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Diameter	22 mm
Weight	202 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	Incapable of measurement
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.5 kV/μs

Max. high voltage at 1 MΩ    10 pF	≤ 27 kV
Spark current	≤ 80 mA
Spark duration at 1 kV    1 MΩ	≤ 1.1 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
Power stage	Integrated

#### Characteristic

Measured with power stage	BIP 355
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#### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 336-01
Pin 1	ECU ignition signal
Pin 2	ECU Gnd
Pin 3	Engine Gnd
Pin 4	Ubatt

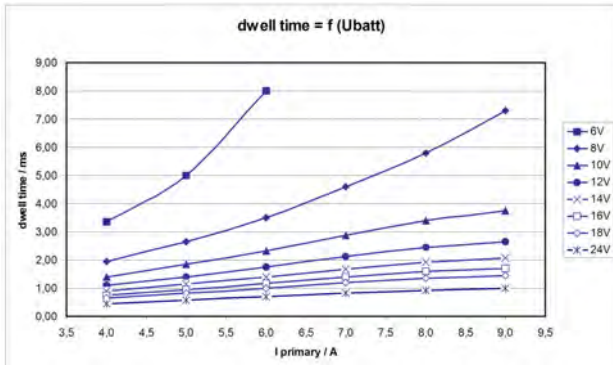
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	2.90	4.20	6.30	14.4 0	-	-
8V	1.83	2.45	3.17	4.10	5.10	6.20
10V	1.33	1.74	2.18	2.68	3.16	3.49
12V	1.05	1.35	1.68	2.02	2.33	2.53
14V	0.86	1.11	1.35	1.62	1.85	1.99
16V	0.73	0.93	1.14	1.35	1.54	1.65
20V	0.56	0.71	0.86	1.02	1.15	1.23
22V	0.50	0.64	0.77	0.91	1.02	1.09
24V	0.46	0.58	0.70	0.82	0.92	0.98

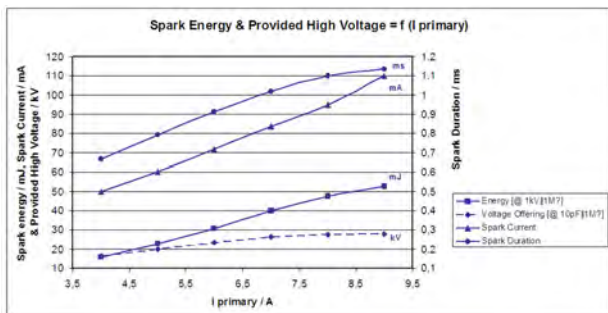
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-currant	Hi voltage
4 A	15.0 mJ	0.650 ms	46 mA	15.6 kV
5 A	22.8 mJ	0.793 ms	62 mA	19.3 kV
6 A	30.2 mJ	0.904 ms	73 mA	22.7 kV
7 A	38.2 mJ	1.010 ms	84 mA	26.0 kV
8 A	47.9 mJ	1.101 ms	96 mA	28.8 kV
9 A	52.9 mJ	1.130 ms	100 mA	30.2 kV



Spark energy

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The PS-T has an integrated transistor and requires an ECU with internal ignition drivers, e.g. MS 4.x or MS 4.x Sport.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

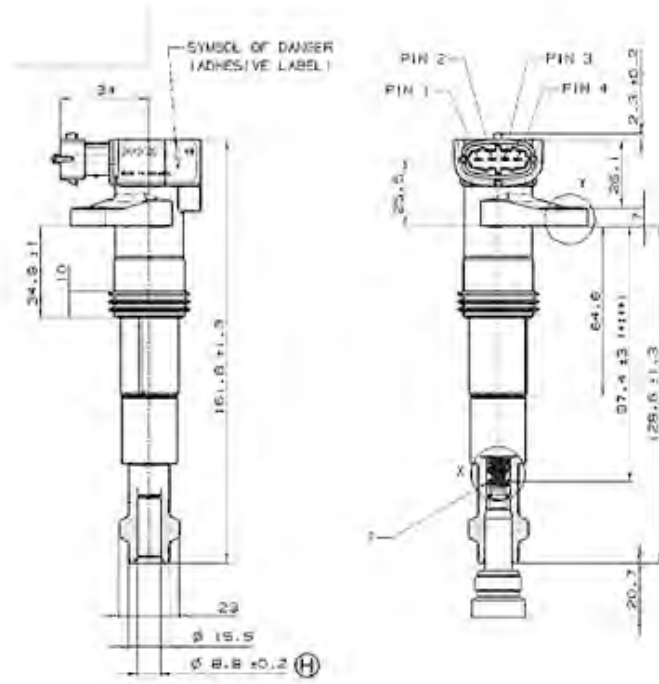
Please find further application hints in the offer drawing at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Single Fire Coil PS-T**  
Order number **0 221 604 103**

Dimensions



## Single Fire Coil S19



2

### Features

- ▶ Max. 30 kV
- ▶ Max. 34 mJ
- ▶ Max. 7.5 kV/μs
- ▶ Max. 20,000 1/min

This single fire coil was developed for the use in Formula 1 high performance engines. It is designed to mount directly on the spark plug.

This coil optionally provides an ionic current measurement.

The S19 has no integrated transistor and requires an ECU with internal ignition power stages.

The upper part (wire side) and the lower part (spark plug side) can be designed per customer specification. The main benefits of this high performance coil are its robustness in hard racing applications and high energy efficiency.

### Application

Spark energy	≤ 34 mJ
Primary current	≤ 25 A
Operating temperature range at outer core	0 to 160°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Diameter	18.5 mm
Weight	100 g
Mounting	Pluggable / pressed

#### Electrical Data

Primary resistance with wire	200 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 7.5 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 30 kV
Spark current	≤ 320 mA
Spark duration at 1 kV    1 MΩ	≤ 0.27 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
Ionic current signal	Optional

#### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> = 600 V)
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#### Connectors and Wires

Connector	Open end
Mating connector	-
Pin 1	U <sub>batt</sub> red
Pin 2	ECU power stage white
Pin 3	Engine GND black
Pin 4	Optional ionic current signal screen wire white

Various motorsport and automotive connectors are available on request.

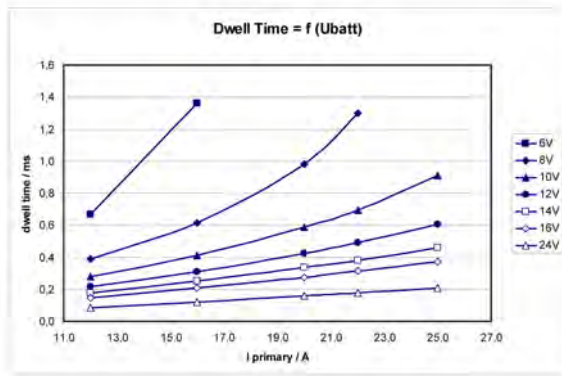
Wire size	AWG 20/22
Wire length L	Max. 100 cm

Please specify the required wire length with your order.

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>				
	12 A	16.0 A	20.0 A	22.0 A	25.0 A
6 V	0.7	1.4			
8 V	0.390	0.613	0.980	1.300	
10 V	0.278	0.411	0.586	0.695	0.910
12 V	0.216	0.310	0.426	0.491	0.606
14 V	0.176	0.250	0.335	0.382	0.460
16 V	0.148	0.208	0.276	0.313	0.371
24 V	0.084	0.119	0.157	0.175	0.208
27 V	0.077	0.107	0.139	0.155	0.180
30 V	0.068	0.094	0.122	0.136	0.157

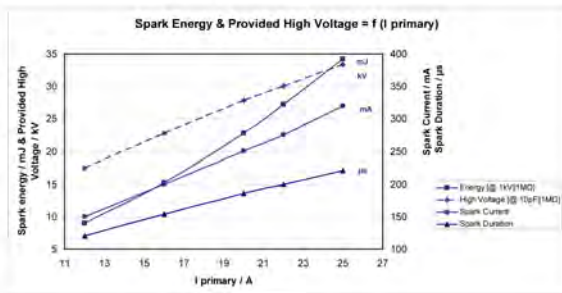
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



*Dwell time*

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
12 A	9 mJ	120 µs	150 mA	17.5 kV
16 A	15.2 mJ	154 µs	200 mA	22.8 kV
20 A	22.8 mJ	186 µs	250 mA	27.8 kV
22 A	27.2 mJ	200 µs	275 mA	30 kV
25 A	34.2 mJ	221 µs	320 mA	33.4 kV



*Spark energy*

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The S22 has no integrated transistor and requires an ECU with internal ignition power stages, e.g. IGBT IRG4BC40S.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

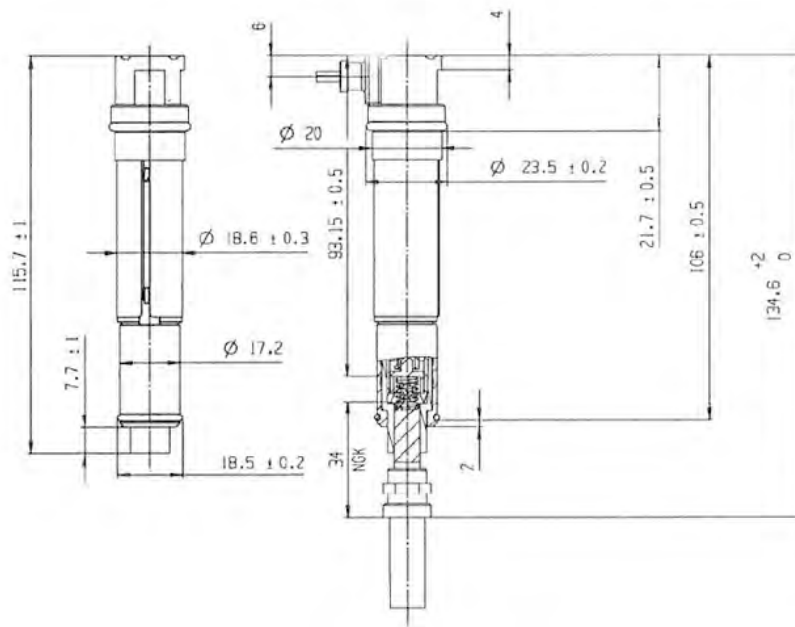
**Ordering Information**

**Single Fire Coil S19**

Order number **0 221 B00 113-01**

## Dimensions

2



## Single Fire Coil S22/S22-T



### Features

- ▶ Max. 25 kV
- ▶ Max. 60 mJ
- ▶ Max. 5.0 kV/μs
- ▶ Max. 10,000 1/min

This single fire coil was developed for the use in high performance engines. It is designed to mount directly on the spark plug and

This coil optionally provides an ionic current measurement. The S22-T has an integrated transistor and requires an ECU with internal ignition drivers. The S22 has no integrated transistor and requires an ECU with internal ignition power stages.

The upper part (wire side) and the lower part (spark plug side) can be designed per customer specification. The main benefits of this high performance coil are its robustness in hard racing applications and high energy efficiency.

### Application

Spark energy	≤ 60 mJ
Primary current	≤ 16 A
Operating temperature range at outer core	Please see Variations
Storage temperature range	-40 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Variations

	S22	S22-T
Primary resistance with wire	330 mΩ	Incapable of measurement
Integrated power stage	-	+

Pin 1	U <sub>batt</sub> red	U <sub>batt</sub> red
Pin 2	ECU ignition power stage white	ECU ignition signal yellow
Pin 3	Engine GND black	ECU GND blue
Pin 4	Ion current signal screen wire white	Engine GND black
Pin 5	N.a.	Optional ion current signal screen wire white
Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> = 600 V)	IGBT IRF5036S (U <sub>ce</sub> = 400 V)
Operating temperature range at outer core	0 to 160°C	0 to 150°C

### Mechanical Data

Diameter	22 mm
Weight	150 g
Mounting	Pluggable / pressed

### Electrical Data

Primary resistance with wire	Please see Variations
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 5.0 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 25 kV
Spark current	≤ 300 mA
Spark duration at 1 kV    1 MΩ	≤ 0.43 ms
Noise suppression	Inductive
Suppression diode / EFU	Integrated
Integrated power stage	Please see Variations
Ionic current signal	Optional

### Characteristic

Measured with power stage	Please see Variations
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### Connectors and Wires

Connector	Open end
Mating connector	-
Pin 1	U <sub>batt</sub> red
Pin 2	Please see Variations
Pin 3	Please see Variations
Pin 4	Please see Variations
Pin 5	Please see Variations

Various motorsport and automotive connectors are available on request.

Wire size AWG 20/22

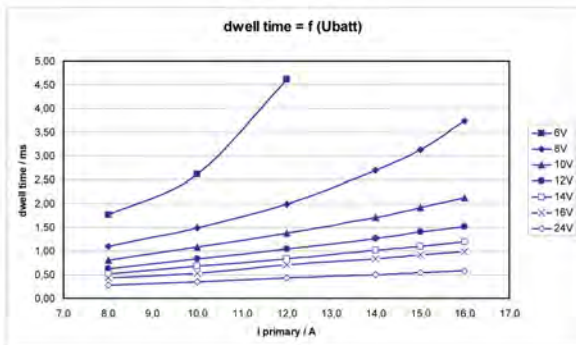
Wire length L Max. 100 cm

Please specify the required wire length with your order.

**Characteristic dwell times [ms]**

U <sub>batt</sub>	I <sub>primary</sub>					
	8.0A	10.0A	12.0A	14.0A	15.0A	16.0A
6V	1.76	2.61	4.61			
8V	1.10	1.49	1.99	2.70	3.12	3.74
10V	0.80	1.08	1.37	1.71	1.91	2.12
12V	0.62	0.83	1.04	1.27	1.40	1.52
14V	0.51	0.68	0.84	1.01	1.10	1.19
16V	0.44	0.53	0.70	0.84	0.91	0.99
20V	0.34	0.44	0.53	0.63	0.68	0.73
24V	0.27	0.35	0.43	0.50	0.54	0.58

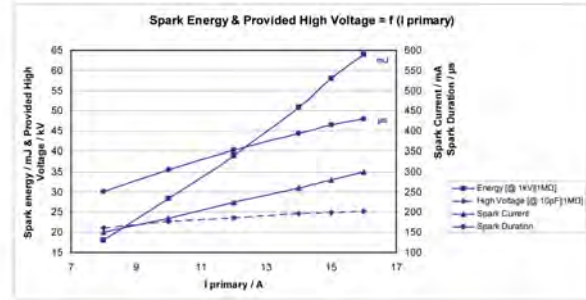
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



*Dwell time*

**Spark energy and provided high voltage**

I <sub>prim.</sub>	Spark energy	-duration	-current	Hi voltage
8 A	18.1 mJ	251 μs	150 mA	21.1 kV
10 A	28.3 mJ	305 μs	185 mA	22.7 kV
12 A	39 mJ	353 μs	225 mA	23.6 kV
14 A	50.8 mJ	394 μs	260 mA	24.6 kV
15 A	58 mJ	415 μs	280 mA	24.9 kV
16 A	64 mJ	430 μs	300 mA	25.2 kV



*Spark energy*

**Installation Notes**

During mounting of the spark plug please pay attention that full clamping and proper contacts are made to ensure safe connection between coil and spark plug.

The S22-T has an integrated transistor and requires an ECU with internal ignition drivers.

The S22 has no integrated transistor and requires an ECU with internal ignition power stages, e.g. IGBT IRG4BC40S.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Operation with limit values of 16 A can reduce the life time of the ignition coil. In case of permanent operation please use 12 A. This will bring a spark energy of 40 mJ.

Please find further application hints at our homepage.

In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Coil S22**

Order number **0 221 B00 115-01**

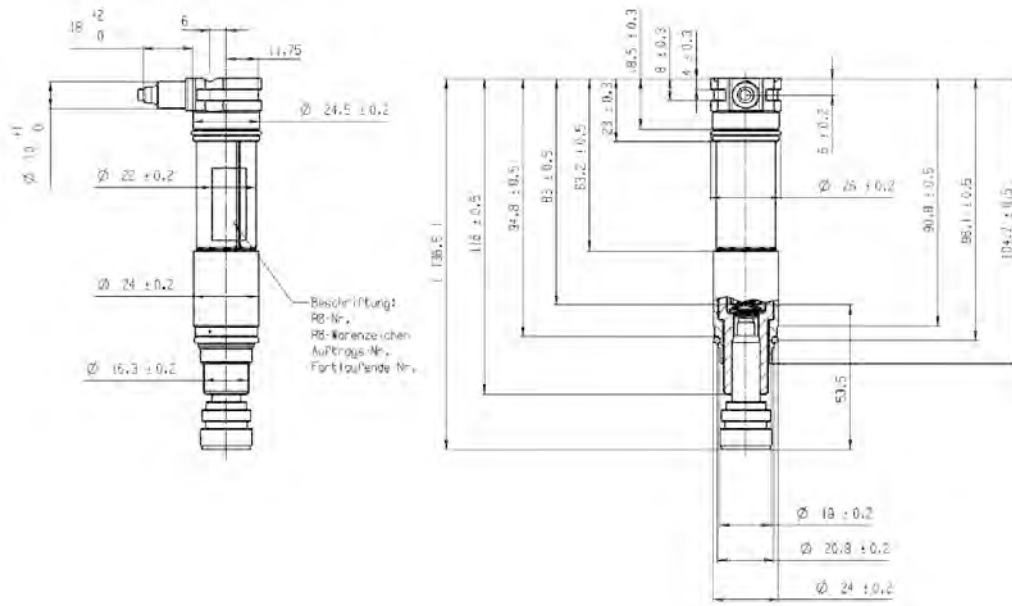
**Coil S22-T**

Integrated transistor

Order number **0 221 B00 116-01**



Dimensions



## Twin Single Fire Coil 2x1



2

### Features

- ▶ Max. 35 kV
- ▶  $2 \times \leq 50 \text{ mJ}$
- ▶ Max.  $2.1 \text{ kV}/\mu\text{s}$
- ▶ Developed for twin spark engines
- ▶ 2 independent coils in 1 housing

This ignition coil is specifically developed for engines with twin sparks.

The advantage of this coil is that there are two separated coils in one housing. So the ignition can be parallel or serial-offset with some angular degrees.

The Twin Single Fire Coil 2x1 has no integrated transistor and requires an ECU with internal ignition power stages.

This coil is a series coil, produced in great quantities. The advantages of coils from run production are low costs and high robustness.

### Application

Spark energy	$2 \times \leq 50 \text{ mJ}$
Primary current	$2 \times \leq 7.5 \text{ A}$
Operating temperature range outer core	-20 to 140°C
Storage temperature range	-40 to 110°C
Max. vibration	$\leq 400 \text{ m/s}^2$ at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Weight	496 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	420 mΩ
Secondary resistance	Incapable of measurement
High voltage rise time	$\leq 2.1 \text{ kV}/\mu\text{s}$
Max. high voltage at $1 \text{ M}\Omega \parallel 10 \text{ pF}$	$\leq 35 \text{ kV}$
Spark current	$\leq 95 \text{ mA}$
Spark duration at $1 \text{ kV} \parallel 1 \text{ M}\Omega$	$\leq 1.14 \text{ ms}$
Suppression diode / EFU	

#### Characteristic

Measured with power stage	IGBT IRG4BC40S ( $U_{ce}=600 \text{ V}$ )
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#### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 335-01
Pin 1	Coil 2 (b) ECU Ignition Power Stage
Pin 2	$U_{batt}$
Pin 3	Coil 1 (a) ECU Ignition Power Stage

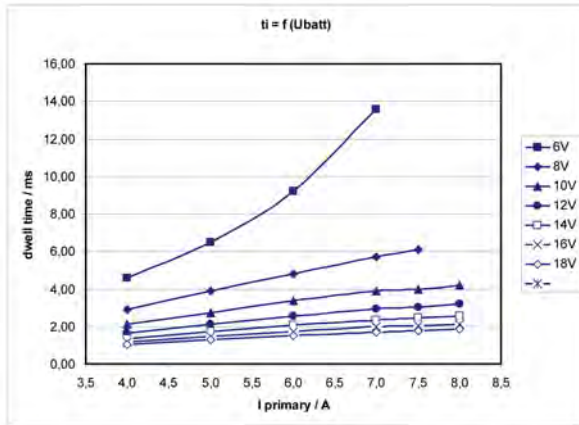
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Characteristic dwell times [ms]

$U_{batt}$	$I_{primary}$					
	4.0A	5.0A	6.0A	7.0A	7.5A	8.0A
6V	4.6	6.5	9.2	13.6		
8V	2.9	3.9	4.8	5.7	6.1	6.5
10V	2.1	2.74	3.36	3.9	4.0	4.2
12V	1.65	2.11	2.55	2.92	3.04	3.18
14V	1.36	1.74	2.07	2.35	2.45	2.55
16V	1.16	1.47	1.75	1.98	2.05	2.14
18V	1.02	1.28	1.51	1.7	1.77	1.84

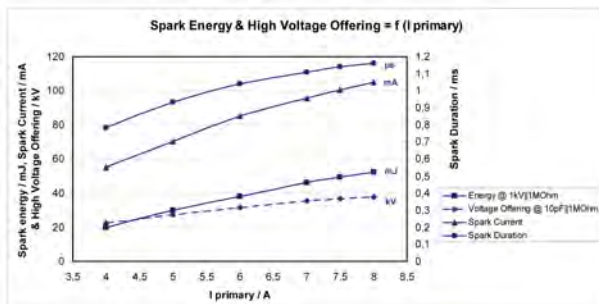
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
4 A	20 mJ	0.784 ms	55 mA	22.5 kV
5 A	29.9 mJ	0.931 ms	70 mA	27.5 kV
6 A	38 mJ	1.04 ms	85 mA	31.5 kV
7 A	46.2 mJ	1.11 ms	90 mA	35.4 kV
7.5 A	49.5 mJ	1.14 ms	95 mA	36.7 kV
8 A	52.4 mJ	1.16 ms	105 mA	37.7 kV



Spark energy

**Installation Notes**

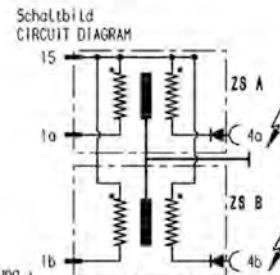
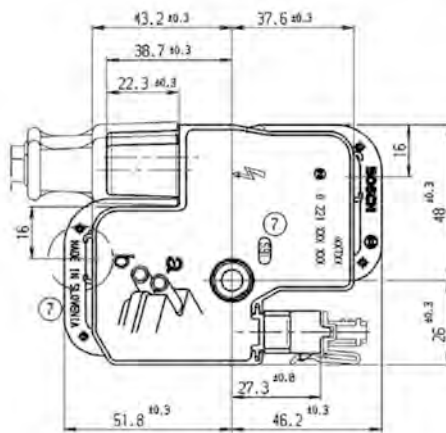
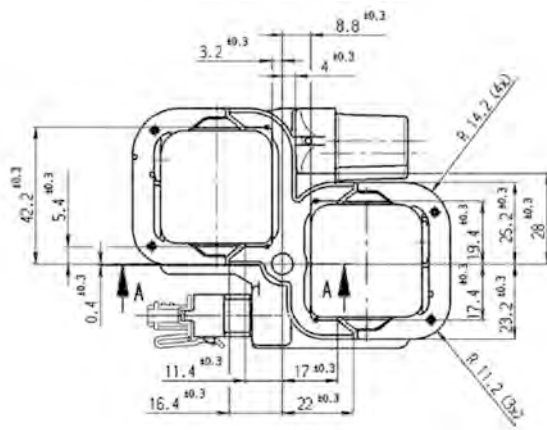
- The coil can be mounted directly on the engine.
- Ignition wires are needed to connect the coil with the spark plug.
- The Twin Single Fire Coil 2x1 has no integrated transistors and requires an ECU with internal ignition power stages, e.g. IGBT or BIP.
- For technical reasons the values of the coils may vary.
- Please regard the specified limit values.
- Please find further application hints in the offer drawing at our homepage.
- In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information**

**Twin Single Fire Coil 2x1**  
 Order number **0 221 503 035**

Dimensions

2



Achtung !  
 Primärschluß führt gefährliche Spannung !  
 CAUTION !  
 PRIMARY CONNECTION HAS DANGEROUS VOLTAGE !

## Double Fire Coil 2x2



### Features

- ▶ Max. 35 kV
- ▶ Max. 70 mJ
- ▶ Max. 1.9 kV/μs
- ▶ For 4 cyl. engines

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

The Double Fire Coil 2x2 has no integrated transistor and requires an ECU with internal ignition power stages. The advantage of this coil is that the ECU needs only two internal ignition power stages for supplying a 4-cylinder engine.

The Double Fire Coil 2x2 benefits from series production ensuring robustness and low cost.

### Application

Spark energy	≤ 70 mJ
Primary current	≤ 8.0 A
Operating temperature range at outer core	-20 to 120°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 200 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Weight	916 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	500 mΩ
Secondary resistance	13.3 kΩ

High voltage rise time	≤ 1.9 kV/μs
Max. high voltage at 1 MΩ    10 pF	≤ 35 kV
Spark current	≤ 70 mA
Spark duration at 1 kV    1 MΩ	≤ 2.2 ms

#### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> =600 V)
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#### Connectors and Wires

Connector	Bosch Jetronic
Mating connector	D 261 205 289-01
Pin 1	Coil 2 ECU Ignition Power Stage
Pin 2	U <sub>batt</sub>
Pin 3	Coil 1 ECU Ignition Power Stage

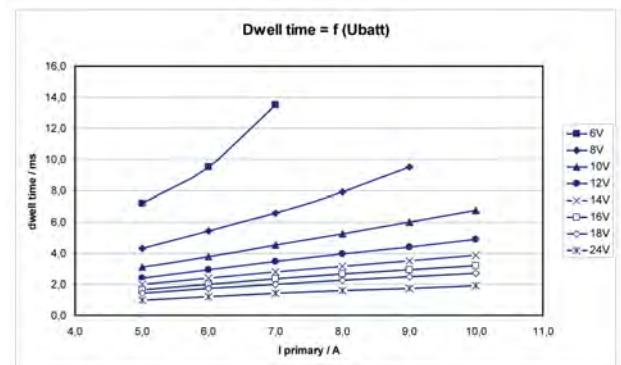
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	5.0 A	6.0 A	7.0 A	8.0 A	9.0 A	10.0 A
6V	6.9	9.3	13.1	22.2		
8V	4.2	5.3	6.7	8.1	9.8	12.0
10V	3.0	3.8	4.6	5.4	6.2	7.0
12V	2.4	2.9	3.5	4.1	4.6	5.1
14V	1.9	2.4	2.8	3.3	3.6	4.0
16V	1.6	2.0	2.4	2.7	3.0	3.3
20V	1.2	1.5	1.8	2.0	2.3	2.5
22V	1.1	1.3	1.6	1.8	2.0	2.2
24V	1.0	1.2	1.4	1.6	1.8	2.0

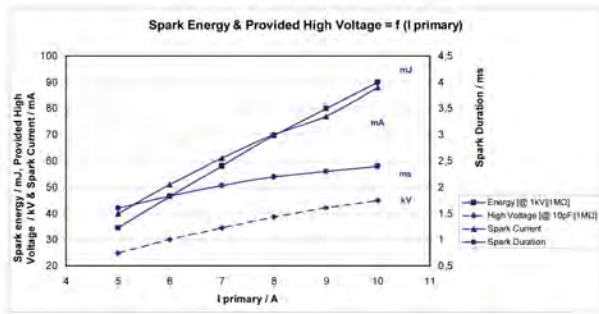
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

### Spark energy and provided high voltage

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	34.5 mJ	1.6 ms	40 mA	24.9 kV
6 A	46.5 mJ	1.83 ms	51 mA	30 kV
7 A	58.0 mJ	2.03 ms	61 mA	34.5 kV
8 A	69.6 mJ	2.2 ms	70 mA	38.6 kV
9 A	79.9 mJ	2.31 ms	77 mA	42.2 kV
10 A	89.9 mJ	2.4 ms	88 mA	45 kV



Spark energy

### Installation Notes

The coil can be mounted directly on the engine.

Ignition wires are needed to connect the coil with the spark plug, please pay attention that the spark plugs are connected in the correct ignition firing order. Numbers in the offer drawing or on the ignition coil are not the firing order but the cylinders' order.

The Double Fire Coil 2x2 has no integrated transistor and requires an ECU with two internal ignition power stages, e.g. IGBT or BIP.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

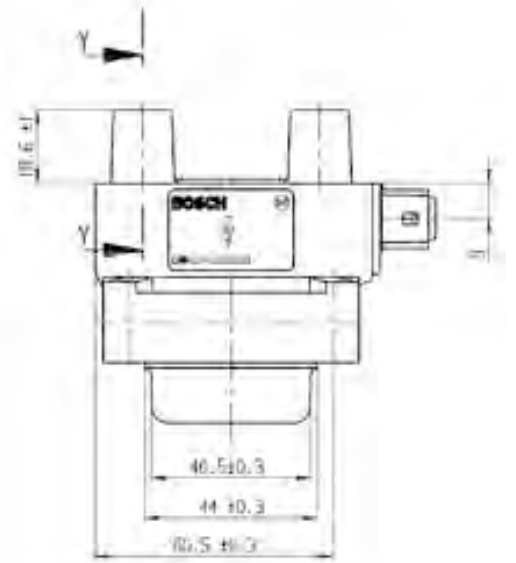
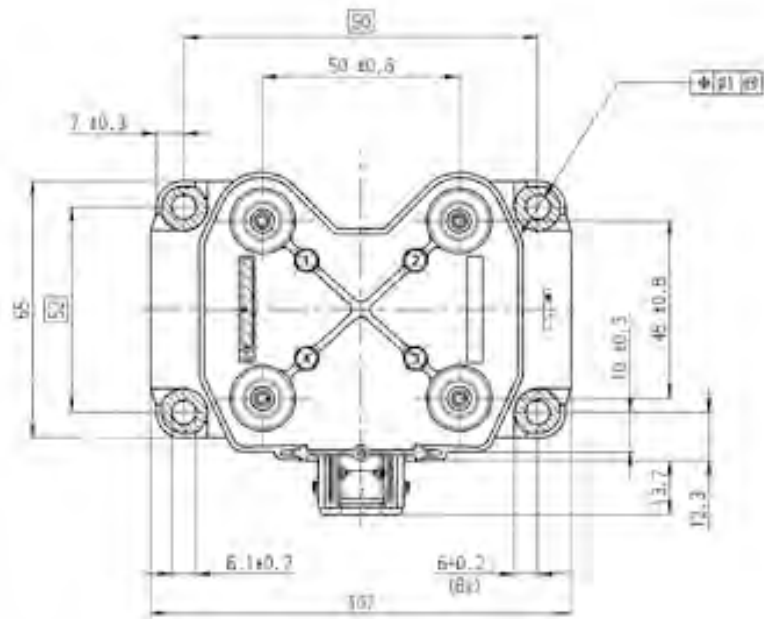
In case of ignition-caused malfunctions, please use screened sensor wires.

### Ordering Information

#### Double Fire Coil 2x2

Order number **0 221 503 407**

Dimensions



## Double Fire Coil 3x2



2

### Features

- ▶ Max. 35 kV
- ▶ Max. 65 mJ
- ▶ Max. 1.9 kV/μs
- ▶ For 6 cyl. engines

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

The Double Fire Coil 3x2 has no integrated transistor and requires an ECU with internal ignition power stages. The advantage of this coil is that the ECU needs only three internal ignition power stages for supplying a 6-cylinder engine.

The Double Fire Coil 3x2 benefits from series production ensuring robustness and low cost.

### Application

Spark energy	≤ 65 mJ
Primary current	≤ 8.0 A
Operating temperature range at outer core	-20 to 120°C
Storage temperature range	-40 to 100°C
Max. vibration	≤ 200 m/s <sup>2</sup> at 5 to 250 Hz

### Technical Specifications

#### Mechanical Data

Weight	1,490 g
Mounting	Screw fastening

#### Electrical Data

Primary resistance with wire	500 mΩ
Secondary resistance	12 kΩ
High voltage rise time	≤ 1.9 kV/μs

Max. high voltage at 1 MΩ    10 pF	≤ 35 kV
------------------------------------	---------

Spark current	≤ 80 mA
---------------	---------

Spark duration at 1 kV    1 MΩ	≤ 1.9 ms
--------------------------------	----------

#### Characteristic

Measured with power stage	IGBT IRG4BC40S (U <sub>ce</sub> = 600 V)
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#### Connectors and Wires

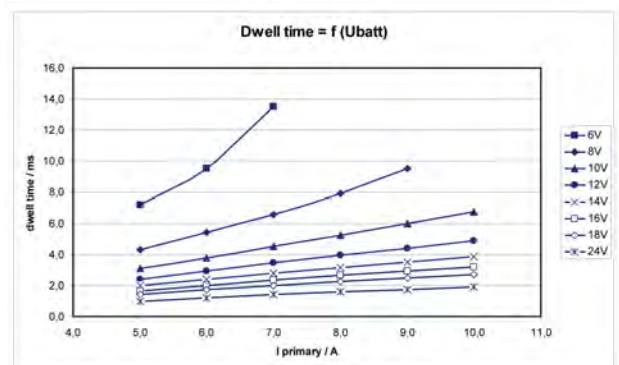
Connector	Bosch Jetronic
Mating connector	D 261 205 351-01
Pin 1	Coil 3 ECU Ignition Power Stage
Pin 2	Coil 2 ECU Ignition Power Stage
Pin 3	Coil 1 ECU Ignition Power Stage
Pin 4	U <sub>batt</sub>

Various motorsport and automotive connectors are available on request.

#### Characteristic dwell times [ms]

U <sub>batt</sub>	I <sub>primary</sub>					
	5.0 A	6.0 A	7.0 A	8.0 A	9.0 A	10.0 A
6V	7.2	9.5	13.5			
8V	4.3	5.4	6.6	7.9	9.5	
10V	3.1	3.8	4.5	5.2	6.0	6.7
12V	2.4	2.9	3.5	3.9	4.4	4.9
14V	2.0	2.4	2.8	3.2	3.5	3.9
16V	1.7	2.0	2.4	2.7	2.9	3.2
18V	1.4	1.7	2.0	2.3	2.5	2.7
20V	1.3	1.5	1.8	2.0	2.2	2.4
22V	1.1	1.3	1.6	1.8	1.9	2.1
24V	1.0	1.2	1.4	1.6	1.8	1.9

Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement

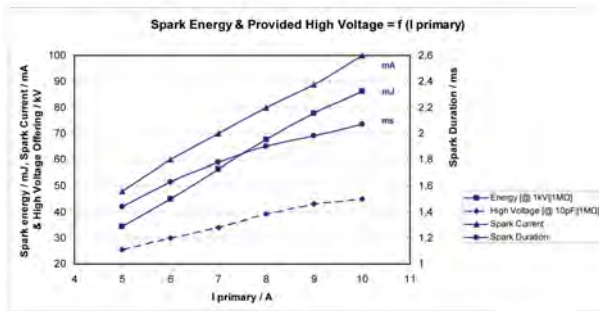


Dwell time



**Spark energy and provided high voltage**

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	34.4 mJ	1.44 ms	48 mA	25.4 kV
6 A	45 mJ	1.63 ms	60 mA	29.9 kV
7 A	56.5 mJ	1.78 ms	70 mA	34 kV
8 A	67.6 mJ	1.9 ms	80 mA	39.3 kV
9 A	77.7 mJ	1.98 ms	88.8 mA	43 kV
10 A	86.2 mJ	2.07 ms	100 mA	45 kV



Spark energy

**Installation Notes**

The coil can be mounted directly on the engine.

Ignition wires are needed to connect the coil with the spark plug, please pay attention that the spark plugs are connected in the correct ignition firing order. Numbers in the offer drawing or on the ignition coil are not the firing order but the cylinders' order.

The Double Fire Coil 3x2 has no integrated transistor and requires an ECU with three internal ignition power stages, e.g. IGBT or BIP.

For technical reasons the values of the coils may vary.

Please regard the specified limit values.

Please find further application hints in the offer drawing at our homepage.

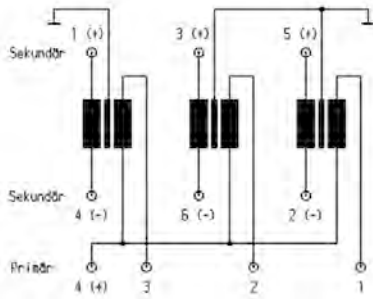
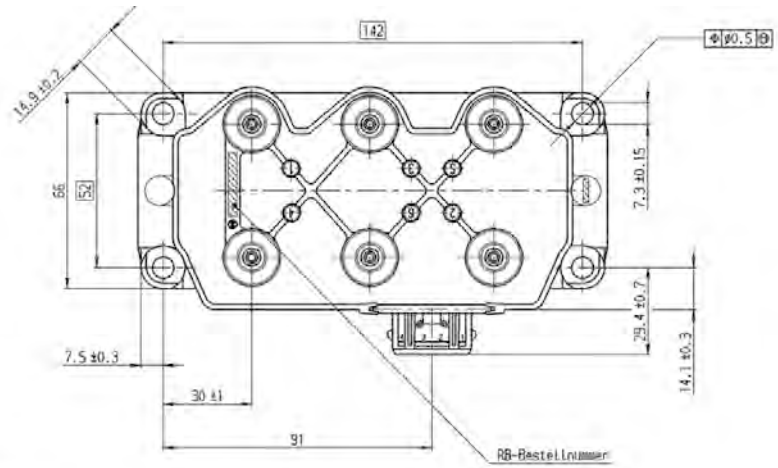
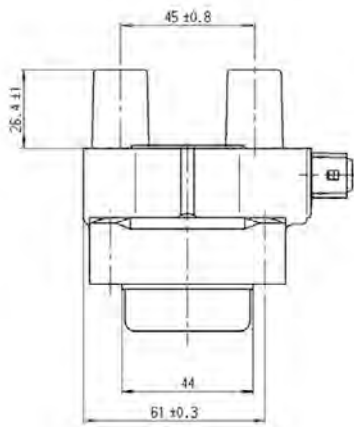
In case of ignition-caused malfunctions, please use screened sensor wires.

**Ordering Information****Double Fire Coil 3x2**

Order number **0 221 503 002**

Dimensions

2



## Ignition Module IM 3.1



### Features

- ▶ Max. 3 cylinders
- ▶ 47 g
- ▶ Fits to all MS 4 ECUs
- ▶ Especially adapted for Coil P and 3x2

This ignition module IM is an external ignition power stage capable of supplying up to three non-transistorized ignition coils.

The IM input signal should be supplied by an ECU with ignition signal outputs in the range of 10 to 20 mA (e.g. MS 4 Sport/MS 4.4 Sport).

The IM unit combines the robustness of a high quality production part with good electrical performance to provide an ideal solution for adapting non-transistorized coils to an ECU without internal ignition driver stages.

### Application

Primary current	≤ 8.5 A
Clamp voltage	380 V ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Size	70.5 x 68 x 20 mm
Weight w/o wire	47 g
Mounting	2 x M4 screws with spring washer

Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤ 70°C

#### Electrical Data

U <sub>Batt</sub> typical	13.5 V
Voltage supply	6 to 16.5 V
I <sub>B</sub> high active on	min. 10 mA
I <sub>B</sub> low off	0 mA
I <sub>B</sub>	10 to 22 mA
I <sub>C</sub> typical	≤ 8.5 A
I <sub>C</sub> max. at T <sub>U</sub> < 120°C	< 10 A
U <sub>CE</sub> satt at I <sub>C</sub> = 5 A	< 3 V
U <sub>CE</sub> satt at I <sub>C</sub> max	< 9 V

#### Characteristic

Characteristic dwell time	See characteristic dwell time from the ignition coil used
Internal transistor	Triple Darlington

#### Connectors and Wires

Three pin connector	Bosch Jetronic three pin
Mating connector	D 261 205 289-01
Pin 1	Collector transistor 1
Pin 2	Collector transistor 2
Pin 3	Collector transistor 3
Four pin connector	Bosch Jetronic four pin
Mating connector	B 261 205 351-01
Pin 1	Basis transistor 3
Pin 2	Gnd
Pin 3	Basis transistor 2
Pin 4	Basis transistor 1

#### Installation Notes

This ignition module can be used with: Coils 2x1, 2x2, 3x2, P35 and PS or comparable coils.

Please ensure that the connectors are safe from water.

The IM has to be mounted onto a cooling body. The mounting surface needs a planarity of 0.2 mm.

A heat conductive paste has to be used.

This ignition module is designed for use with engine control units which have no integrated ignition transistor.

Please observe the specified limit values.

Please find further application hints in the offer drawing at our homepage.

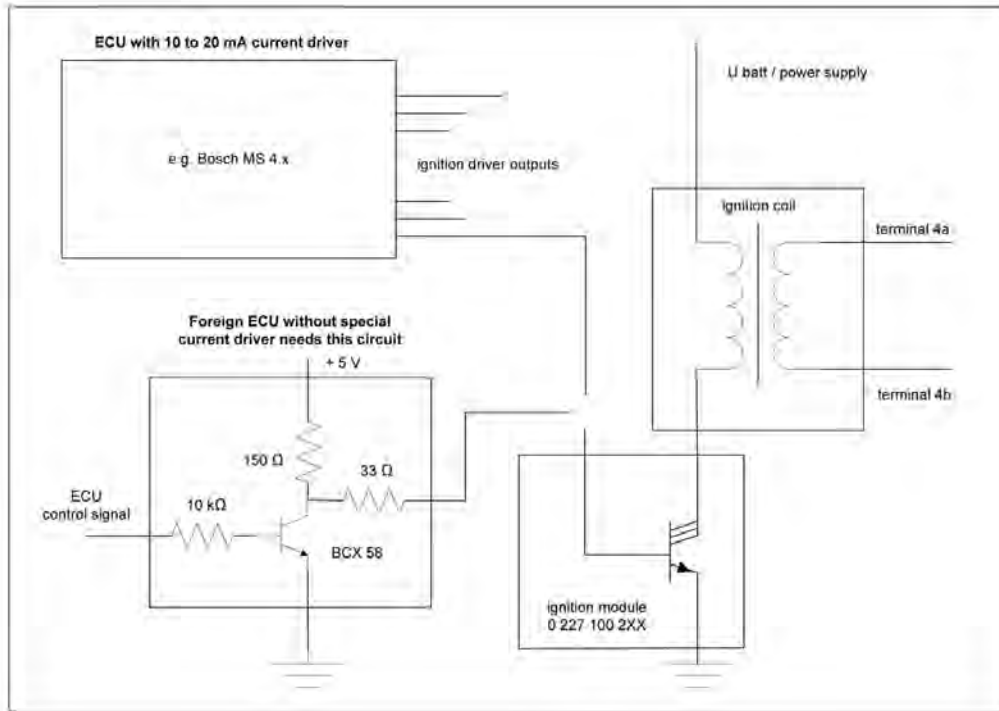
## Ordering Information

## Ignition Module IM 3.1

Order number 0 227 100 209

## Dimensions

2



## Ignition Module IM 3.2



### Features

- ▶ Max. 3 cylinders
- ▶ 47 g
- ▶ Fits to all MS 4 ECUs
- ▶ Especially adapted for Coil P and 3x2

This ignition module IM 3.2 is an external ignition power stage capable of supplying up to three non-transistorized ignition coils.

The IM input signal should be supplied by an ECU with ignition signal outputs in the range of 10 to 20 mA (e.g. MS 4 Sport/MS 4.4 Sport).

The IM unit combines the robustness of a high quality production part with good electrical performance to provide an ideal solution for adapting non-transistorized coils to an ECU without internal ignition driver stages.

### Application

Primary current	≤ 8.5 A
Clamp voltage	380 V ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Size	71 x 48 x 21 mm
Weight w/o wire	47 g
Mounting	2 x M4 screws with spring washer
Operating temperature	-40 to 110°C
Permissible fuel temperatures	≤ 70°C

#### Electrical Data

U <sub>Batt</sub> typical	13.5 V
Voltage supply	6 to 16.5 V
I <sub>B</sub> high active on	min. 10 mA
I <sub>B</sub> low off	0 mA
I <sub>B</sub>	10 to 22 mA
I <sub>C</sub> typical	≤ 8.5 A
I <sub>C</sub> max. at T <sub>U</sub> < 120°C	< 10 A
U <sub>CE</sub> satt at I <sub>C</sub> = 5 A	< 3 V
U <sub>CE</sub> satt at I <sub>C</sub> max	< 9 V

#### Characteristic

Characteristic dwell time	See characteristic dwell time from the ignition coil used
Internal transistor	Triple Darlington

#### Connectors and Wires

Seven pin connector	Bosch Jetronic seven pin
Mating connector	F 02U B00 252-01
Pin 1	Collector transistor 1
Pin 2	Basis transistor 1
Pin 3	Collector transistor 2
Pin 4	Gnd
Pin 5	Basis transistor 2
Pin 6	Collector transistor 3
Pin 7	Basis transistor 3

#### Installation Notes

This ignition module can be used with: Coils 2x1, 2x2, 3x2, P35 and PS or comparable coils.

Please ensure that the connectors are safe from water.

The IM has to be mounted onto a cooling body. The mounting surface needs a planarity of 0.2 mm.

A heat conductive paste has to be used.

This ignition module is designed for use with engine control units which have no integrated ignition transistor.

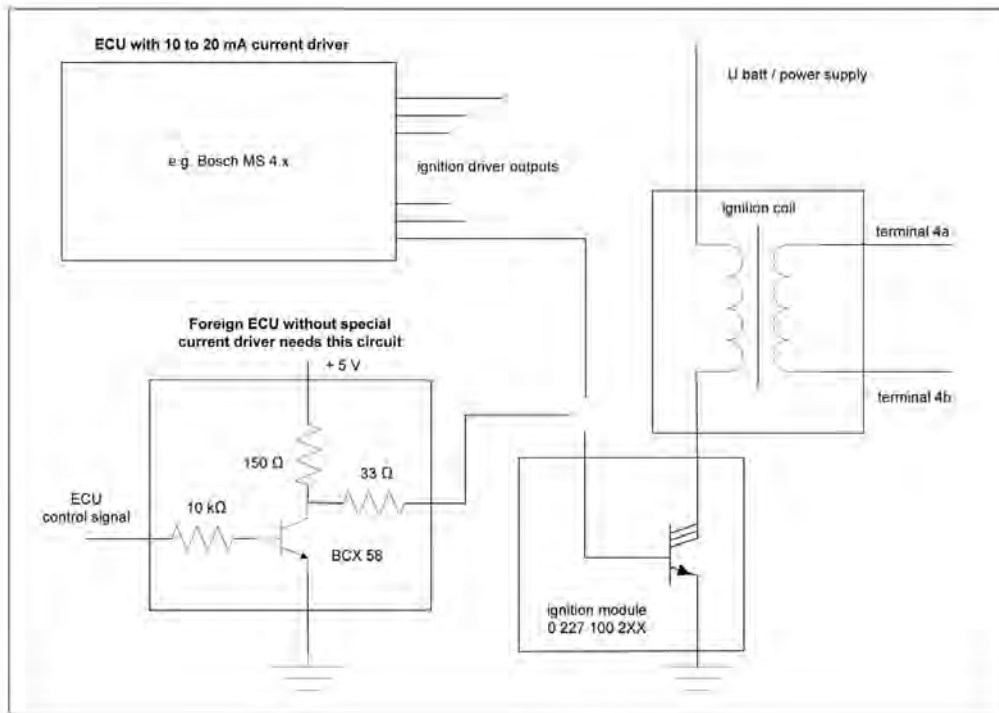
Please observe the specified limit values.

Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

**Ignition Module IM 3.2**  
Order number **0 227 100 203**

## Dimensions



## Ignition Module IM 4



### Features

- ▶ Max. 4 cylinders
- ▶ 54 g
- ▶ Fits to all MS 4 ECUs
- ▶ Especially adapted for Coil P, 2x2 and 2x1

This ignition module IM is an external ignition power stage capable of supplying up to four non-transistorized ignition coils.

The IM input signal should be supplied by an ECU with ignition signal outputs in the range of 10 to 20 mA (e.g. MS 4 Sport/MS 4.4 Sport).

The IM unit combines the robustness of a high quality production part with good electrical performance to provide an ideal solution for adapting non-transistorized coils to an ECU without internal ignition driver stages.

### Application

Primary current	≤ 8.5 A
Clamp voltage	380 V ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s <sup>2</sup> at 5 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Size	70.5 x 68 x 20 mm
Weight w/o wire	54 g
Mounting	2 x M4 screws with spring washer

### Electrical Data

U <sub>Batt</sub> typical	13.5 V
Voltage supply	6 to 16.5 V
I <sub>B</sub> high active on	min. 10 mA
I <sub>B</sub> low off	0 mA
I <sub>B</sub>	10 to 22 mA
I <sub>C</sub> typical	< 8.5 A
I <sub>C</sub> max. at T <sub>U</sub> < 120°C	< 10 A
U <sub>CE</sub> satt at I <sub>C</sub> = 5 A	< 3 V
U <sub>CE</sub> satt at I <sub>C</sub> max	< 9 V

### Connectors and Wires

Four pin connector	Bosch Jetronic four pin
Mating connector	D 261 205 351-01
Pin 1	Collector transistor 4
Pin 2	Collector transistor 3
Pin 3	Collector transistor 2
Pin 4	Collector transistor 1
Five pin connector	Bosch Jetronic five pin
Mating connector	D 261 205 352-01
Pin 1	Basis transistor 1
Pin 2	Basis transistor 2
Pin 3	Gnd
Pin 4	Basis transistor 3
Pin 5	Basis transistor 4

### Installation Notes

This ignition module can be used with: Coils 2x1, 2x2, 3x2, P35 and PS or comparable coils.

Please ensure that the connectors are safe from water.

The IM has to be mounted onto a cooling body. The mounting surface needs a planarity of 0.2 mm.

A heat conductive paste has to be used.

This ignition module is designed for use with engine control units which have no integrated ignition transistor.

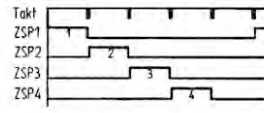
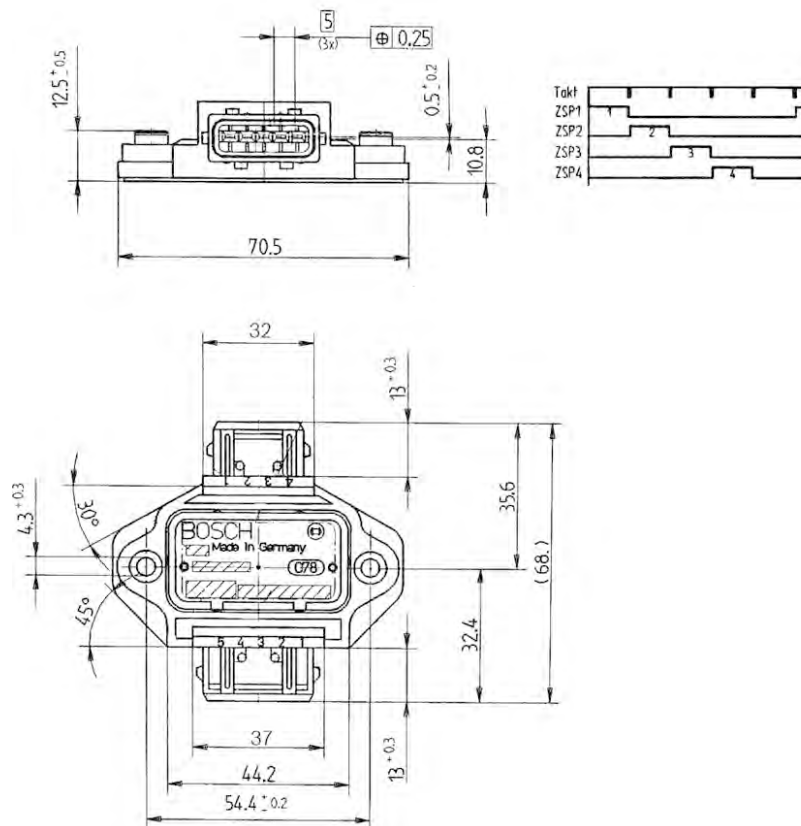
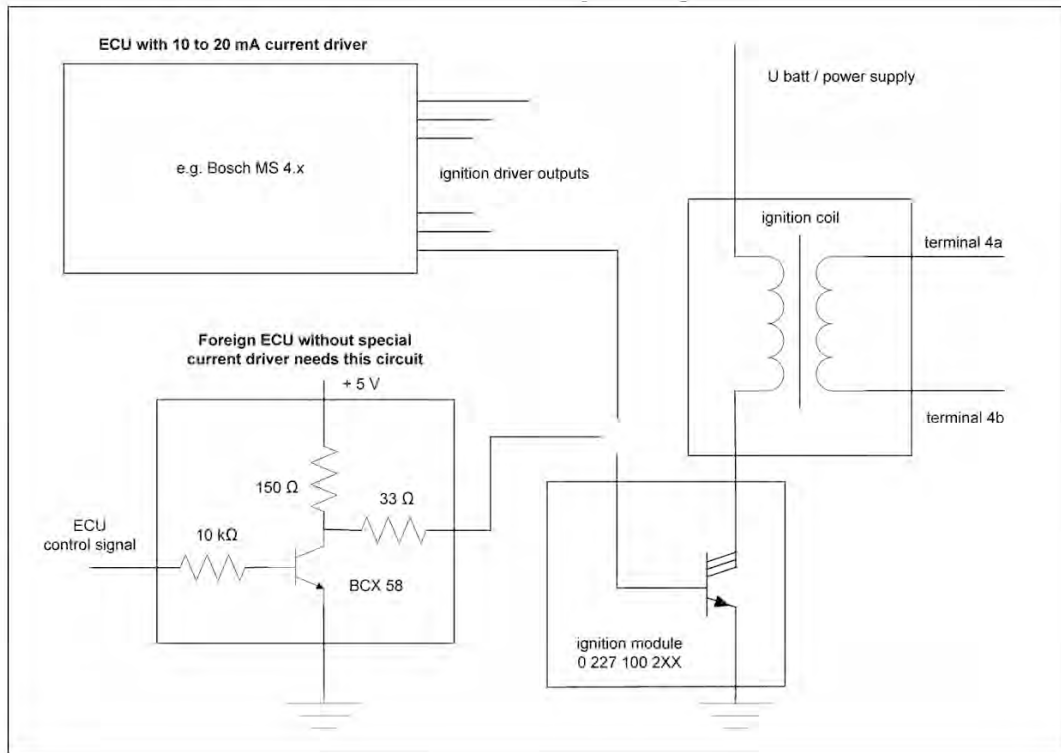
Please observe the specified limit values.

### Ordering Information

**Ignition Module IM 4**  
Order number **0 227 100 211**

Dimensions

2





# Alternators and Starters

3

<b>Alternators</b>	<b>144</b>
<b>Starters</b>	<b>150</b>

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## Alternator B3



3

### Features

- ▶ 4,800 g
- ▶ 210 A
- ▶ Clockwise rotation

The B3 is a powerful 12 V alternator. It has a specially wound stator, high current diodes and an extra fine balanced rotor.

The alternator and the appropriate regulator build a system to generate electrical power by consuming mechanical power, delivered by the combustion engine via a belt driven pulley. The rotation of the pulley is transmitted to the rotor that generates a rotation current in the stator. The rotating current (AC) is transformed through the rectifier in direct current (DC). The regulator controls the rotor current, and as consequence the alternator output through the B+ connection.

The main benefit of this alternator is the high power output in a small low weight package. Furthermore it is optimized concerning vibration endurance.

### Application

Application	210 A
Max. ambient temperature	105°C
Max. ambient temperature (short-term)	120°C
Rotating direction	Clockwise

### Technical Specifications

#### Mechanical Data

Body material	Cast aluminum
Weight w/o pulley	4.8 kg
Max. rotor speed	18,000 rpm
Moment of inertia	22 kgcm <sup>2</sup>

Outer diameter w/o screw	136 mm
Length w/o pulley	117 mm
Battery B+ connection	M8x1.25
Tightening torque	22 Nm

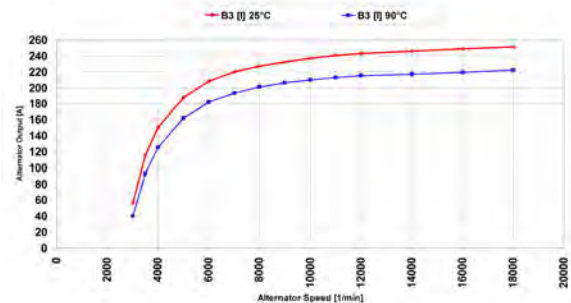
#### Electrical Data

Output voltage at 10 A	14.2 V
Temperature compensation	-10 mV/K
High temperature cut off derating	-250 mV/K
Excitation resistor	internal
Cut-in-speed	3,000 1/min

#### Characteristic

Rpm [1/min]	I <sub>c</sub> [A] at 25°C	I <sub>c</sub> [A] at 90°C
3,000	57	40
3,500	115	93
4,000	150	125
5,000	188	162
6,000	208	182
7,000	220	193
8,000	227	201
9,000	232	206
10,000	237	210
11,000	241	213
12,000	243	215
14,000	246	217
16,000	249	219
18,000	251	222

Please note: Measured with U=13.1 V and t=20 min



**Installation Notes**

Ground connection for power and regulator is through the case. Ensure that the case has a high current, low resistance connection to vehicle ground.

Operating the alternator is only permitted with the installed regulator and a connected 12 V battery.

Output current specified at 6,000 rpm, 13.1 V, 25°C inlet temperature and alternator steady-state-temperature.

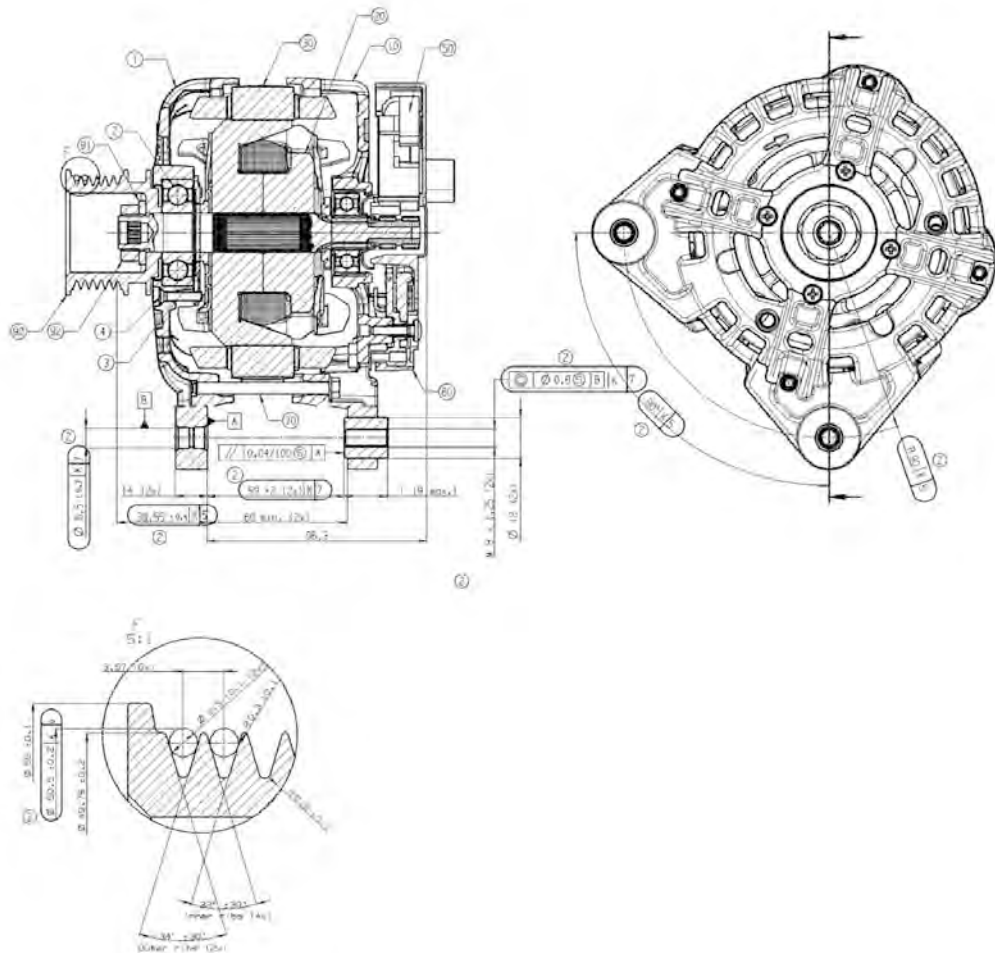
The excitation current can also be realized by an external lamp.

Please find further application hints in the offer drawing at our homepage.

**Ordering Information**

**Alternator B3**  
 Order number **F 02U V00 646-01**

**Dimensions**



## Alternator GCM1



3

### Features

- ▶ 3,400 g
- ▶ 110 to 140 A
- ▶ Clockwise or anticlockwise rotation

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

### Application

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

### Technical Specifications

#### Mechanical Data

Case material	aluminum
Weight	3,400 g
Current regulator unit	integrated
Max. rotations	18,000 x 1/min
Diameter	108 mm
Length without shaft stub	128 mm
Distance between mounting points	154 mm

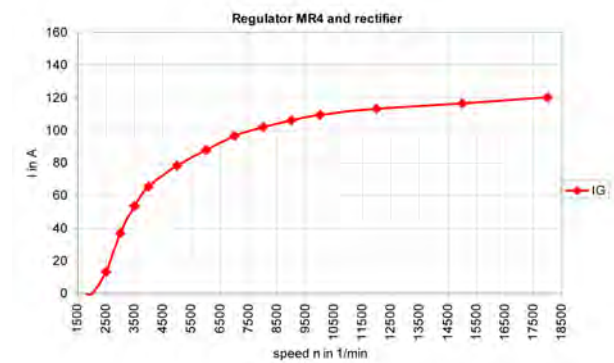
#### Electrical Data

Rated current	110/130/140 A
Supply voltage	13.5 V
Cut-in speed	3,000 x 1/min

Coupling	screws
Battery B+	M6
Control lamp D+	flat-pin connector, see drawing
Internal D+ resistor	only GCM1 140 A Nascar

#### Characteristic 110 A

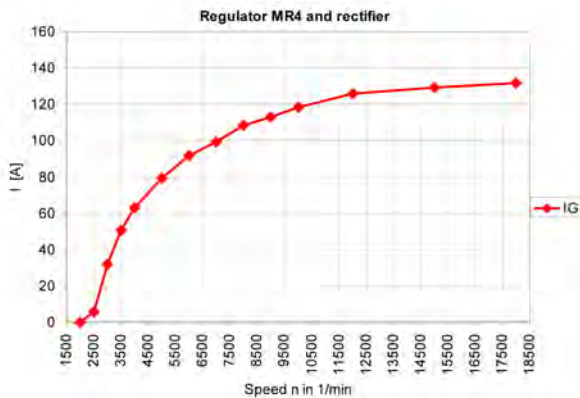
Rpm [1/min]	$I_G$ [A] at 90°C
2,000	0
2,500	13
3,000	37
3,500	54
4,000	65
5,000	78
6,000	88
7,000	96
8,000	102
9,000	105
10,000	108
12,000	113
15,000	117
18,000	120



#### Characteristic 130 A

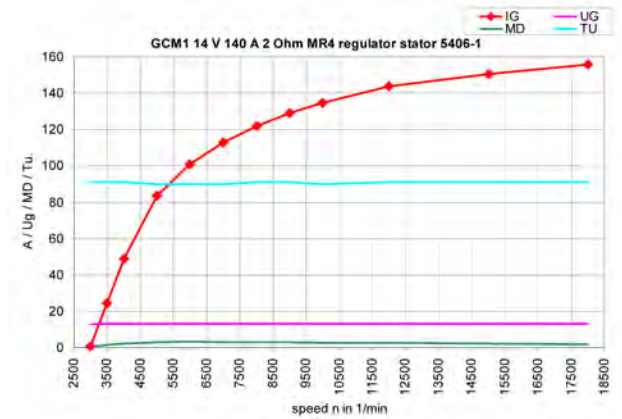
Rpm [1/min]	$I_G$ [A] at 90°C
2,000	0
2,500	6
3,000	32
3,500	51
4,000	63
5,000	80
6,000	90
7,000	98

8,000	105
9,000	111
10,000	116
12,000	121
15,000	127
18,000	131



**Characteristic 140 A / Nascar**

Rpm [1/min]	I <sub>G</sub> [A] at 90°C
2,000	0
2,500	0
3,000	1
3,500	25
4,000	49
5,000	83
6,000	101
7,000	113
8,000	122
9,000	129
10,000	135
12,000	144
15,000	151
18,000	156



**Installation Notes**

An external cooling can contribute to increase the performance. It will only be effective if the incoming air is 30°Kelvin cooler than the ambient air. Otherwise, the restriction of the air flow will negate any cooling benefits. If these conditions are met, the cooling air should be distributed over the center axis at the rear of the alternator for optimal cooling. For the cooling air to be effective we must be sure that we do not encounter any vacuum effects. If there is a vacuum effect present the use of external blower fan will be required. Care should be taken that no excessive external contaminants are introduced into the cooling air stream. This could severely short the alternator service life. It would be prudent to perform comparative measurements on the alternator to determine the effectiveness of the external cooling air. Installation without rubber mounting.

**Ordering Information**

- 110 A anticlockwise rotation**  
Order number **B 261 208 606-02**

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- 110 A clockwise rotation**  
Order number **B 261 208 607-03**

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- 130 A anticlockwise rotation**  
Order number **B 261 208 604-02**

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- 130 A clockwise rotation**  
Order number **B 261 208 605-02**

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- 140 A anticlockwise rotation**  
Order number **F 01E B01 857-02**

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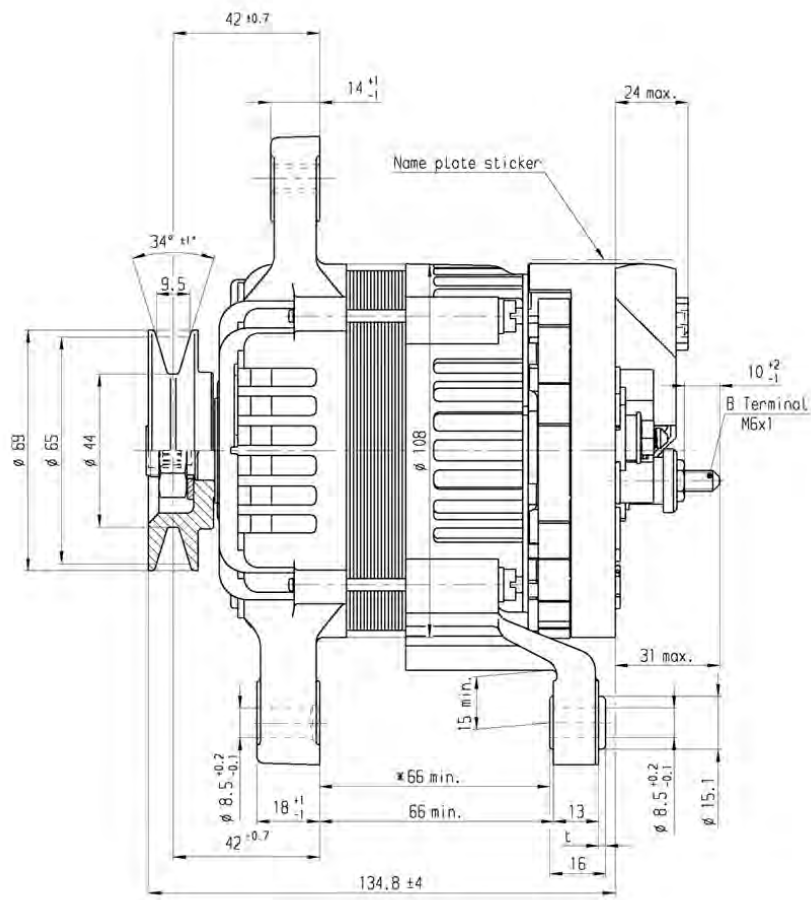
- 140 A clockwise rotation**  
Order number **B 261 208 603-02**

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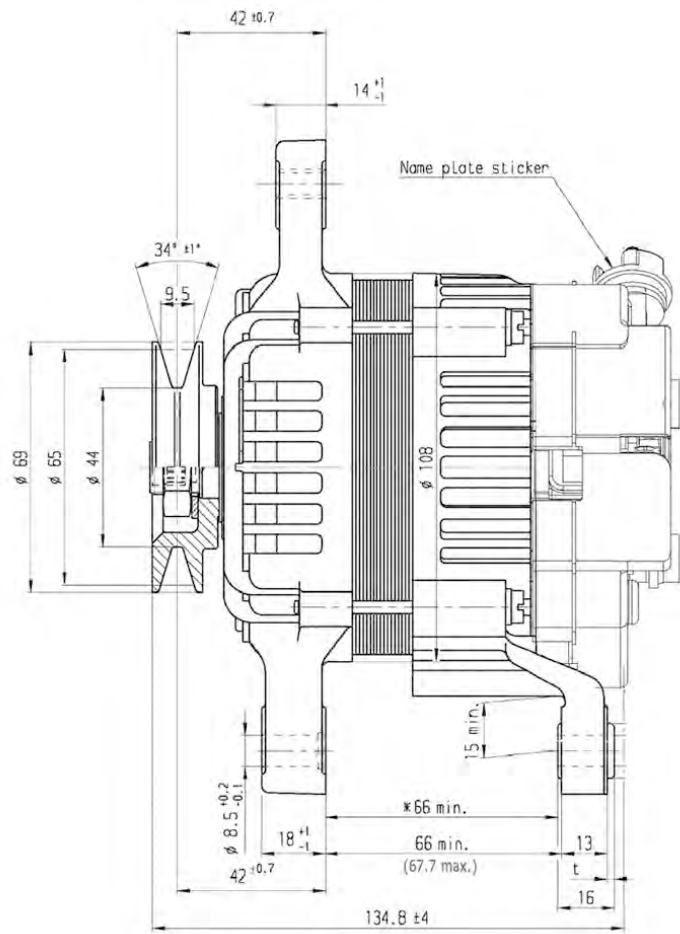
- 140 A Nascar clockwise rotation**  
Order number **F 02U V00 004-05**

Dimensions

3



Design 110/ 130 /140 A



Design 140 A Nascar

## Starter 1.4 kW



3

### Features

- ▶ 1.4 kW
- ▶ 3,600 x 1/min

This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter; we offer it in clockwise and counter-clockwise version. Further special versions on request.

### Application

Max. temperature	150 °C
Vibration	High protection

### Technical Specifications

#### Mechanical Data

Weight	3,200 g
Revolutions	3,600 x 1/min
Modul	2/11

#### Electrical Data

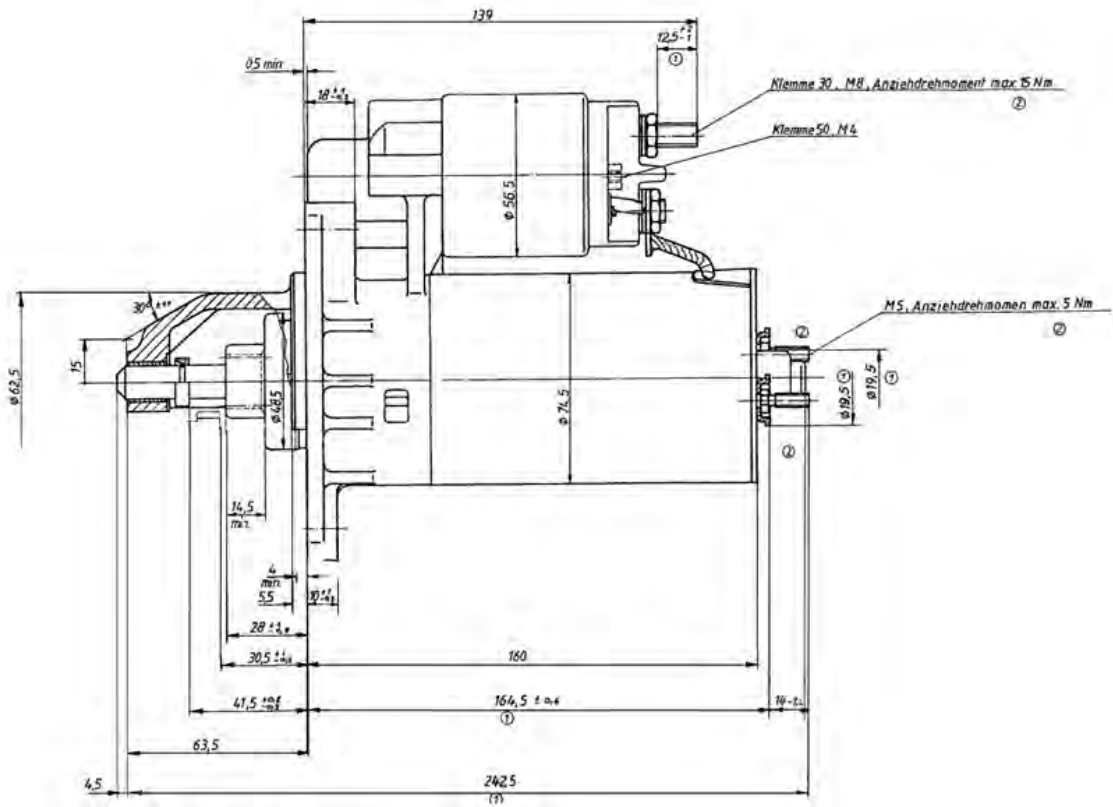
Performance	1.4 kW
-------------	--------

### Ordering Information

**Starter 1.4 kW**  
Order number **on request**



Dimensions



## Starter 1.7 kW



3

### Features

- ▶ 1.7 kW
- ▶ 3,600 x 1/min
- ▶ Transmission ratio i 5.0

This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter; we offer it in clockwise and counter-clockwise version. Further special versions on request.

### Application

Max. temperature	150 °C
Vibration	High protection

### Technical Specifications

#### Mechanical Data

Weight	3,700 g
Revolutions	3,600 x 1/min
Transmission ratio	i 5.0
Module	2/11

#### Electrical Data

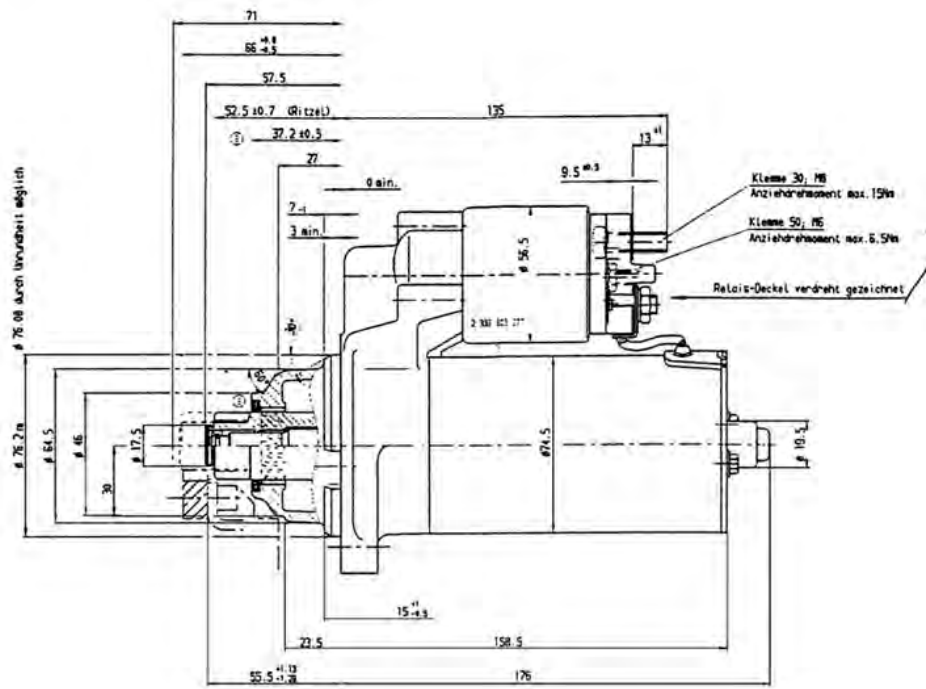
Performance	1.7 kW
-------------	--------

### Ordering Information

#### Starter 1.7 kW

Order number **on request**

Dimensions



## Starter 2.0 kW

3



### Features

- ▶ 2.0 kW
- ▶ 4,700 x 1/min
- ▶ Transmission ratio i 5.0

This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter; we offer it in clockwise and counter-clockwise version. Further special versions on request.

### Application

Max. temperature	150 °C
Vibration	High protection

### Technical Specifications

#### Mechanical Data

Weight	4,050 g
Revolutions	4,700 x 1/min
Transmission ratio	i 5.0
Module	2/11

#### Electrical Data

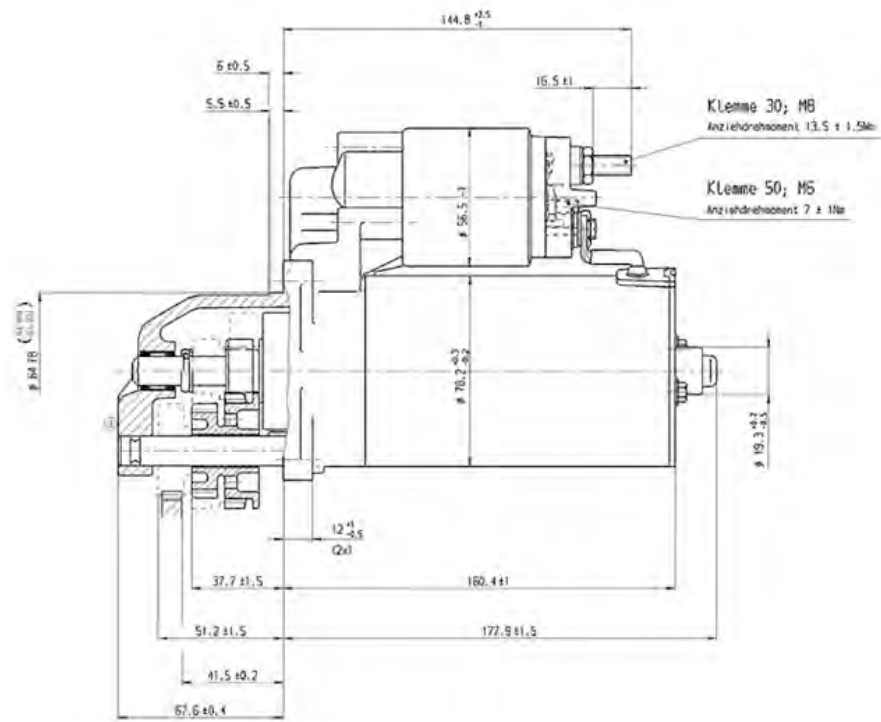
Performance	2.0 kW
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### Ordering Information

#### Starter 2.0 kW

Order number **on request**

Dimensions

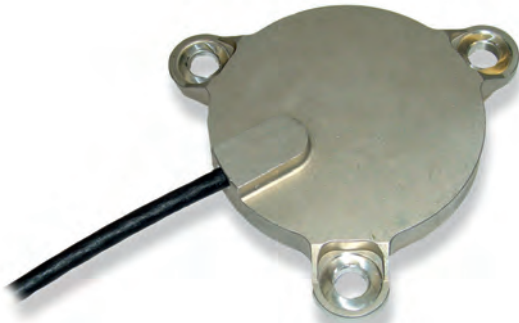




<b>Absolute Position Sensor</b>	<b>158</b>
<b>Dynamic Vehicle Sensor</b>	<b>160</b>
<b>Gear Shift Sensors</b>	<b>169</b>
<b>Knock Sensors</b>	<b>174</b>
<b>Lambda Sensors</b>	<b>178</b>
<b>Linear Potentiometers</b>	<b>189</b>
<b>Pressure Sensors Air</b>	<b>209</b>
<b>Pressure Sensors Differential</b>	<b>227</b>
<b>Pressure Sensors Fluid</b>	<b>231</b>
<b>Rotary Potentiometers</b>	<b>259</b>
<b>Speed Sensors</b>	<b>276</b>
<b>Temperature Sensors</b>	<b>301</b>
<b>Thermocouple Probes</b>	<b>329</b>
<b>Wire Potentiometers</b>	<b>334</b>

---

## Absolute Position Sensor APS-C



4

### Features

- ▶ Contactless technology
- ▶ CAN output
- ▶ Signal resolution: 0.7°
- ▶ Wide operating temperature range

This sensor is designed to measure the absolute angular position of a still standing or rotating shaft.

The device uses Hall sensor technology to detect the magnetic flux density distribution of a magnet which is mounted frontal on the shaft. The absolute angle position value from the sensor is transmitted over CAN. The sensor can be calibrated and configured with hard- and software tools.

The main feature and benefit of this sensor is the combination of a contactless measuring principal, a wide temperature range and a motorsport connector.

### Application

Measuring range	0 to 360°
Measuring principle	Hall-effect
Angle reference type	Absolute
Signal revolution	0.703152°

### Technical Specifications

#### Mechanical Data

Fixation	3 x M5
Sealing	O-ring
Weight w/o wire	39 g
Size w/o wire	See Dimensions
Storage temperature range	-40 to 120 °C

Operating temperature range	-40 to 120 °C
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

#### Electrical Data

Power supply	(6.5) 10 to 17 V
Current	70 mA

#### Environment

Magnet for APS-C	F 02U 002 465-01
------------------	------------------

#### Connectors and Wires

Connector	ASL 6-03-05PB-HE
Mating connector	ASL 0-03-05SB-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	CAN+
Pin 4	CAN-
Pin 5	Calibration pin
Sleeve	DR-25
Wire size	AWG 24
Wire length	15 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The sensor is designed to measure the absolute angle of the camshaft e.g. quick start application.

The unit can be connected to any CAN system (1 MBaud).

The unit is secure from miss-pinning.

Before the first operation, the sensor has to be calibrated. Please connect the calibration pin to 12 V.

To meet the specifications and to avoid errors, the distance between sensor and the magnet has to be less than 2 mm.

To avoid measurement errors, the eccentricity between sensor and magnet has to be as small as possible (< 0.3 mm).

To change the CAN-ID of the sensor, it can be programmed by the external CAN module EM-C.

The angle position value can be set to zero via the external CAN module EM-C or by using the calibration pin.

Please note that for a correct functionality of the sensor a magnet with a material remanence of 1.03 Tesla is needed (not included, available on request).

Please find further application hints in the offer drawing at our homepage.

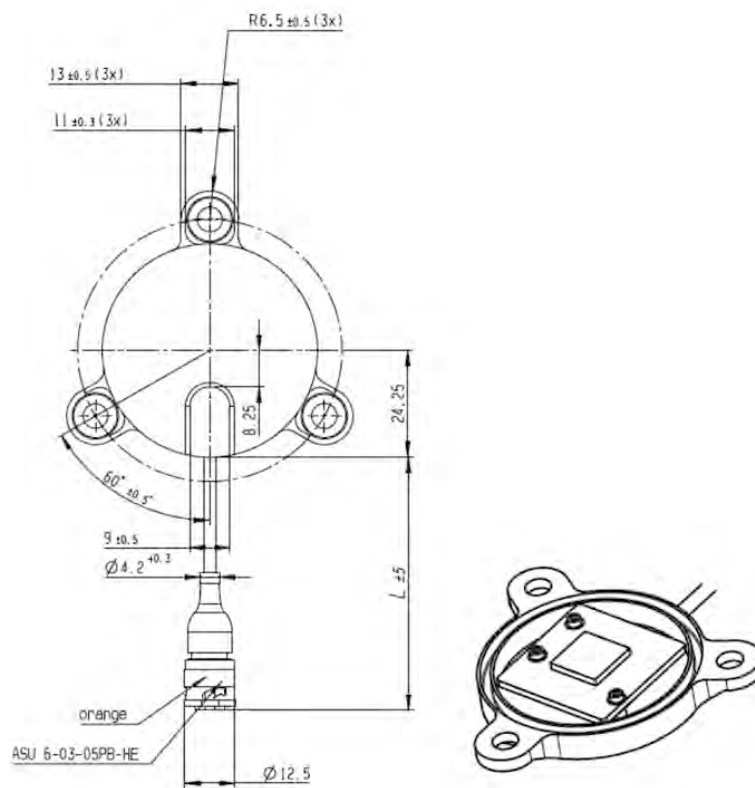


**Communication**

Communication link	CAN
Application tool	EM-C or RaceCon
Signal output	CAN
CAN Baud rate	1 Mbaud
CAN refresh rate	700 Hz

**Ordering Information**

**Absolute Position Sensor APS-C**  
Order number **F 02U V00 086-01**

**Dimensions**

## Acceleration Sensor AM 600-2



4

### Features

- ▶ 2 -axis
- ▶ Measurement range:  $\pm 4.5$  g
- ▶ 5 Hz low-pass filtered

This sensor is designed to measure the physical effects of lateral acceleration in two axes (e.g. for analysis of acceleration and deceleration behavior of race cars). In order to achieve this, the sensor features two measuring elements for acceleration, in two integrated circuits. The sensing element consists of a micro machined sensor chip and an evaluation ASIC – allowing for high precision measurement applications. The main benefits of this high performance coil are its robustness in hard racing applications and high energy efficiency.

### Application

Measuring range	x, y $\pm 4.5$ g
Max. vibration	5,000 m/s <sup>2</sup> in operation
Storage temperature range	-55 to 105°C
Operating temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	30 g
Size	24 x 27 x 13.5 mm
Mounting	2 x M3
Tightening torque	2 Nm

#### Electrical Data

Power supply	5 V
Power supply max.	6 V
Full scale output	2.5 = 0 g; 440 mV/g
Supply current	7 mA
Supply current max.	12 mA

#### Characteristic

Sensitivity	440 mV/g
Offset	2,500 mV at 0 g
Tolerance of sensitivity	$\pm 3$ %
Non-linearity of sensitivity	$\pm 2$ %

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig <sub>x</sub>
Pin 4	Sig <sub>y</sub>
Pin 5	Scr
Sleeve	DR-25
Wire size	AWG 24
Wire length	15 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The AM 600-2 can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated fixed hole.

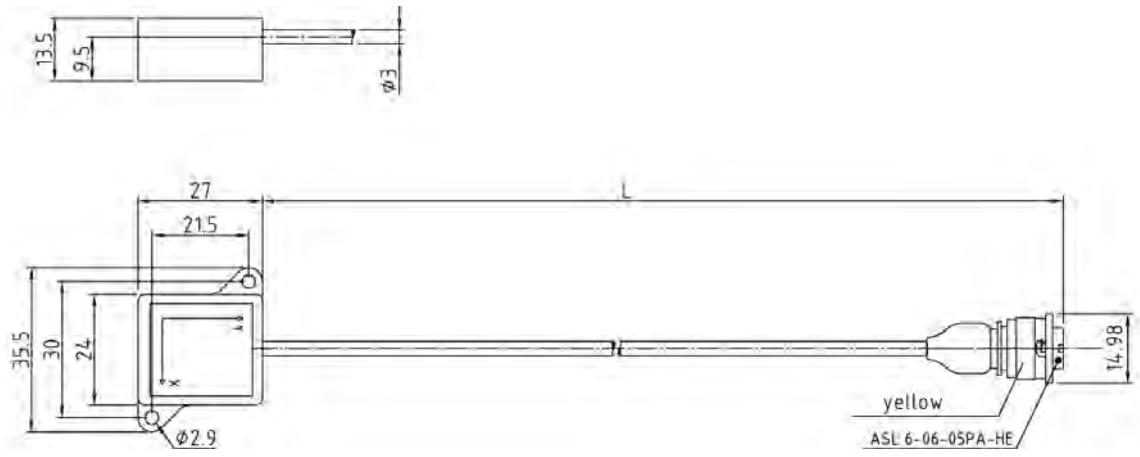
Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Acceleration Sensor AM 600-2**  
Order number **B 261 209 311-04**

## Dimensions



## Acceleration Sensor AM 600-3



4

### Features

- ▶ 3-axis
- ▶ Measurement range:  $\pm 4,5$  g
- ▶ 5 Hz low-pass filtered

This sensor is designed to measure the physical effects of lateral acceleration in three axes (e.g. for analysis of acceleration and deceleration behavior of race cars). In order to achieve this, the sensor features three measuring elements for acceleration, in three integrated circuits. The sensing element consists of a micro machined sensor chip and an evaluation ASIC – allowing for high precision measurement applications. The main benefits of this high performance coil are its robustness in hard racing applications and high energy efficiency.

### Application

Measuring range	x, y, z $\pm 4,5$ g
Max. vibration	5,000 m/s <sup>2</sup> in operation
Storage temperature range	-55 to 105°C
Operating temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	50 g
Size	24 x 27 x 29.8 mm
Mounting	2 x M3
Tightening torque	2 Nm

#### Electrical Data

Power supply	5 V
Power supply max.	6 V
Full scale output	2.5 = 0 g; 440 mV/g
Supply current	7 mA
Supply current max.	12 mA

#### Characteristic

Sensitivity	440 mV/g
Offset	2,500 mV at 0 g
Tolerance of sensitivity	$\pm 3$ %
Non-linearity of sensitivity	$\pm 2$ %

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig <sub>y</sub>
Pin 4	Sig <sub>x</sub>
Pin 5	Sig <sub>z</sub>
Sleeve	DR-25
Wire size	AWG 24
Wire length	15 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Installation Notes

The AM 600-3 can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated fixed hole.

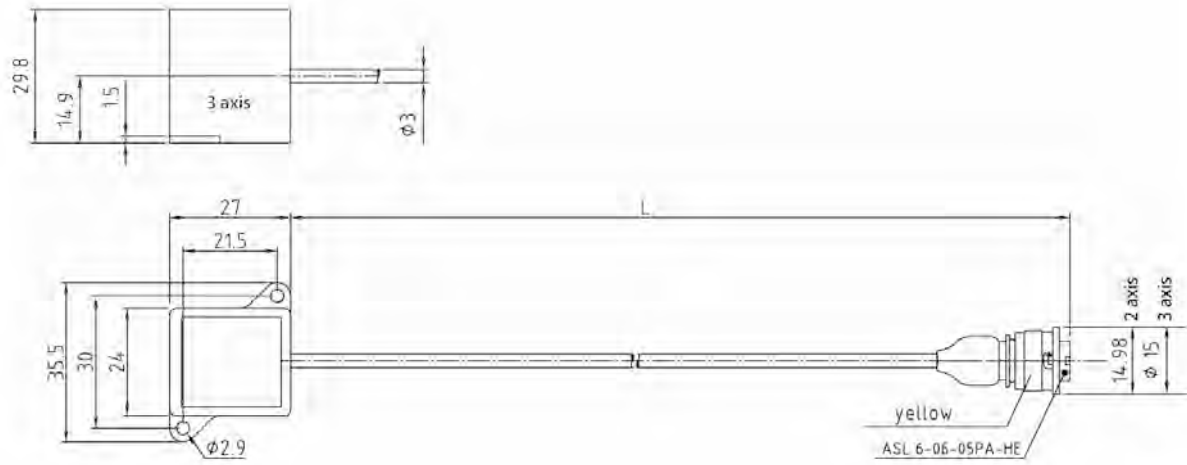
Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

**Acceleration Sensor AM 600-3**  
Order number **B 261 209 313-02**

## Dimensions



## Lean Angle Sensor LAS-1



4

### Features

- ▶ Yaw-rate, roll-rate and acceleration measurements
- ▶ 2-axis accelerometer
- ▶ CAN-output
- ▶ 15 Hz low-pass filtered
- ▶ Measurement ranges:  $\pm 4.1$  g;  $\pm 160^\circ/\text{s}$

This sensor is designed to measure the acceleration and the rate of turn in two axis (yaw rate  $\Omega_z$ , roll rate  $\Omega_x$ , lateral acceleration  $a_y$  and longitudinal acceleration  $a_x$ ).

An internal diagnosis indicates too high vibrations or turning rates. In combination with a MS 5 ECU and its algorithm a very precise lean angle of motorcycles can be calculated.

The main feature and benefit of this sensor is its wide measuring range, the standardized 1 Mbaud CAN- signal output and the combination of high quality production part and robust design.

### Application

Application I	$\pm 160^\circ/\text{s}$ (roll rate/yaw rate)
Application II	$\pm 4.1$ g (X and Y acceleration)
Operating temperature range	-20 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	96 g
Size	33 x 98 x 91 mm

#### Electrical Data

Power supply	7 to 18 V
Max input current	200 mA
Power up time	< 150 ms

#### CAN Message

##### CAN ID 01 0x174

Byte	Value
0	Yaw Rate
1	
2	Yaw STAT
3	Reserved
4	Acc Y
5	
6	Acc Y STAT
7	Unused

##### CAN ID 02 0x178

Byte	Value
0	Roll Rate
1	
2	Roll STAT
3	Reserved
4	Acc X
5	
6	Acc X STAT
7	Unused

#### Characteristic

##### Characteristic Application I

Measuring range	$\pm 160^\circ/\text{s}$
Over range limit	$\pm 1,000^\circ/\text{s}$
Absolute resolution	0.1°/s
Cut-off frequency (-3 dB)	15 Hz

##### Characteristic Application II

Measuring range	$\pm 4.1$ g
Over range limit	$\pm 10$ g
Absolute resolution	0.01 g
Cut-off frequency (-3 dB)	15 Hz

#### Connectors and Wires

Connector	AMP 114-18063-076
Mating connector	F 02U B00 240-01
Pin 1	GND

Pin 2	CANL
Pin 3	CANH
Pin 4	UBAT

### CAN Parameters

Byte order	Little endian, high-byte/low-byte, Intel
CAN speed	1 MBaud
CAN refresh rate	10 ms
Identifier length	11 bit
Bit mask	signed
Offset (all signals)	0x8000 hex
Quantization Yaw Rate	0.005 [°/s/digit]
Quantization Roll Rate	0.005 [°/s/digit]
Quantization Acc X-Axis	0.0001274 [g/digit]
Quantization Acc Y-Axis	0.0001274 [g/digit]

#### Conversion formula

Yaw rate [°/s] = (Hex-value – 8000 h) \* 0.005 [°/s/digit]

Roll rate [°/s] = (Hex-value – 8000 h) \* 0.005 [°/s/digit]

### Bit combination of sensor status

#### Yaw\_STAT, Roll\_STAT, AccY\_STAT and ACCX\_STAT

Xx00 xxxx = signal in specification

Xx01 xxxx = sensor not available

Xx10 xxxx = signal failure

Xx11 xxxx = reserved

X1xx xxxx = initialization is running

X0xx xxxx = initialization is ready

1xxx xxxx = reserved

0xxx xxxx = reserved

### Installation Notes

Important: In order not to exceed the maximum vibration level, the mount should be damped and not resonate.

For measuring the yaw and roll rate the LAS-1 can be connected directly to most control units and data logging systems.

The lean angle of motorcycles can be calculated in a MS 5 with motorcycle functionality.

Please avoid abrupt temperature changes.

For mounting please use only the integrated fixing holes.

Please ensure that the environmental conditions do not exceed the sensor specifications.

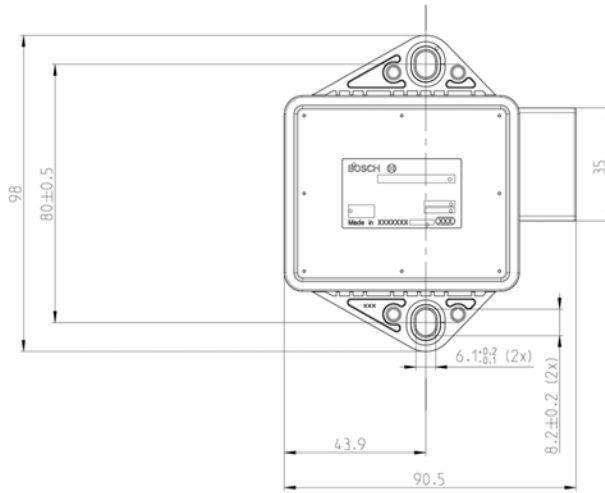
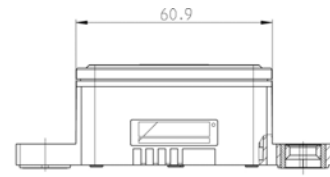
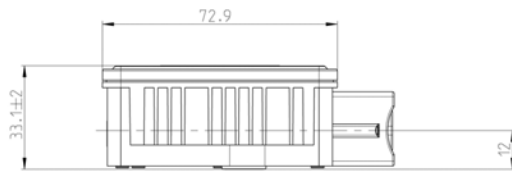
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Lean Angle Sensor LAS-1

Order number **F 02U V00 657-01**

Dimensions





## Yaw Rate Sensor YRS 3



### Features

- ▶ Yaw rate and acceleration measurement
- ▶ CAN output
- ▶ 15 Hz low-pass filtered
- ▶ Measurement ranges:  $\pm 4.1$  g;  $\pm 160^\circ/\text{s}$

This sensor is designed to measure the physical effects of yawing, lateral and longitudinal acceleration. In order to achieve this, the sensor features both a measuring element for yaw rate and two for acceleration, with one appropriate integrated circuit.

A rotation around the third orthogonal axis, a yaw rate, creates a Coriolis force on the accelerometers, which is detected by the element. Apart from the measuring element for yaw rate, a pure surface micro machined measuring element for acceleration is utilized to measure the vehicles lateral and longitudinal acceleration. This enables a very precise application.

The main feature and benefit of this sensor is its wide measuring range, the standardized 1 Mbaud/s CAN-signal output and the combination of high quality production part and robust design.

### Application

Application I	$\pm 160^\circ/\text{s}$
Application II	$\pm 4.1$ g
Operating temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	65 g
Size	34 x 80 x 84 mm

#### Electrical Data

Power supply	7 to 18 V
Max input current	130 mA
CAN speed	1 Mbaud/s

#### CAN Message

##### CAN\_ID\_01 0x70

Byte	Value
0	Yaw Rate 1
1	
2	Reserved
3	
4	Acc Y Axis
5	
6	Reserved
7	Unused

##### CAN\_ID\_02 0x80

Byte	Value
0	Yaw Angular Acceleration
1	
2	Reserved
3	
4	Acc X Axis
5	
6	Reserved
7	Unused

#### Characteristic

##### Characteristic Application I

Measuring range	$\pm 160^\circ/\text{s}$
Over range limit	$\pm 1,000^\circ/\text{s}$
Absolute resolution	0.1 $^\circ/\text{s}$
Cut-off frequency (-3 dB)	15 Hz

##### Characteristic Application II

Measuring range	$\pm 4.1$ g
Over range limit	$\pm 10$ g
Absolute resolution	0.01 g
Cut-off frequency (-3 dB)	15 Hz

#### Connectors and Wires

Connector	AMP 114-18063-076
Mating connector	F 02U 002 235-01
Pin 1	GND

Pin 2	CANL
Pin 3	CANH
Pin 4	UBAT

### CAN Parameters

Byte order	LSB (Intel)
CAN speed	1 Mbaud/s
Bit mask	signed
Offset (all signals)	0x8000 hex
Quantization Yaw Rate 1	0.005 [°/s/digit]
Quantization Yaw Ang. Acc	0.125 [°/s/digit]
Quantization Acc X-Axis	0.0001274 [g/digit]
Quantization Acc Y-Axis	0.0001274 [g/digit]

### Installation Notes

The YRS 3 can be connected directly to most control units and data logging systems.

The sensor is protected against reverse polarity and short-circuits.

Please avoid abrupt temperature changes.

For mounting please use only the integrated fixing holes.

Please ensure that the environmental conditions do not exceed the sensor specifications.

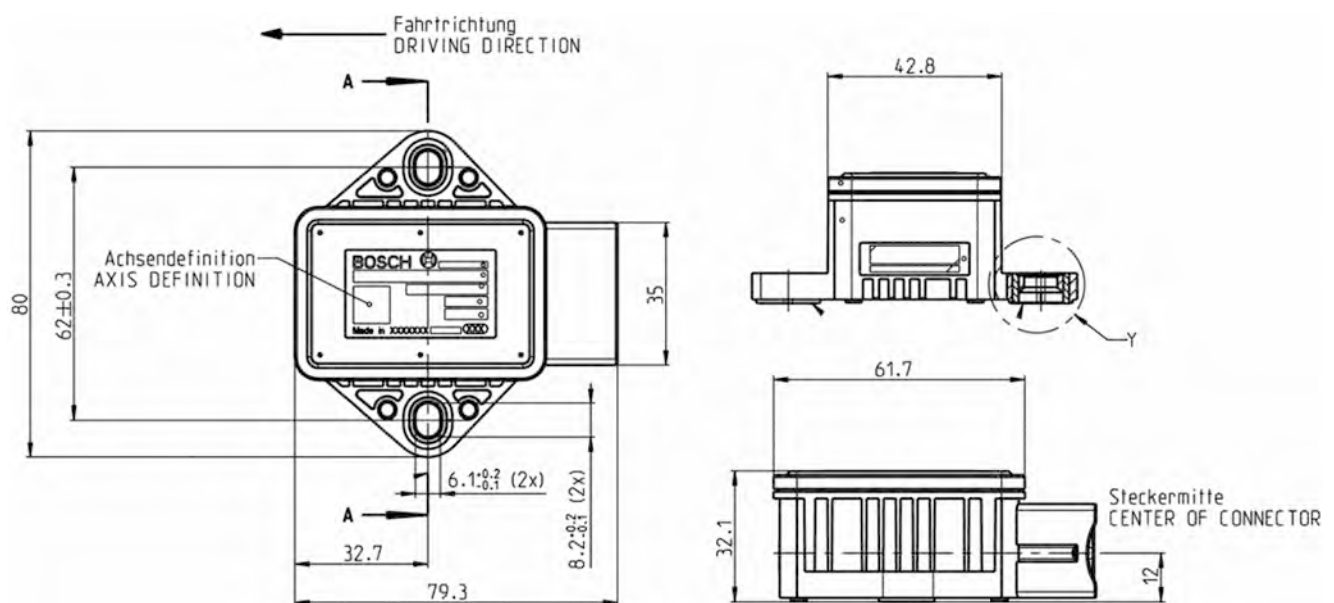
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Yaw Rate Sensor YRS 3

Order number **0 265 005 838**

### Dimensions



## Gear Shift Sensor GSS-2



### Features

- ▶ Strain gauge technology
- ▶ Measurement range: -450 to 450 N
- ▶ Analog output

This sensor is designed to measure force relative to gear shifting in order to control the engine operation allowing the driver to maintain no-lift-shift/full throttle during shifting (up and down).

A circuit of precise resistors and an integrated amplifier supply a force dependent output voltage signal. As soon as this signal exceeds a certain threshold value in the ECU, the ignition and injection can be adjusted automatically according to the individual ECU application.

The main feature and benefit of this sensor is the combination of high quality production part and robust design with metal housing and motorsport spec connection. Furthermore this sensor has a dual way functionality.

### Application

Measuring range	-450 to 450 N
Max. vibration	800 m/s <sup>2</sup> at 5 Hz to 2 kHz
Operating temperature range	0 to 80°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	90 g
Size	65 x 16 x 16 mm
Mounting	2 x M10 x 1
Tightening torque	22 Nm
Mech. range programmable up to	450 N
F <sub>max</sub>	800 N

Mech. load limit	1800 N
Max. cycles at 300 N	300,000 cycles

#### Electrical Data

Power supply	12 V
--------------	------

#### Characteristic

Signal Output	0,5 to 4,5 V
Zero Output	2,5 V

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	Scr

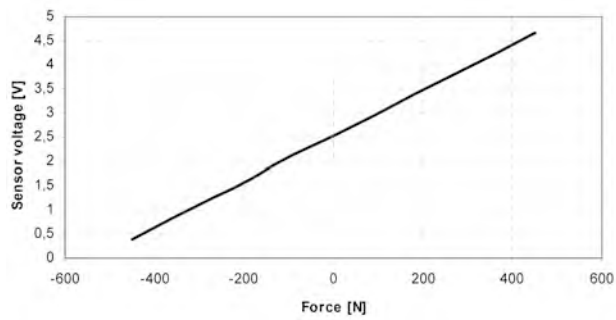
Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm

Please specify the required wire length with your order.

#### Sensor voltage

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



## 4

### Installation Notes

The GSS-2 can be connected directly to most control units and data logging systems.

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.

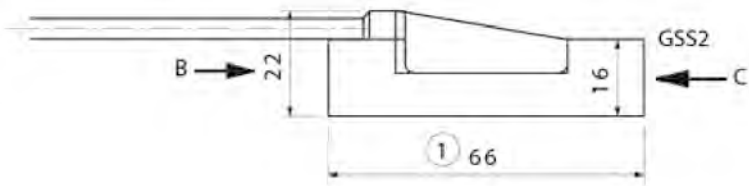
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### **Gear Shift Sensor GSS-2**

Order number **B 261 209 227-01**

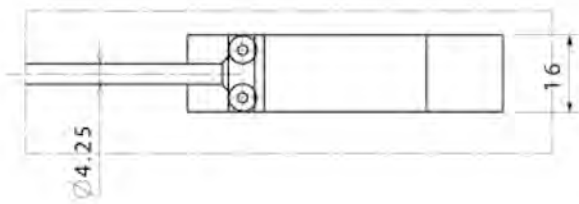
Dimensions



(Spannungsanstieg)  
(Increasing Voltage)

Kraftrichtung für Signaländerung  
Direction of signal altering force

(Spannungsabfall)  
(Decreasing Voltage)



Ansicht B  
view

M10 x 1

Gewindetiefe  
thread length 11,7mm  
max. Anzugsmoment  
max. fastening torque 22 Nm

Ansicht C  
view

M10 x 1

Gewindetiefe  
thread length 11,7mm  
max. Anzugsmoment  
max. fastening torque 22 Nm

## Gear Shift Sensor GSS-M



4

### Features

- ▶ Strain gauge technology
- ▶ Measurement range: -1000 to +1000 N
- ▶ Analog output
- ▶ Carbon fiber housing

This sensor is specifically designed for the use with motorcycle applications. The sensor measures the relative force during gear shifting directly relaying data to the ECU in order to gain max power from rapid up or down shifting.

An electronic circuit composed of a precise strain gauge and an integrated amplifier supplies a force-dependent output signal. As soon as this signal exceeds a certain threshold, the ignition and injection can be adjusted automatically according to the individual ECU application. The carbon fiber housing achieves excellent protection for the electronics and reduces the overall weight of the sensor.

The main features and benefits of this sensor are its small dimensions, its minimal weight, its precise temperature compensation and its combination of high quality production and robust design with a motorsport spec connector.

### Application

Working range	-1000 to +1000 N
Max. vibration	800 m/s <sup>2</sup> at 5 Hz to 2 kHz
Operating temperature range	0 to 80°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	30 g
Size	51 x 36 x 16 mm
Mounting	2 x M6

Tightening torque	22 Nm
F <sub>max</sub>	±1,000 N
Mech. load limit	±3,000 N

#### Electrical Data

Power supply	12 V
--------------	------

#### Characteristic

Signal output	0.2 to 4.8 V
Zero output	(20 to 70°C) 2.5 V ±100 mV

#### Connectors and Wires

Connector	ASU 0-03-05PC-HE
Mating connector	ASU 6-03-05SC-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	Scr

### Installation Notes

The GSS-M can be connected directly to most control units and data logging systems.

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.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

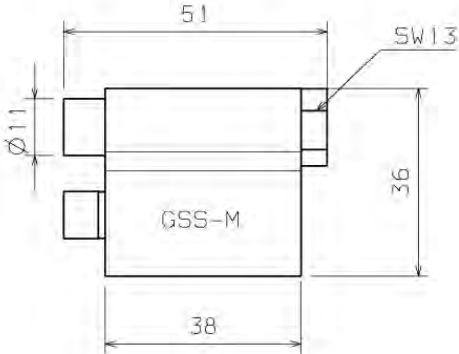
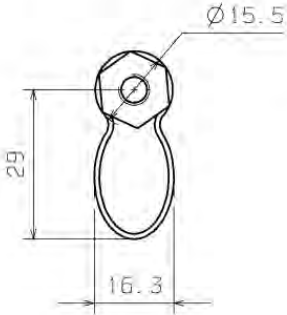
#### Gear Shift Sensor GSS-M

Order number **F 02U V00 354-01**

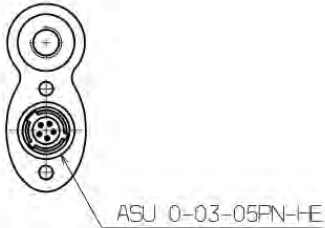
Dimensions

Kraftrichtung für Signaländerung  
Direction of signal altering force

$F_1 \longleftrightarrow F_2$   
(Spannungsabfall)  
(decreasing voltage)



$F_1 \longrightarrow \longleftarrow F_2$   
(Spannungsanstieg)  
(increasing voltage)



M6 - right handed / Rechtsgewinde  
Gewindetiefe  
thread length: 15 mm  
max. Anzugsmoment  
max. fastening torque: 22 Nm

M6 - right handed / Rechtsgewinde  
Gewindetiefe  
thread length: 10 mm  
max. Anzugsmoment  
max. fastening torque: 22 Nm

## Knock Sensor KS-P



4

### Features

- ▶ Engine vibration measurements
- ▶ Measurement range 1 to 20 kHz
- ▶ Robust design
- ▶ Integrated series connector

This sensor is used for detecting structural born vibrations in spark ignition engines due to uncontrolled combustion. This sensor is suitable for operation in extreme conditions.

Due to the inertia of the seismic mass, the sensor moves in correlation to the engine block vibration; this motion results in a compressive force which is converted into a voltage signal via a piezoceramic sensor element. As a result, upper and lower voltage thresholds can be defined directly correlating to an acceleration magnitude. The main benefits of this sensor are its robust mechanical design, compact housing and precise determination of structure-related noise. The small packaging is accomplished by integrating the connector directly to the sensor.

### Application

Application	1 to 20 kHz
Operating temperature range	-40 to 130°C
Storage temperature range	0 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Male thread (for cast)	M8x25
Male thread (for Al)	M8x30
Installation torque	20±5 Nm

Weight w/o wire	48 g
Protection	IP 54

#### Electrical Data

Range of frequency	1 to 20 kHz
Sensitivity at 5 kHz	26 ± 8 mV/g
Max. sensitivity changing (life-time)	-17 %
Linearity between 5 to 15 kHz (from 5 kHz value)	-10 to 20 %
Linearity between 15 to 20 kHz (linear increasing with freq)	20 to 50 %
Main resonance frequency	> 25 kHz
Impedance	> 1 MΩ
Temperature dependence of sensitivity	0,06 mV/g°C
Capacity field	800 to 1400 pF

#### Connectors and Wires

Connector	Y 280 A62 566A
Connector loom	D 261 205 337
Pin 1	Sig+
Pin 2	Sig-
Pin 3	Scr

Various motorsport and automotive connectors are available on request.

#### Installation Notes

The KS-P can be connected to all Bosch Motorsport ECUs featuring knock control

The sensor must rest directly on the brass compression sleeve during operation.

To ensure low-resonance coupling of the sensor to the measurement location, the contact surface must be clean and properly machined to provide a secure flush mounting.

The sensor wire is to be routed such that no resonance vibration can occur.

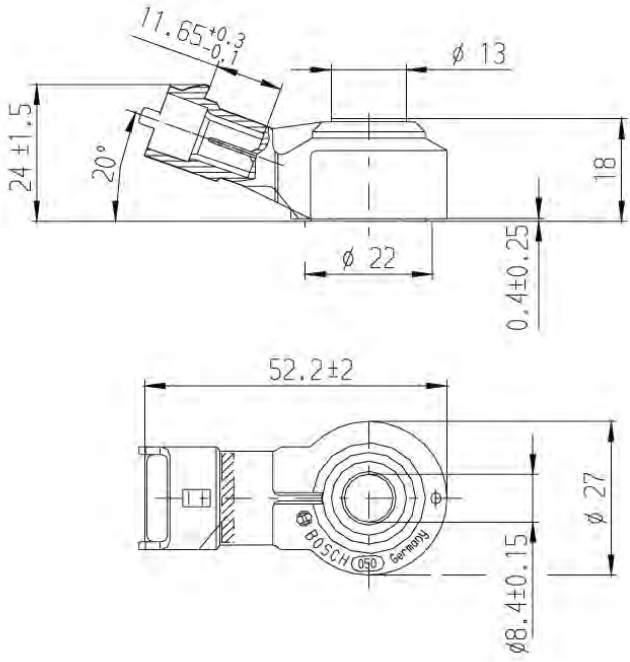
Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

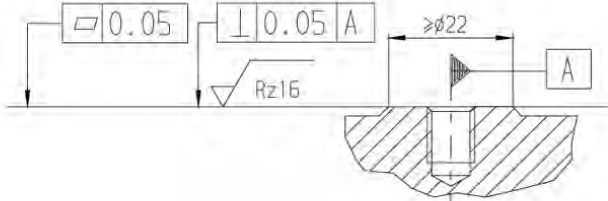
**Knock Sensor KS-P**  
Order number **0 261 231 120**



Dimensions



Beispiel/EXAMPLE



## Knock Sensor KS-R



4

### Features

- ▶ Engine vibration measurements
- ▶ Measurement range 1 to 20 kHz
- ▶ Robust design

This sensor is used for detecting structural born vibrations in spark ignition engines due to uncontrolled combustion. This sensor is suitable for operation in extreme conditions.

Due to the inertia of the seismic mass, the sensor moves in correlation to the engine block vibration; this motion results in a compressive force which is converted into a voltage signal via a piezoceramic sensor element. As a result, upper and lower voltage thresholds can be defined directly correlating to an acceleration magnitude. The main benefits of this sensor are its robust mechanical design, compact housing and precise determination of structure-related noise. Connection to this sensor can be tailored to customer requirements through specified wire lengths and various connector options.

### Application

Application	1 to 20 kHz
Operating temperature range	-40 to 130°C
Storage temperature range	0 to 100°C
Max. vibration	≤ 800 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Male thread (for cast)	M8x25
Male thread (for Al)	M8x30
Installation torque	20 ± 5 Nm
Weight w/o wire	82 g
Protection	IP 54

#### Electrical Data

Range of frequency	1 to 20 kHz
Sensitivity at 5 kHz	26 ± 8 mV/g
Max. sensitivity changing (lifetime)	-17 %
Linearity between 5 to 15 kHz (from 5 kHz value)	-10 to 20 %
Linearity between 15 to 20 kHz (linear increasing with freq)	20 to 50 %
Main resonance frequency	> 25 kHz
Impedance	> 1 MΩ
Temperature dependence of sensitivity	0,06 mV/g°C
Capacity field	800 to 1400 pF

#### Connectors and Wires

Connector	A 261 230 076
Mating connector	D 261 205 289
Pin 1	Sig +
Pin 2	Sig -
Pin 3	Scr
Sleeve	Elastomer
Wire size	AWG 24
Wire length L	50 cm
Various motorsport and automotive connectors on request.	
Please specify the required wire length with your order.	

#### Installation Notes

The KS-P can be connected to all Bosch Motorsport ECUs featuring knock control

The sensor must rest directly on the brass compression sleeve during operation.

To ensure low-resonance coupling of the sensor to the measurement location, the contact surface must be clean and properly machined to provide a secure flush mounting.

The sensor wire is to be routed such that no resonance vibration can occur.

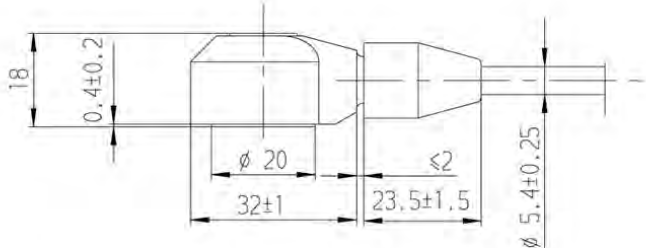
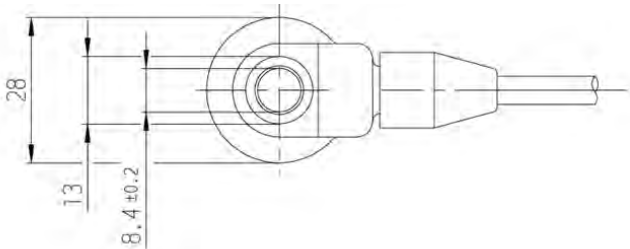
Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

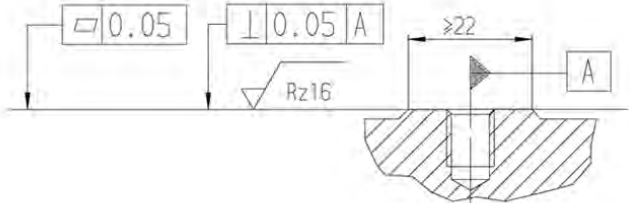
##### Knock Sensor KS-R

Order number **0 261 231 047**

Dimensions



Beispiel/example/:



## Lambda Sensor LSU 4.2



4

### Features

- ▶ Application: Lambda 0.65 to  $\infty$
- ▶ Wide-band
- ▶ Exhaust gas temperature range (max.) for short time < 1,030°C
- ▶ Max. Hexagon temperature 570°C

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

The wide band lambda sensor LSU 4.2 is a planar  $ZrO_2$  dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of Lambda 0.65 to air makes the LSU capable of being used as a universal sensor for Lambda 1 measurement as well as for other Lambda 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. The main benefit of the LSU is the very robust design combined with the high Bosch production quality standard.

### Application

Application	Lambda 0.65 to $\infty$
Fuel compatibility	gasoline/Diesel
Exhaust gas temperature range (operating)	930°C
Exhaust gas temperature range (max.) for short time	< 1,030°C
Hexagon temperature	< 570°C
Cable and protective sleeve temperature	< 250°C
Connector temperature	< 120°C

Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	300 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Weight w/o wire	120 g
Length	84 mm
Thread	M18x1.5
Wrench size	22 mm
Tightening torque	40 to 60 Nm

#### Electrical Data

Power supply H+ nominal	9 V
Heater power steady state	10 W
Heater control frequency	>2 Hz
Nominal resistance of Nernst cell	80 $\Omega$
Max. current load for Nernst cell	10(DC)/250(AC) $\mu$ A

#### Characteristic

Signal output	$I_p \text{ meas} / U_a \text{ (AWS)}$
Accuracy at Lambda 0.8	$0.80 \pm 0.01$
Accuracy at Lambda 1	$1.016 \pm 0.007$
Accuracy at Lambda 1.7	$1.70 \pm 0.05$

#### Connectors and Wires

Connector	Y 928 K00 050
Mating connector	D 261 205 138
Pin 1	IP/APE
Pin 2	UN/RE
Pin 3	VM/IPN
Pin 4	Uh-/H-
Pin 5	Uh+/H
Pin 6	IA/RT

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The LSU 4.2 can be connected to most Bosch Motorsport ECUs.

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 (wire 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.

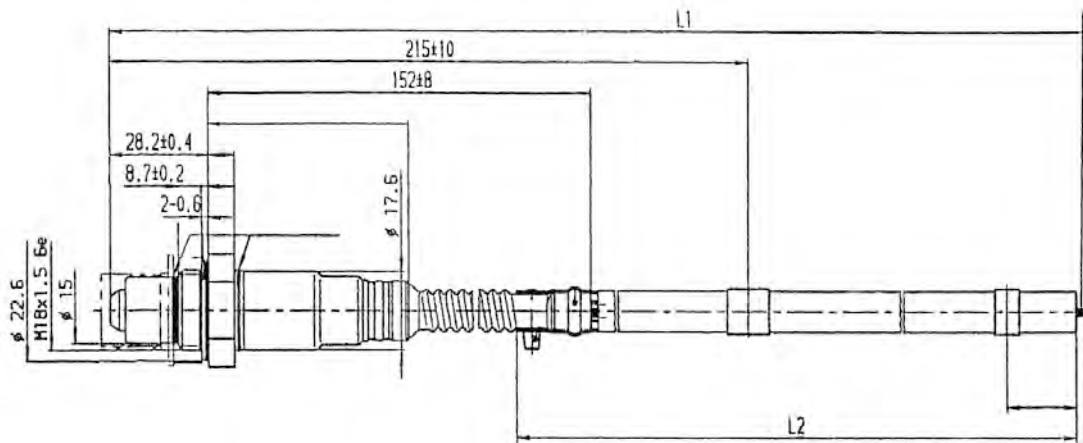
Please find further installation notes in the offer drawing at our homepage.

### Ordering Information

#### Lambda Sensor LSU 4.2

Order number **0 258 006 065**

### Dimensions



## Lambda Sensor LSU 4.9



4

### Features

- ▶ Application: Lambda 0.65 to  $\infty$
- ▶ Wide band
- ▶ Exhaust gas temperature range (max.) for short time < 1,030°C
- ▶ Max. Hexagon temperature 600°C

This sensor is designed to measure the oxygen content and Lambda value of exhaust gases in automotive engines (gasoline or Diesel). The wide band Lambda sensor LSU 4.9 is a planar ZrO<sub>2</sub> dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of Lambda 0.65 to air makes the LSU 4.9 capable of being used as a universal sensor for Lambda 1 measurement as well as for other Lambda ranges. The connector module contains a trimming resistor, which defines the characteristic of the sensor. The LSU 4.9 operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and Lambda control units like LT4. The main benefit of the LSU 4.9 is the robust design combined with the high Bosch production quality standard.

### Application

Application	Lambda 0.65 to $\infty$
Fuel compatibility	gasoline/Diesel/E85
Exhaust gas pressure	< 4 bar
Exhaust gas temperature range (operating)	< 930°C
Exhaust gas temperature range (max.) for short time	< 1,030°C
Hexagon temperature	< 600°C
Wire and protective sleeve temperature	< 250°C

Connector temperature	< 140°C
Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	300 m/s <sup>2</sup>

### Technical Specifications

#### Variations

##### LSU 4.9 with automotive connector

Connector	1 928 404 682
Mating connector	D 261 205 356-01
Pin 1	IP / APE
Pin 2	VM / IPN
Pin 3	Uh- / H-
Pin 4	Uh+ / H+
Pin 5	IA / RT
Pin 6	UN / RE

##### LSU 4.9 with motorsports connector

Connector	AS 6-07-35PN
Mating connector	AS 0-07-35SN
Pin 1	Uh+ / H+
Pin 2	Uh- / H-
Pin 3	IP / APE
Pin 4	VM / IPN
Pin 5	UN / RE
Pin 6	IA / RT

#### Mechanical Data

Weight w/o wire	120 g
Length	84 mm
Thread	M18x1.5
Wrench size	22 mm
Tightening torque	40 to 60 Nm

#### Electrical Data

Power supply H+ nominal	7.5 V
System supply voltage	10.8 V to 16.5 V
Heater power steady state	7.5 W
Heater control frequency	≥ 100 Hz
Nominal resistance of Nernst cell	300 Ω
Max current load for Nernst cell	250 μA

#### Characteristic

Signal output	I <sub>p meas</sub> / U <sub>a</sub> (AWS)
Accuracy at Lambda 0.8	0.80 ± 0.01

Accuracy at Lambda 1	1.016 ± 0.007	
Accuracy at Lambda 1.7	1.70 ± 0.05	
<b>IP</b>	<b>U<sub>λ</sub> [V]</b>	<b>Lambda</b>
-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	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 Wires

Connector	Please see variations
Mating connector	Please see variations
Sleeve	fiber glass / silicone coated
Wire size	AWG 24
Wire length L	32.5 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The LSU 4.9 can be connected to most Bosch Motorsport ECUs and lambda control units 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 (wire 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 at our homepage.

### Ordering Information

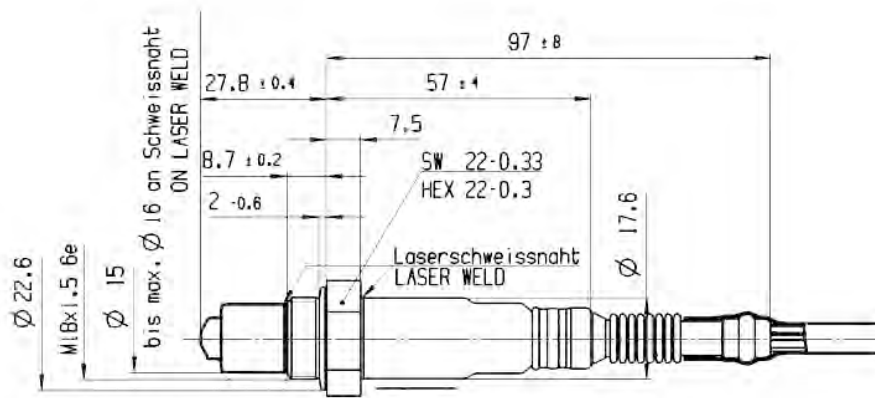
#### Lambda Sensor LSU 4.9

With automotive connector  
Order number **0 258 017 025**

#### Lambda Sensor LSU 4.9

With motorsports connector  
Order number **B 261 209 356-05**

## Dimensions





## Lambda Sensor LSU 4.9D



### Features

- ▶ Lambda control for Diesel engines
- ▶ Wide band
- ▶ Exhaust gas temperature range (max.) for short time < 1,030°C
- ▶ Max. Hexagon temperature 600°C

This sensor is designed to measure the oxygen content and Lambda value of exhaust gases in automotive engines. Due to its protective tube the LSU 4.9D is especially designed for Diesel applications.

The wide band lambda sensor LSU 4.9D is a planar ZrO<sub>2</sub> dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of Lambda = 0.65 to air makes the LSU capable of being used as an universal sensor for Lambda = 1 measurement as well as for other Lambda 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 units like LT4.

The main benefit of the LSU is the robust design combined with the high Bosch production quality standard.

### Application

Application	Lambda 0.65 to ∞
Fuel compatibility	Diesel
Exhaust gas pressure	< 4 bar
Exhaust gas temperature range (operating)	< 930°C
Exhaust gas temperature range (max.) for short time	< 1,030°C
Hexagon temperature	< 600°C
Wire and protective sleeve temperature	< 250°C

Connector temperature	< 140°C
Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	300 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Weight w/o wire	120 g
Length	84 mm
Thread	M18x1.5
Wrench size	22 mm
Tightening torque	40 to 60 Nm

#### Electrical Data

Power supply H+ nominal	7.5 V
System supply voltage	10.8 V to 16.5 V
Heater power steady state	7.5 W
Heater control frequency	≥ 100 Hz
Nominal resistance of Nernst cell	300 Ω
Max current load for Nernst cell	250 μA

#### Characteristic

Signal output	I <sub>p</sub> meas / U <sub>a</sub> (AWS)
Accuracy at lambda = 0.8	0.80 ±0.01
Accuracy at lambda = 1	1.016 ±0.007
Accuracy at lambda = 1.7	1.70 ±0.05

IP	U <sub>λ</sub> [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	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 Wires

Connector	1 928 404 687
Mating connector	09 4421 01
Pin 1	IP / APE
Pin 2	VM / IPN
Pin 3	Uh- / H-
Pin 4	Uh+ / H
Pin 5	IA / RT
Pin 6	UN / RE
Sleeve	fiber glas / silicone coated
Wire length L	30 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The LSU 4.9D can be connected to most Bosch Motorsport ECUs and lambda control units like LT4.

The lambda sensor should be installed at a 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 (wire 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.

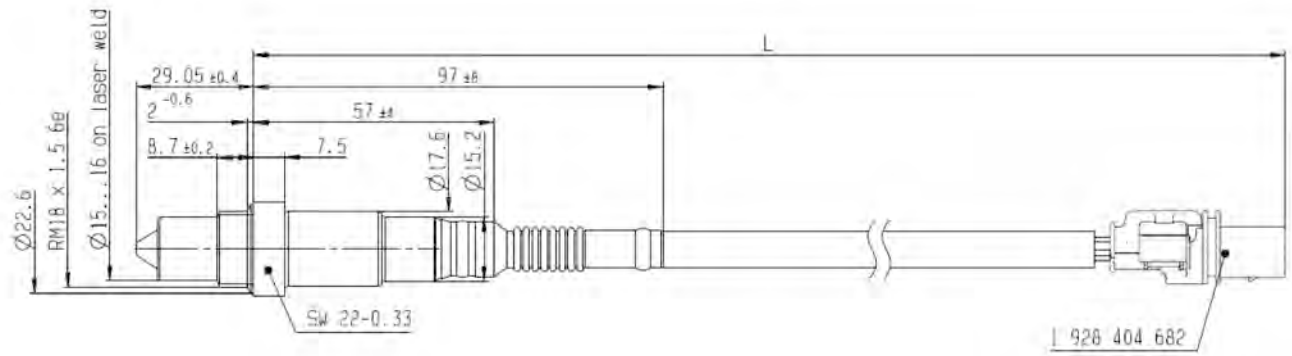
The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Use only the recommended grease for lubricating the thread.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Lambda Sensor LSU 4.9D**  
Order number **0 281 004 135**

## Dimensions



## Lambda Sensor Mini-LSU 4.9



4

### Features

- ▶ Application: Lambda 0.65 to  $\infty$
- ▶ Wide band
- ▶ Exhaust gas temperature range (max.) for short time < 1,030°C
- ▶ Max. Hexagon temperature 700°C

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

The wide band lambda sensor Mini-LSU 4.9 is a planar ZrO<sub>2</sub> dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of Lambda = 0.65 to air makes the LSU capable of being used as an universal sensor for Lambda = 1 measurement as well as for other Lambda ranges. The connector housing contains a trimming resistor, which defines the characteristic of the sensor. The Mini-LSU 4.9 operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4.

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

### Application

Application	Lambda 0.65 to $\infty$
Fuel compatibility	gasoline/Diesel/E85
Exhaust gas pressure	< 4 bar
Exhaust gas temperature range (operating)	< 930°C
Exhaust gas temperature range (max.) for short time	< 1,030°C
Hexagon temperature	$\leq$ 700°C
Wire and protective sleeve temperature	< 250°C
Connector temperature	< 150°C

Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	On request

### Technical Specifications

#### Mechanical Data

Weight w/o wire	28 g
Length	60 mm
Thread	M16x1.5
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	$\geq$ 100 Hz
Nominal resistance of Nernst cell	300 $\Omega$
Max. current load for Nernst cell	250 $\mu$ A

#### Characteristic

Signal output	$I_p \text{ meas} / U_a \text{ (AWS)}$
Accuracy at lambda 0.8	$0.80 \pm 0.01$
Accuracy at lambda 1	$1.016 \pm 0.007$
Accuracy at lambda 1.7	$1.70 \pm 0.05$

IP	$U_\lambda$ [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	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 Wires

Connector	1 928 404 682
Connector loom	09 4421 01
Pin 1	IP/APE
Pin 2	VM/IPN
Pin 3	Uh-/M-
Pin 4	Uh+/M+
Pin 5	IA/RT
Pin 6	UN/RE
Sleeve	fiber glass / silicone coated
Wire size	AWG 22
Wire length L	30 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The Mini-LSU 4.9 can be connected to most Bosch Motorsport ECUs and Lambda Control Units like LT4.

The lambda sensor should be installed at point which permits the measurement of a representative exhaust-gas mixture and 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.

Sensors should be installed as close to vertical as possible (wire 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 system up stand and surrounding the sensor must be sealed in order to avoid the effects of leakage air.

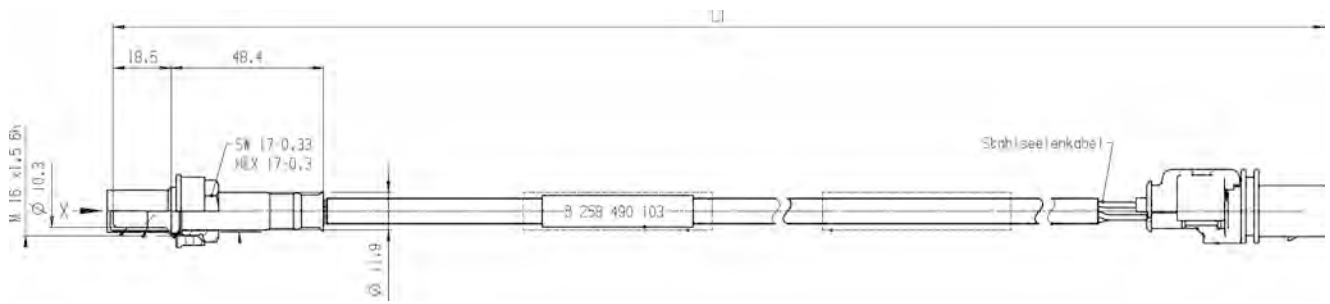
Protect the sensor against condensation water. The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Use only the recommended grease for lubricating the thread.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Lambda Sensor Mini-LSU 4.9**  
Order number **B 258 490 103-20**

Dimensions



## Linear Potentiometer LP 10



### Features

- ▶ Measurement range 0 to 10 mm
- ▶ Low power consumption
- ▶ Compact design

The LP 10 is a short length linear potentiometer which is designed to measure the relative position of two point e.g. the stabilizer movement.

Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with a hard metal housing and low power consumption.

### Application

Application	0 to 10 mm
Temperature range	-20 to 85°C
Storage temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	70 g
Min. length	50 mm
Mounting	2 x M3
Tightening torque	2 Nm

#### Electrical Data

Power supply	5 V
Nominal resistance	1 kΩ
Resistance tolerance	20 %
Non-linearity	1 %
Max. current	1 mA

### Connectors and Wires

Connector	KPSE 6E8-33P-DN
Connector loom	KPSE 0E8-33S-DN
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 10 can be connected directly to most electronic control units and data logging systems.

Optional mounting modifications are available.

Each mounting orientation is possible.

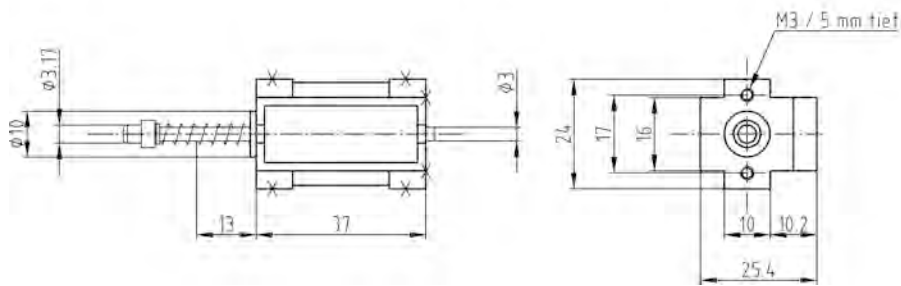
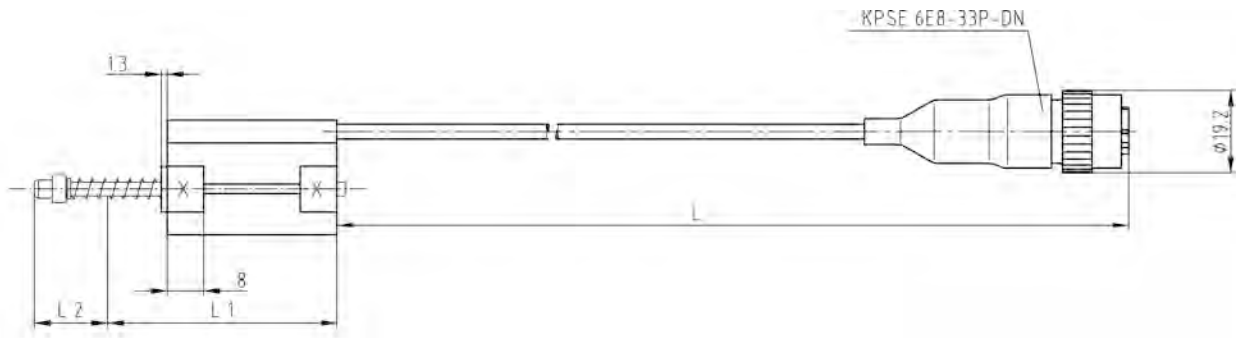
Comes with a spring return shaft.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Linear Potentiometer LP 10**  
Order number **B 261 209 535-01**

Dimensions





## Linear Potentiometer LP 25



### Features

- ▶ Measurement range 0 to 25 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 25 is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement. Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing and low power consumption.

### Application

Application	0 to 25 mm
Temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	68 g
Min. length	147 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP65
Max. shaft velocity	1 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	22 V
Nominal resistance	1 kΩ
Resistance tolerance	10 %
Non-linearity	0.25 %

### Connectors and Wires

Connector	ASL 6-06-05SA-HE
Connector loom	ASL 0-06-05PA-HE
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 200 cm
Various motorsports and automotive connectors on request.	
Please specify the requested wire length with your order.	

### Installation Notes

The LP 25 can be connected directly to most electronic control units and data logging systems.

Optional mounting modifications are available.

Each mounting orientation is possible.

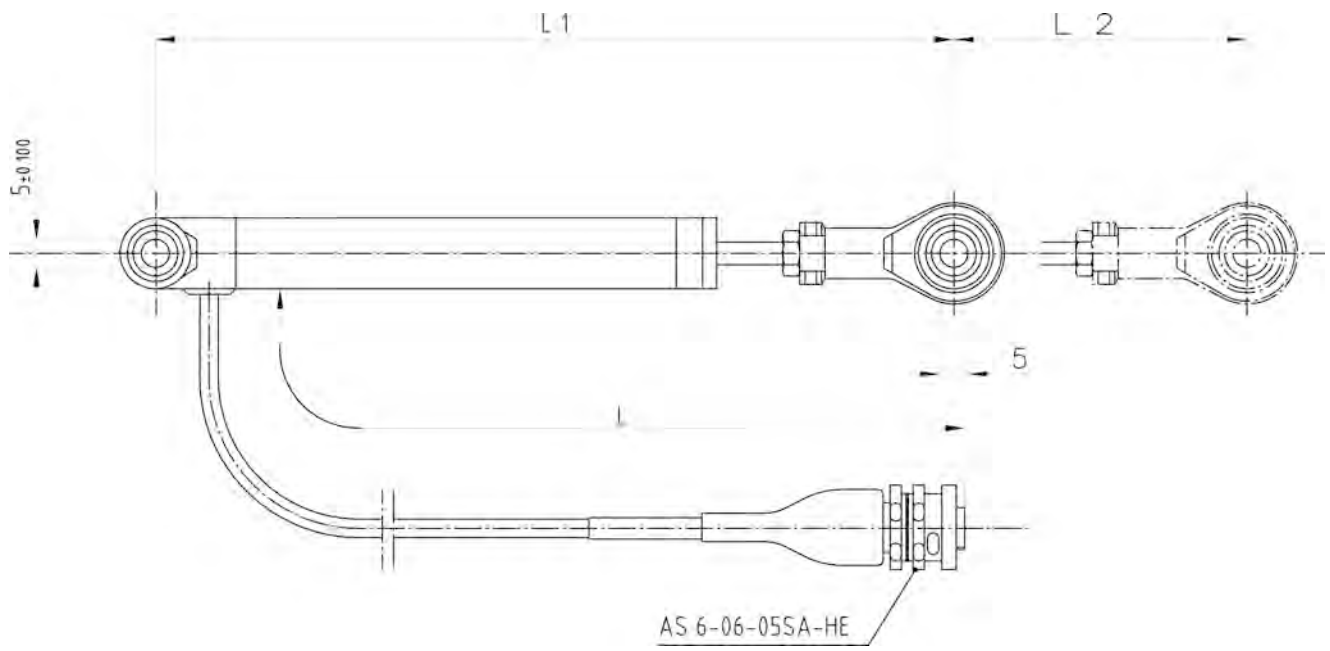
Comes with a spring return shaft.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Linear Potentiometer LP 25**  
Order number **B 261 209 547**

Dimensions



## Linear Potentiometer LP 25 twin



### Features

- ▶ Measurement range 0 to 25 mm
- ▶ Double output
- ▶ Aluminum housing

The LP 25 twin is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement and for use in electronic throttle control systems. Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving ends to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing, low power consumption and infinite resolution.

### Application

Application	0 to 25 mm
Temperature range	-30 to 100°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	60 g
Min. length	95 mm
Mounting	Ø 3 mm
Protection	IP66
Max. shaft velocity	< 10 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	22 V
Nominal resistance	1 kΩ

Resistance tolerance	10 %
Non-linearity	0.25 %

### Connectors and Wires

Connector	AS 6-07-35PN
Connector loom	AS 0-07-35SN
Pin 1	U <sub>s</sub> 1
Pin 2	Gnd 1
Pin 3	Sig 1
Pin 4	U <sub>s</sub> 2
Pin 5	Gnd 2
Pin 6	Sig 2
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 25 twin can be connected directly to most electronic control units and data logging systems.

Application where redundant signals are necessary to ensure system runs failsafe.

Each mounting orientation is possible.

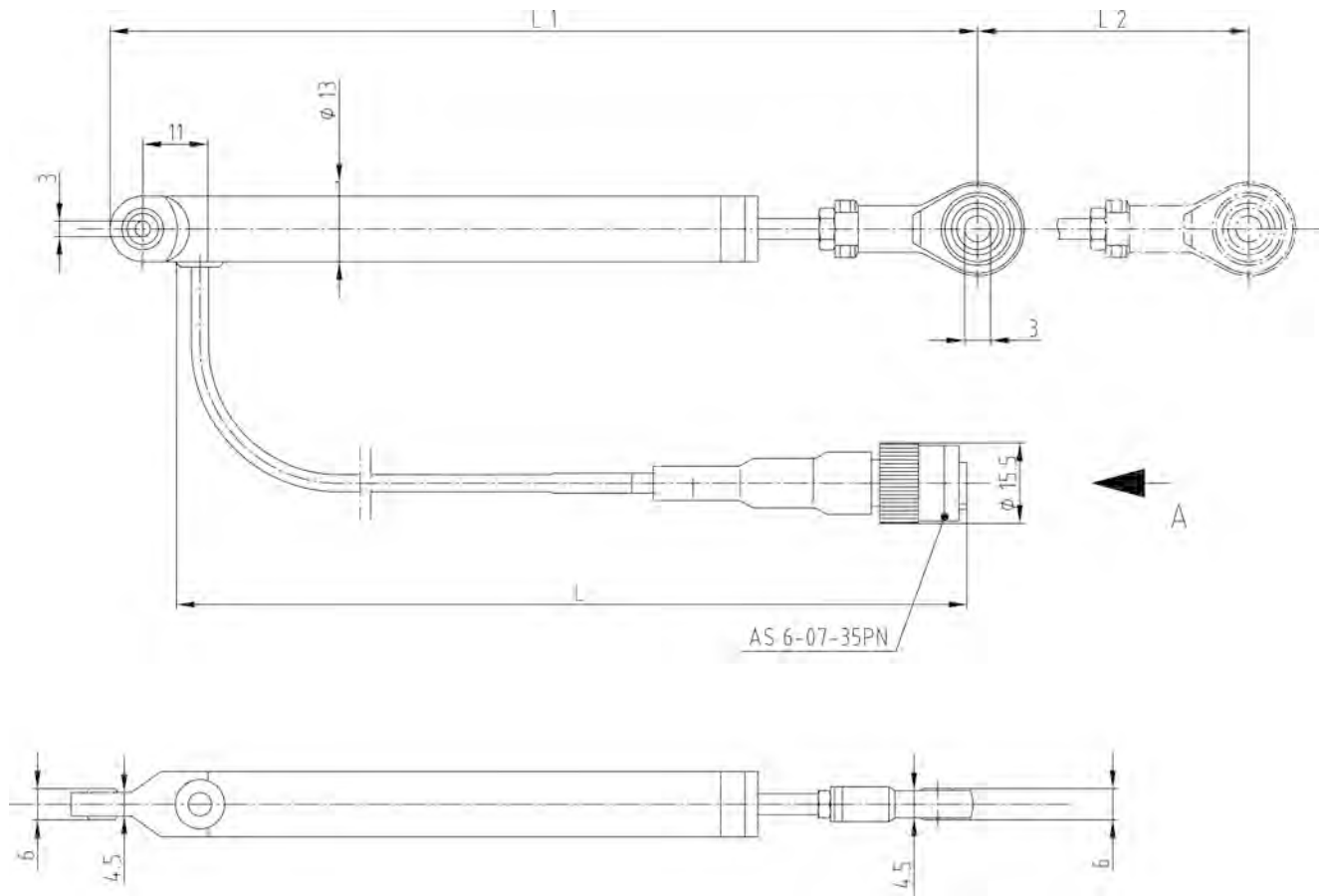
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Linear Potentiometer LP 25 twin**  
Order number **B 261 209 858**

Dimensions

4



## Linear Potentiometer LP 50



### Features

- ▶ Measurement range: 0 to 50 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 50 is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement. The operating mode of this sensor is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them. The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing, low power consumption and infinite resolution.

### Application

Application	0 to 50 mm
Temperature range	-40 to 105°C
Storage temperature range	-55 to 125°C
Max. vibration	100 m/s <sup>2</sup> at 10 to 500 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	27 g
Min. length	172 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP64
Max. shaft velocity	1.5 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	42 V

Nominal resistance	4.7 kΩ
Resistance tolerance	20 %
Non-linearity	0.25 %
Max. current	1 mA

### Connectors and Wires

Connector	KPSE 6E8-33P-DN
Mating connector	KPSE 0E8-33S-DN
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsport and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 50 can be connected directly to the most electronic control units and data logging systems.

Ball joints at shaft end and case.

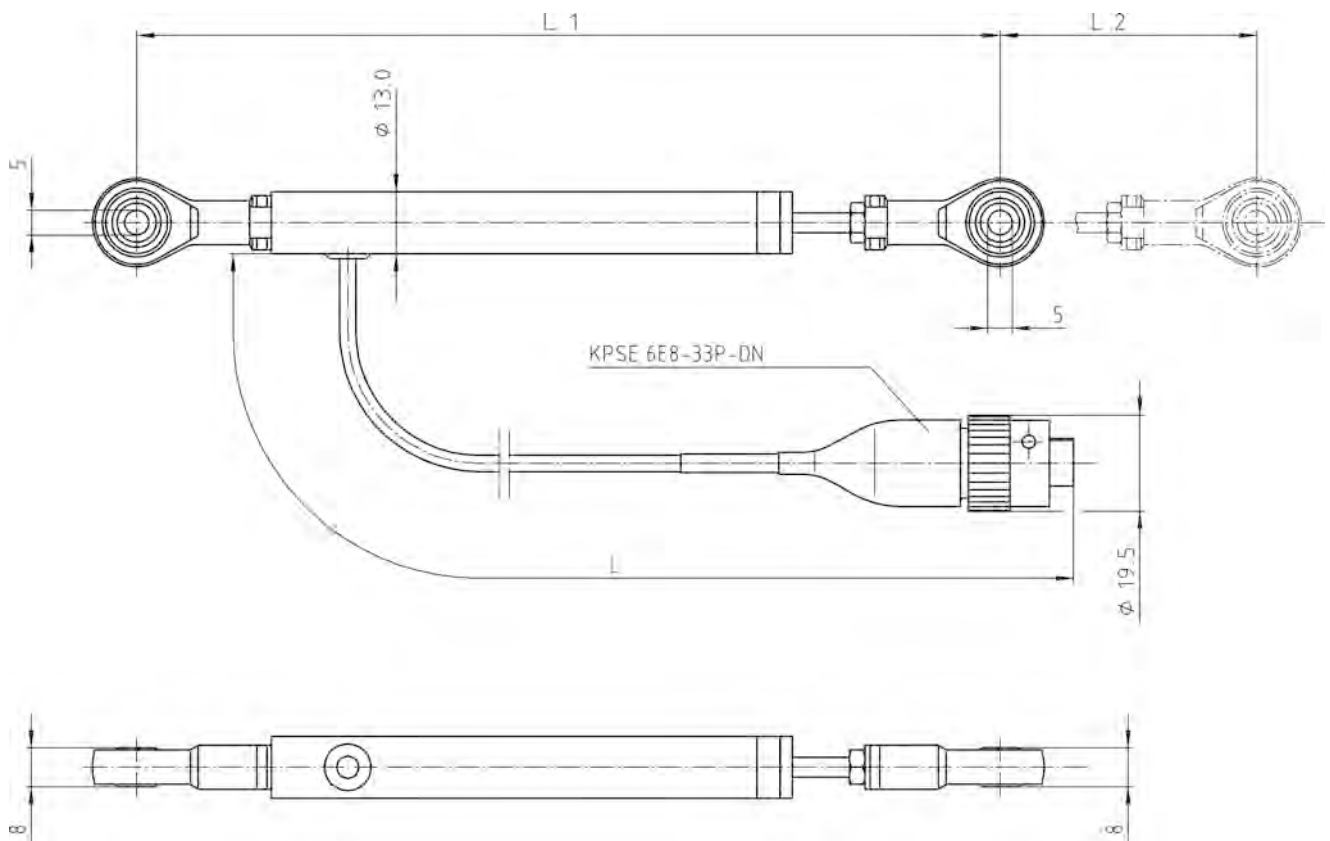
Each mounting orientation is possible.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Linear Potentiometer LP 50**  
Order number **B 261 209 133-01**

Dimensions



## Linear Potentiometer LP 50 twin



### Features

- ▶ Measurement range: 0 to 50 mm
- ▶ Double output
- ▶ Aluminum housing

The LP 50 twin is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement and for use in electronic throttle control systems. It works base on the linear tape potentiometer principle where the distance traveled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing, low power consumption and infinite resolution.

### Application

Application	0 to 50 mm
Temperature range	-30 to 100°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	66 g
Min. length	120 mm
Mounting	Ø 3 mm
Protection	IP66
Max. shaft velocity	< 10 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	< 45 V
Nominal resistance	2 kΩ

Resistance tolerance	10 %
Non-linearity	0.25 %

### Connectors and Wires

Connector	AS 6-07-35PN
Connector loom	AS 0-07-35SN
Pin 1	U <sub>s</sub> 1
Pin 2	Gnd 1
Pin 3	Sig 1
Pin 4	U <sub>s</sub> 2
Pin 5	Gnd 2
Pin 6	Sig 2
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 50 twin can be connected directly to most electronic control units and data logging systems.

Application where redundant signals are necessary to ensure system runs failsafe.

Each mounting orientation is possible.

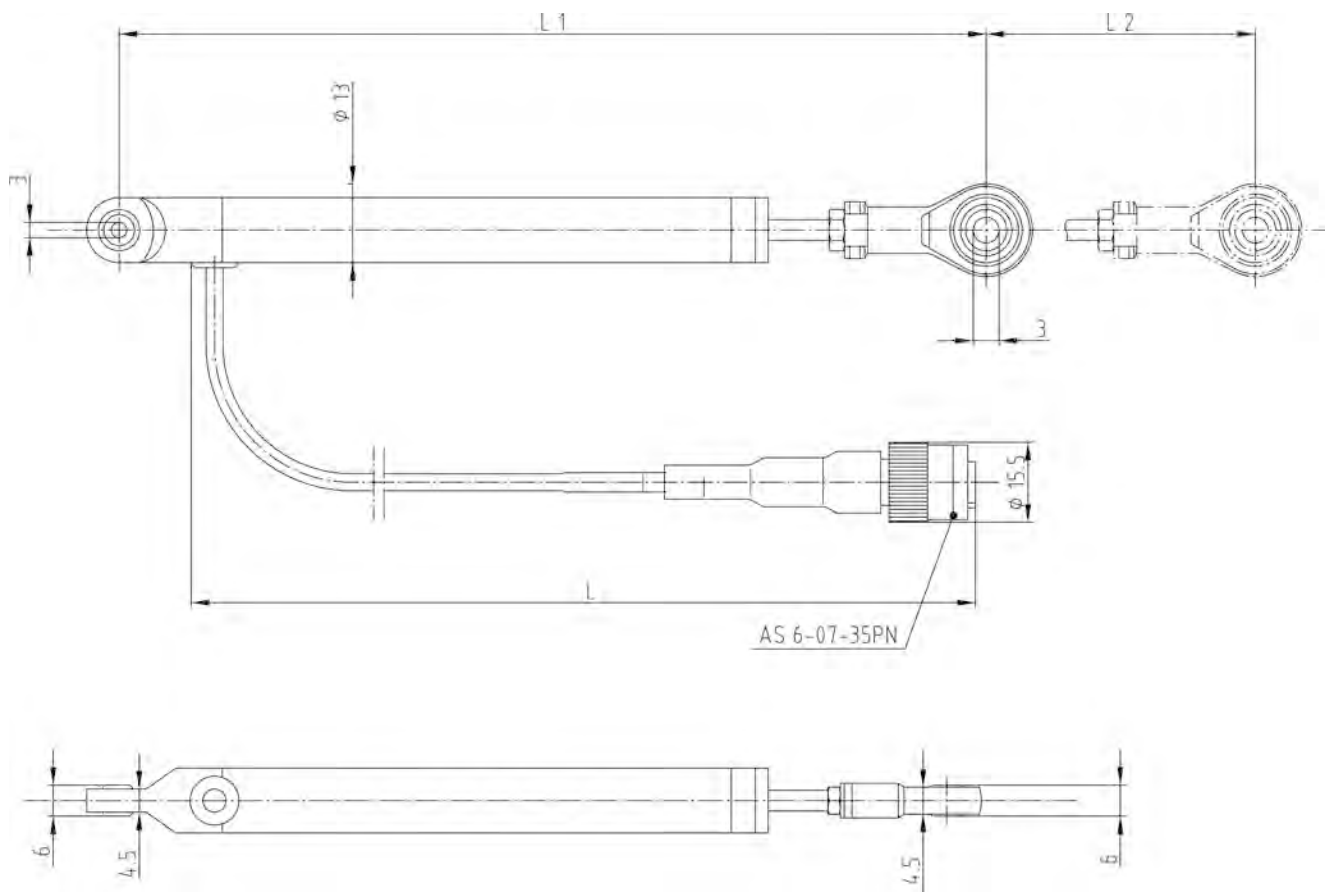
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Linear Potentiometer LP 50 twin**  
Order number **B 261 209 859-01**

Dimensions

4





## Linear Potentiometer LP 75



### Features

- ▶ Measurement range: 0 to 75 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 75 is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement. Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with hard metal housing and low power consumption.

### Application

Application	0 to 75 mm
Temperature range	-30 to 100°C
Max. vibration	126 m/s <sup>2</sup> at 10 to 12 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	78 g
Min. length	223.6 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP66

#### Electrical Data

Power supply	5 V
Power supply max.	67 V
Nominal resistance	3 kΩ

Resistance tolerance	10 %
Non-linearity	0.15 %

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

#### Installation Notes

The LP 75 can be connected directly to most electronic control units and data logging systems.

Ball joints at shaft end and case.

Each mounting orientation is possible.

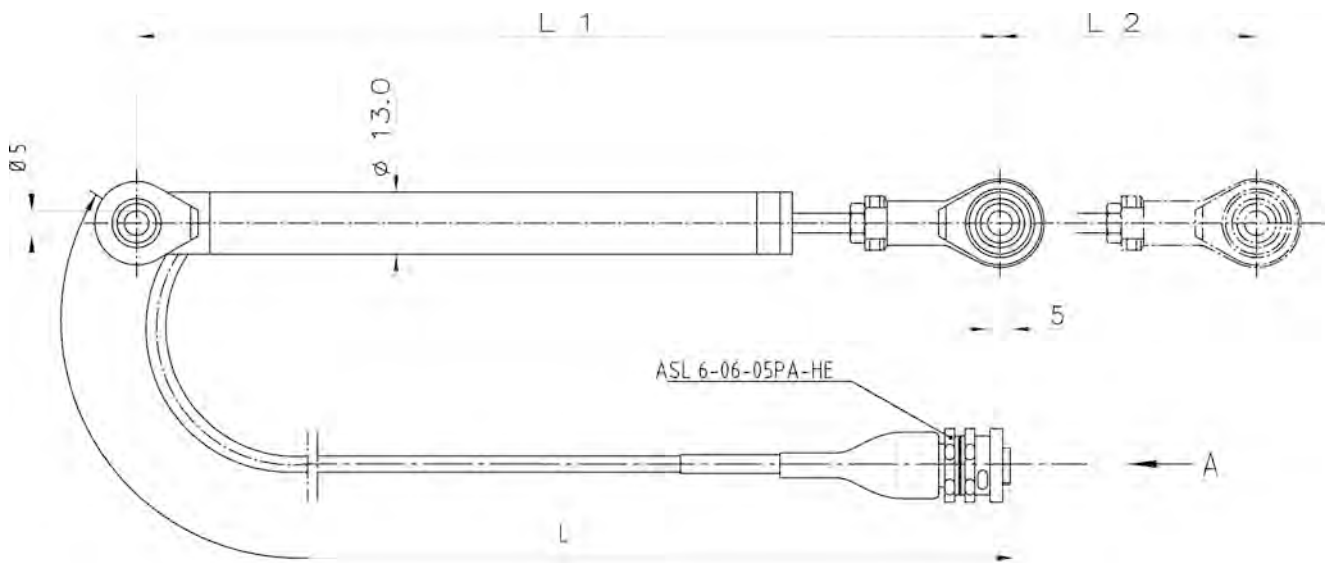
Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

##### Linear Potentiometer LP 75

Order number **B 261 209 856**

Dimensions



## Linear Potentiometer LP 75F



### Features

- ▶ Measurement range: 0 to 75 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 75F is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement.

The operating mode of this sensor is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its compact and lightweight design together with its wider operating temperature range

### Application

Application	0 to 75 mm
Temperature range	-30 to 100°C
Max. vibration	126 m/s <sup>2</sup> at 10 to 12 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	78 g
Min. length	223.6 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP66
Max. shaft velocity	10 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	67 V
Nominal resistance	3 kΩ

Resistance tolerance	10 %
Non-linearity	0.15 %

#### Connectors and Wires

Connector	KPSE 6E8-33P-DN-A34
Mating connector	KPSE 0E8-33S-DN
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsport and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 75F can be connected directly to most electronic control units and data logging systems.

Each mounting orientation is possible.

Please find further application hints in the offer drawing at our homepage.

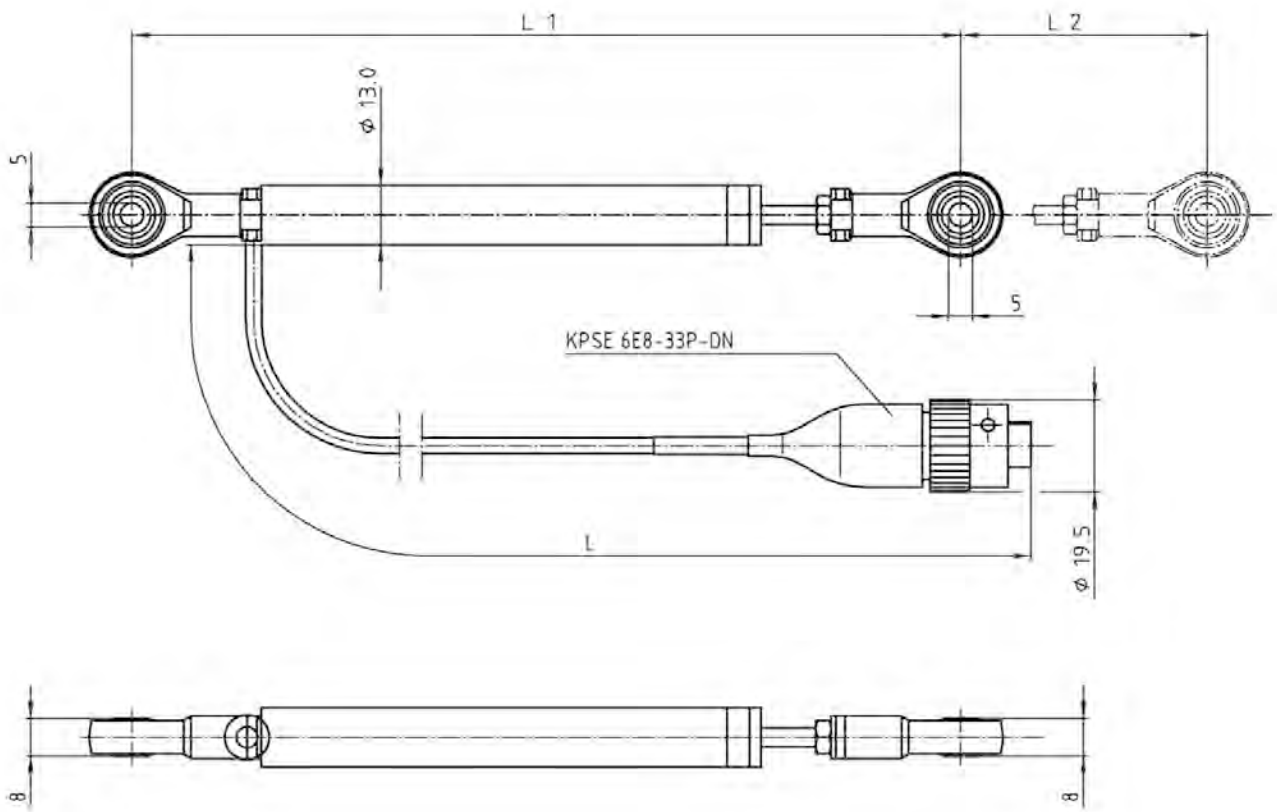
The LP 75F can be connected directly to most electronic control units and data logging systems.

### Ordering Information

**Linear Potentiometer LP 75F**  
Order number **B 261 209 852-01**

Dimensions

4



## Linear Potentiometer LP 100



### Features

- ▶ Measurement range: 0 to 100 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 100 is a linear potentiometer which is designed to measure the relative position of two points e.g. the gear position, throttle position or suspension movement.

Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing, low power consumption and infinite resolution.

### Application

Application	0 to 100 mm
Temperature range	-30 to 100°C
Max. vibration	126 m/s <sup>2</sup> at 10 to 12kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	85 g
Min. length [L1]	227 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP66
Max. shaft velocity	10 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	74 V
Nominal resistance	4 kΩ

Resistance tolerance	10 %
Non-linearity	0.15 %
Power supply	5 V

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

#### Installation Notes

The LP 100 can be connected directly with most electronic control units and data logging systems.

Ball joints at shaft end and case.

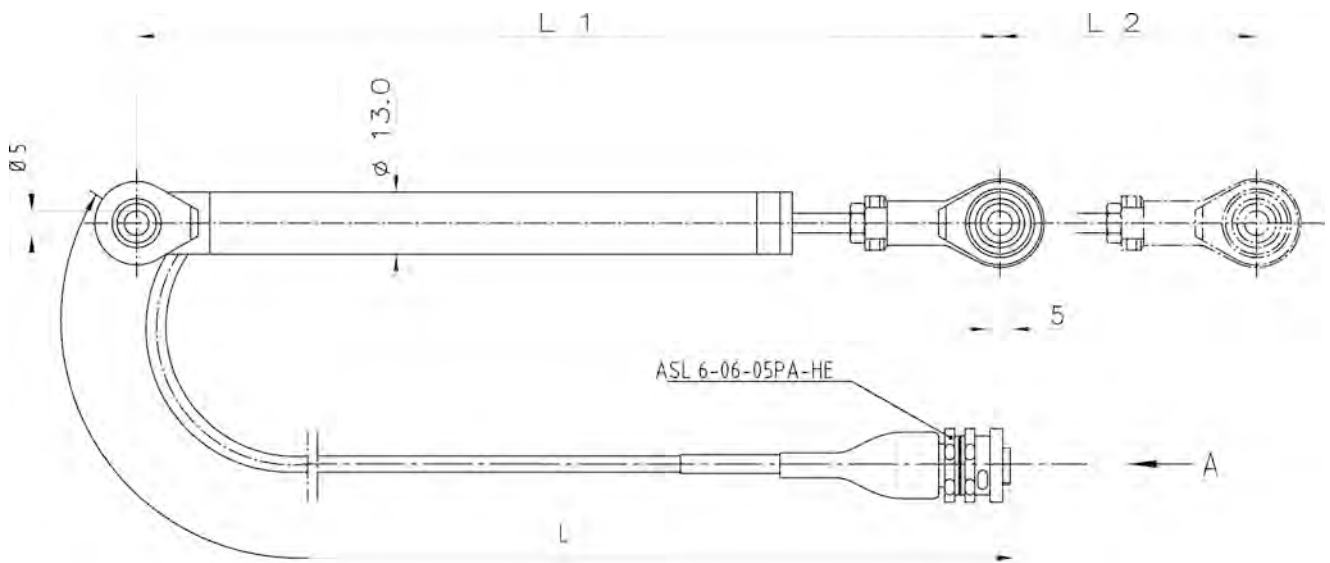
Each mounting orientation is possible.

Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

**Linear Potentiometer LP 100**  
Order number **B 261 209 857-01**

Dimensions



## Linear Potentiometer LP 100F



### Features

- ▶ Measurement range: 0 to 100 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 100F is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement.

Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its compact and lightweight design together with its wider operating temperature range.

### Application

Application	0 to 100 mm
Temperature range	-30 to 85°C
Max. vibration	126 m/s <sup>2</sup> at 10 to 12 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	85 g
Min. length [L1]	220 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP65

#### Electrical Data

Power supply	5 V
Power supply max.	74 V
Nominal resistance	4 kΩ

Resistance tolerance	10 %
Non-linearity	0.15 %

#### Connectors and Wires

Connector	KPSE 6E8-33P-DN-A34
Connector loom	KPSE 0E8-33S-DN
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 100F can be connected directly to most electronic control units and data logging systems.

Each mounting orientation is possible.

Please find further application hints in the offer drawing at our homepage.

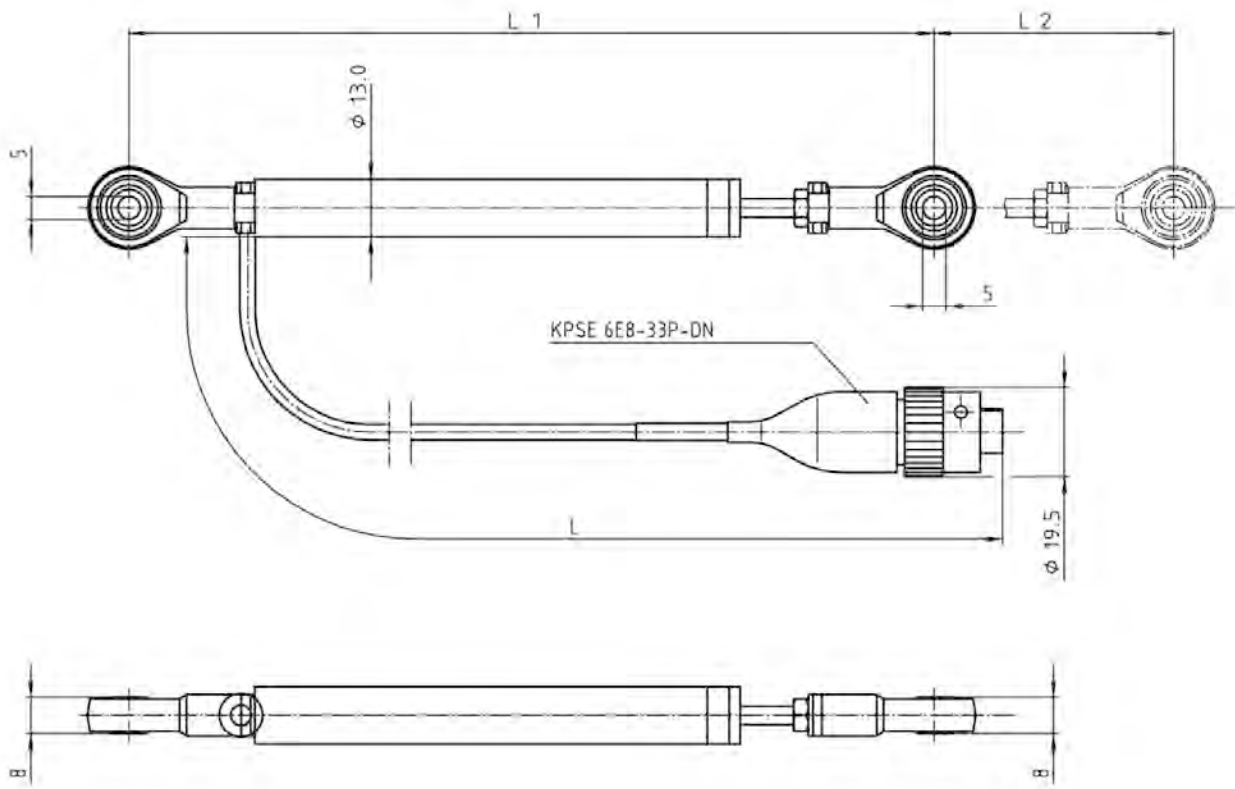
The LP 100F can be connected directly to most electronic control units and data logging systems.

### Ordering Information

**Linear Potentiometer LP 100F**  
Order number **B 261 209 853-01**

Dimensions

4





## Linear Potentiometer LP 150



### Features

- ▶ Measurement range: 0 to 150 mm
- ▶ Aluminum housing
- ▶ Low power consumption

The LP 150 is a linear potentiometer which is designed to measure the relative position of two point e.g. the gear position, throttle position or suspension movement.

Its operating mode is based on the linear tape potentiometer principle where the distance travelled between the moving end to the wiper is proportional to the resistance between them.

The advantage of this LP is its precise and compact design with an anodized aluminum cylindrical housing, low power consumption and infinite resolution

### Application

Application	0 to 150 mm
Temperature range	-40 to 85°C

### Technical Specifications

#### Mechanical Data

Weight w/o wire	118 g
Min. length	282 mm
Mounting	2 x M5
Tightening torque	10 Nm
Protection	IP65
Max. shaft velocity	1 m/sec

#### Electrical Data

Power supply	5 V
Power supply max.	130 V
Nominal resistance	6 kΩ

Resistance tolerance	10 %
Non-linearity	0.15 %

### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 25 cm

Various motorsports and automotive connectors on request.

Please specify the requested wire length with your order.

### Installation Notes

The LP 150 can be connected directly to most electronic control units and data logging systems.

Ball joints at shaft end and case.

Each mounting orientation is possible.

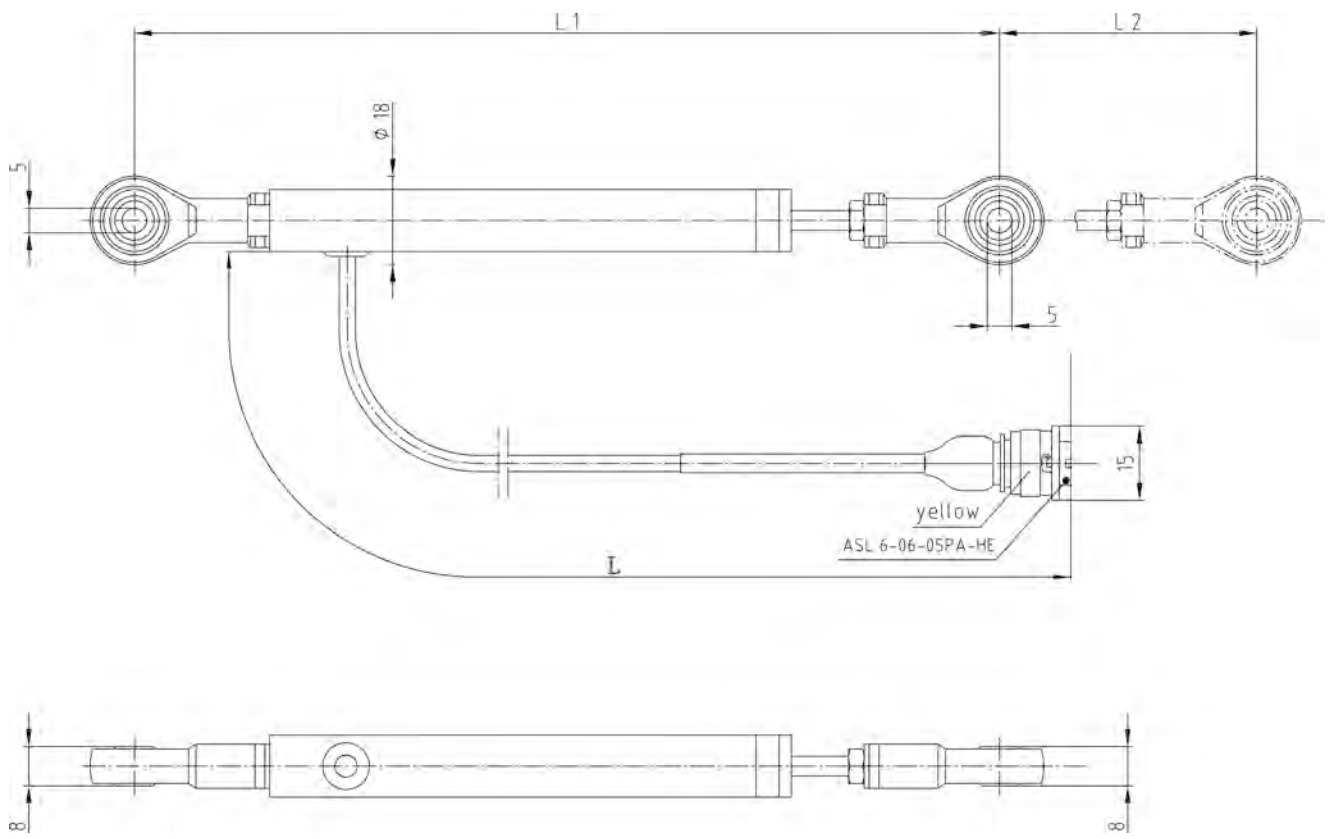
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Linear Potentiometer LP 150

Order number **B 261 209 534**

Dimensions



## Pressure Sensor Air PSA-B



### Features

- ▶ Absolute air pressure measurements
- ▶ Measurement range 0.1 to 1.15 bar or 0.2 to 2.5 bar
- ▶ Analog output

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

An integrated circuit combines a piezo-resistive sensor element and electronic systems for signal-amplification and temperature-compensation. The output of the sensor is an analog, ratio metric signal.

Two different pressure ranges are available (0.1 to 1.15 bar or 0.2 to 2.5 bar).

The main feature and benefit of this sensor is the combination of both high quality production part and motor-sport connector.

### Application

Application	Please see variations
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 130°C
Media temp. range	-40 to 130°C
Storage temp. range	-40 to 130°C
Max. vibration	Please see variations

### Technical Specifications

#### Variations

	PSA-B (0.1 to 1.15 bar)	PSA-B (0.2 to 2.50 bar)
Max. vibration	280 m/s <sup>2</sup> at 200 Hz	125 m/s <sup>2</sup> at 440 Hz

Tolerance (FS) at $U_s = 5\text{ V}$	$\pm 0.016\text{ bar}$	$\pm 0.034\text{ bar}$
Tolerance (FS)	$\pm 1.39\%$	$\pm 1.36\%$
Sensitivity	4,040 mV/bar	1,848 mV/bar
Offset	-4.8 mV	30.4 mV

#### Mechanical Data

Mounting	M6
Fitting	12.05 mm
Weight w/o wire	17 g
Sealing	O-ring 7.59 x 2.62 mm

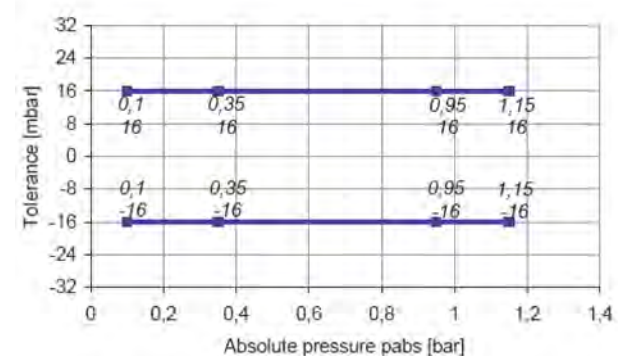
#### Electrical Data

Power supply $U_s$	4.75 to 5.25 V
Max. power supply	16 V
Full scale output $U_A$ at 5 V	0.3 to 4.8 V
Current $I_S$	9 mA

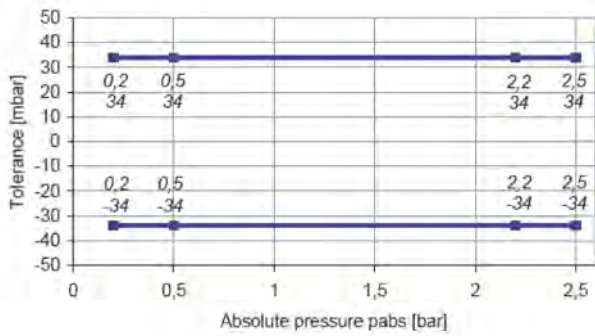
#### Characteristic

Response time T10/90	1 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5\text{ V}$	Please see variations
Tolerance (FS)	Please see variations
Sensitivity	Please see variations
Offset	Please see variations

#### Tolerance 0.1 to 1.15 bar



## Tolerance 0.2 to 2.5 bar



Avoid miss-pinning (max. 5 minutes at  $I = 0.3$  A).

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

## PSA-B

0.1 to 1.15 bar

Order number **B 261 209 702-01**

## PSA-B

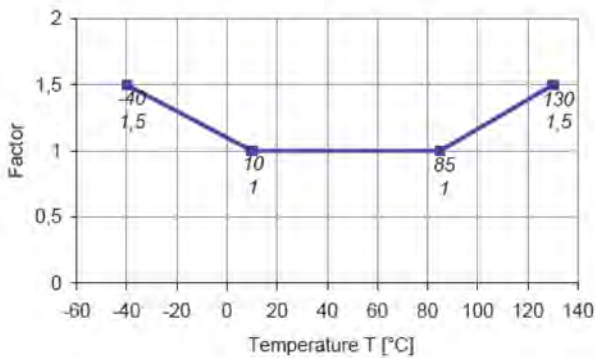
0.2 to 2.5 bar

Order number **B 261 209 710-01**

## Adapter for PSA-B

Order number **B 261 209 725-01**

## Expansion of Tolerance



## Connectors and Wires

Connector ASL 6-06-05PC-HE

Mating connector ASL 0-06-05SC-HE

Pin 1 -

Pin 2 GND

Pin 3 SIG

Pin 4  $U_s$

Pin 5 -

Various motorsport and automotive connectors are available on request.

Sleeve DR-25

Wire size AWG 24

Wire length L 15 to 100 cm

Please specify the requested wire length with your order.

## Installation Notes

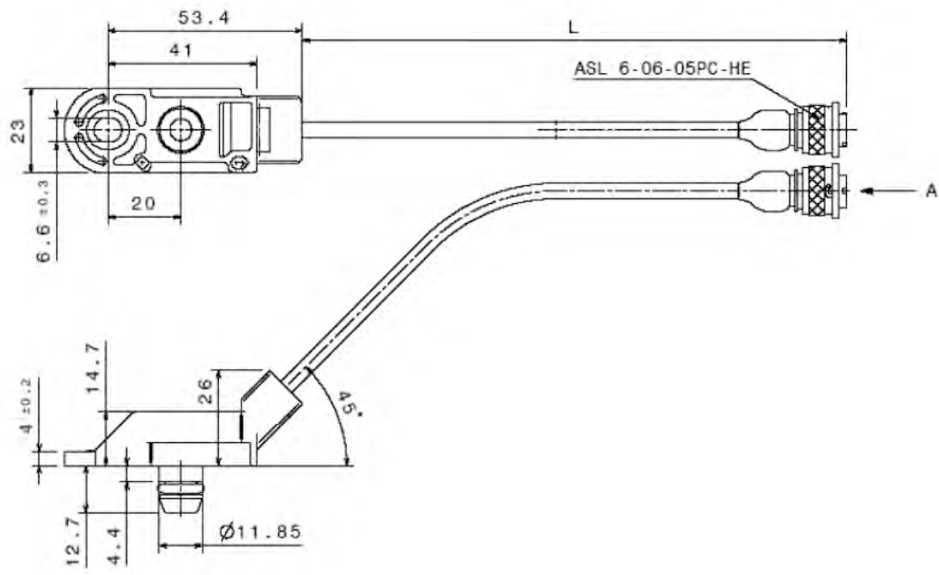
The PSA-B is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.

The sensor can be connected directly to most control units.

To avoid noise, an ECU-input circuit with a RC-low pass filter ( $\tau = 2$  ms) is recommended.

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

## Dimensions



## Pressure Sensor Air PSA-C



4

### Features

- ▶ Absolute air pressure measurements
- ▶ Measurement range 0.2 to 1.05 bar or 0.2 to 2.5 bar
- ▶ Analog output
- ▶ External tube connector

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

An integrated circuit combines a piezo-resistive sensor element and electronics for signal-amplification and temperature-compensation. Air pressure is supplied to the sensor via a tube connector. The output of the sensor is an analog, ratio metric 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	Please see ordering informations
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 130°C
Media temp. range	-40 to 130°C
Storage temp. range	-40 to 130°C
Max. vibration	20 m/s <sup>2</sup> at 10 to 1,000 Hz

### Technical Specifications

#### Variations

	PSA-C (0.2 to 1.05 bar)	PSA-C (0.2 to 2.50 bar)
Tolerance (FS) at $U_s = 5\text{ V}$	$\pm 0.017\text{ bar}$	$\pm 0.042\text{ bar}$
Tolerance (FS)	$\pm 1.62\%$	$\pm 1.68\%$
Sensitivity	5,000 mV/bar	1,532 mV/bar
Offset	-600 mV	724 mV

#### Mechanical Data

Mounting	M6
Fitting	6 mm
Weight w/o wire	40 g

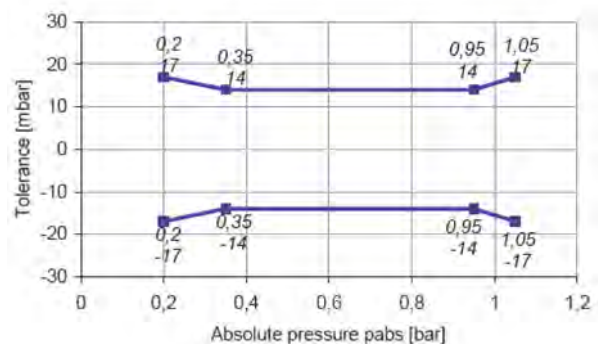
#### Electrical Data

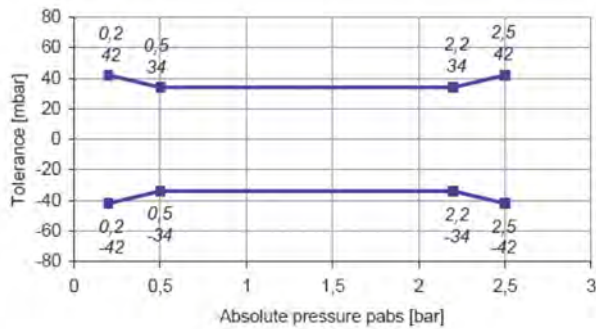
Power supply $U_s$	4.75 to 5.25 V
Max power supply $U_s$ max.	16 V
Full scale output $U_A$ at 5 V	0.3 to 4.8 V
Current $I_S$	9 mA

#### Characteristic

Response time $T_{10/90}$	10 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5\text{ V}$	Please see variations
Tolerance (FS)	Please see variations
Sensitivity	Please see variations
Offset	Please see variations

#### Tolerance 0.2 to 1.05 bar

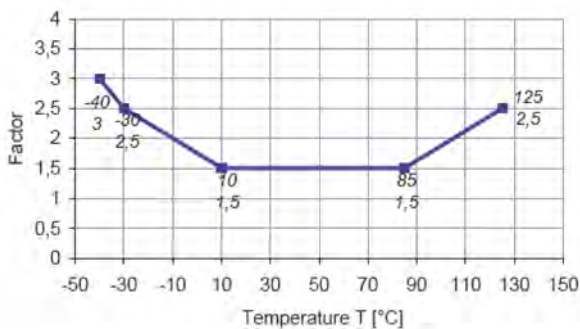


**Tolerance 0.2 to 2.50 bar****Ordering Information****PSA-C**

0.2 to 1.05 bar

Order number **0 261 230 037****PSA-C**

1.05 to 2.50 bar

Order number **0 281 002 389****Expansion of Tolerance****Connectors and Wires**

Connector	Bosch Jetronic
Mating connector	D 261 205 289
Pin 1	U <sub>s</sub>
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

**Installation Notes**

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

Avoid liquid entering the measuring cell.

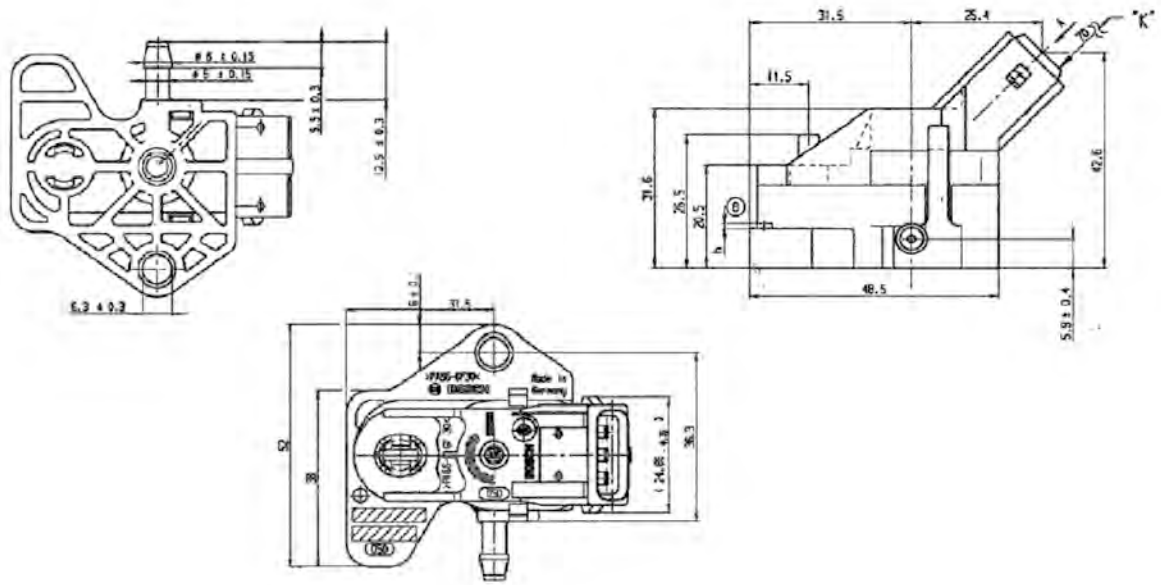
The sensor can be connected directly to most control units.

To avoid noise, an ECU-input circuit with a RC-low pass filter ( $\tau = 2$  ms) is recommended.

Avoid miss-pinning (max. 5 minutes at  $I = 0.3$  A).

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

Dimensions





## Pressure Sensor Air PSB-2



### Features

- ▶ Absolute air pressure measurements
- ▶ Measurement range 0.1 to 2.0 bar
- ▶ Analog output

This sensor is designed for precise measurements of absolute air pressure, especially the air box and boost pressure of gasoline or Diesel engines.

An integrated circuit combines a piezo-resistive sensor element and electronics for signal-amplification and temperature-compensation. The output of the sensor is an analog, ratio metric signal.

The main feature and benefit of this sensor is the combination of the high quality of the production part and an individual calibration. Each sensor is delivered with a calibration sheet to enable very small measurement tolerances.

### Application

Application	0.1 to 2.0 bar (a)
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 130°C
Media temp. range	-40 to 130°C
Storage temp. range	-40 to 130°C
Max. vibration	280 m/s <sup>2</sup> at 200 Hz, 125 m/s <sup>2</sup> at 440 Hz sine

### Technical Specifications

#### Mechanical Data

Mounting	M6
Fitting	12,05 mm

Weight w/o wire	17 g
Sealing	O-ring 7.59 x 2.62 mm

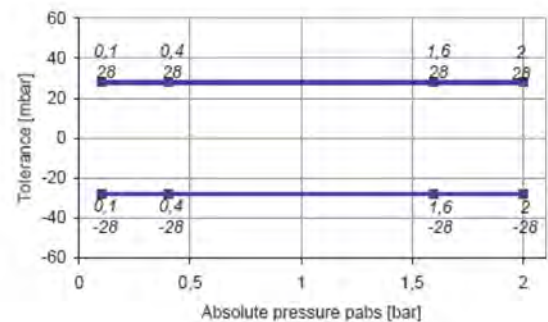
#### Electrical Data

Power supply $U_s$	4.75 to 5.25 V
Max power supply $U_s$ max.	16 V
Full scale output $U_A$ at 5 V	0.3 to 4.8 V
Current $I_S$	9 mA

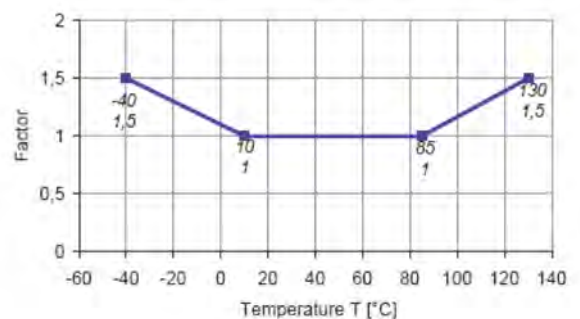
#### Characteristic

Response time $T_{10/90}$	1 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5$ V	± 0.028 bar
Tolerance (FS)	± 1.4 %
Sensitivity	2236 mV/bar
	(an individual calibration sheet will be delivered)
Offset	176 mV
	(an individual calibration sheet will be delivered)

#### Tolerance



#### Expansion of Tolerance



#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE

Pin 1	-
Pin 2	GND
Pin 3	SIG
Pin 4	U <sub>s</sub>
Pin 5	-

Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire Size	AWG 24
Wire Length L	15 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

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 ( $\tau = 2$  ms) is recommended.

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

Avoid miss-pinning (max. 5 minutes at  $I = 0.3$  A).

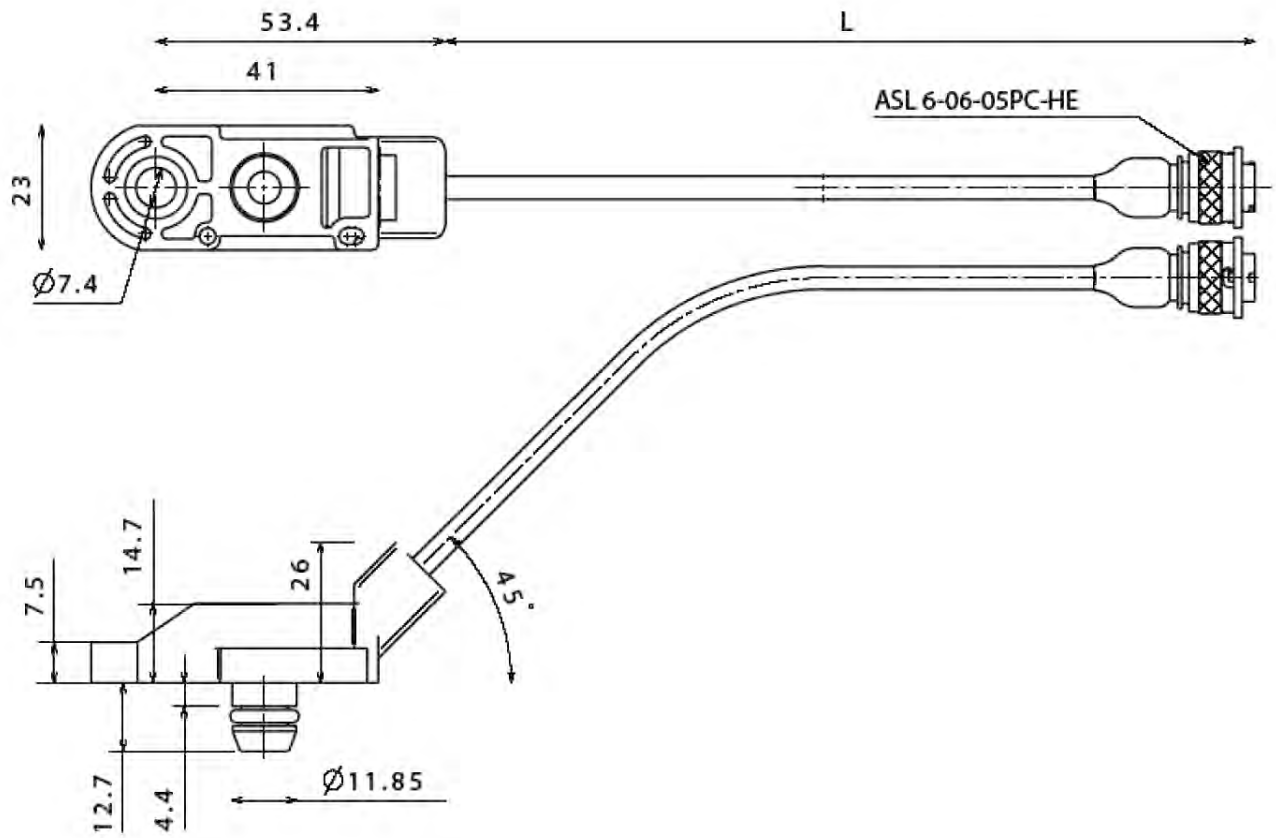
To optimise the accuracy of this sensor, an individual calibration data sheet is delivered with each sensor.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Pressure Sensor Air PSB-2**  
Order number **B 261 209 337**

## Dimensions



## Pressure Sensor Air PSB-4



4

### Features

- ▶ Absolute air pressure measurements
- ▶ Measurement range 0.5 to 4.0 bar
- ▶ Analog output
- ▶ Very short response time

This sensor is designed to measure absolute air pressure, especially the air box and boost pressure of gasoline or Diesel engines over a wide range.

An integrated circuit combines a piezo-resistive sensor element, electronics for signal-amplification and temperature-compensation. The output of the sensor is an analog, ratio metric signal.

The main feature and benefit of this sensor is the combination of the high quality of the production part and an individual calibration. Each sensor is delivered with a calibration sheet to enable very small measurement tolerances. Furthermore the sensor has a very short response time.

### Application

Application	0.5 to 4 bar (a)
Pressure reference type	absolute
Max. pressure	6 bar
Operating temp. range	-40 to 130°C
Media temp. range	-40 to 130°C
Storage temp. range	-40 to 130°C
Max. vibration	20 m/s <sup>2</sup> at 10 to 1,000 Hz

### Technical Specifications

#### Mechanical Data

Mounting	M6
Fitting	12.05 mm
Weight w/o wire	20 g
Sealing	O-ring 7.59 x 2.62 mm

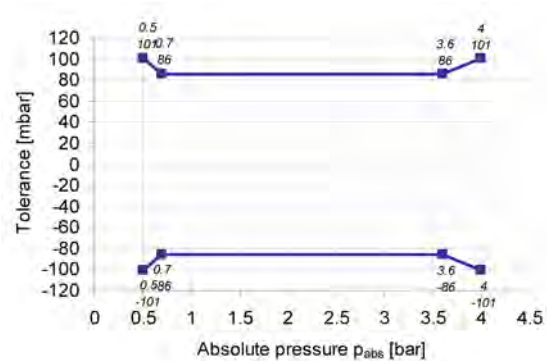
#### Electrical Data

Power supply $U_s$	4.5 to 5.5 V
Max power supply $U_s$ max.	16 V
Full scale output $U_A$ at 5 V	0.3 to 4.8 V
Current $I_S$	9 mA

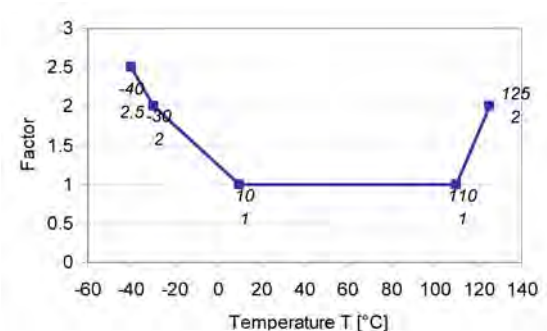
#### Characteristic

Response time $T_{10/90}$	0.2 ms
Compensated range	0 to 80°C
Tolerance (FS) at $U_s = 5 V$	$\pm 0.056$ bar
Tolerance (FS)	$\pm 1.4 \%$
Sensitivity	1142 mV/bar (an individual calibration sheet will be delivered)
Offset	71 mV (an individual calibration sheet will be delivered)

#### Tolerance



#### Expansion of Tolerance



### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	U <sub>s</sub>
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm

Please specify the required wire length with your order.

### Installation Notes

The PSB-4 is designed for engines using ROZ95, ROZ98, M15, E22 and Diesel.

The sensor can be connected directly to most control units.

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

Avoid miss-pinning (max. 5 minutes at I = 0.3 A).

Please note that the 6mm tube connector has no function.

To optimize the accuracy of this sensor, an individual calibration sheet is delivered with each sensor.

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

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

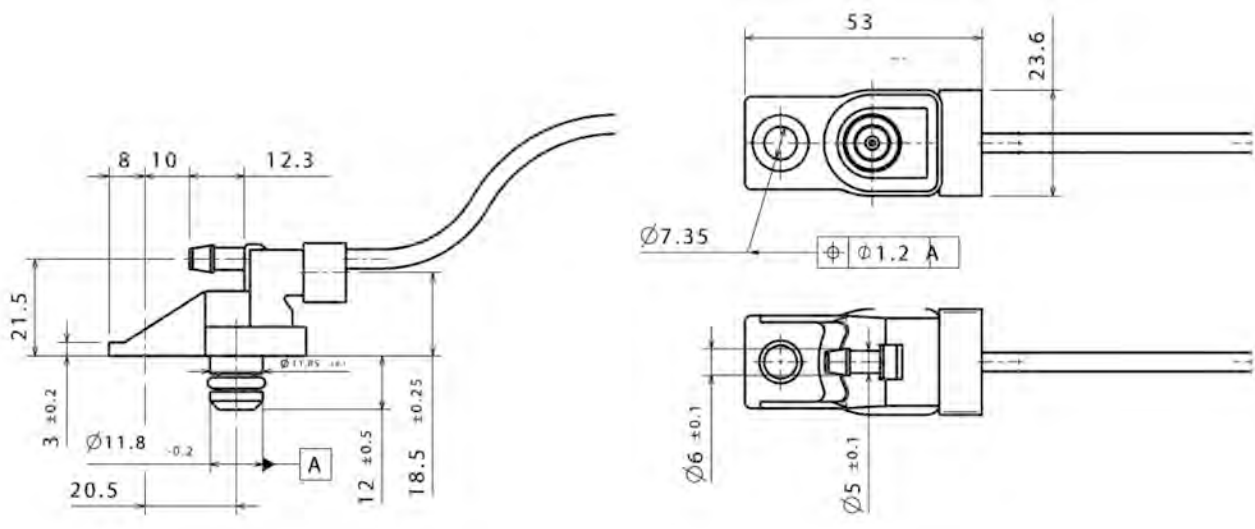
### Ordering Information

#### Pressure Sensor Air PSB-4

Order number **B 261 209 348-01**

Dimensions

4



## Pressure Sensor Air PSP



### Features

- ▶ Absolute air pressure measurements
- ▶ Measurement range 0.2 to 3.0 bar
- ▶ Analog output
- ▶ Very short response time

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

An integrated circuit combines a piezo-resistive sensor element and an electronic for signal-amplification and temperature compensation. The output of the sensor is an analog, ratio metric signal.

The main feature and benefit of this sensor is the combination of both high quality production part and motor-sport connector.

### Application

Application	0.2 to 3 bar (a)
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 125°C
Media temp. range	-40 to 125°C
Storage temp. range	-40 to 130°C
Max. vibration	0.19 mm at 100 to 200 Hz
	250 m/s <sup>2</sup> at 200 to 500 Hz

### Technical Specifications

#### Mechanical Data

Mounting	M6
Fitting	12.05 mm

Weight w/o wire	17 g
Sealing	O-ring 7.59 x 2.62 mm

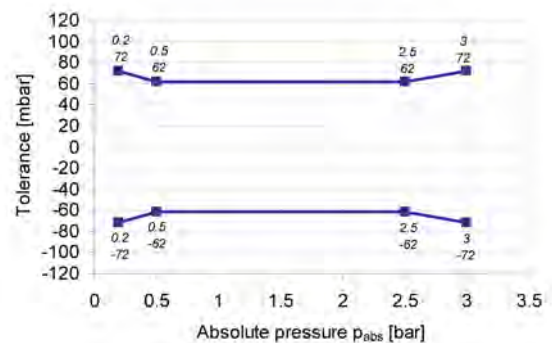
#### Electrical Data

Power supply $U_s$	4.5 to 5.5 V
Max power supply $U_s$ max	16 V
Full scale output $U_A$ at 5 V	0.3 to 4.8 V
Current $I_S$	9 mA

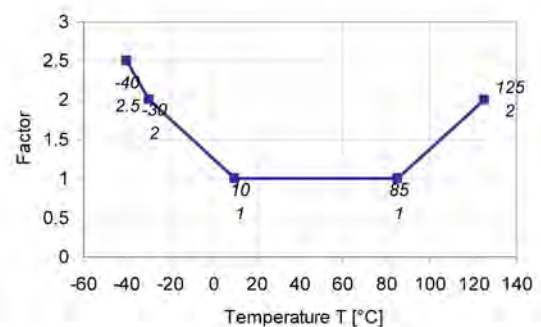
#### Characteristic

Response time $T_{10/90}$	0.2 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5 V$	$\pm 0.042$ bar
Tolerance (FS)	$\pm 1.4\%$
Sensitivity	1,518 mV/bar
Offset	96 mV

#### Tolerance



#### Expansion of Tolerance



#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-H
Pin 1	-
Pin 2	GND
Pin 3	SIG

Pin 4	$U_s$
Pin 5	-
Various motorsport and automotive connectors are available on request.	
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm
Please specify the required wire length with your order.	

### Installation Notes

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-low pass filter ( $\tau = 2$  ms) is recommended.

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

Avoid miss-pinning (max. 5 minutes at  $I = 0.3$  A).

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

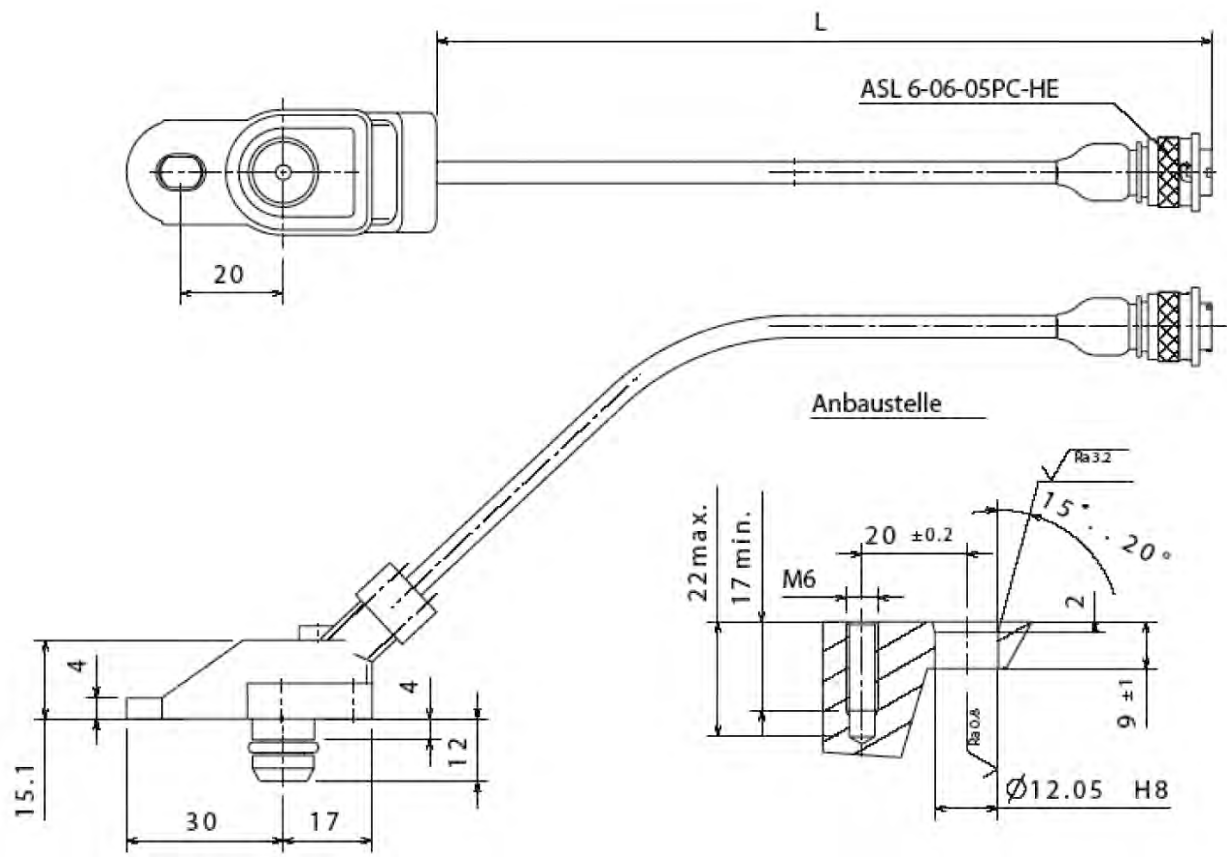
### Ordering Information

#### Pressure Sensor Air PSP

Order number **B 261 209 690-01**



## Dimensions



## Pressure Sensor Air PST



4

### Features

- ▶ Absolute air pressure and temperature measurements
- ▶ Measurement range 0.1 to 1.15 bar
- ▶ Analog output
- ▶ Very short response time

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

An integrated circuit combines a piezo-resistive sensor element, electronics for signal-amplification and temperature-compensation. The output of the sensor is an analog, ratio metric signal. An NTC resistance is used for temperature measurements.

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

### Application

Application 1	0.1 to 1.15 bar (a)
Application 2	-40 to 125°C
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 125°C
Media temp. range	-40 to 125°C
Storage temp. range	-40 to 130°C
Max. vibration	0.19 mm at 100 to 200 Hz 250 m/s <sup>2</sup> at 200 to 500 Hz sine

### Technical Specifications

#### Mechanical Data

Mounting	M6
Fitting	18 mm
Weight w/o wire	30 g
Sealing	O-ring 13.95 x 2.62 mm

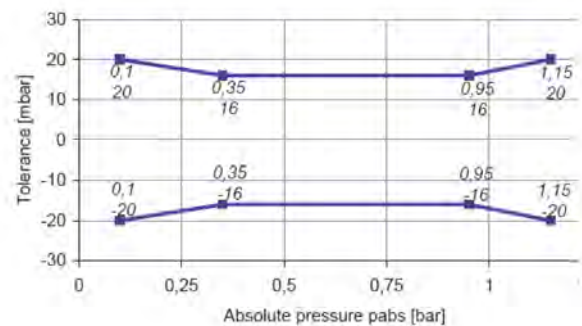
#### Electrical Data

Power supply $U_s$	4.5 to 5.5 V
Max power supply $U_s$ max.	16 V
Full scale output $U_A$ at 5 V	0. to 4.8 V
Current $I_S$	9 mA

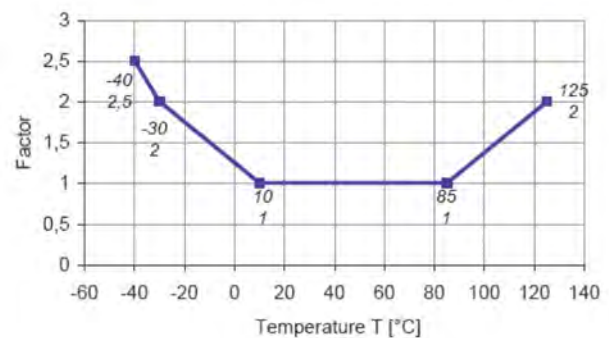
#### Characteristic Application 1

Response time $T_{10/90}$	0.2 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5 V$	$\pm 0.016$ bar
Tolerance (FS)	$\pm 1.39\%$
Sensitivity	4,047 mV/bar
Offset	-4.76 mV

#### Tolerance



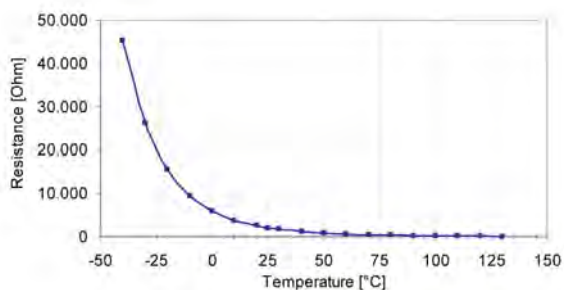
#### Expansion of Tolerance



#### Characteristic Application 2

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
Resistance at 20°C	2.5 kOhm
Tolerance	5 %
Response time $\tau_{63}$	45 s at air ; $v = 6 \text{ m/s}$



### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 336
Pin 1	Gnd
Pin 2	NTC
Pin 3	$U_s$
Pin 4	Pressure Sig
Pin 5	-

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

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-low pass filter ( $\tau = 2 \text{ ms}$ ) 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 at  $I = 0.3 \text{ A}$ ).

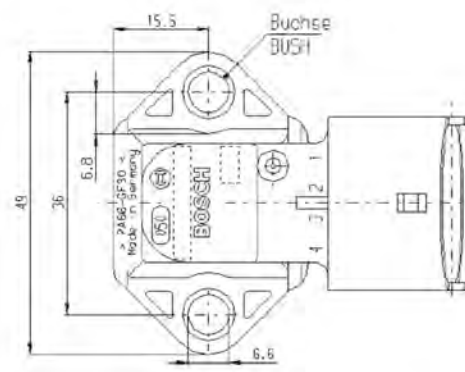
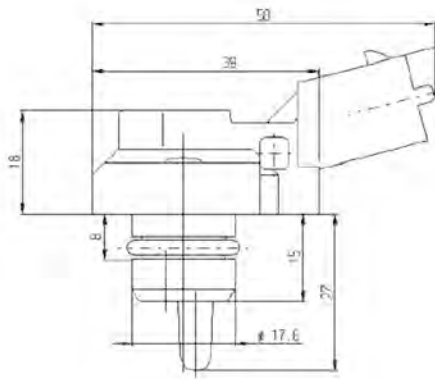
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### Pressure Sensor Air PST

Order number **0 261 230 022**

Dimensions



## Pressure Sensor Differential DP-A



### Features

- ▶ Relative air pressure measurements
- ▶ Measurement range 0 to 0.1 bar
- ▶ Analog output
- ▶ Very short response time

This sensor is designed to measure the relative pressure of non-corrosive, non-ionic working gases e.g. dry air. The sensor has two pressure connections for differential pressure measurements. A typical application is the measurement of air speed by using a pitot tube.

The main feature and benefit of this sensor is the combination of a high quality production part and robust design with metal housing and motorsport connector.

### Application

Application	0 to 0.1 bar (r)
Pressure reference type	relative
Max. pressure	1,4 bar
Operating temp. range	-20 to 70°C
Media temp. range	-20 to 70°C
Storage temp. range	-40 to 85°C
Max. vibration	200 m/s <sup>2</sup> , 10 to 500 Hz

### Technical Specifications

#### Mechanical Data

Mounting	2 x M3
Fitting	4.5 mm
Installation torque	2 Nm
Weight w/o wire	58 g

Size	37 x 29 x 19 mm
Pressure port	5 mm

#### Electrical Data

Power supply $U_s$	4.8 to 15 V
Max. Power supply $U_s$ max.	15 V
Full scale output $U_A$ at 5 V	0.5 to 4.5 V
Current $I_S$	12 mA

#### Characteristic

Response time $T_{10/90}$	0.1 ms
Compensated range	0 to 50°C
Thermal effects at 0 to 50°C rel. to 25°C	0.1 % FS/°C
Non-linearity and hysteresis	0.1 % FS
Long term stability (1 Mio cycles or 1 year)	± 0.2 % FS
Sensitivity	40,000 mV/bar
Offset	500 mV

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm

Please specify the requested wire length with your order.

Various motorsport and automotive connectors are available on request.

#### Installation Notes

Media: Non-corrosive, non-ionic working gases, such as dry air and dry gases.

The DP-A can be connected directly to most control units.

Any mounting orientation is possible.

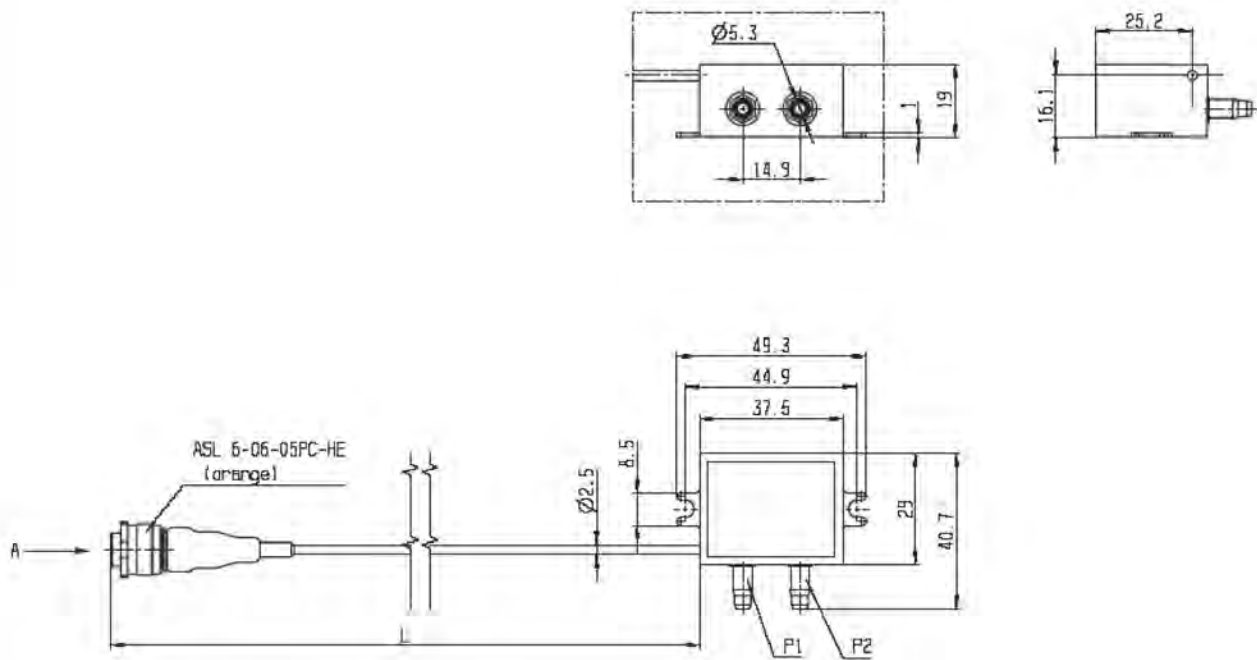
For a correct functionality be sure that the range of supplied pressure  $P_2 \geq P_1$ .

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Pressure Sensor Differential DP-A  
Order number B 261 209 696

Dimensions



## Pressure Sensor Differential DP-C



### Features

- ▶ Relative air pressure measurements
- ▶ Measurement range 0 to 0.1 bar
- ▶ Analog output
- ▶ Very short response time

This sensor is designed to measure the relative pressure of non-corrosive, non-ionic working gases e.g. dry air. The sensor has two pressure connections for differential pressure measurements. A typical application is the measurement of air speed by using a pitot tube. The main feature and benefit of this sensor is the combination of a high quality production part and robust design with metal housing and motorsport connector.

### Application

Application	0 to 0.1 bar (r)
Pressure reference type	relative
Max. pressure	1.4 bar
Operating temp. range	-20 to 70°C
Media temp. range	-20 to 70°C
Storage temp. range	-40 to 85°C
Max. vibration	200 m/s <sup>2</sup> , 10 to 500 Hz

### Technical Specifications

#### Mechanical Data

Mounting	2 x M2.5
Fitting	2.6 mm
Installation torque	2 Nm

Weight w/o wire	24 g
Size	35 x 25 x 19 mm
Pressure port	5 mm

#### Electrical Data

Power supply $U_s$	4.8 to 15 V
Max. power supply $U_s$ max.	15 V
Full scale output $U_A$ at 5 V	0.5 to 4.5 V
Current $I_S$	12 mA

#### Characteristic

Response time $T_{10/90}$	0.1 ms
Compensated range	0 to 50°C
Thermal effects at 0 to 50°C rel. to 25°C	0.1 % FS/°C
Non-linearity and hysteresis	0.1 % FS
Long term stability (1 Mio cycles or 1 year)	± 0.2 % FS
Sensitivity	40,000 mV/bar
Offset	500 mV

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm

Please specify the requested wire length with your order.

Various motorsport and automotive connectors are available on request.

#### Installation Notes

Media: Non-corrosive, non-ionic working gases, such as dry air and dry gases.

The DP-C can be connected directly to most control units.

Any mounting orientation is possible.

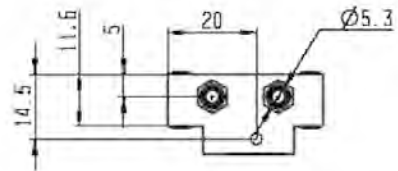
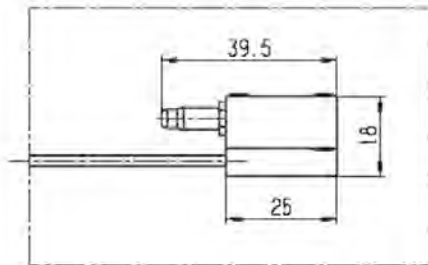
For a correct functionality be sure that the range of supplied pressure  $P_2 \geq P_1$ .

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

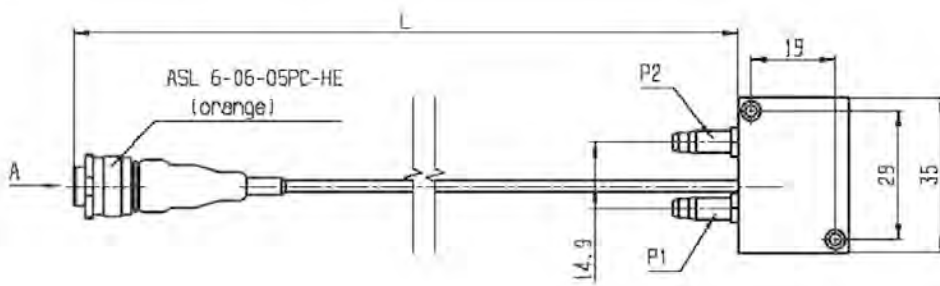
Ordering Information

Pressure Sensor Differential DP-C  
Order number B 261 209 701-01

Dimensions



Auxiliary view A  
Scale: 1:1





## Pressure Sensor Fluid PSC-10



### Features

- ▶ Absolute fluid pressure measurements
- ▶ Measurement range 0.5 to 11.0 bar
- ▶ Analog output

This sensor is designed to measure absolute pressure of various kinds of media e.g. Diesel, gasoline, water, engine oil, transmission oil or air. The sensor is available for two different supply voltage ranges.

The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

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

### Application

Application	0.5 to 11 bar (a)
Pressure reference type	absolute
Max. pressure	20 bar
Operating temp. range	-40 to 125°C (140°C)
Media temp. range	-40 to 125°C (140°C)
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSC-10 (5 V)	PSC-10 (12 V)
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V

Full scale output $U_A$	10 to 90 % $U_s$ ratio-metric	0.5 to 4.5 V non-ratiometric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	400 mV/bar at $U_s = 5 V$	400 mV/bar
Offset	100 mV at $U_s = 5 V$	100 mV

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply $U_s$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_S = 5 V$	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	GND
Pin 3	SIG
Pin 4	$U_s$
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

## Installation Notes

The PSC-10 can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

### PSC-10

4.75 to 5.25 V

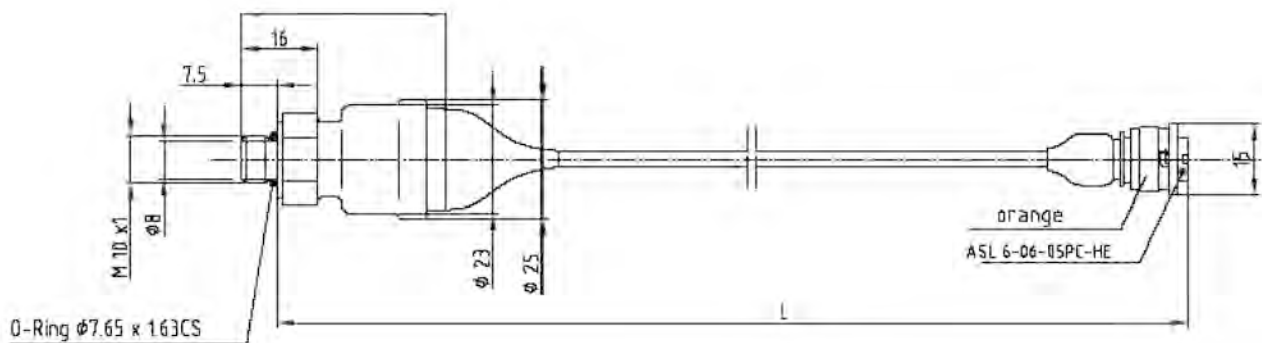
Order number **F 01T A21 304-01**

### PSC-10

8 to 30 V

Order number **B 261 209 079-01**

## Dimensions



## Pressure Sensor Fluid PSC-10R



### Features

- ▶ Relative fluid pressure measurements
- ▶ Measurement range 0 to 10 bar
- ▶ Analog output

This sensor is designed to measure the pressure of media in relation to the ambient pressure (e.g. Diesel, gasoline, water, engine oil, transmission oil or air). The sensor is available for two different supply voltage ranges. The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

The main feature and benefit of this sensor is the combination of both high quality production part and motor-sport connector.

### Application

Application	0 to 10 bar (r)
Pressure reference type	relative
Max. pressure	20 bar
Operating temp. range	Please see variations
Media temp. range	Please see variations
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSC-10R (5 V)	PSC-10R (12 V)
Operating temp. range	-40 to 125°C (140°C)	-40 to 125°C
Media temp. range	-40 to 125°C (140°C)	-40 to 125°C
Power supply $U_S$	4.75 to 5.25 V	8 to 30 V
Full scale output $U_A$	10 to 90 % $U_S$ ratio-metric	0.5 to 4.5 V non-ratiometric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	400 mV/bar at $U_S = 5 V$	400 mV/bar
Offset	500 mV at $U_S = 5 V$	500 mV

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_S$	Please see variations
Max power supply $U_S$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_S = 5 V$	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_S$
Pin 2	GND
Pin 3	SIG
Pin 4	$U_S$
Pin 5	-

Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The PSC-10R can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### PSC-10R

4.75 to 5.25 V

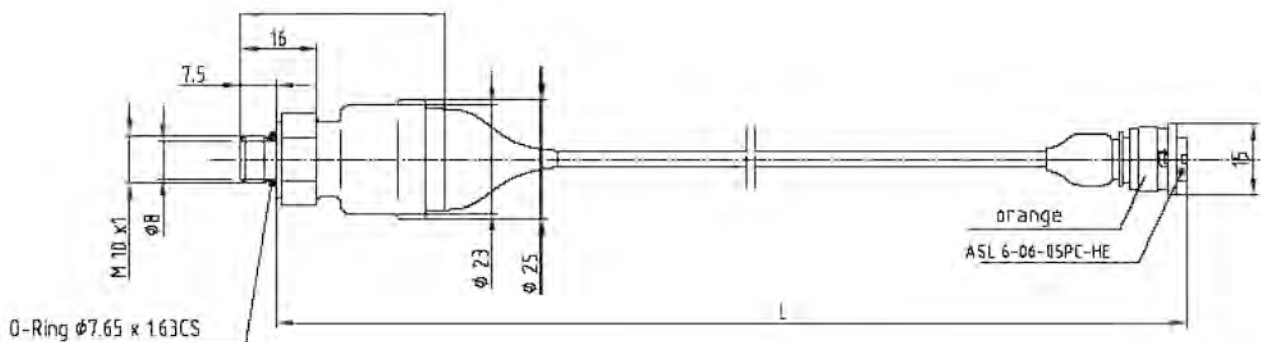
Order number **F 01T A21 303**

#### PSC-10R

8 to 30 V

Order number **F 01T A21 305-01**

### Dimensions



## Pressure Sensor Fluid PSC-250R



### Features

- ▶ Relative fluid pressure measurements
- ▶ Measurement range 0 to 250 bar
- ▶ Analog output

This sensor is designed to measure the pressure of media in relation to the ambient pressure (e.g. Diesel, gasoline, water, engine oil, transmission oil or air). The sensor is available for two different supply voltage ranges. The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

The main feature and benefit of this sensor is the combination of both high quality production part and motor-sport connector.

### Application

Application	0 to 250 bar (r)
Pressure reference type	relative
Max. pressure	500 bar
Operating temp. range	Please see variations
Media temp. range	Please see variations
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSC-250R (5 V)	PSC-250R (12 V)
Operating temp. range	-40 to 125°C (140°C)	-40 to 125°C
Media temp. range	-40 to 125°C (140°C)	-40 to 125°C
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V
Full scale output $U_A$	10 to 90 % $U_s$ ratio-metric	0.5 to 4.5 V non-ratiometric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	40 mV/bar at $U_s = 5$ V	40 mV/bar
Offset	500 mV at $U_s = 5$ V	500 mV

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply $U_s$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_s = 5$ V	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	-



## Pressure Sensor Fluid PSC-260



### Features

- ▶ Absolute fluid pressure measurement
- ▶ 0 to 260 bar
- ▶ For gasoline, Diesel, oil or brake fluid
- ▶ Robust and compact design
- ▶ High robustness against vibrations

The PSC-260 is specially designed to measure absolute pressure in gasoline direct injection applications. This sensor is also compatible with other kind of fluids e.g. Diesel, engine oil, transmission oil or brake fluid. The sensor uses a thin layer technique to achieve high accuracy pressure measurements. The stainless steel measuring cells with piezoresistive bridges are hermetically welded with stainless steel pressure ports. The internal reference ensures ambient pressure independent measurements.

The main benefits of this sensor are its high accuracy, its wide measurement range and its robust and compact design.

### Application

Application	0 to 260 bar (a)
Pressure reference type	absolute
Max. pressure	320 bar
Operating temp. range	-40 to 130°C (140°C)
Media temp. range	-40 to 130°C (140°C)
Storage temp. range	-30 to 60°C
Max. vibration	560 m/s <sup>2</sup> at 800 to 900 Hz 350 m/s <sup>2</sup> at 1.000 to 2.500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M10 x 1
Wrench size	27 mm
Installation torque	22 Nm in steel 32.5 Nm in aluminum
Weight w/o wire	35,2 g
Sealing	sealed cone

#### Electrical Data

Power supply $U_S$	4.75 to 5.25 V
Max power supply $U_S$ max	16 V
Full scale output $U_A$	10 to 90 % $U_S$ ratio metric
Current $I_S$	12 mA

#### Characteristic

Load capacity	10 nF
Output resistance	10 $\Omega$
Tolerance (FS)	+ 1 % (0 to 100°C) + 1.5 % (-40 to 0°C and 100 to 130°C)
Sensitivity	15 mV/bar at $U_S = 5$ V
Offset	500 mV at $U_S = 5$ V

#### Connectors and Wires

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 motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The PSC-260 can be connected directly to most control units. Please consider the TCI for the electrical connection of the sensor.

The sensor has a protection for overvoltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

Please consider using the adapter F 02U 002 711-01.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

**Ordering Information**

**Pressure Sensor Fluid PSC-260**

Order number **F02U V00 990-02**

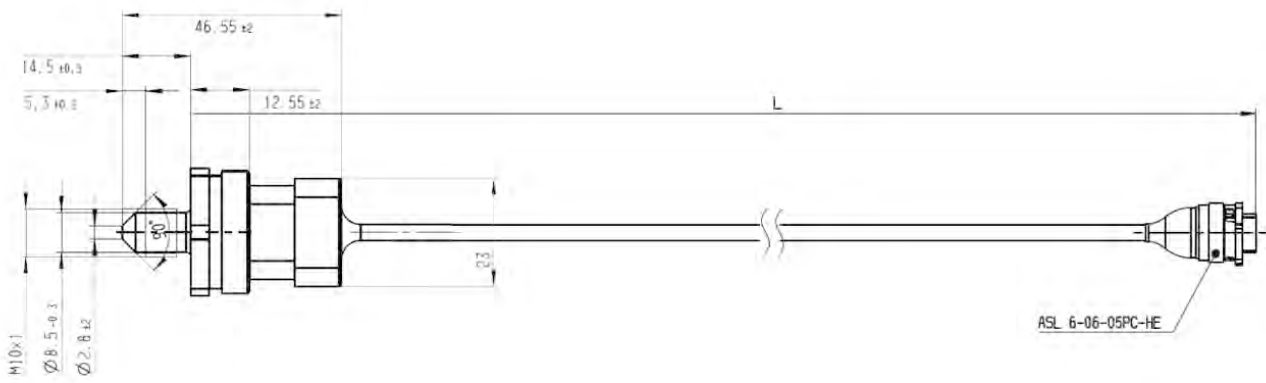
**Accessories**

**Adapter**

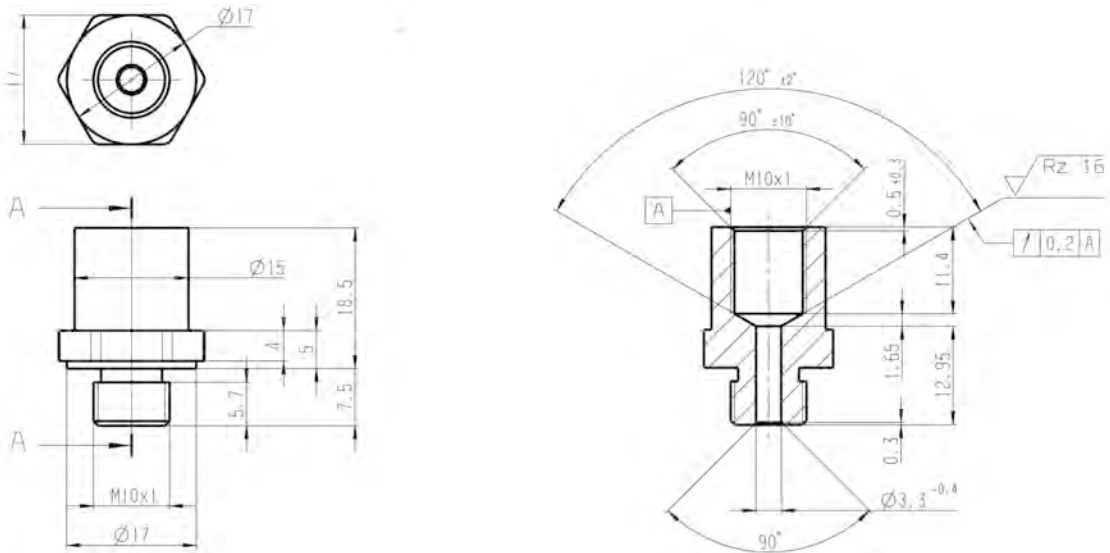
Order number **F 02U 002 711-01**

4

**Dimensions**



**Sensor**



**Adapter**



## Pressure Sensor Fluid PSM



### Features

- ▶ Absolute fluid pressure measurements
- ▶ Pressure measurement range 0 to 12 bar or 0 to 250 bar
- ▶ High robustness against vibrations
- ▶ Compact design
- ▶ Analog output

This sensor is designed to measure absolute pressure of various kinds of media e.g. Diesel, gasoline, water, engine oil, transmission oil or air. The sensor is available for two different supply voltage ranges.

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

An individual calibration sheet will be delivered with each sensor.

The main feature and benefit of this sensor is a good protection against vibrations.

### Application

Application	Please see Variations
Pressure reference type	absolute
Max. pressure	Please see Variations
Operating temp. range	-20 to 120°C
Media temp. range	-20 to 120°C
Storage temp. range	-20 to 50°C
Bio fuel compatibility	E85/M100
Max. vibration	1,000 m/s <sup>2</sup> max at 5 to 5,000 Hz (sine)

### Technical Specifications

#### Variations

	0 to 12	0 to 250
Measuring range	0 to 12 bar	0 to 250 bar
Tolerance (FS) at $U_s = 5\text{ V}$	$\pm 0.12\text{ bar}$	$\pm 2.5\text{ bar}$
Max. pressure	24 bar	500 bar

#### Mechanical Data

Male thread	M10x1
Wrench size	16 mm
Installation torque	10 Nm
Weight w/o wire	24.5 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	8 to 16 V
Full scale output UA 4.9 V	$\pm 1.5\%$
Current $I_S$	25 mA

#### Characteristic

Compensated range	0 to 120°C
Tolerance (FS) at $U_s = 5\text{ V}$	Please see Variations
Tolerance (FS)	$\pm 1\%$
Sensitivity/Offset	(an individual calibration sheet will be delivered)

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	SCR
Sleeve	Viton
Wire size	AWG 24
Wire length L	15 to 100 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Installation Notes

The PSM can be connected directly to most control units.

Each mounting orientation is possible.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

100 % relative humidity is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### PSM

0 to 12 bar

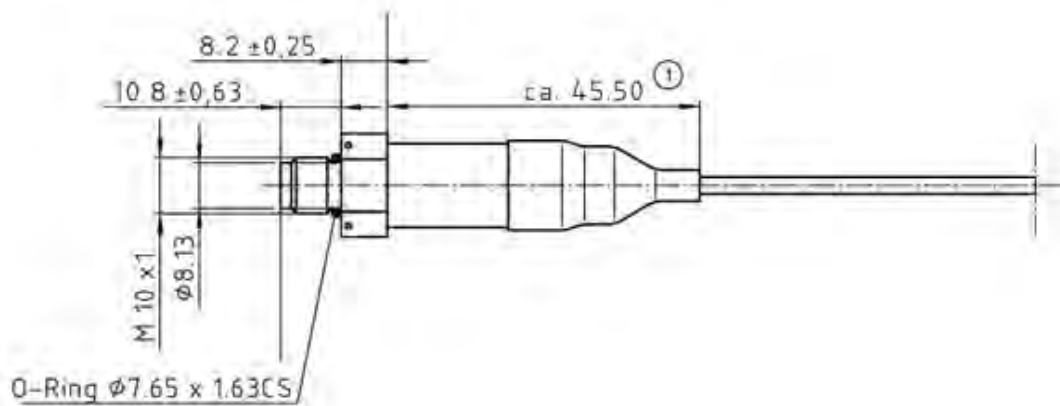
Order number **B 261 209 331**

#### PSM

0 to 250 bar

Order number **B 261 209 332-01**

### Dimensions



## Pressure Sensor Fluid PSM-S



### Features

- ▶ Absolute fluid pressure measurements
- ▶ Pressure measurement range 0 to 12 bar or 0 to 70 bar
- ▶ High robustness against vibrations
- ▶ Compact design
- ▶ Analog output

This sensor is designed to measure absolute pressure of various kinds of media e.g. Diesel, gasoline, water, engine oil, transmission oil or air. The sensor is available for two different supply voltage ranges.

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

An individual calibration sheet will be delivered with each sensor.

The main feature and benefit of this sensor is a good protection against vibrations.

### Application

Application	0 to 12 bar (a)
Pressure reference type	absolute
Max. pressure	Please see variations
Operating temp. range	-55 to 140°C
Media temp. range	-55 to 140°C
Storage temp. range	-20 to 50°C
Bio fuel compatibility	E85/M100
Max. vibration	1,000 m/s <sup>2</sup> max at 5 to 10,000 Hz (sine)

### Technical Specifications

#### Variations

	0 to 12	0 to 70
Measuring range	0 to 12 bar	0 to 70 bar
Tolerance (FS) at $U_s = 5\text{ V}$	$\pm 0.24\text{ bar}$	$\pm 0.7\text{ bar}$
Tolerance (FS)	$\pm 2\%$	$\pm 1\%$
Max. pressure	36 bar	210 bar

#### Mechanical Data

Male thread	M8x1
Wrench size	13 mm
Installation torque	6 Nm
Weight w/o wire	20 g
Sealing	O-ring 6.07 x 1.62 mm

#### Electrical Data

Power supply $U_s$	8 to 16 V
Full scale output $U_A$	$4.7\text{ V} \pm 1.5\%$

#### Characteristic

Compensated range	0 to 125 °C
Tolerance (FS) at $U_s = 5\text{ V}$	Please see variations
Tolerance (FS)	Please see variations
Sensitivity/Offset	(an individual calibration sheet will be delivered)

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	$U_s$
Pin 2	GND
Pin 3	SIG
Pin 4	-
Pin 5	SCR
Sleeve	Viton
Wire size	AWG 24
Wire length L	15 to 100 cm
Various motorsport and automotive connectors are available on request.	
Please specify the required wire length with your order.	

#### Installation Notes

The PSM-S can be connected directly to most control units.

Each mounting orientation is possible.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

100 % relative humidity is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### PSM-S

0 to 12 bar, 36 bar,  $\pm 0.24$  bar,  $\pm 2\%$

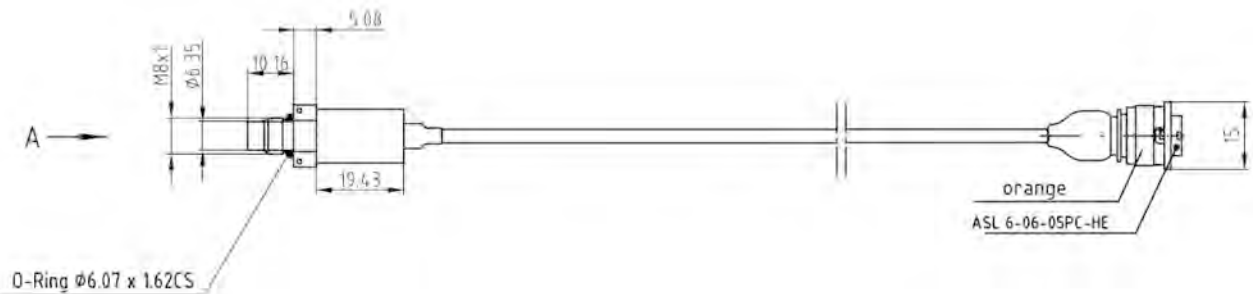
Order number **F 01T A21 315-01**

#### PSM-S

0 to 70 bar, 210, 36 bar,  $\pm 0.7$  bar,  $\pm 1\%$

Order number **F 01T A21 316-01**

### Dimensions



## Pressure Sensor Fluid PSS-10



### Features

- ▶ Absolute fluid pressure measurements
- ▶ Measurement range 0.5 to 11.0 bar
- ▶ Analog output
- ▶ Integrated series connector

This sensor is designed to measure absolute pressure of various kinds of media e.g. Diesel, gasoline, water, engine oil, transmission oil or air.

The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique. These are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

The main benefit of this sensor is the high quality of a production part at a low price. The sensor is available for two different supply voltage ranges.

### Application

Application	0.5 to 11 bar (a)
Pressure reference type	absolute
Max. pressure	20 bar
Operating temp. range	-40 to 125°C (140°C)
Media temp. range	-40 to 125°C (140°C)
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSS-10 (5 V)	PSS-10 (12 V)
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V

Full scale output $U_a$	10 to 90% $U_s$ ratio-metric	0.5 to 4.5 V non-ratiometric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	400 mV/bar at $U_s=5$ V	400 mV/bar
Offset	100 mV at $U_s=5$ V	100 mV
Mating connector	261 205 339	261 205 334

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply $U_s$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_s = 5$ V	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please variations
Offset	Please variations

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	Please see variations
Pin 1	GND
Pin 2	SIG
Pin 3	$U_s$
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

## Installation Notes

The PSS-10 can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

### PSS-10

4.75 to 5.25 V

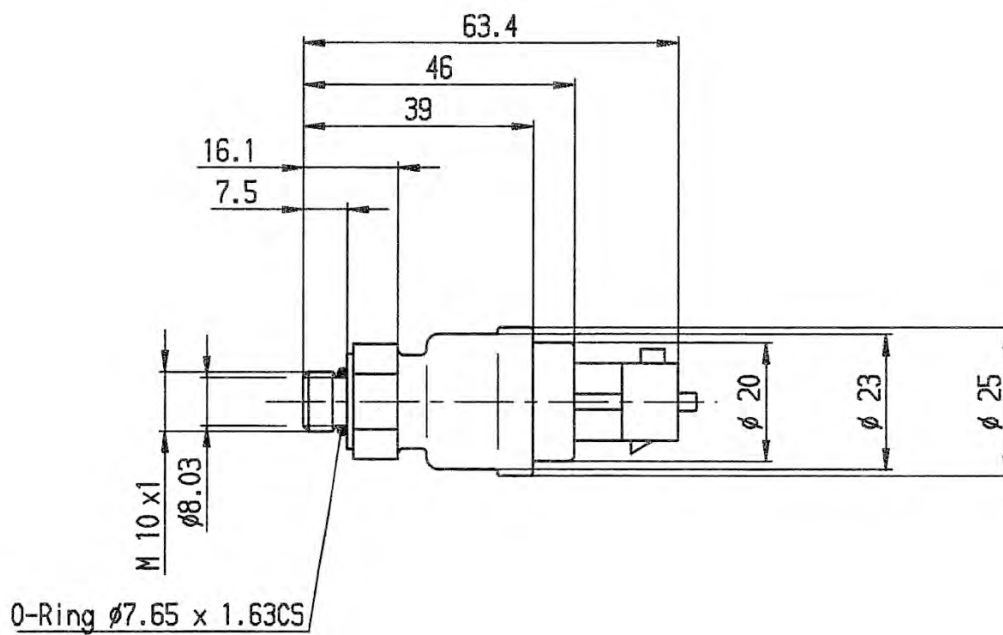
Order number **B 261 209 341-01**

### PSS-10

8 to 30 V

Order number **B 261 209 064-01**

## Dimensions



## Pressure Sensor Fluid PSS-10R



### Features

- ▶ Relative fluid pressure measurements
- ▶ Measurement range 0 to 10 bar
- ▶ Analog output
- ▶ Integrated series connector

This sensor is designed to measure the pressure of media in relation to the ambient pressure (e.g. Diesel, gasoline, water, engine oil, transmission oil, air). The sensor is available for two different supply voltage ranges.

The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

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

### Application

Application	0 to 10 bar (r)
Pressure reference type	relative
Max. pressure	20 bar
Operating temp. range	Please see variations
Media temp. range	Please see variations
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSS-10 (5 V)	PSS-10 (12 V)
Operating temp. range	-40 to 125°C (140°C)	-40 to 125°C
Media temp. range	-40 to 125°C (140°C)	-40 to 125°C
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V
Full scale output $U_a$	10 to 90% $U_s$ ratio-metric	0.5 to 4.5 V non-ratio-metric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	400 mV/bar at $U_s=5$ V	400 mV/bar
Offset	500 mV at $U_s=5$ V	500 mV
Mating connector	D 261 205 339	D 261 205 334

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply $U_s$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90 °C
Tolerance (FS) at $U_s = 5$ V	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	Please see variations
Pin 1	Gnd
Pin 2	Sig
Pin 3	$U_s$
Pin 4	-

Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Installation Notes

The PSS-10R can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

#### Ordering Information

##### PSS-10R

4.75 to 5.25 V

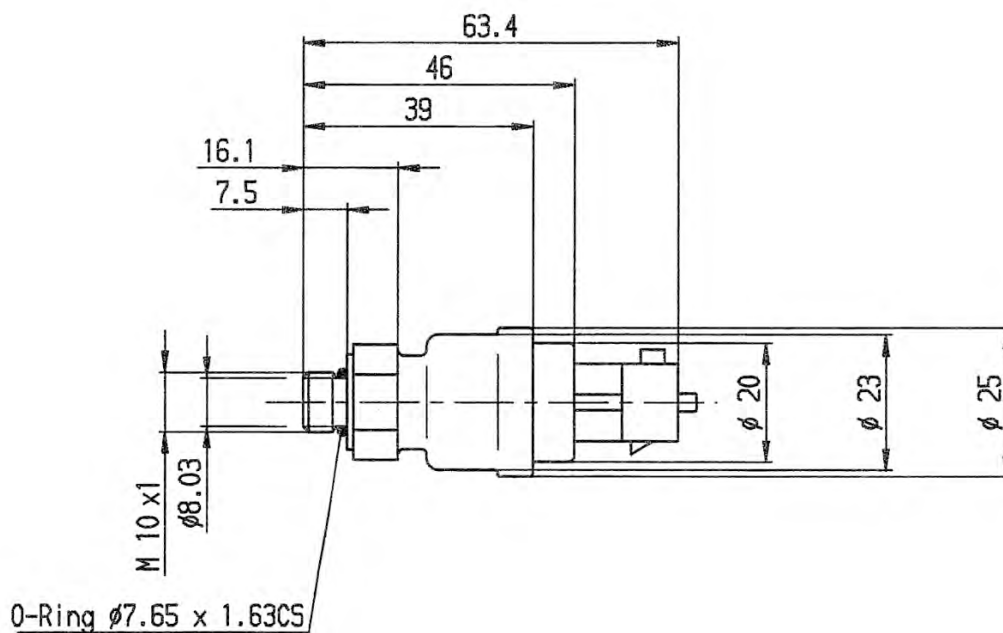
Order number **F 01T A21 312-01**

##### PSS-10R

8 to 30 V

Order number **F 01T A21 307**

#### Dimensions





## Pressure Sensor Fluid PSS-100R



### Features

- ▶ Relative fluid pressure measurements
- ▶ Measurement range 0 to 100 bar
- ▶ Analog output
- ▶ Integrated series connector

This sensor is designed to measure the pressure of media in relation to the ambient pressure (e.g. Diesel, gasoline, water, engine oil, transmission oil or air). The sensor is available for two different supply voltage ranges. The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

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

### Application

Application	0 to 100 bar (r)
Pressure reference type	relative
Max. pressure	200 bar
Operating temp. range	Please see variations
Media temp. range	Please see variations
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSS-100R (5 V)	PSS-100R (12 V)
Operating temp. range	-40 to 125°C (140°C)	-40 to 125°C
Media temp. range	-40 to 125°C (140°C)	-40 to 125°C
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V
Full scale output $U_A$	10 to 90 % $U_s$ ratio-metric	0.5 to 4.5 V non-ratio-metric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	40 mV/bar at $U_s = 5$ V	40 mV/bar
Offset	500 mV at $U_s = 5$ V	500 mV
Mating connector	261 205 339	261 205 334

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	Please see variations

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_s = 5$ V	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	Please see variations
Pin 1	Gnd
Pin 2	Sig
Pin 3	$U_s$
Sleeve	DR-25

Wire size	AWG 24
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Wire length L	13 to 95 cm
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Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The PSS-100R can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### PSS-100R

4.75 to 5.25 V

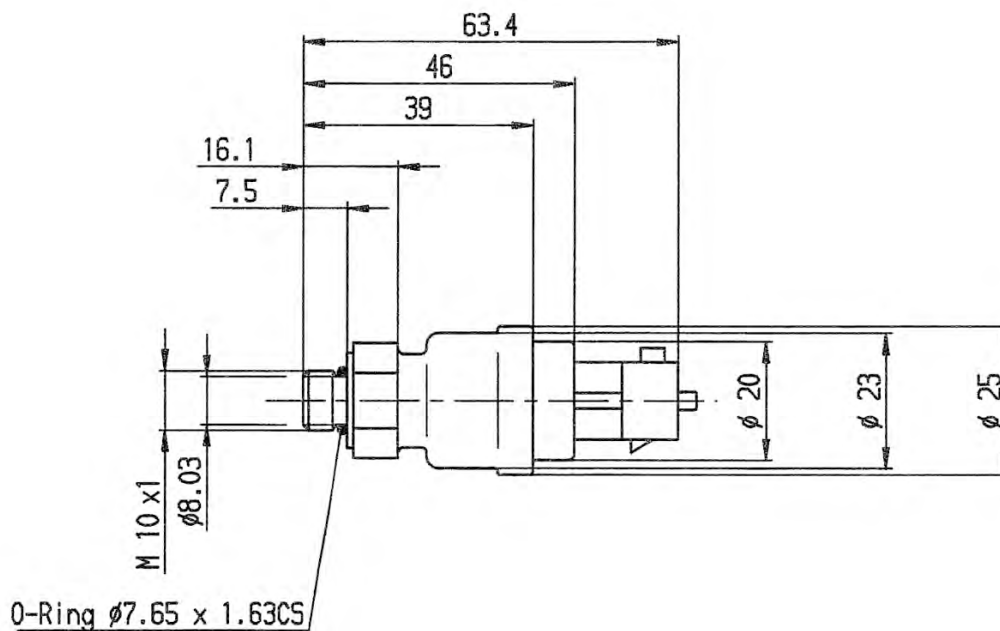
Order number **B 261 209 347-01**

#### PSS-100R

8 to 30 V

Order number **F 01T A21 310**

### Dimensions



## Pressure Sensor Fluid PSS-250R



### Features

- ▶ Relative fluid pressure measurements
- ▶ Measurement range 0 to 250 bar
- ▶ Analog output
- ▶ Integrated series connector

This sensor is designed to measure the pressure of media in relation to the ambient pressure (e.g. Diesel, gasoline, water, engine oil, transmission oil or air). The sensor is available for two different supply voltage ranges. The sensor uses stainless steel measuring cells with piezo-resistive measuring bridges in thin layer technique, which are hermetically welded together with stainless steel pressure ports. This guarantees a complete media compatibility.

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

### Application

Application	0 to 250 bar (r)
Pressure reference type	relative
Max. pressure	500 bar
Operating temp. range	Please see variations
Media temp. range	Please see variations
Storage temp. range	-20 to 50°C
Bio fuel compatibility	-
Max. vibration	100 m/s <sup>2</sup> rms at 10 to 2,000 Hz

### Technical Specifications

#### Variations

	PSS-250R (5 V)	PSS-250R (12 V)
Operating temp. range	-40 to 125°C (140°C)	-40 to 125°C
Media temp. range	-40 to 125°C (140°C)	-40 to 125°C
Power supply $U_s$	4.75 to 5.25 V	8 to 30 V
Full scale output $U_A$	10 to 90 % $U_s$ ratio-metric	0.5 to 4.5 V non-ratio-metric
Response time T10/90	1.5 ms	1.0 ms
Sensitivity	16 mV/bar at $U_s = 5$ V	16 mV/bar
Offset	500 mV at $U_s = 5$ V	500 mV
Mating connector	261 205 339	261 205 334

#### Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 7.65 x 1.63 mm

#### Electrical Data

Power supply $U_s$	Please see variations
Max power supply $U_s$ max	± 30 V
Full scale output $U_A$	Please see variations
Current $I_S$	8 mA

#### Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_s = 5$ V	± 0.1 bar
Tolerance (FS)	± 1 %
Sensitivity	Please see variations
Offset	Please see variations

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	Please see variations
Pin 1	GND
Pin 2	SIG
Pin 3	$U_s$
Pin 4	-

Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The PSS-250R can be connected directly to most control units.

The sensor has a protection for over voltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### PSS-250R

4.75 to 5.25 V

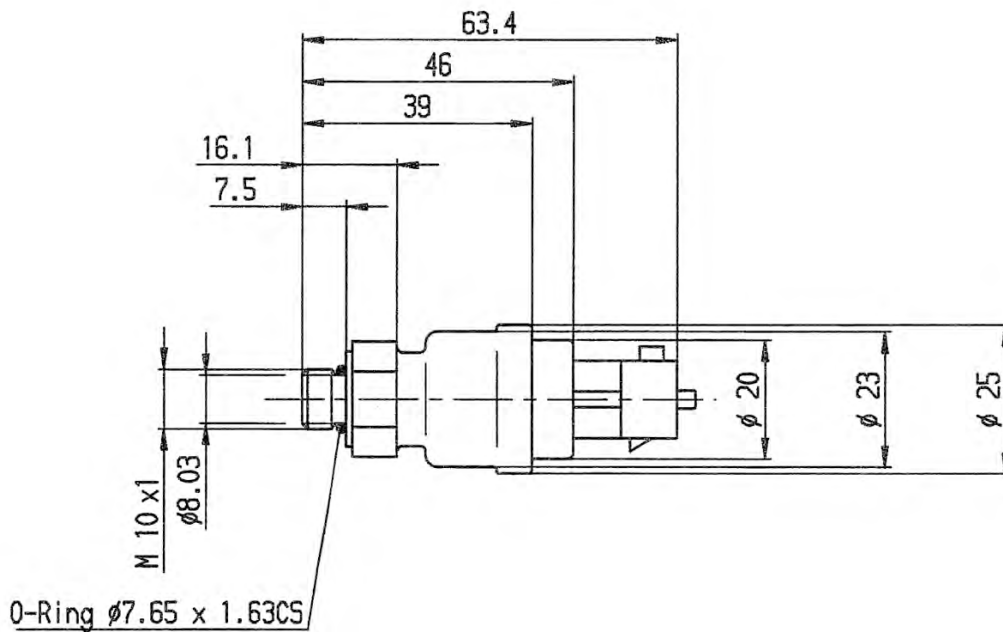
Order number **B 261 209 965-01**

#### PSS-250R

8 to 30 V

Order number **B 261 209 067-01**

### Dimensions



## Pressure Sensor Fluid PSS-260



### Features

- ▶ Absolute fluid pressure measurement
- ▶ 0 to 260 bar
- ▶ For gasoline, Diesel, oil or brake fluid
- ▶ Robust and compact design

The PSS-260 is specially designed to measure absolute pressure in gasoline direct injection applications. This sensor is also compatible with other kind of fluids e.g. Diesel, engine oil, transmission oil or brake fluid.

The sensor uses a thin layer technique to achieve high accuracy pressure measurements. The stainless steel measuring cells with piezoresistive bridges are hermetically welded with stainless steel pressure ports. The internal reference ensures ambient pressure independent measurements.

The main benefits of this sensor are its high accuracy, its wide measurement range and its robust and compact design.

### Application

Application	0 to 260 bar (a)
Pressure reference type	absolute
Max. pressure	320 bar
Operating temp. range	-40 to 130°C (140°C)
Media temp. range	-40 to 130°C (140°C)
Storage temp. range	-30 to 60°C
Max. vibration	127 m/s <sup>2</sup> RMS at 800 to 2,500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M10 x 1
Wrench size	27 mm

Installation torque	22 Nm in steel 32.5 Nm in aluminum
Weight w/o wire	35.2 g
Sealing	sealed cone

#### Electrical Data

Power supply $U_s$	4.75 to 5.25 V
Max power supply $U_s$ max	16 V
Full scale output $U_A$	10 to 90 % $U_s$ ratio metric
Current $I_s$	12 mA

#### Characteristic

Load capacity	10 nF
Output resistance	10 $\Omega$
Tolerance (FS)	+ 1 % (0 to 100°C) + 1.5 % (-40 to 0°C and 100 to 130°C)
Sensitivity	15 mV/bar at $U_s = 5$ V
Offset	500 mV at $U_s = 5$ V

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 334-01
Pin 1	GND
Pin 2	SIG
Pin 3	$U_s$

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The PSS-260 can be connected directly to most control units. Please consider the TCI for the electrical connection of the sensor.

The sensor has a protection for overvoltage, reverse polarity and short-circuit.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.

Each mounting orientation is possible.

Please consider using the adapter F 02U 002 711-01.

The sensor meets all EMV, EMC and ESD automotive standards.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Pressure Sensor Fluid PSS-260**  
Order number **0 261 545 030**

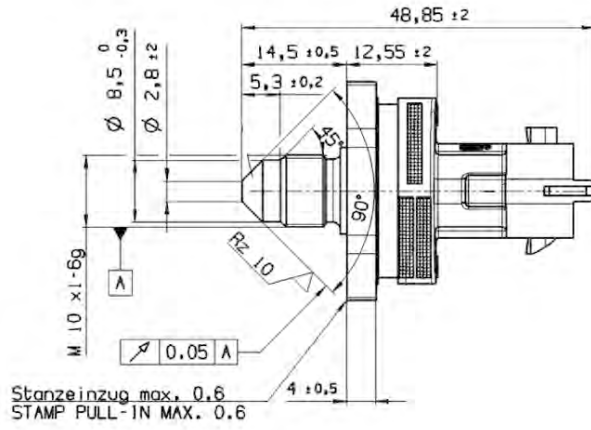
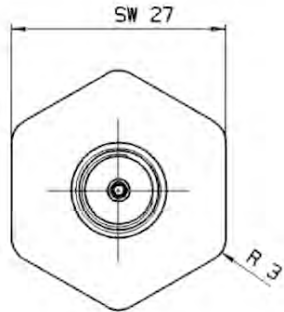
Accessories

Adapter

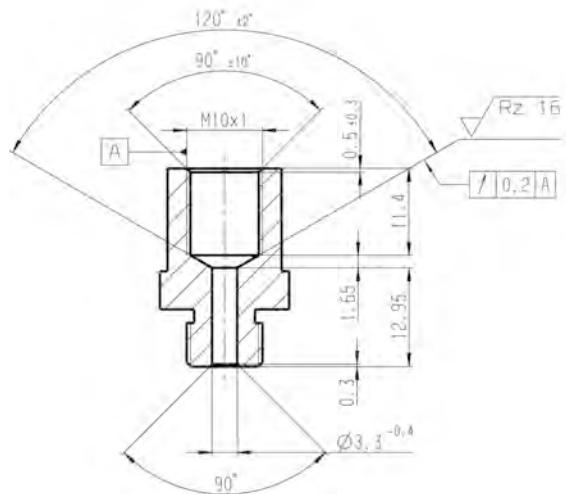
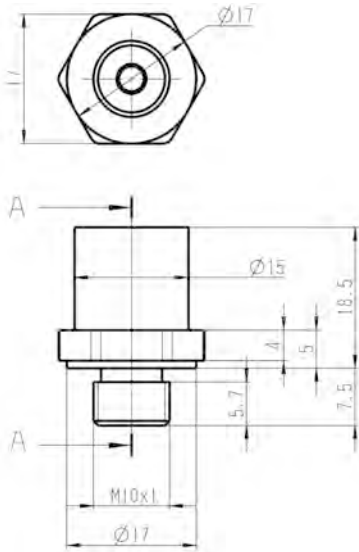
Order number F 02U 002 711-01

Dimensions

4



Sensor



Adapter

## Pressure Sensor Fluid PST-F



### Features

- ▶ Absolute fluid pressure and temperature measurements
- ▶ Pressure measurement range 0.5 to 6.0 bar
- ▶ Temperature measurement range -40 to 125°C
- ▶ Analog output

This sensor is designed to measure absolute pressure and temperature of various kinds of fluids e.g. Diesel, gasoline, oil or transmission oil.

The PST-F is equipped with a piezo-resistive pressure sensor element integrated in a silicon chip together with signal processing electronics. The active surface of this chip is exposed to a reference vacuum. The temperature sensor element is an NTC-resistor.

The main feature of this sensor is the integration of two functions (fluid pressure and fluid temperature) in one housing.

### Application

Application 1	0.5 to 6 bar (a)
Application 2	-40 to 125°C
Reference	absolute
Max. pressure	20 bar
Operating temp. range	-40 to 125°C
Storage temp. range	-40 to 130°C
Biofuel compatibility	E22, M15
Max. vibration	40 m/s <sup>2</sup> at 1 to 250 Hz 60 m/s <sup>2</sup> at 250 to 2,600 Hz 40 m/s <sup>2</sup> at 260 to 3,200 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M6
Weight without wire	30 g
Wrench size	10 mm
Installation torque	11.5 Nm
Sealing	O-ring 13.95 x 2.62 mm

#### Electrical Data

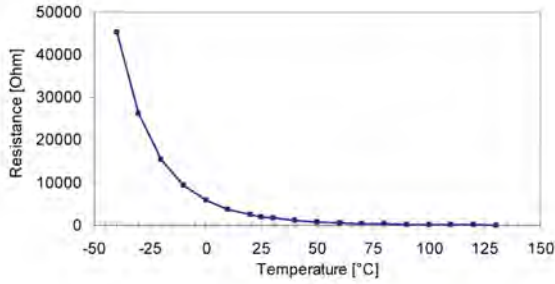
Power supply $U_s$	4.75 to 5.25 V
Max power supply $U_{S\ max}$	16 V
Full scale output P	0.5 to 4.5 V
Current $I_S$	9 mA

#### Characteristic 1

Response time $T_{10/90}$	1 ms
Output load	10 k $\Omega$
Sensitivity	727 mV/bar
Offset	500 mV

#### Characteristic 2

T [°C]	R [ $\Omega$ ]
-40	45,303
-30	26,108
-20	15,458
-10	9,395
0	5,671
10	3,791
20	2,499
30	1,706
40	1,174
50	834
60	595
70	436
80	322
90	243
100	187
110	144
120	113
125	100
Response Time tau 63	45 s in air; v = 6 m/s



To avoid noise, an ECU-input circuit with a RC-low pass filter is recommended.  
(R = 21 kΩ, C = 100 nF)

For the temperature measurement, a 1 kΩ pull-up at 5 V is recommended.

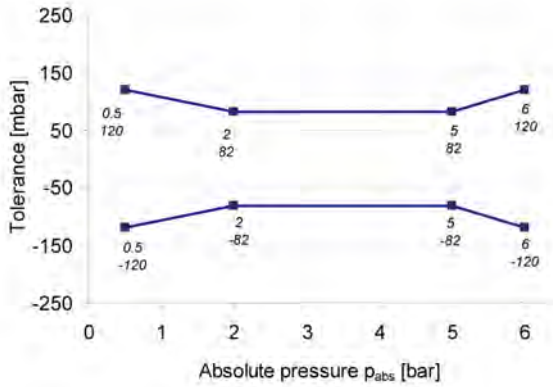
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

**Ordering Information**

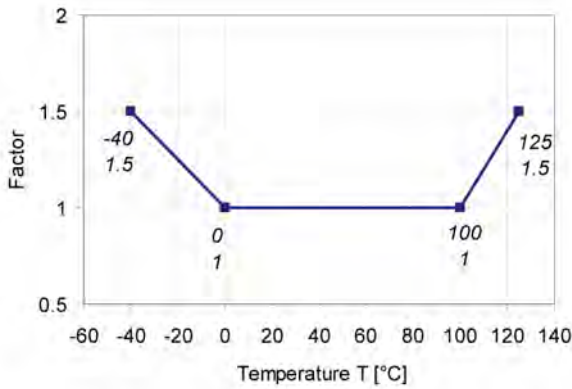
**Pressure Sensor Fluid PST-F**  
Order number **0 261 230 147**

**4**

**Tolerance**



**Expansion of Tolerance**



**Connectors and Wires**

Connector	Bosch Compact
Mating connector	D 261 205 336-01
Pin 1	Gnd
Pin 2	NTC
Pin 3	U <sub>s</sub>
Pin 4	Pressure Sig

**Installation Notes**

The sensor can be connected directly to most control units.

Please do not fix the sensor directly to the engine block to avoid undesired strong vibrations.





## Pressure Sensor Fluid PST-F 2



4

### Features

- ▶ Absolute fluid pressure and temperature measurements
- ▶ Pressure measurement range 0 to 280 bar
- ▶ Temperature measurement range -40°C to 140°C

This sensor is designed to measure absolute gasoline pressure and gasoline temperature in direct injection systems.

The pressure measurement is based on the expansion of a steel diaphragm, where strain gauges are placed to form a Wheatstone bridge. The measured signal is proportional to the pressure and is processed in an application specific integrated circuit.

The temperature measurement is conducted by a NTC-Thermistor. The main feature of this sensor is its compact design and the integration of two functions (pressure and temperature measurements) in one housing.

### Application

Application 1	0 to 280 bar (a)
Application 2	-40 to 140°C
Reference	Absolute
Max. pressure $p_{absmax}$	340 bar
Operating temp. range	-40 to 130°C (140°C)
Media temp. range	-40 to 130°C (140°C)
Storage temp. range	-30 to 60°C
Biofuel compatibility	E26
Max. vibration	210 m/s <sup>2</sup> at 147 to 1350 Hz 175 m/s <sup>2</sup> at 1350 to 2000 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M10x1
Weight without wire	36 g

Wrench size	27 mm
Installation torque	40 Nm
Sealing	Sealed cone

#### Electrical Data

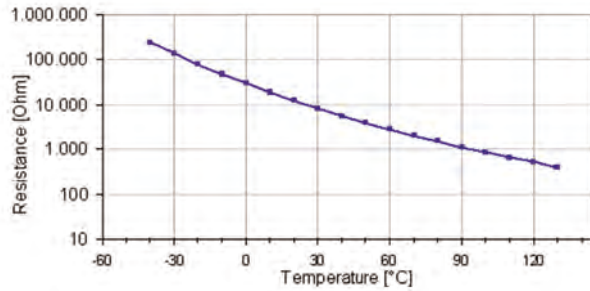
Power supply $U_s$	4.75 to 5.25 V
Max power supply $U_s$ max	16 V
Full scale output $U_A$ (V)	0.5 to 4.5 V $U_s$ ratio metric
Current $I_S$	12 mA

#### Characteristic 1

Response time T10/90	Pressure: 0,2 to 0,8 ms Temperature: 9 s (response time of temperature signal in oil dip bath 20 to 100°C)
Compensated range	-40 to 130°C
Tolerance (FS) at $U_s$	+/- 1 % at 0 to 100°C +/- 1.5% at -40 to 0°C and 100 to 130°C
Sensitivity	14,3 mV/bar @ $U_s = 5$ V
Offset	500 mV at $U_s = 5$ V

#### Characteristic 2

T [°C]	R [Ω]
-40	243,241
-30	135,753
-20	78,716
-10	47,258
0	29,287
10	18,684
20	12,240
30	8,218
40	5,642
50	3,955
60	2,826
70	2,055
80	1,519
90	1,141
100	868.4
110	669.9
120	523.2
130	413.3
140	330.0



### Connectors and Wires

Connector	Bosch Compact
Mating Connector	F02U B00 596-01
Pin 1	GND
Pin 2	Sig
Pin 3	NTC
Pin 4	U <sub>s</sub>

### Installation Notes

The sensor can be connected directly to most control units.

For the temperature measurement, please use a pull-up resistor with an optimal value 4.6kOhm.

Please note that using the adapter F02U 002 956-01 in connection with the PST-F 2 the ambient conditions could be changed (e.g. medium temperature dissipation or undesired vibrations).

The sensor has a protection for overvoltage, reverse polarity and short-circuit.

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 available at <http://www.bosch-motorsport.com>

### Ordering Information

#### Pressure Sensor Fluid PST-F 2

Order number **0 261 B10 554-00**

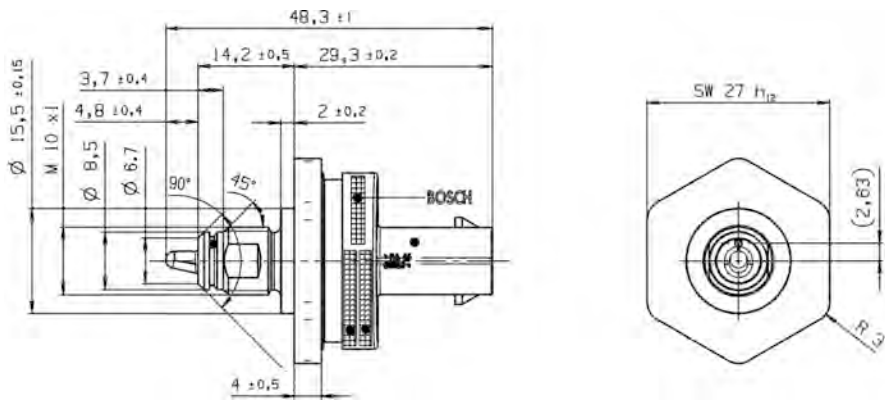
#### Accessories

#### Pressure Sensor Fluid PST-F 2 Adapter

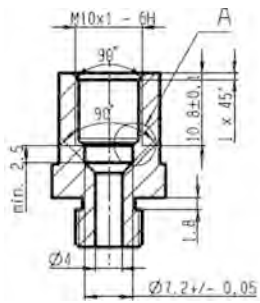
Order number **F02U 002 956-01**

Dimensions

4



Pressure Sensor Fluid PST-F 2



Pressure Sensor Fluid PST-F 2 Adapter

## Rotary Potentiometer RP 50-/130-/350-M



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range: 0 to 50°, 0 to 130° or 0 to 350°
- ▶ Robust aluminum housing
- ▶ Wide operating temperature range

These sensors are designed to measure rotational movement, e.g. throttle angle, spring travel, gearbox position or steering angle.

A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. The housings 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 sensors are fitted in a shrink down boot for additional protection.

The main benefit of these sensors is the combination of high accuracy, very robust aluminum housing and motor-sport spec connection.

### Application

Measuring range	Please see Variations
Operating temperature range	-55 to 125°C

### Technical Specifications

#### Variations

	RP 50-M	RP 130-M	RP 350-M
Measuring range	0 to 50°	0 to 130°	0 to 350°
Total resistance	3 kΩ	4 kΩ	8 kΩ
Max. allowable contact current	1 mA	10 mA	1 mA

Connector	ASL 6-06-05PA- HE	KPTA 6E6-4P-C- DN	ASL 6-06-05PA- HE
Mating connector	ASL 0-06-05SA- HE	KPTA 1E6-4S-C- DN	ASL 0-06-05SA- HE

#### Mechanical Data

Weight w/o wire	38 g
Protection class	IP66
Mounting	2 x M4
Housing	Aluminum alloy

#### Electrical Data

Power supply $U_s$	5 V
Maximal power supply	42 V
Total resistance	Please see Variations
Current $I_S$	1 $\mu$ A
Max. allowable contact current	Please see Variations

#### Characteristic

Direction of rotation	Anti-clockwise
-----------------------	----------------

Both rotation directions are available on request.

#### Connectors and Wires

Connector	Please see Variations
Mating connector	Please see Variations
Pin 1 (A)	$U_s$
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

#### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Both rotation directions and other rotation angles available on request.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

**Ordering Information**

**Rotary Potentiometer RP 50-M**

Order number **B 261 209 571-01**

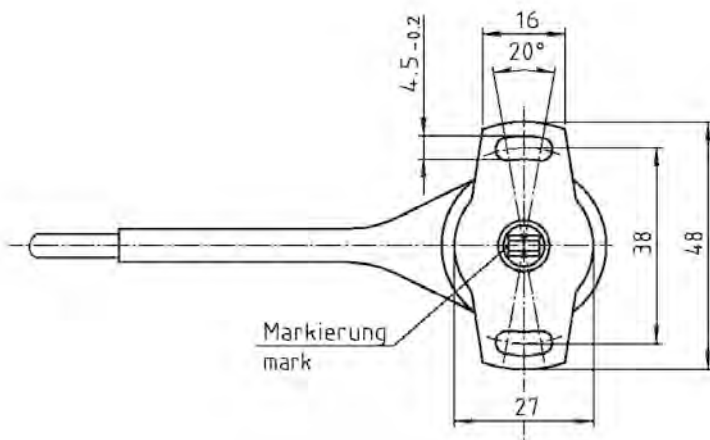
**Rotary Potentiometer RP 130-M**

Order number **B 261 209 576**

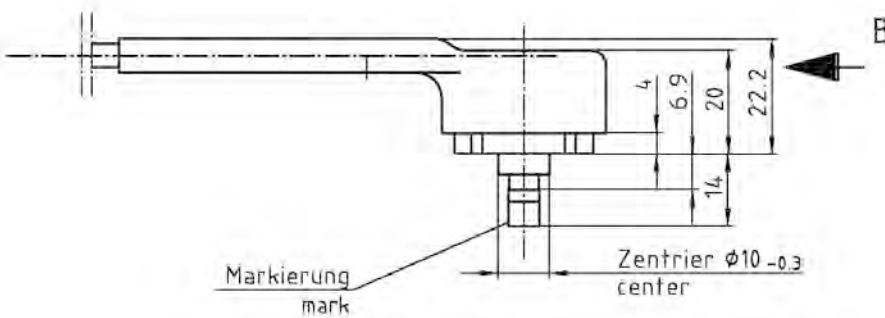
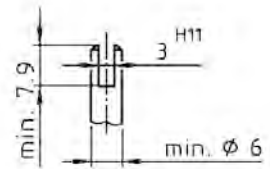
**Rotary Potentiometer RP 350-M**

Order number **B 261 209 577-01**

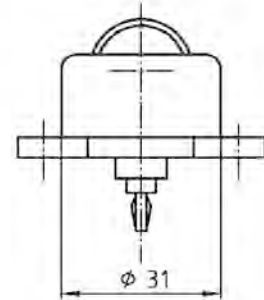
**Dimensions**



- Abmessungen der Antriebsseite
- dimension of driveshaft



**Ansicht B**  
view



## Rotary Potentiometer RP 55



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range 0 to 55°
- ▶ Quill shaft mounting

This sensor is designed to measure rotational movement, e.g. spring travel.

A rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus a voltage proportional to the angle can be measured. The housing is made of shock resistant aluminum. The internals are made of high temperature resistant synthetic material. The main benefit of this sensor is the special way of mounting with a quill shaft.

### Application

Application	0 to 55°
Operating temperature range	-25 to 75°C
Storage temperature range	-25 to 105°C
Max. vibration	100 m/s <sup>2</sup> at 30 to 500 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	59 g
Protection class	IP63
Mounting	d1 6 mm
Lifetime	5 x 10 <sup>6</sup> rotations
Housing	Aluminum alloy

#### Electrical Data

Power supply U <sub>s</sub>	5 V
Total resistance	5 kΩ
Current I <sub>s</sub>	1 μA
Max. allowable contact current	10 mA

### Characteristic

Temp. coefficient	50 ppm/°K
Direction of rotation	Anti-Clockwise

### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	ASL 0-06-05SA-HE
Pin 1 (A)	U <sub>s</sub>
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Both rotation directions and other rotation angles available on request.

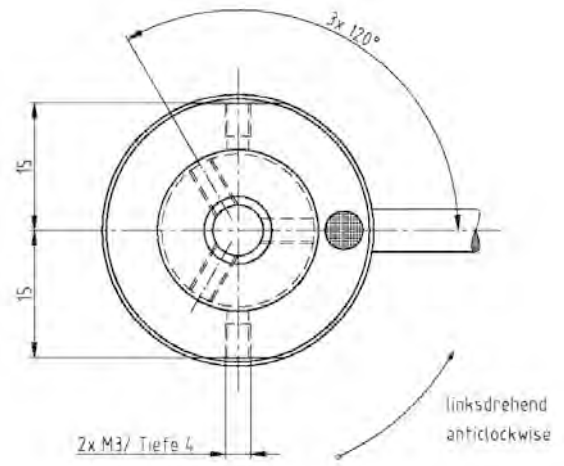
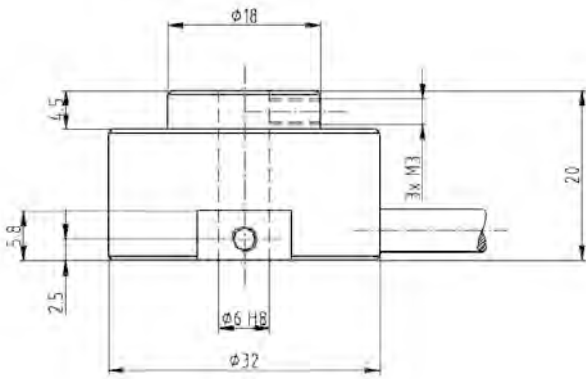
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Rotary Potentiometer RP 55**  
Order number **B 261 209 578-01**

Dimensions

4





## Rotary Potentiometer RP 86



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range: 0 to 86°
- ▶ Compact design

This sensor is designed to measure rotational movement, e.g. throttle angle or spring travel. A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. The housing and the bearings are made of high temperature resistant plastic. The main benefit of this sensor is the combination of a high quality production part and extremely short dimensions

### Application

Application	0 to 86°
Angle between internal mechanical stops	95°
Operating temperature range	-40 to 130°C
Max. vibration	700 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Weight w/o wire	26 g
Mounting	2 x M4
Lifetime	2 x 10 <sup>6</sup> rotations
Housing	Synthetic material

#### Electrical Data

Power supply U <sub>s</sub>	5 V
Max. power supply	42 V

Total resistance	2 kΩ ± 20 %
Current I <sub>s</sub>	18 μA

#### Characteristic

Max. rotation speed	120 min <sup>-1</sup>
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	
Redundancy	No

#### Connectors and Wires

Connector	Bosch Compact
Mating connector	D 261 205 334
Pin 1 (A)	U <sub>s</sub>
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has an internal mechanical stop and a Ø 14.65x2 sealing.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Both rotation directions and other rotation angles available on request.

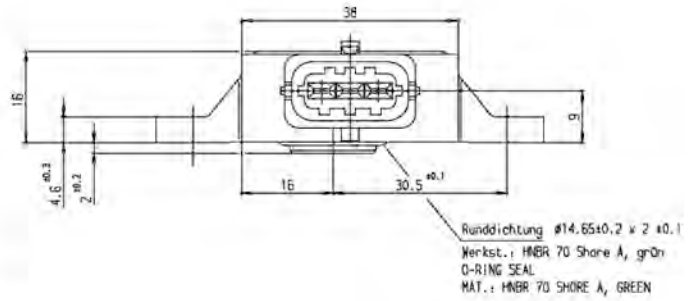
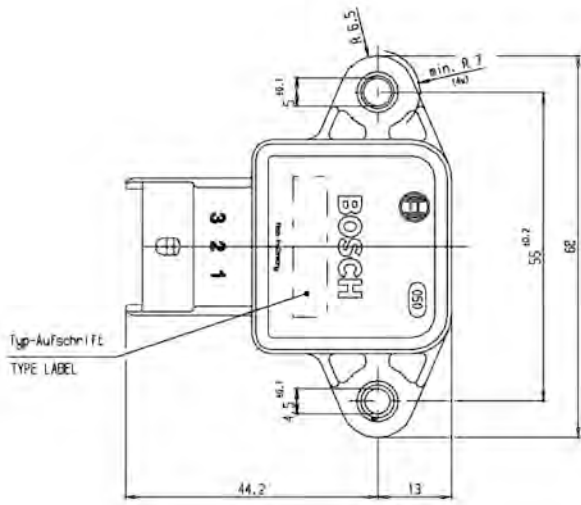
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Rotary Potentiometer RP 86**  
Order number **0 280 122 016**

Dimensions

4



## Rotary Potentiometer RP 100/130/308



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range: 0 to 100°, 0 to 130° or 0 to 308°
- ▶ Wide operating temperature range

This sensor is designed to measure rotational movement, e.g. throttle angle, spring travel, gearbox position or steering angle.

A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. 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 sensor is fitted in a shrink down boot for additional protection. The main benefit of this sensor is the combination of both high accuracy and motorsports spec connection.

### Application

Application	Please see variations
Operating temperature range	-40 to 150°C
Max. vibration	200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Variations

	RP 100	RP 130	RP 308
Measuring range	0 to 100°	0 to 130°	0 to 308°
Total resistance	3 kΩ ± 20 %	3 kΩ ± 20 %	5 kΩ ± 20 %

### Mechanical Data

Weight w/o wire	32 g
Protection class	IP65
Mounting	2 x M4
Lifetime	50 x 10 <sup>6</sup> rotations
Housing	Synthetic material

### Electrical Data

Power supply U <sub>s</sub>	5 V
Max. power supply	42 V
Total resistance	Please see variations
Current I <sub>s</sub>	1 μA
Max. allowable contact current	10 mA

### Characteristic

Max. rotation speed	120 min <sup>-1</sup>
Temp. coefficient	5 ppm/°K
Direction of rotation	Anti-clockwise
Both rotation directions are available on request	

### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1 (A)	U <sub>s</sub>
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

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

Both rotation directions and other rotation angles available on request.

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

### Ordering Information

**RP 100**

Order number **B 261 209 127-01**

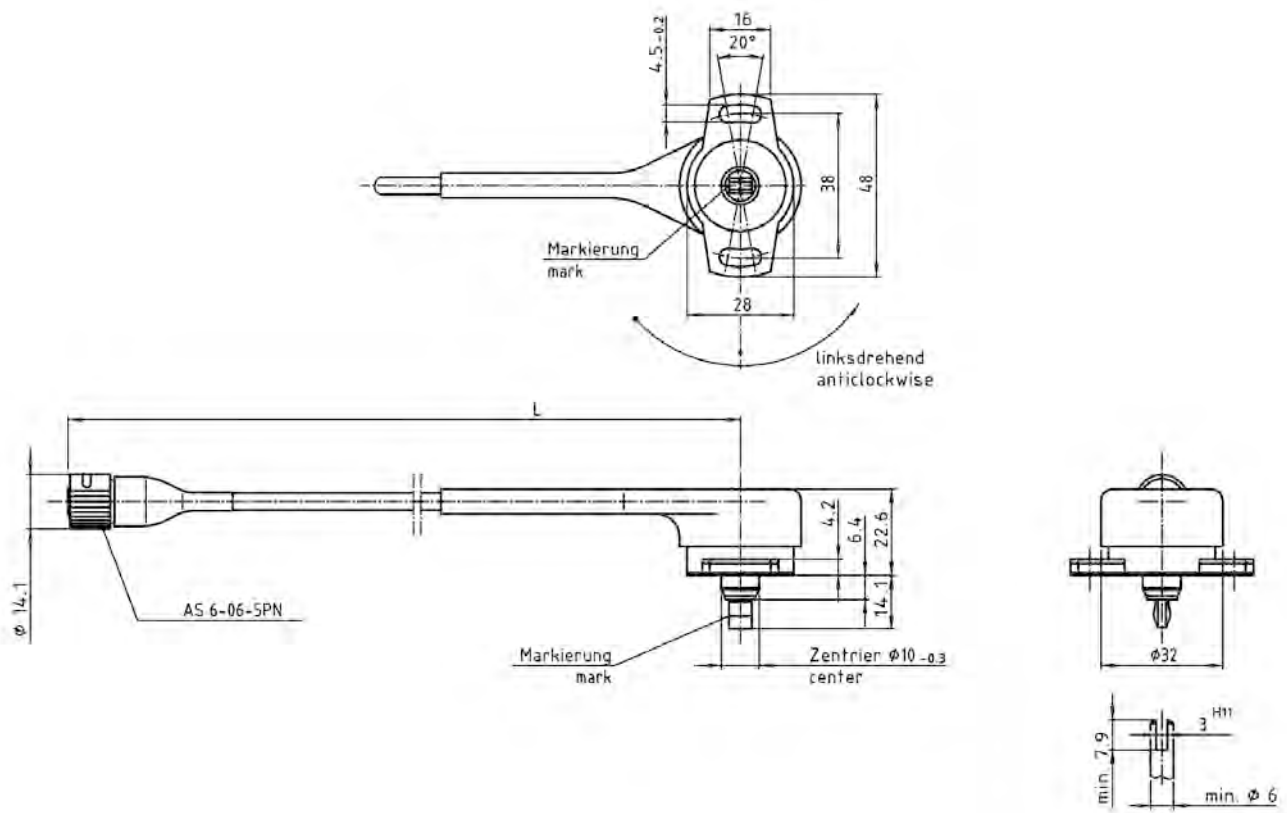
**RP 130**

Order number **B 261 209 128-02**

**RP 308**

Order number **B 261 209 570-01**

### Dimensions



## Rotary Potentiometer RP 100 twin



### Features

- ▶ Rotational movement measurement
- ▶ Dual output
- ▶ Measurement range: 0 to 100°
- ▶ Wide operating temperature range

This sensor is designed to measure rotational movement, e.g. gearbox position or throttle angle. A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. 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 sensor is fitted in a shrink down boot for additional protection. The main benefit of this sensor is the extremely high reliability through the redundant sensor design.

### Application

Application	0 to 100°
Operating temperature range	-40 to 150°C
Max. vibration	200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

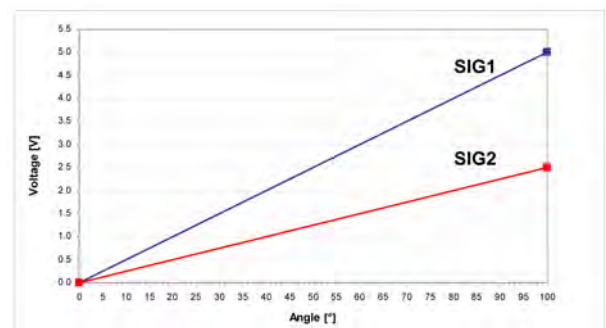
Weight w/o wire	32 g
Protection class	IP65
Mounting	2 x M4
Lifetime	50 x 10 <sup>6</sup> rotations
Housing	Synthetic material

#### Electrical Data

Power supply $U_s$	5 V
Max. power supply	42 V
Total resistance	3 k $\Omega$ $\pm$ 20 %
Current $I_S$	1 $\mu$ A
Max. allowable contact current	10 mA

#### Characteristic

Max. rotation speed	120 min <sup>-1</sup>
Temp. coefficient	5 ppm/°K
Direction of rotation	Anti-clockwise
Both rotation directions are available on request	
Redundancy	



#### Connectors and Wires

Connector	AS 6-07-35PN
Mating connector	AS 0-07-35SN
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig1
Pin 4	$U_s$
Pin 5	Gnd
Pin 6	Sig2
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors on request.

Please specify the requested wire length with your order.

#### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

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

Both rotation directions and other rotation angles available on request.

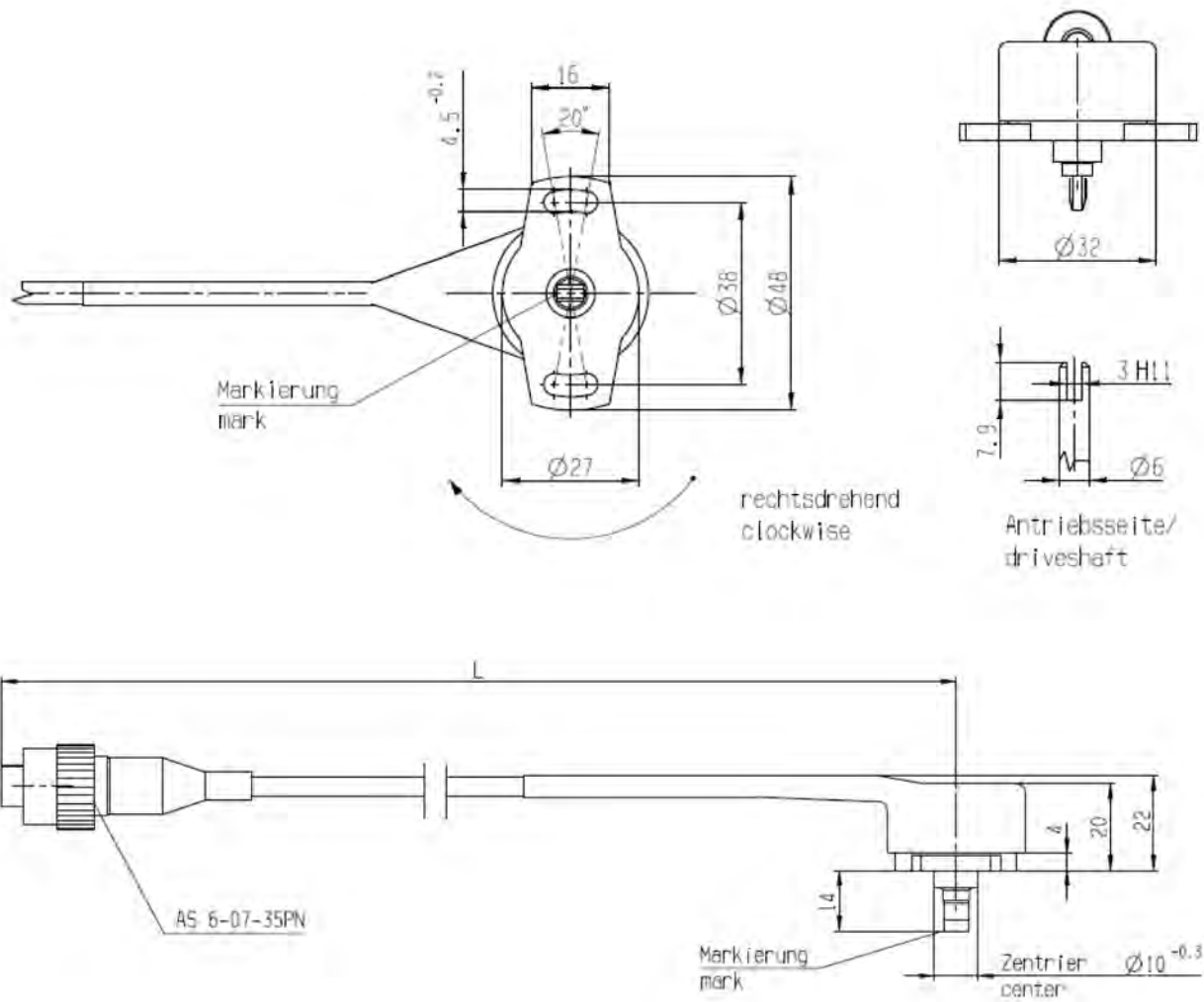
Free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System ([www.bosch-motorsport.com](http://www.bosch-motorsport.com)).

**Ordering Information**

**Rotary Potentiometer RP 100 twin**  
 Order number **B 261 209 591-02**

**4**

**Dimensions**



## Rotary Potentiometer Mini-RP 100-M



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range: 0 to 100°
- ▶ Compact design
- ▶ Robust housing

This sensor is designed to measure rotational movement, e.g. throttle angle or spring travel. A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. 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 sensor is fitted in a shrink down boot for additional protection. The main benefit of this sensor is the combination of high accuracy, motorsports spec connection and a very small and robust aluminum housing.

### Application

Application	0 to 100°
Operating temperature range	-40 to 150°C
Storage temperature range	0 to 100°C
Max. vibration	200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	32 g
Protection class	IP65
Mounting	2 x M4

Lifetime	50 x 10 <sup>6</sup> rotations
Housing	Aluminum alloy

#### Electrical Data

Power supply $U_s$	5 V
Max. power supply	42 V
Total resistance	3 k $\Omega$ $\pm$ 20%
Current $I_s$	1 $\mu$ A
Max. allowable contact current	10 mA

#### Characteristic

Max. rotation speed	120 min <sup>-1</sup>
Temp. coefficient	5 ppm/°K
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1 (A)	$U_s$
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Both rotation directions and other rotation angles available on request.

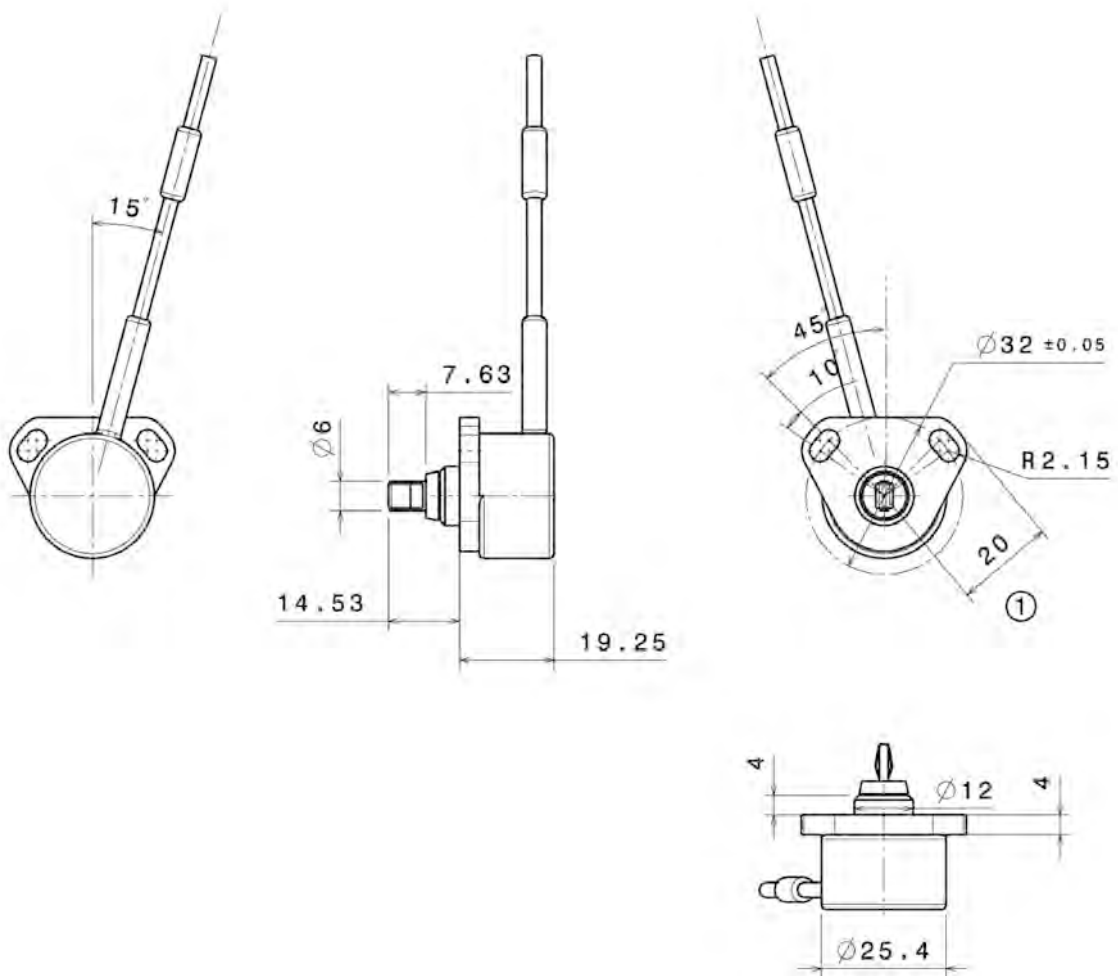
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Rotary Potentiometer Mini-RP 100-M**  
Order number **B 261 209 587-01**

Dimensions

4





## Rotary Potentiometer RP 345-M



### Features

- ▶ Rotational movement measurement
- ▶ Measurement range: 0 to 345°
- ▶ Robust aluminum housing
- ▶ Wide operating temperature range

This sensor is designed to measure rotational movement, e.g. throttle angle, spring travel, gearbox position or steering angle.

A throttle rotation moves an internal slider (wiper) on a resistive element which is supplied with voltage. Thus voltage proportional to the angle can be measured. The housing is made of shock resistant aluminum. The internal is made of high temperature resistant synthetic material. The mounting plate is protected with a metal cover to ensure a good fixation. The sensor is fitted in a shrink down boot for additional protection.

The main benefit of this sensor is the combination of both high accuracy and very tough aluminum housing.

### Application

Application	0 to 345°
Operating temperature range	-40 to 150°C
Max. vibration	200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	32 g
Protection class	IP65
Mounting	2 x M4

Lifetime	50 x 10 <sup>6</sup> rotations
Housing	Aluminum alloy

#### Electrical Data

Power supply U <sub>s</sub>	5 V
Maximal power supply	42 V
Total resistance	5 kΩ ± 20 %
Current I <sub>s</sub>	1 μA
Max. allowable contact current	10 mA

#### Characteristic

Max. rotation speed	120 min <sup>-1</sup>
Temp. coefficient	5 ppm/°K
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	
Redundancy	No

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	ASL 0-06-05SA-HE
Pin 1 (A)	U <sub>s</sub>
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	16 to 30 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor has no internal mechanical stops.

Each mounting orientation is possible.

The sensor meets all EMV, EMC and ESD automotive standards.

Both rotation directions and other rotation angles available on request.

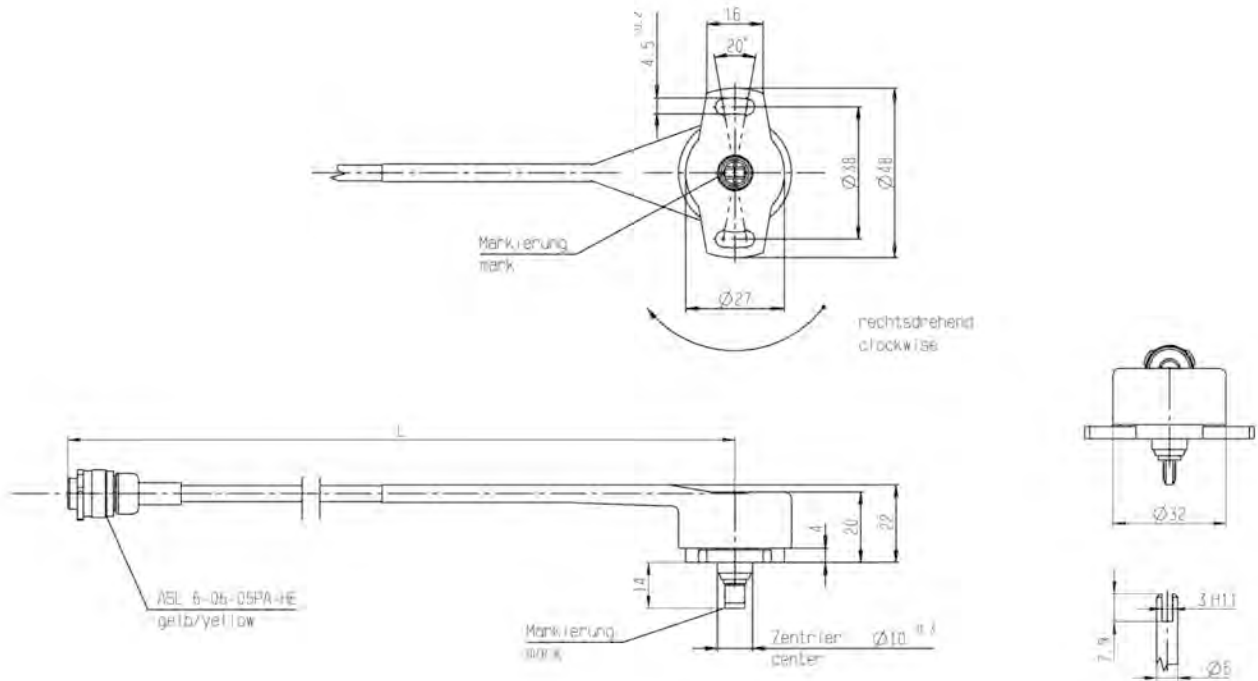
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Rotary Potentiometer RP 345-M  
 Order number F 01T A21 400

Dimensions

4



## Rotary Potentiometer RP 360-H



### Features

- ▶ Rotational movement measurement
- ▶ Hall effect technology
- ▶ Measurement range: 0 to 360°
- ▶ Analogue output 0.5 to 4.5 V

This sensor is designed to measure rotational movement, e.g. throttle angle, spring travel, gearbox position or steering angle.

The electronic is designed with a magnetic rotary sensor with Hall elements and digital signal processing. The angular position is provided by a two pole magnet integrated in the sensor shaft. A Hall effect sensor is disposed between two magnets in association with a movable specially formed ferromagnetic part. This is used to control flux in the sensor in order to produce a linearly varying output voltage dependent on the position.

The main benefit of this sensor is its contactless Hall effect technology and its robust design for motorsport applications. Other measurement ranges are available on request.

### Application

Application	0 to 360°
Operating temperature range	-40 to 140°C (5 V supply)
Storage temperature range	-55 to 140°C
Max. vibration	200 m/s <sup>2</sup> at 5 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	< 35 g
Protection class	IP68

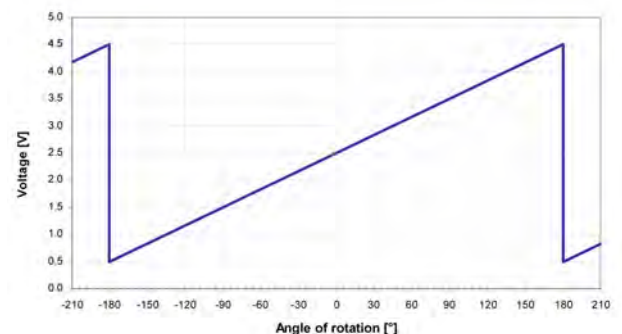
Mounting	2 x M4
Lifetime	20 x 10 <sup>6</sup> operations of ±75°
Housing	Synthetic material

#### Electrical Data

Power supply U <sub>s</sub>	5 V regulated
	9 V to 30 V unregulated
Max. power supply	30 V
Total resistance	10 kΩ
Current I <sub>s</sub>	< 12.5 mA
Resolution	0.025 % of measurement range
Output voltage range	0.5 to 4.5 V
Output load	10 kΩ

#### Characteristic

Max. rotation speed	600 min <sup>-1</sup>
Temp. coefficient	< 30 ppm/°K in 5 V supply mode
	< 90 ppm/°K in 9 V to 30 V supply mode
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	
Redundancy	No



#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	ASL 0-06-05SA-HE
Pin 1 (A)	U <sub>s</sub>
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-
Sleeve	DR-25
Wire size	AWG 22
Wire length L	16

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The products of the RP series can be connected directly to most control units.

The sensor is designed with contactless Hall effect technology.

Any mounting orientation is possible.

Sensor is at mid point of electrical angle when shaft and wire exit are aligned as shown in the offer drawing.

Operating temperature range for unregulated supply: -40 to 137°C (9 V supply). Derate upper temperature limit by 0.57°C for every 1 V increase in supply, e.g. -40 to 125°C at 30 V.

Both rotation directions and other measurement ranges are available on request.

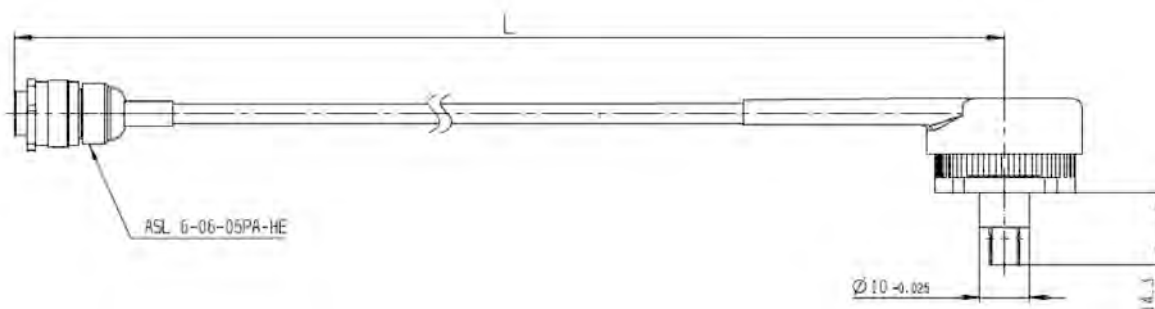
Please find further application hints in the offer drawing at our homepage.

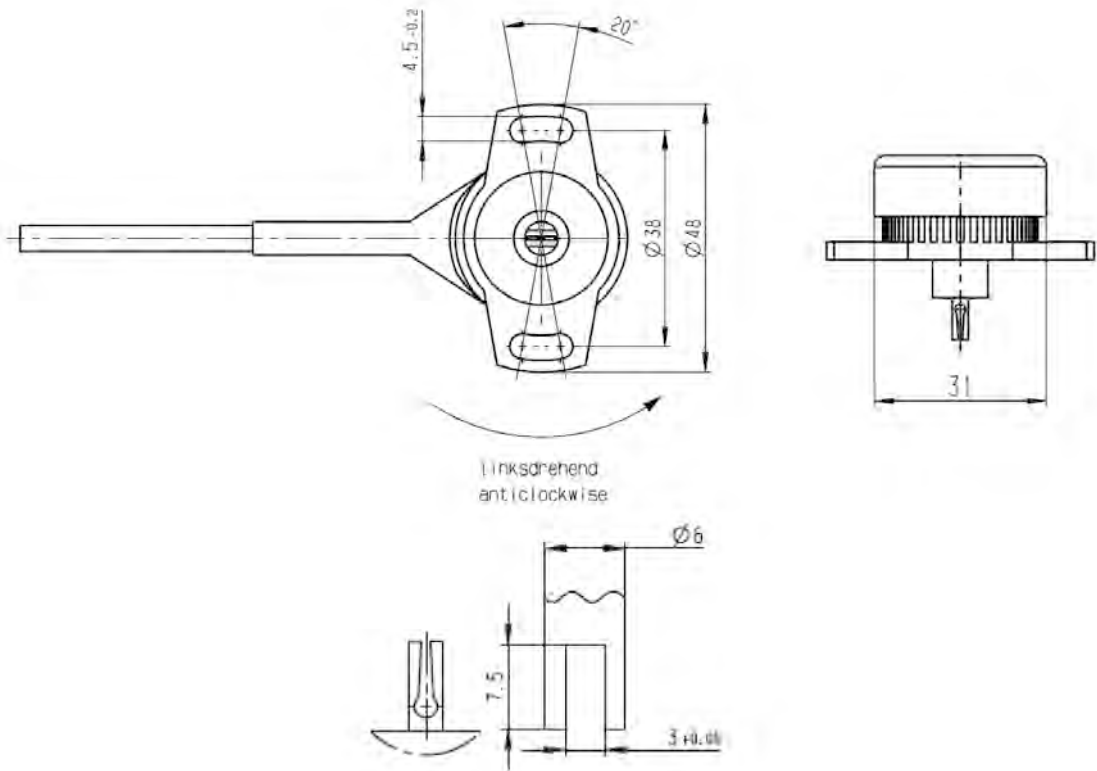
### Ordering Information

**Rotary Potentiometer RP 360-H**

Order number **F 02U V00 641-01**

### Dimensions





## Hall-Effect Speed Sensor HA-D 90



4

### Features

- ▶ Wheel/camshaft\*/crankshaft speed
- ▶ Same housing as Inductive sensor IS-M
- ▶ Very high precision measurement
- ▶ Self-learning
- ▶ Measuring of differences with 2 Hall sensors

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft\*, crankshaft or wheel-speed), but it is not a “true power-on” sensor. Due to the rotation of a ferromagnetic target wheel in front of the HA-D, the magnetic field is modulated at the place of the Hall probe.

The main feature and benefit of this sensor is a very good detection of the falling edge, due to a differential measuring method. This sensor is a combination of a high quality production part and robust design with a small housing.

\*: see Installation Notes

### Application

Application	Speed
Max. frequency	≤ 10 kHz
Target wheel air gap AG	0.4 to 1.0 mm
Temperature range	-40 to 150°C
Output circuit	Open collector for 1 kΩ
Output type	Active high
External magnetic fields	≤ 50 mT
Max. vibration	1,200 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	12 g
Mounting	Screw 1 x M6
Bore diameter	11.8 mm

Installation depth L2	30 mm
Tightening torque	6 Nm

#### Electrical Data

Power supply	5 to 18 V
Current IS	20 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	< 1.0 % (≤ 6 kHz) < 1.5 % (≤ 10 kHz)
Signal output	0.52 V to < U <sub>s</sub>

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h	3.4 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	ASL 0-06-05SC-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	Nc
Pin 5	Nc

Various motorsport and automotive connectors available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 100 cm

Please specify the required wire length with your order.

#### Installation Notes

The HA-D 90 is no true-power-on sensor. It needs the falling edge of two teeth for correct working. After a time of 0.68 s without rotation of the detected wheel it needs again the falling edge of two teeth.

The HA-D 90 can be connected directly to most control units and data logging systems

Please specify the angle between the mounting and the target wheel.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please ensure that the environmental conditions do not exceed the sensor specifications.

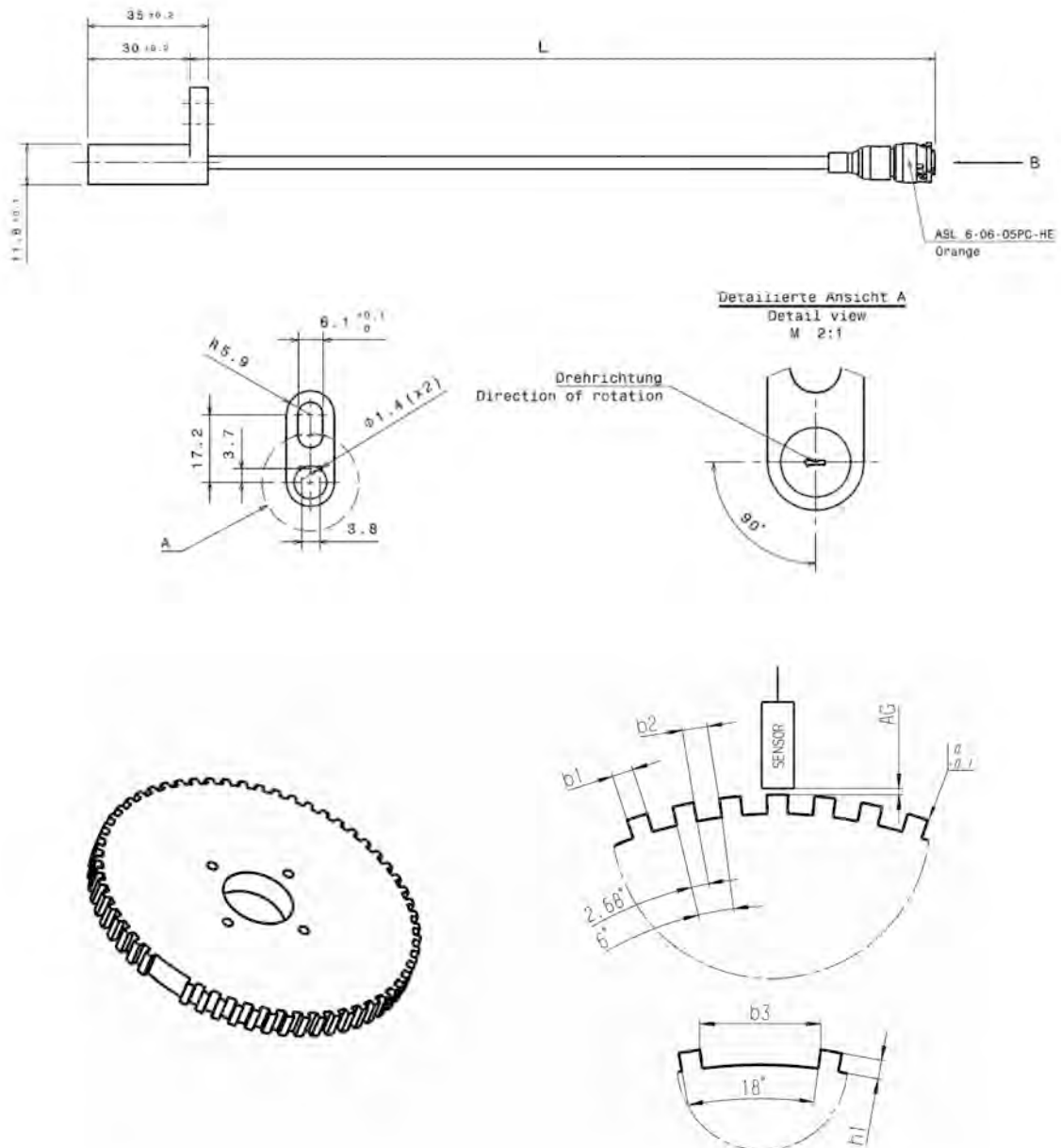
Please find further application hints in the offer drawing at our homepage.

## Ordering Information

### Hall-Effect Speed Sensor HA-D 90

Order number F 02U V00 334-01

## Dimensions



## Hall-Effect Speed Sensor HA-M



4

### Features

- ▶ Camshaft/crankshaft/wheel speed
- ▶ Max. frequency 10 kHz
- ▶ Self-learning
- ▶ Active high/low programmable
- ▶ Same housing as Inductive sensor IS-M

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft, crankshaft or wheel speed).

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. A Hall-effect sensor element with integrated signal conditioning circuit detects this change and generates a digital output signal. We offer this sensor with two different types of output: Active high and Active low.

The main feature and benefit of this sensor is the combination of a high quality production part and robust design with metal housing and motorsport connectors.

### Application

Application	Speed
Max. frequency	≤10 kHz
Target wheel air gap	0.5 to 1.5 mm
Temperature range	- 40 to 160°C
Output circuit	Open collector for 1 kOhm
Output type	Please see Ordering Information
External magnetic fields	< 1 mT
Max. vibration	1,200 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Variations

##### Active low with connector / active high with connector

Connector	ASU 6-03-03PN-HE
Mating connector	ASU 0-03-03SN-HE
Pin 1	U <sub>s</sub>

Pin 2	Gnd
Pin 3	Sig
<b>Active high, without connector</b>	
Red	U <sub>s</sub>
Black	Gnd
Green	Sig

#### Mechanical Data

Weight w/o wire	12 g
Mounting	1 x M6
Bore diameter	11.8 mm
Installation depth L2	30 mm
Tightening torque	6 Nm

#### Electrical Data

Power supply	5 to 18 V
Current I <sub>s</sub>	5.6 to 18 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	< 4 % (≤ 6 kHz) < 8 % (≤ 10 kHz)
Signal output	0.52 V to < U <sub>s</sub>

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h	3.4 mm
Number of teeth	60-2

#### Connectors and Wires

Various motorsport and automotive connectors available on request.

Pin layout	Please see Variations
Sleeve	DR-25
Wire size	AWG 24
Wire length L	10 to 100 cm
Please specify the required wire length with your order.	

#### Installation Notes

The HA-M can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.



If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### HA-M

Active low

Order number **B 261 209 283-01**

#### HA-M

Active high

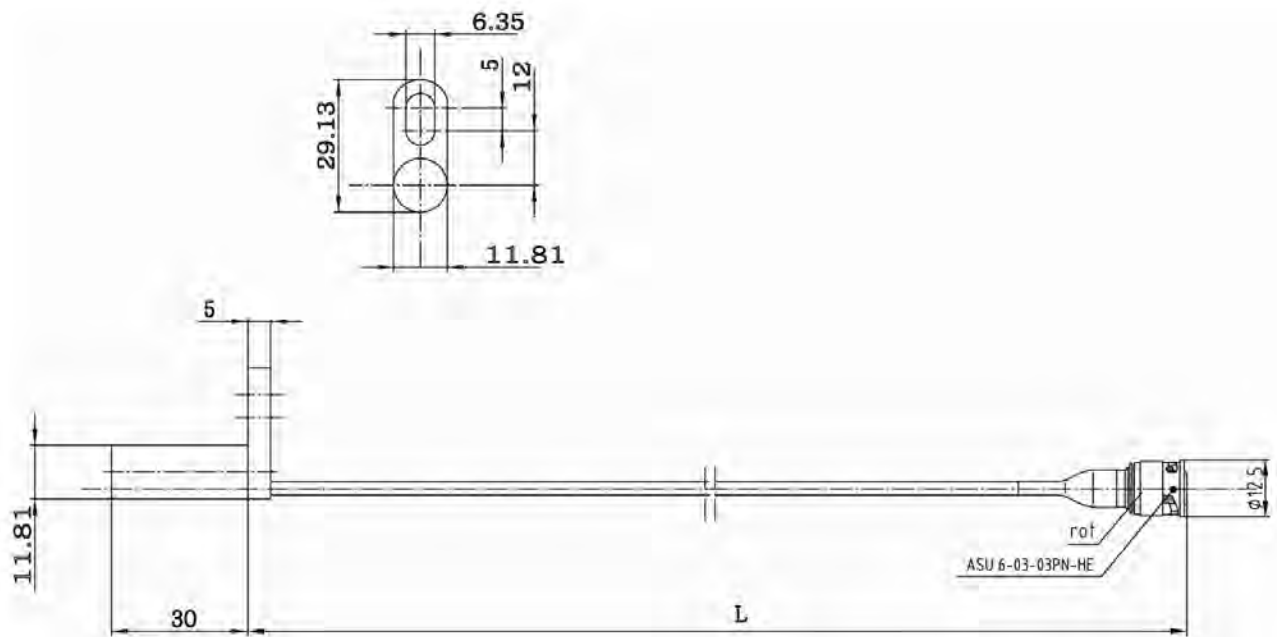
Order number **B 261 209 295-01**

#### HA-M

Active high, without connector

Order number **F 02U V00 627-01**

### Dimensions



## Hall-Effect Speed Sensor HA-P



4

### Features

- ▶ Wheel/camshaft speed
- ▶ 24.0 mm depth
- ▶ Robust design
- ▶ Active low

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft, crankshaft or wheel-speed).

Due to the rotation of a ferromagnetic target wheel in front of the HA-P, the magnetic field is modulated at the place of the Hall probe. A Hall-effect sensor element with integrated signal conditioning circuit detects this change and generates a digital output signal.

The main feature and benefit of this sensor is the combination of a high quality production part and robust design with metal housing.

### Application

Application	Speed
Max. frequency	≤ 10 kHz
Target wheel air gap	0.5 to 1.4 mm
Temperature range	-40 to 150°C
Output type	Active low
Output circuit	Open collector for 1 kΩ
Max. vibration	1,000 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	70 g
Mounting	With screw 1 x M6
Bore diameter	18 mm

Installation depth L2	24 mm
Tightening torque	8 Nm

#### Electrical Data

Power supply	4.5 to 24 V
Current IS	10 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	< 1.5 % (≤ 6 kHz) < 2 % (≤ 10 kHz)
Signal output	0.4 V to < US

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h	3.4 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	1 928 404 227
Mating connector	D 261 205 335
Pin 1	Gnd
Pin 2	Sig
Pin 3	U <sub>S</sub>

### Installation Notes

The HA-P can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

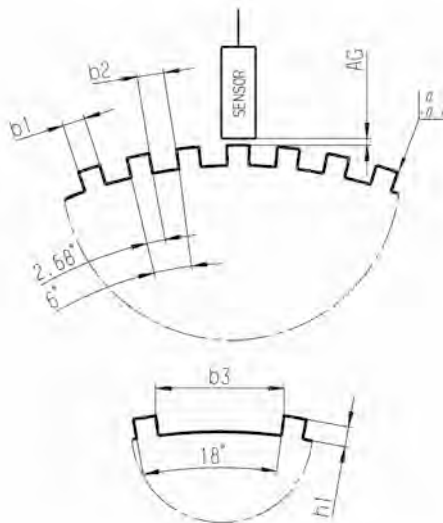
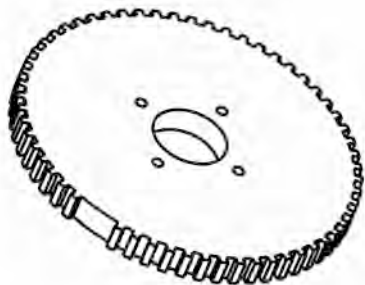
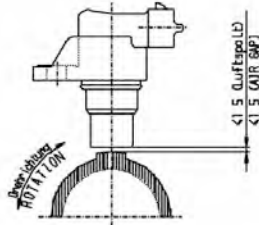
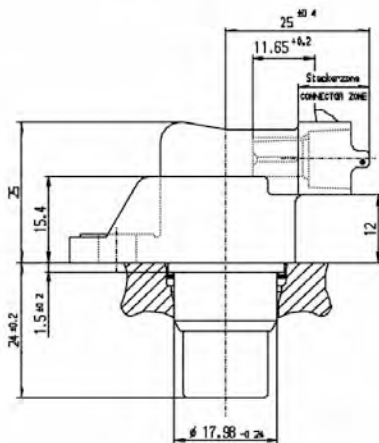
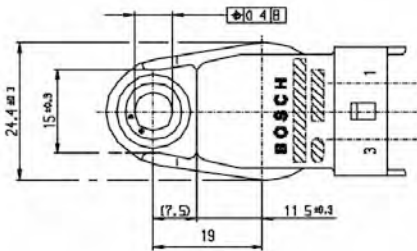
Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Hall-Effect Speed Sensor HA-P**  
Order number **0 232 103 037**

Dimensions



## Hall-Effect Speed Sensor HA-P2



4

### Features

- ▶ Wheel/camshaft/crankshaft speed
- ▶ 15 mm depth
- ▶ Very small housing
- ▶ Very light weight
- ▶ Active low

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft, crankshaft or wheel-speed).

Due to the rotation of a ferromagnetic target wheel in front of the HA-P2, the magnetic field is modulated at the place of the Hall probe. A Hall-effect sensor element with integrated signal conditioning circuit detects this change and generates a digital output signal.

The main feature and benefit of this sensor is the combination of a high quality production part, robust design, very small housing and low weight.

### Application

#### Application

Application	Speed
Max. frequency	≤10 kHz
Target wheel air gap	0.5 to 2.5 mm
Temperature range	-40 to 160°C
Output circuit	Open collector for 1 kΩ
Output type	Active low
External magnetic fields	< 0.1 mT
Max. vibration	400 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	12 g
Bore diameter	15 mm
Installation depth L2	15 mm
Mounting	With screw 1 x M6
Tightening torque	8 Nm

#### Electrical Data

Power supply US	4.75 to 18 V
Current I <sub>s</sub>	10 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	
up to 1.5 mm	< 4 % (≤ 10 kHz)
up to 2.5 mm	< 8 % (≤ 10 kHz)
Signal output	0.4 V to < U <sub>s</sub>

#### Connectors and Wires

Connector	Hirschmann 872-658-501 Cod.A
Mating connector	F 02U B00 555-01
Pin 1	U <sub>s</sub>
Pin 2	Sig
Pin 3	Gnd

Various motorsport and automotive connectors available on request.

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h1	3.4 mm
Number of teeth	60-2

### Installation Notes

#### Application Notes

The HA-P2 can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please ensure that the environmental conditions do not exceed the sensor specifications.

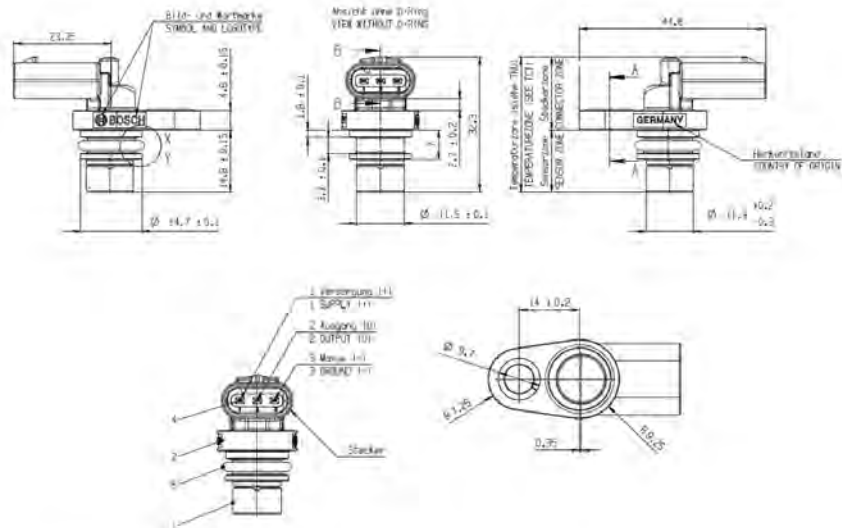
Please find further application hints in the offer drawing at our home-page.

## Ordering Information

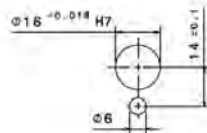
### Hall-Effect Speed Sensor HA-P2

Order number **0 232 103 111**

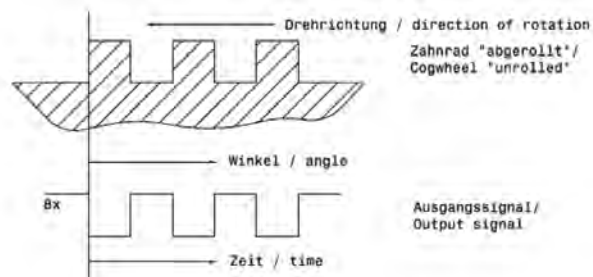
## Dimensions



### Einbauvorschrift Mounting requirement



### Signal-Definition Signal definition



## Hall-Effect Speed Sensor Mini-HA-P



4

### Features

- ▶ Wheel/camshaft speed
- ▶ Max. frequency  $\leq 10$  kHz
- ▶ High vibration resistance
- ▶ Low weight
- ▶ Small housing

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft, crankshaft or wheel speed).

Due to the rotation of a ferromagnetic target wheel in front of the Mini-HA-P, the magnetic field is modulated at the place of the Hall probe. A Hall-effect sensor element with integrated signal conditioning circuit detects this change and generates a digital output signal. The main feature and benefit of this sensor is the combination of a high quality production part and robust design with a very small housing.

### Application

Application	Speed
Max. frequency	$\leq 10$ kHz
Target wheel air gap	0.2 to 1.5 mm
Temperature range	-40 to 150°C
Output circuit	Open collector for 1 k $\Omega$
Output type	Active low
External magnetic fields	$\leq 0.3$ mT
Max. vibration	1,200 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Variations

Connector	ASL 6-06-05PC-HE	1 234 482 092
Mating connector	ASL 0-06-05SC-HE	F 02U B00 555-01
Pin 1	U <sub>s</sub>	Gnd
Pin 2	Gnd	Sig
Pin 3	Sig	U <sub>s</sub>
Pin 4	Nc	-
Pin 5	Nc	-

#### Mechanical Data

Weight w/o wire	19.2 g
Mounting	With screw 1 x M6
Bore diameter	11.5 mm
Installation depth L2	9 mm
Tightening torque	8 Nm

#### Electrical Data

Power supply	5 to 18 V
Current I <sub>S</sub>	10 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	< 3 % ( $\leq 6$ kHz) < 5 % ( $\leq 10$ kHz)
Signal output	0.4 V to < U <sub>s</sub>

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h	3.4 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	Please see Variations
Various motorsport and automotive connectors available on request.	
Sleeve	HT wire $\varnothing$ 5.2 mm
Wire size	AWG 20
Wire length L	< 27 cm
Please specify the required wire length with your order.	

## Installation Notes

The Mini-HA-P can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

## Ordering Information

### Mini-HA-P

ASL 6-06-05PC-HE

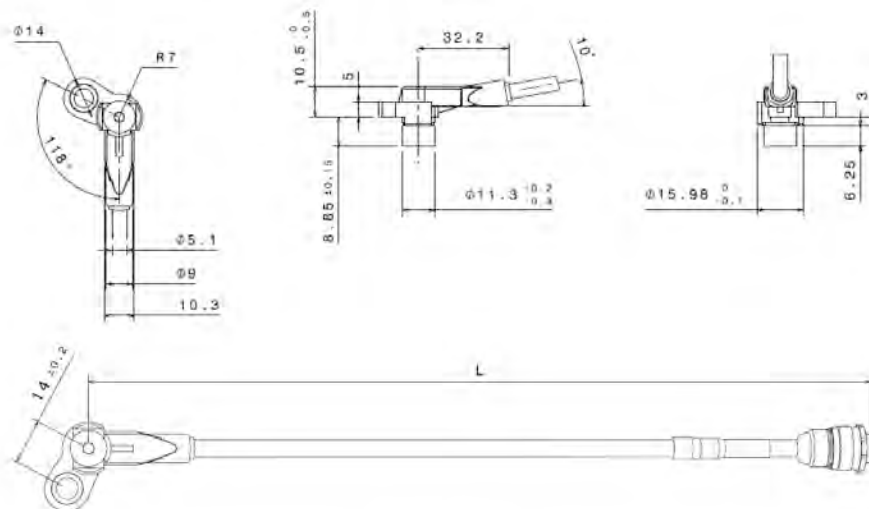
Order number **F 02U V00 564-02**

### Mini-HA-P

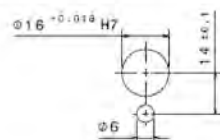
1 234 482 092

Order number **F 02U V00 566-02**

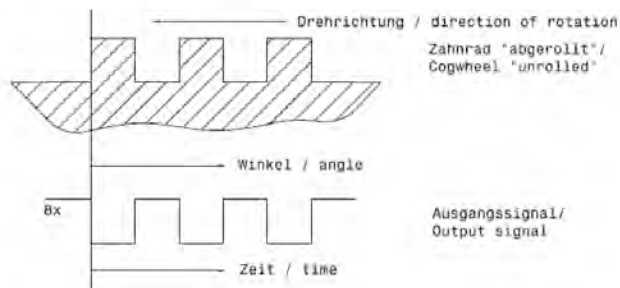
## Dimensions

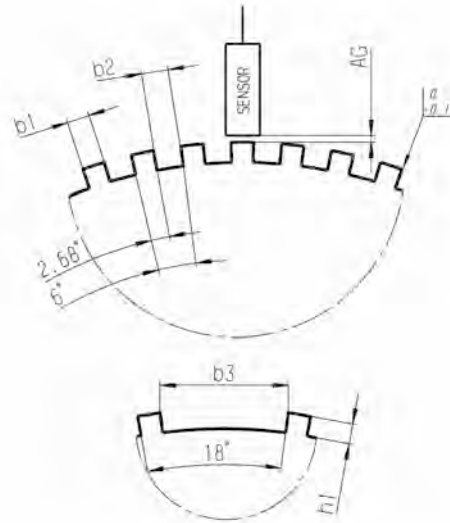
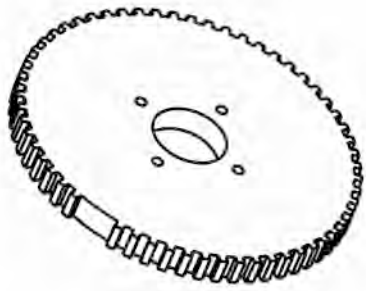


**Einbauvorschrift**  
Mounting requirement



**Signal-Definition**  
Signal definition







## Hall-Effect Speed Sensor Mini-HA-P sealed



### Features

- ▶ Wheel/camshaft/crankshaft speed
- ▶ Max. frequency  $\leq 10$  kHz
- ▶ High vibration resistance
- ▶ Very small housing
- ▶ O-ring sealing

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft, crankshaft and wheel-speed).

Due to the rotation of a ferromagnetic target wheel in front of the Mini-HA-P sealed, the magnetic field is modulated at the place of the Hall probe. A Hall-effect sensor element with integrated signal conditioning circuit detects this change and generates a digital output signal.

The main feature and benefit of this sensor is the combination of a high quality production part and a robust design with a very small housing.

### Application

Application	Speed
Max. frequency	$\leq 10$ kHz
Target wheel air gap	0.2 to 1.5 mm
Temperature range	-40 to 150°C
Output circuit	Open collector for 1 k $\Omega$
Output type	Active low
External magnetic fields	$\leq 0.3$ mT
Max. vibration	1,200 m/s <sup>2</sup> at 10 Hz to 2 kHz

### Technical Specifications

#### Variations

Connector	ASL 6-06-05PC-HE	Without connector
Mating connector	ASL 0-06-05SC-HE	-
Pin 1	U <sub>s</sub>	U <sub>s</sub> (red)
Pin 2	Gnd	Sig (green)
Pin 3	Sig	Gnd (black)
Pin 4	Nc	-
Pin 5	Nc	-

#### Mechanical Data

Weight w/o wire	19.2 g
Mounting	With screw 1 x M6
Bore diameter	16 mm
Installation depth L2	12 mm
Tightening torque	8 Nm

#### Electrical Data

Power supply	5 to 18 V
Current I <sub>S</sub>	10 mA

#### Characteristic

Accuracy repeatability of the falling edge of tooth	< 3 % ( $\leq 6$ kHz)
	< 5 % ( $\leq 10$ kHz)
Signal output	0.4 V to < U <sub>s</sub>

#### Environment

Target wheel diameter D	162.34 mm
Thickness t	12.5 mm
Width of teeth b1	3.8 mm
Width of gap b2	4.7 mm
Width of sync. gap b3	20.79 mm
Depth of teeth h	3.4 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	Please see Variations
Sleeve	HT wire $\varnothing$ 5.2 mm
Wire size	AWG 20
Wire length L	< 27 cm
Various motorsport and automotive connectors are available on request.	
Please specify the required wire length with your order.	

## Installation Notes

The Mini-HA-P sealed can be connected directly to most control units and data logging systems.

Please avoid abrupt temperature changes.

For mounting please use only the integrated plug.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please ensure that the environmental conditions do not exceed the sensor specifications.

Please find further application hints in the offer drawing at our homepage.

## Ordering Information

### Mini-HA-P sealed

ASL 6-06-05PC-HE

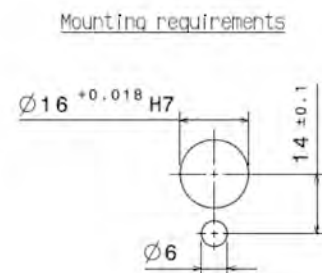
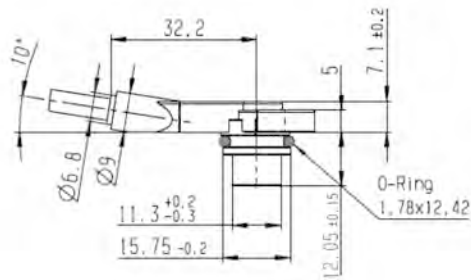
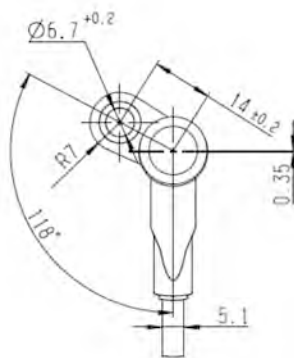
Order number **F 02U V00 500-01**

### Mini-HA-P sealed

without connector

Order number **F 02U V00 570-01**

## Dimensions



## Inductive Speed Sensor IA



### Features

- ▶ Crankshaft/wheel speed
- ▶ 32.2 mm depth/lead
- ▶ Bore diameter 12.5 mm
- ▶ Max. operating temperature 230°C

This sensor is designed for incremental measurement of rotational speed (e.g. crankshaft or wheel speed). The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

The main benefit of this sensor is the combination of a high quality production part and robust, high temperature resistance. Additionally the installation depth can be changed according to the customer request.

### Application

Application	Speed
Max. frequency	≤ 15 kHz
Target wheel air gap AG	0.8 ± 0.3 mm
Operating temp. range (sensing head)	-40 to 230°C
Storage temperature range	0 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

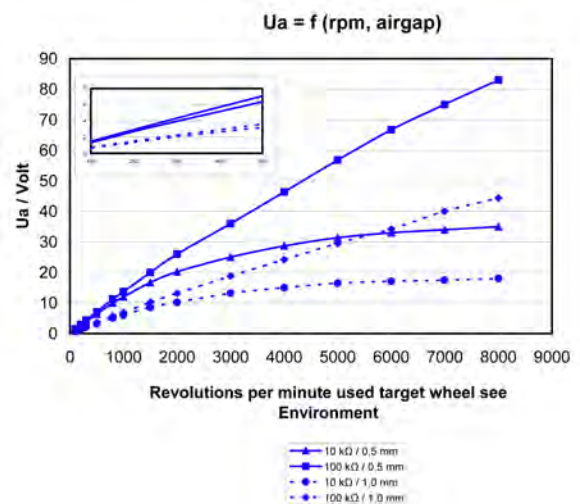
Magnetic pole	Round
Bore diameter	12.5 mm
Weight w/o wire	30 g
Installation depth L2	32.2 mm

#### Electrical Data

Coil resistance	1,200 Ω
Inductance max.	400 mH
Output voltage max.	190 V <sub>p,p</sub>

#### Environment

Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2



#### Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector	ASL 0-06-05PN-HE
Pin 1	-
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	Scr

Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	10 to 100 cm

Please specify the required wire length with your order.

## Installation Notes

The inductive speed sensor IA is developed for wheels made of ferromagnetic material.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

The installation depth L2 can be changed individually according to customer request.

Please contact our technical consultancy for more information.

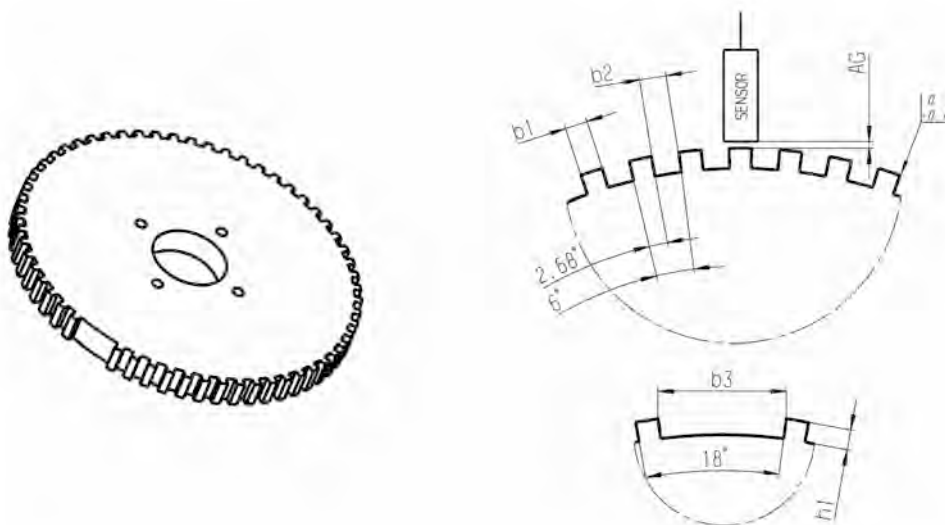
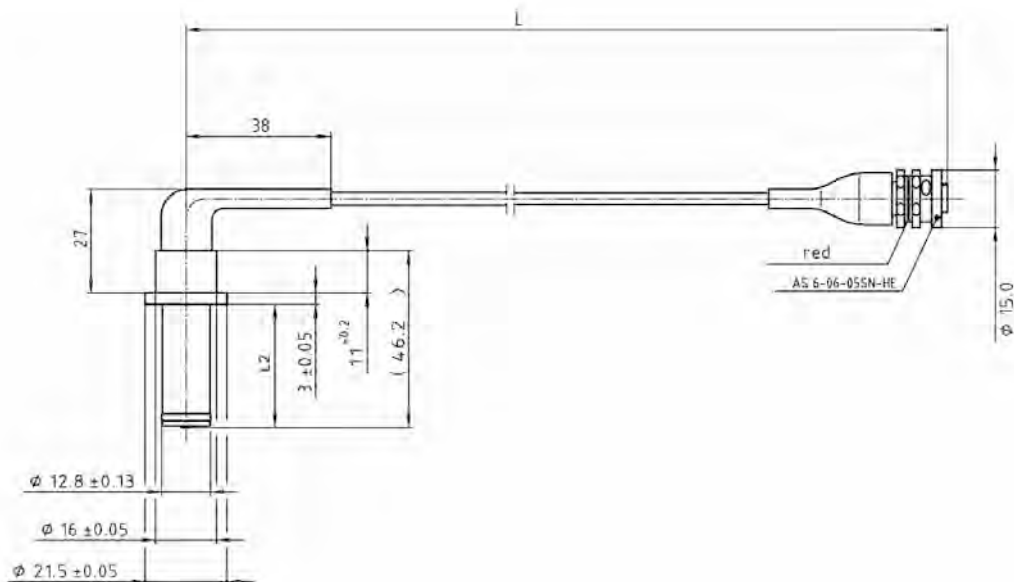
Please find further application hints in the offer drawing at our homepage.

## Ordering Information

### Inductive Speed Sensor IA

Order number **B 261 209 519-01**

## Dimensions



## Inductive Speed Sensor IA-C



### Features

- ▶ Crankshaft/wheel speed
- ▶ 24.0 mm, 315° depth/lead
- ▶ Bore diameter 18 mm

This sensor is designed for incremental measurement of rotational speed (e.g. crankshaft or wheelspeed).

The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

It is available in a DR-25 sleeve with various connector options.

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

### Application

Application	Speed
Max. frequency	≤ 15 kHz
Target wheel air gap AG	0.8 ± 0.3 mm
Operating temp. range (sensing head)	-40 to 130°C
Storage temperature range	-40 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

Magnetic pole	Round
Bore diameter	18 mm
Tightening torque	8 Nm
Weight w/o wire	40 g
Installation depth L2	23.7 mm

#### Electrical Data

Coil resistance	860 Ω ± 10 %
Inductance max.	370 mH ± 15 %
Output voltage max.	200 VP-P

#### Environment

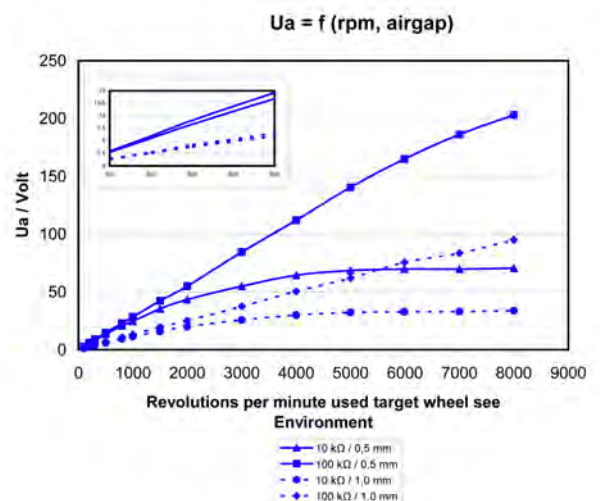
Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	1 928 404 227
Mating connector	D 261 205 335
Pin 1	Sig+
Pin 2	Sig-
Pin 3	Scr

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.



#### Installation Notes

The inductive speed sensor IA-C is developed for wheels made of ferromagnetic material.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please contact our technical consultancy for more information.

Please find further application hints in the offer drawing at our homepage.

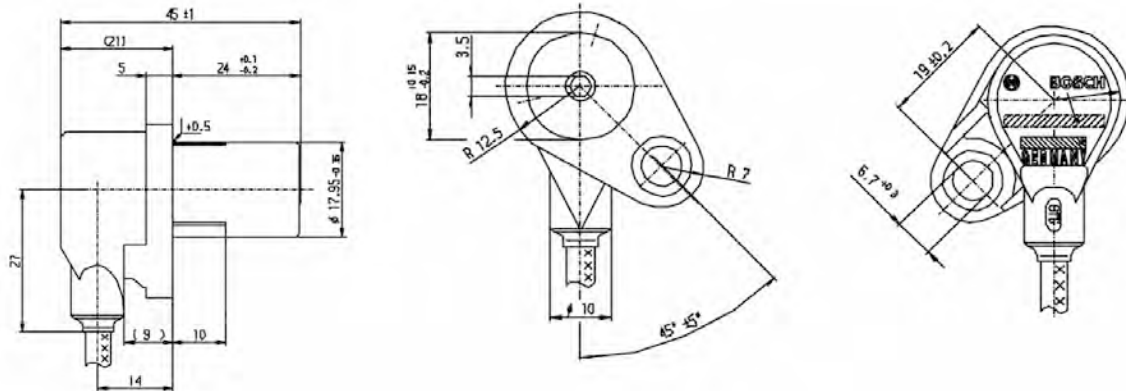
The inductive speed sensor IA-C is developed for wheels made of ferromagnetic material.

### Ordering Information

#### Inductive Speed Sensor IA-C

Order number 0 261 210 136

### Dimensions



## Inductive Speed Sensor IS



### Features

- ▶ Crankshaft/wheel speed
- ▶ 32.2 mm depth/lead
- ▶ Bore diameter 12.5 mm
- ▶ Max. operating temperature 230°C

This sensor is designed for incremental measurement of rotational speed (e.g. crankshaft or wheel speed).

The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

The main benefit of this sensor is the combination of a high quality production part and robust, high temperature resistance. Additionally the installation depth can be changed according to the customer request.

### Application

Application	Speed
Max. frequency	≤15 kHz
Target wheel air gap AG	0.8 ± 0.3 mm
Operating temp. range (sensing head)	-40 to 230°C
Storage temperature range	0 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

Magnetic pole	Round
Bore diameter	12.5 mm
Tightening torque	8 Nm

Weight w/o wire	30 g
Installation depth L2	32.2 mm

#### Electrical Data

Coil resistance	1,200 Ω
Inductance max.	400 mH
Output voltage max.	190 V P-P

#### Environment

Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

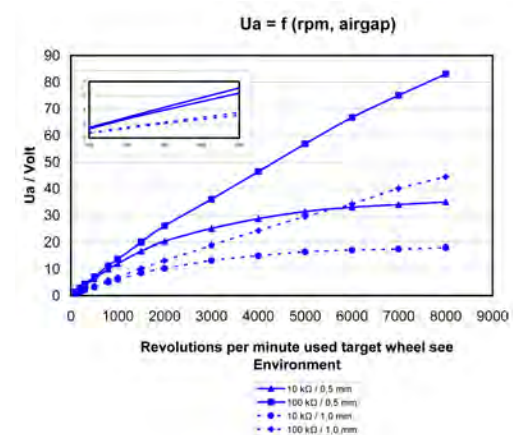
#### Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector	ASL 0-06-05PN-HE
Pin 1	Nc
Pin 2	Sig-
Pin 3	Sig+
Pin 4	Nc
Pin 5	Scr

Various motorsport and automotive connectors available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	10 to 100 cm

Please specify the required wire length with your order.



## Installation Notes

The inductive speed sensor IS is developed for wheels made of ferromagnetic material.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

The installation depth L2 can be changed individually according to customer request.

Please contact our technical consultancy for more information.

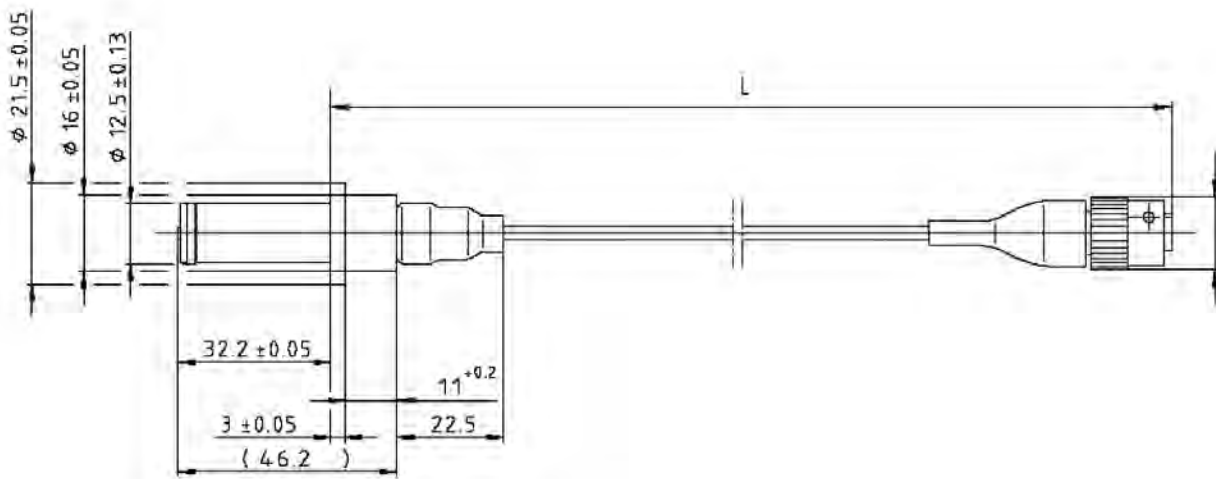
Please find further application hints in the offer drawing at our homepage.

## Ordering Information

### Inductive Speed Sensor IS

Order number **B 261 209 517-01**

## Dimensions





## Inductive Speed Sensor IS-C



### Features

- ▶ Wheel speed
- ▶ 3/8-24 UNF-2A THD
- ▶ Bore diameter 12.9 mm
- ▶ Metal housing

This sensor is designed for incremental measurement of rotational speed (e.g. crankshaft or wheelspeed). The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

The main benefit of this sensor is the combination of a high quality production part with very compact design, and high temperature resistance.

### Application

Application	Speed
Max. frequency	≤ 15 kHz
Target wheel air gap AG	0.8 ± 0.3 mm
Operating temp. range (sensing head)	-40 to 230°C
Storage temperature range	0 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

Magnetic pole	Round
Bore diameter	12.9 mm

Tightening torque	8 Nm
Weight w/o wire	25 g
Installation depth L2	24.1 mm

#### Electrical Data

Coil resistance	340 Ω
Inductance max.	64 mH

#### Environment

Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

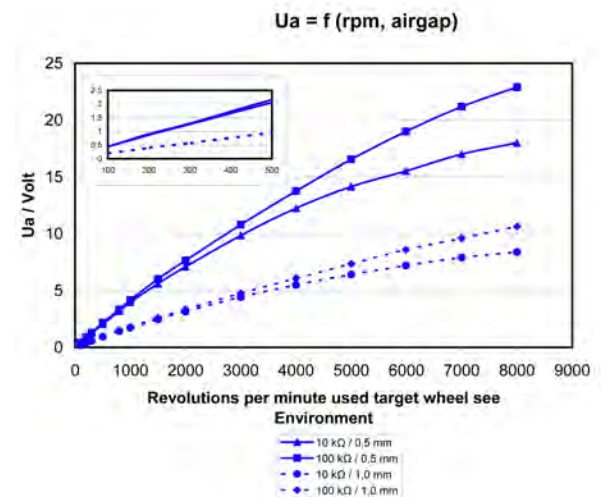
#### Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector	ASL 0-06-05PN-HE
Pin 1	Nc
Pin 2	GND
Pin 3	Sig+
Pin 4	Nc
Pin 5	Scr

Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	Max. 50 cm

Please specify the required wire length with your order.



### Installation Notes

The inductive speed sensor IS-C is developed for wheels made of ferromagnetic material.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

This sensor is also available with a M10x1 male thread.

Please contact our technical consultancy for more information.

Please find further application hints in the offer drawing at our homepage.

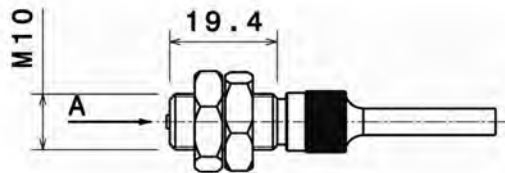
4

### Ordering Information

#### Inductive Speed Sensor IS-C

Order number **B 261 209 609-01**

### Dimensions



## Inductive Speed Sensor IS-M



### Features

- ▶ Crankshaft/wheel speed
- ▶ Same housing as Hall-Sensor HA-M
- ▶ Low weight
- ▶ Max. operating temperature 225°C

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

The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

It is available in a DR-25 sleeve with various connector options and different installation depths.

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

### Application

Application	Speed
Max. frequency	≤ 15 kHz
Target wheel air gap AG	0.5 ± 0.25 mm
Operating temp. range (sensing head)	-40 to 225°C
Storage temperature range	-40 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

Magnetic pole	Round, 2.36 mm
---------------	----------------

#### Electrical Data

Coil resistance	390 Ω
Inductance max.	75 mH
Output voltage max.	55 VP-P

#### Environment

Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

#### Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector	ASL 0-06-05PN-HE
Pin 1	Nc
Pin 2	Sig-
Pin 3	Sig+
Pin 4	Nc
Pin 5	Scr

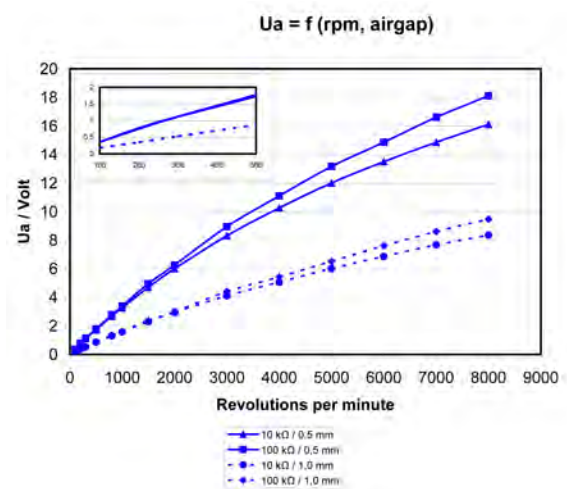
Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
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Wire size	AWG 24
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Wire length L	10 to 100 cm
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Please specify the required wire length with your order.



### Installation Notes

The inductive speed sensor IS-M is developed for wheels made of ferromagnetic material.

If a wheel with different dimension has to be used (see Environment), the technical function has to be tested individually.

The installation depth can be changed individually according the customer request.

Please contact our technical consultancy for more information.

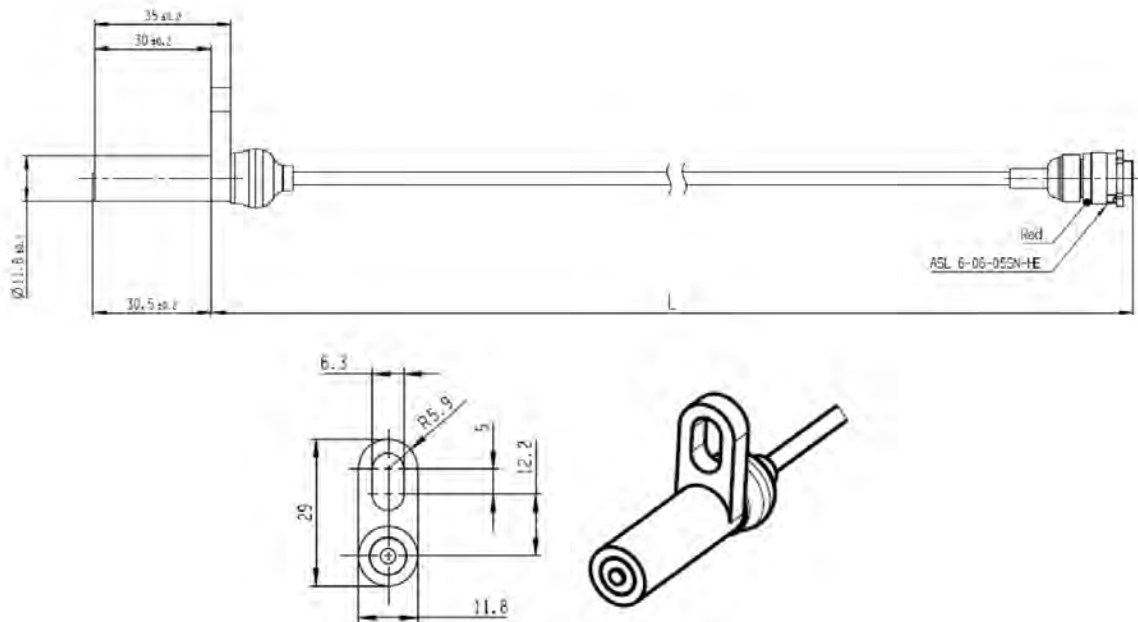
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Inductive Speed Sensor IS-M

Order number **F 02U V00 693-01**

### Dimensions



## Inductive Speed Sensor IS-T



### Features

- ▶ Turbocharger speed
- ▶ Max. 15 mm depth/lead
- ▶ Bore diameter 6.3 mm
- ▶ Metal housing

This sensor is designed for incremental measurement of rotational speed of a turbo charger.

The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. Every time a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points.

The main benefit of this sensor is robustness, a very compact design and high temperature resistance.

### Application

Application	Speed
Target wheel air gap AG	$0.5 \pm 0.1$ mm
Operating temp. range (sensing head)	-40 to 230°C
Storage temperature range	0 to 100°C
Max. vibration	800 m/s <sup>2</sup> max. 80 h

### Technical Specifications

#### Mechanical Data

Magnetic pole	Round
Bore diameter	6.3 mm
Tightening torque	1.4 Nm
Weight w/o wire	14 g
Installation depth L2	20 mm

#### Electrical Data

Coil resistance	30 Ω
Inductance max.	2.6 mH

#### Environment

Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

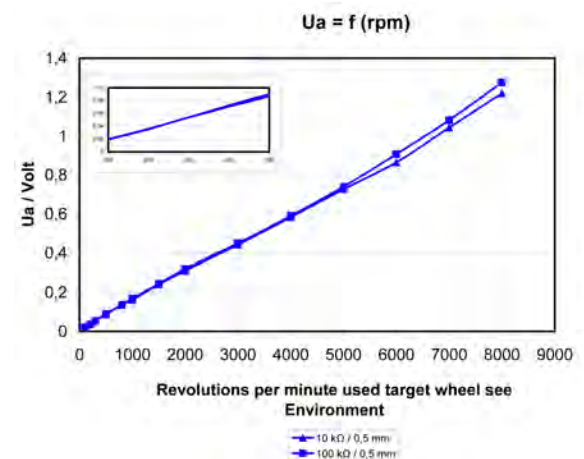
#### Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector	ASL 0-06-05PN-HE
Pin 1	Nc
Pin 2	GND
Pin 3	Sig
Pin 4	Nc
Pin 5	Scr

Various motorsport and automotive connectors are available on request.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	10 to 100 cm

Please specify the required wire length with your order.



### Installation Notes

This inductive speed sensor IS-T is developed for wheels made of ferromagnetic material by turbo charger.

If a wheel with different dimensions is used (see Environment), the technical function has to be tested individually.

Please contact our technical consultancy for more information.

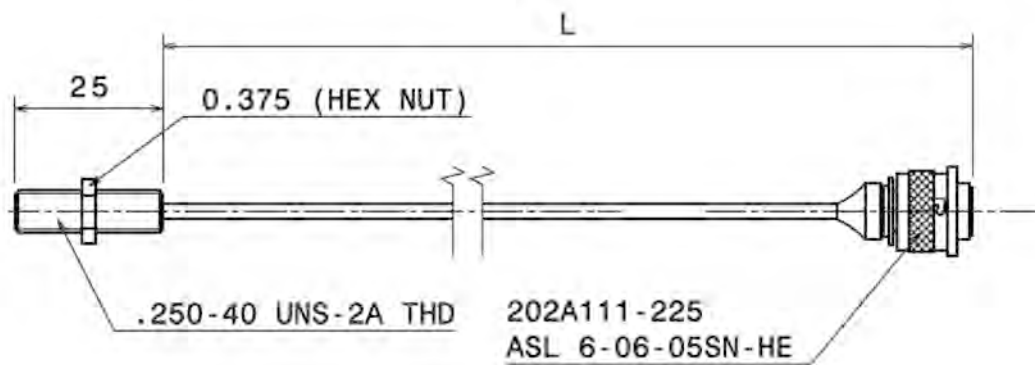
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Inductive Speed Sensor IS-T**

Order number **B 261 209 662-01**

### Dimensions



## Temperature Sensor NTC M5-HS



### Features

- ▶ Wide measurement range: -55 to 300°C
- ▶ Very short response time
- ▶ Strong protection against ambient temperature
- ▶ Compact and robust design

This sensor is designed to measure temperatures up to 300°C of oil, water, fuel or air. 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-sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. To improve a good protection against the ambient temperature, the housing is made of stainless steel and partly filled with an isolation-paste. The main benefit of the sensor is a very compact design and its very short response time.

### Application

Application	-55 to 300°C
Storage temperature range	0 to 100°C
Bio fuel compatibility	-

### Technical Specifications

#### Mechanical Data

Male thread	M5x1
Wrench size	8 mm
Installation torque	8 Nm
Weight w/o wire	6 g
Sealing	O-Ring 4 x 1 mm

#### Electrical Data

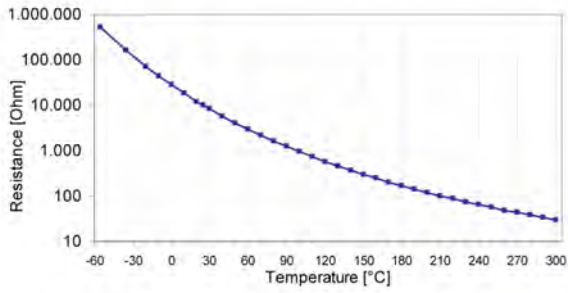
Characteristic	NTC
Nominal resistance	10 kΩ

#### Characteristic

Accuracy at 25°C (homogeneous cond.)	± 0.3°C
Accuracy at 100°C (homogeneous cond.)	± 1.3°C
Rel. resistance tolerance at 25°C	1 %
Response time tau in still water	< 4 s

#### Characteristic Application

T [°C]	R [Ω]
-55	519,910
-35	158,090
-20	71,668
-10	44,087
0	27,936
10	18,187
20	12,136
25	10,000
30	8,284
40	5,774
50	4,103
60	2,967
70	2,182
80	1,629
90	1,234
100	946.6
120	578.1
140	368.8
160	244.4
180	167.6
200	118.5
220	86.08
240	64.08
260	48.76
280	37.86
300	29.94



## 4

## Connectors and Wires

Connector	ASL 6-06-05PN-HE
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Mating connector	ASL 0-06-05SN-HE
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Pin 1	-
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Pin 2	Sig-
-------	------

Pin 3	Sig+
-------	------

Pin 4	-
-------	---

Pin 5	-
-------	---

Various motorsport and automotive connectors are available on request.

Wire size	AWG 24
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Wire length L	15 to 50 cm
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Please specify the required wire length with your order.

## Installation Notes

The NTC M5-HS can be connected directly to most control units using a pull-up resistance (typically 1 or 3 k $\Omega$ ).

Any mounting orientation is possible.

Please find further application hints in the offer drawing at our homepage.

Free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

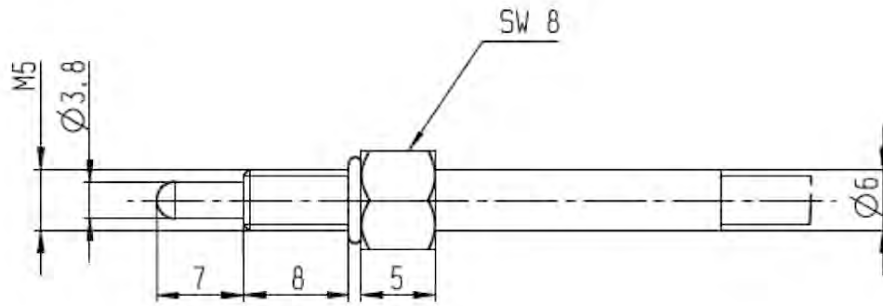
## Ordering Information

## Temperature Sensor NTC M5-HS

Order number **F 02U V00 510-01**



## Dimensions



## Temperature Sensor NTC M6



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### Features

► **Measurement range:** -55 to 125°C

This sensor is designed to measure fluid temperatures e.g. oil, water or fuel. This signal may be used as a control value for engine control units or as a measurement value which is logged in a data acquisition system. The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. The sensing element is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to a AWG 24 wire. To improve the response time, the element is molded into a high performance heat paste. The main benefit of the sensor is the combination of a high quality production part and a robust and compact design.

### Application

Application	-55 to 125°C
Storage temperature range	0 to 100°C
Bio fuel compatibility	-
Max. vibration	800 m/s <sup>2</sup> at 5 to 500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M6x1
Wrench size	10 mm
Installation torque	3 Nm
Weight w/o wire	8.5 g
Sealing	O-Ring 4.47 x 1.78 mm

#### Electrical Data

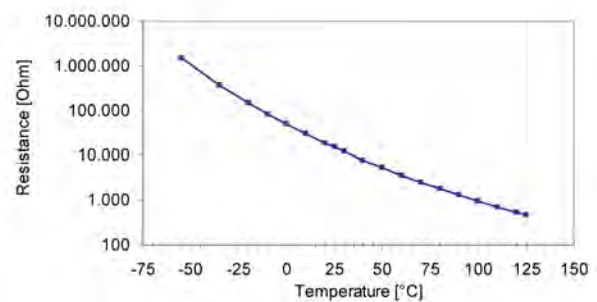
Characteristic	NTC
Max. power at 25 °C	200 mW
Nominal resistance at 25°C	15 kΩ

#### Characteristic

Accuracy at 25°C	± 1.1°C
Accuracy at 100°C	± 4.4°C
Rel. resistance tolerance at 25°C	± 5 %
Response time tau 63 in still water	< 9 s

#### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-
Various motorsport and automotive connectors are available on request.	
Wire size	AWG 24
Wire length L	15 to 50 cm
Please specify the required wire length with your order.	

## Installation Notes

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

Any mounting orientation is possible.

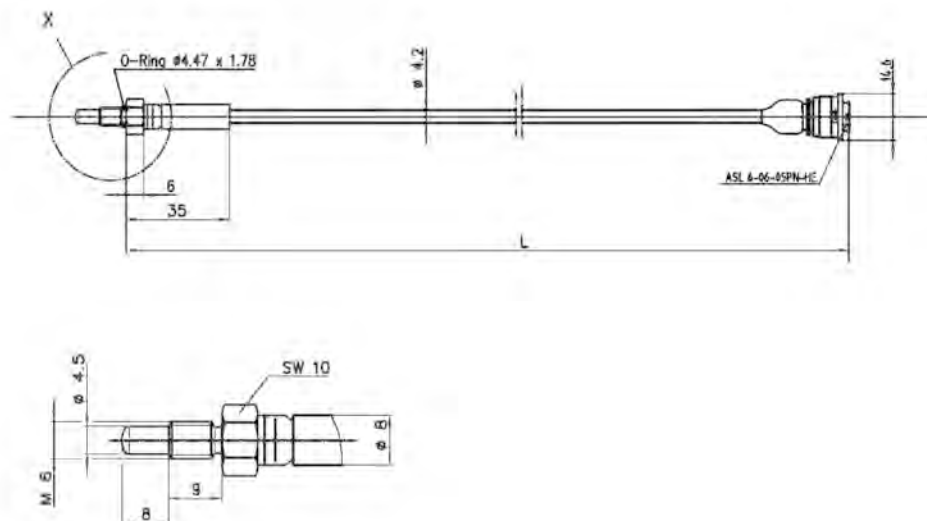
Please find further application hints in the offer drawing at our homepage.

Free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

**Temperature Sensor NTC M6**  
Order number **B 261 209 386-01**

## Dimensions



## Temperature Sensor NTC M6-H



4

### Features

- Wide measurement range: -25 to 300°C

This sensor is designed to measure fluid temperatures e.g. oil, water or fuel. This signal may be used as a control value for engine control units or as a measurement value which is logged in a data acquisition system. The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. The sensing element is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to a AWG 24 wire. To improve the response time, the element 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. It is especially designed to measure high temperatures (up to 300°C).

### Application

Application	-25 to 300°C
Storage temperature range	0 to 100°C
Bio fuel compatibility	-
Max. vibration	800 m/s <sup>2</sup> at 5 to 500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M6x1
Wrench size	10 mm
Installation torque	3 Nm
Weight w/o wire	8.5 g
Sealing	O-Ring 4.47 x 1.78 mm

#### Electrical Data

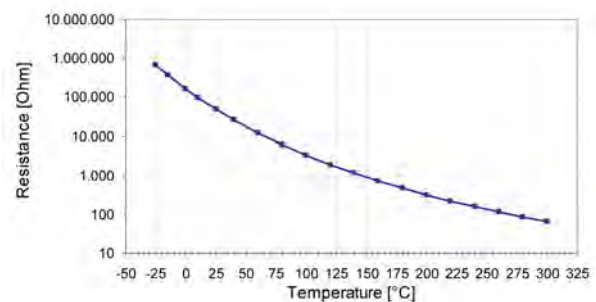
Characteristic	NTC
Max. power at 25°C	200 mW
Nominal resistance at 25°C	49.12 kΩ

#### Characteristic

Accuracy at 25°C	± 1.84°C
Accuracy at 100°C	± 1.5°C
Rel. resistance tolerance at 25°C	8 %
Response time tau 63 in still water	< 7 s

#### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Wire size	AWG 24
Wire length L	15 to 50 cm

Please specify the required wire length with your order.

### Installation Notes

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

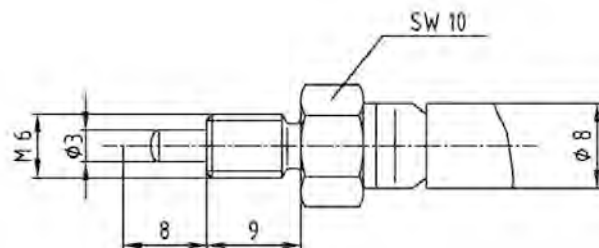
Any mounting orientation is possible.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

**Temperature Sensor NTC M6-H**  
Order number **B 261 209 989-01**

### Dimensions



## Temperature Sensor NTC M6-HS

4



### Features

- ▶ Wide measurement range: -55 to 300°C
- ▶ Very short response time
- ▶ Strong protection against ambient temperature
- ▶ Robust design

This sensor is designed to measure temperatures up to 300 °C of oil, water, fuel or air. 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-sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. To improve a good protection against the ambient temperature, the housing is made of stainless steel and partly filled with an isolation-paste. The main benefit of the sensor is a very robust and compact design and its very short response time.

### Application

Application	-55 to 300 °C
Storage temperature range	0 to 100 °C
Bio fuel compatibility	-

### Technical Specifications

#### Mechanical Data

Male thread	M6x1
Wrench size	10 mm
Installation torque	8 Nm
Weight w/o wire	6.5 g
Sealing	O-Ring 4.47 x 1.78 mm

#### Electrical Data

Characteristic	NTC
Nominal resistance at 25 °C	10 kΩ

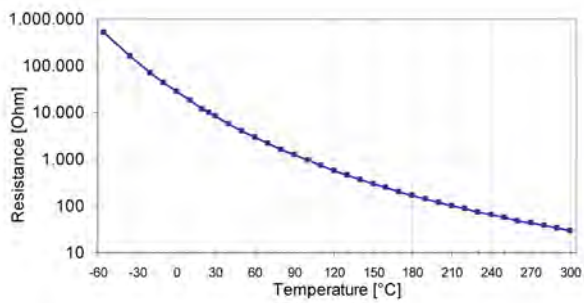
#### Characteristic

Accuracy at 25 °C (homogeneous cond.)	± 0.3 °C
Accuracy at 100 °C (homogeneous cond.)	± 1.3 °C
Rel. resistance tolerance at 25°C	1 %
Response time tau 63 in still water	< 4 s

#### Characteristic Application

T [°C]	R [Ω]
-55	519,910
-35	158,090
-20	71,668
-10	44,087
0	27,936
10	18,187
20	12,136
25	10,000
30	8,284
40	5,774
50	4,103
60	2,967
70	2,182
80	1,629
90	1,234
100	946.6
110	735.5
120	578.1
130	459.4
140	368.8
150	298.9
160	244.4
170	201.6
180	167.6
190	140.4
200	118.5
210	100.7
220	86.08
230	74.05

240	64.08
250	55.75
260	48.76
270	42.87
280	37.86
290	33.59
300	29.94



### Connectors and Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Wire size	AWG 24
Wire length L	15 to 50 cm

Please specify the required wire length with your order.

### Installation Notes

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

Any mounting orientation is possible.

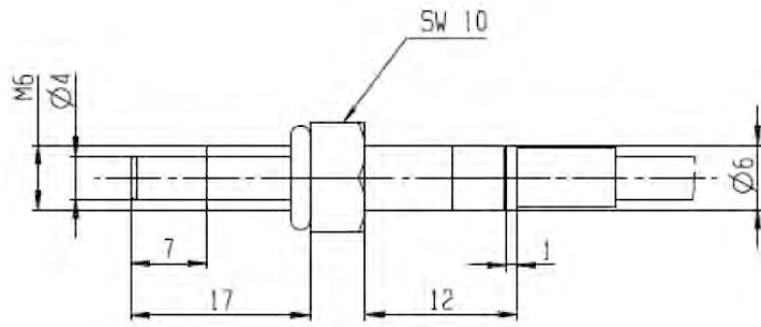
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging at our homepage.

### Ordering Information

#### Temperature Sensor NTC M6-HS

Order number **F 02U V00 486-01**

Dimensions





## Temperature Sensor NTC M8



### Features

- ▶ Measurement range: -55 to 125°C
- ▶ Robust design

This sensor is designed to measure fluid temperatures e.g. oil, water or fuel. This signal may be used as a control value for engine control units or as a measurement value which is logged in a data acquisition system. The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. The sensing element is a lacquer-coated thermistor disk which is connected via a copper-clad Fe wire to a AWG 24 wire. To improve the response time, the element is molded into a high performance heat paste. The main benefit of the sensor is the combination of a high quality production part and a robust and compact design.

### Application

Application	-55 to 125°C
Storage temp. range	0 to 100°C
Bio fuel compatibility	-
Max. vibration	800 m/s <sup>2</sup> to 5 to 500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M8x1
Wrench size	12 mm
Installation torque	3 Nm
Weight w/o wire	10 g
Sealing	O-Ring 6.35 x 1.78 mm

#### Electrical Data

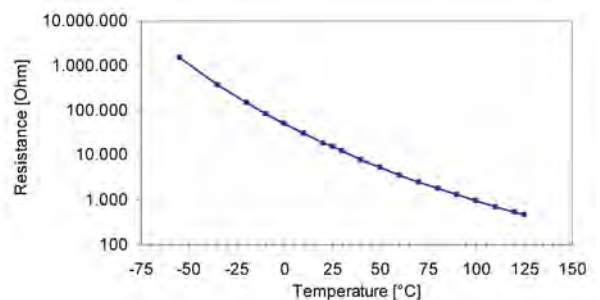
Characteristic	NTC
Max. power at 25°C	200 mW
Nominal resistance at 25°C	15 kΩ

#### Characteristic

Accuracy at 25°C	± 1.1°C
Accuracy at 100°C	± 4.4°C
Rel. resistance tolerance	± 5 %
Response time tau 63 in still water	< 11 s

#### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Wire size	AWG 24
Wire length L	15 to 50 cm

Please specify the required wire length with your order.

### Installation Notes

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

Any mounting orientation is possible.

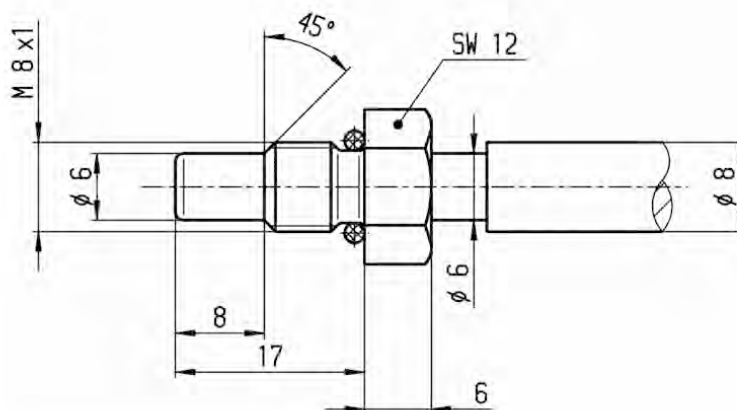
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### Temperature Sensor NTC M8

Order number **B 261 209 384-01**

### Dimensions



## Temperature Sensor NTC M8-HS



### Features

- ▶ Wide measurement range: -55 to 300°C
- ▶ Very short response time
- ▶ Strong protection against ambient temperature
- ▶ Robust design

This sensor is designed to measure temperatures up to 300°C of oil, water, fuel or air. 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-sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises and the resistance decreases. To improve a good protection against the ambient temperature, the housing is made of stainless steel and partly filled with an isolation-paste. The main benefit of the sensor is a very robust design and its very short response time.

### Application

Application	-55 to 300°C
Storage temperature range	0 to 100°C
Bio fuel compatibility	-

### Technical Specifications

#### Mechanical Data

Male thread	M8x1
Wrench size	12 mm
Installation torque	8 Nm
Weight w/o wire	8 g
Sealing	O-Ring 6.35 x 1.78 mm

#### Electrical Data

Characteristic	NTC
Nominal resistance	10 kΩ

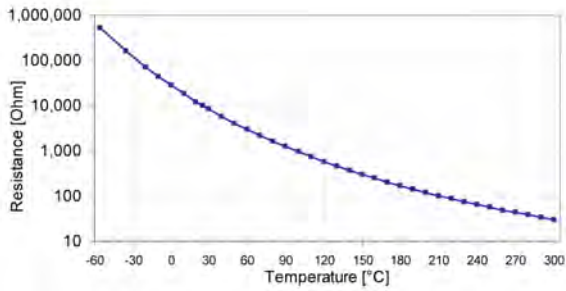
#### Characteristic

Accuracy at 25°C (homogeneous cond.)	± 0.3°C
Accuracy at 100°C (homogeneous cond.)	± 1.3°C
Rel. resistance tolerance at 25°C	1 %
Response time tau in still water	< 4 s
63	

#### Characteristic Application

T [°C]	R [Ω]
-55	519,910
-35	158,090
-20	71,668
-10	44,087
0	27,936
10	18,187
20	12,136
25	10,000
30	8,284
40	5,774
50	4,103
60	2,967
70	2,182
80	1,629
90	1,234
100	946.6
110	735.5
120	578.1
130	459.4
140	368.8
150	298.9
160	244.4
170	201.6
180	167.6
190	140.4
200	118.5
210	100.7
220	86.08
230	74.05

240	64.08
250	55.75
260	48.76
270	42.87
280	37.86
290	33.59
300	29.94



### Connectors and Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	-
Pin 2	Sig-
Pin 3	Sig+
Pin 4	-
Pin 5	-

Various motorsport and automotive connectors are available on request.

Wire size	AWG 24
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Wire length L	15 to 50 cm
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Please specify the required wire length with your order.

### Installation Notes

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

Any mounting orientation is possible.

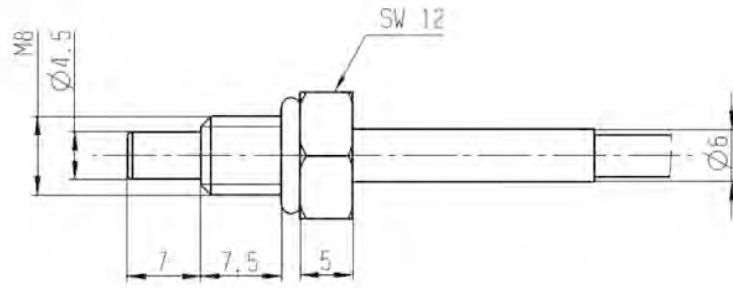
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### Temperature Sensor NTC M8-HS

Order number **F 02U V00 509-01**

Dimensions



## Temperature Sensor NTC M12



4

### Features

- Measurement range: -40 to 130°C
- Robust design

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

The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The sensing 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 a high quality production part and a robust compact design.

### Application

Application	-40 to 130°C
Storage temp. range	0 to 100°C
Bio fuel compatibility	E85/M22
Max. vibration	600 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Male thread	M12x1.5
Wrench size	19 mm
Installation torque	25 Nm
Weight w/o wire	29 g
Sealing	Not included

#### Electrical Data

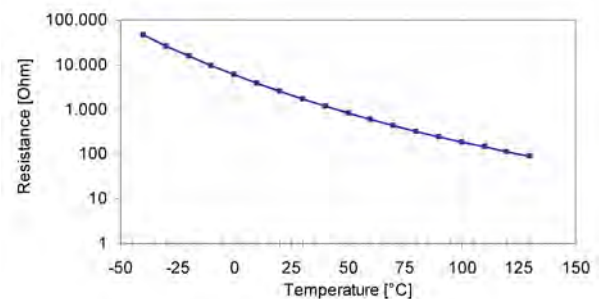
Characteristic	NTC
Nominal resistance at 20°C	2.5 kΩ ± 5 %

#### Characteristic

Accuracy at 25°C	± 1.4°C
Accuracy at 100°C	± 3.4°C
Response time tau 63 in still water	< 15 s

#### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	Bosch Jetronic
Mating connector	D 261 205 288
Pin 1	SIG+
Pin 2	SIG-

## Installation Notes

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

Any mounting orientation is possible.

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

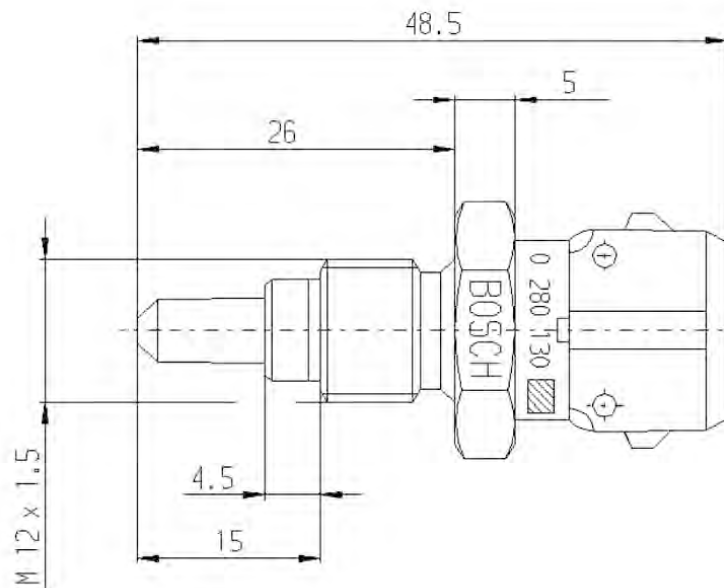
Free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging at our homepage.

## Ordering Information

### Temperature Sensor NTC M12

Order number **0 280 130 026**

## Dimensions



## Temperature Sensor NTC M12-H



4

### Features

- ▶ Measurement range: -40 to 150°C
- ▶ Robust design

This sensor is designed to measure fluid temperatures e.g. oil, water or fuel. This signal may be used as a control value for engine control units or as a measurement value which is logged in a data acquisition system. The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The sensing 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 a high quality production part and a robust compact design.

### Application

Application	-40 to 150°C
Storage temperature range	-30 to 60°C
Bio fuel compatibility	E85/M22
Max. vibration	300 m/s <sup>2</sup>

### Technical Specifications

#### Mechanical Data

Male thread	M12x1.5
Wrench size	19 mm
Installation torque	18 Nm
Weight w/o wire	28.3 g
Sealing	Al-washer

#### Electrical Data

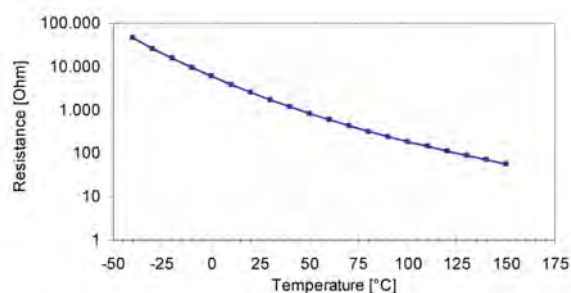
Characteristic	NTC
Nominal resistance at 20°C	2.5 kΩ ± 20°C

### Characteristic

Accuracy at 25°C	± 1.4°C
Accuracy at 100°C	± 0.8°C
Response time tau 63 in still water	< 15 s

### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	Bosch Compact
Mating connector	D 261 205 337
Pin 1	SIG+
Pin 2	SIG-



## Installation Notes

The NTC M12-H can be connected directly to most control units using a pull-up resistor (typically 1 or 3 k $\Omega$ ).

Any mounting orientation is possible.

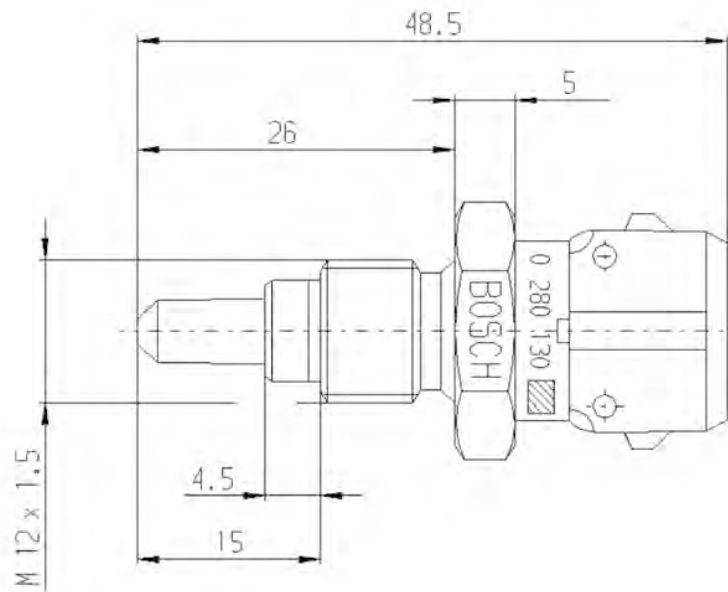
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

**Temperature Sensor NTC M12-H**

Order number **0 281 002 170**

## Dimensions



## Temperature Sensor NTC M12-L



4

### Features

- ▶ Measurement range: -40 to 140°C
- ▶ Air temperature measurement
- ▶ Robust design

This sensor is designed to measure air temperature e.g. in the air box or ambient temperature. The signal may be used as a control value for engine control units or as a measurement value which is logged in a data acquisition system.

The NTC sensing element has a negative temperature coefficient. This means, that with increasing temperature the conductivity rises. The sensing 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 a high quality production part and a robust and compact design.

### Application

Application	-40 to 140°C
Storage temp. range	-30 to 60°C
Bio fuel compatibility	E85/M22
Max. vibration	300 m/s <sup>2</sup> at 50 to 250 Hz

### Technical Specifications

#### Mechanical Data

Male thread	M12x1.5
Wrench size	19 mm
Installation torque	15 Nm
Weight w/o wire	24.6 g
Sealing	Not included

#### Electrical Data

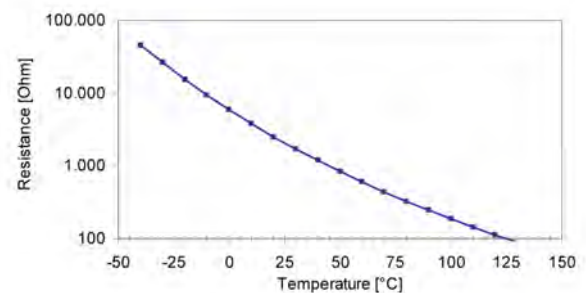
Characteristic	NTC
Nominal resistance ± 5%	2.5 kΩ at 20°C

### Characteristic

Accuracy at 25°C	± 1.4°C
Accuracy at 100°C	± 3.4°C
Response Time tau 63 in still water	< 10 s

### Characteristic Application

T [°C]	R [Ω]
-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 Wires

Connector	Bosch Compact
Mating connector	D 261 205 288-01
Pin 1	SIG+
Pin 2	SIG-

## Installation Notes

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

Any mounting orientation is possible.

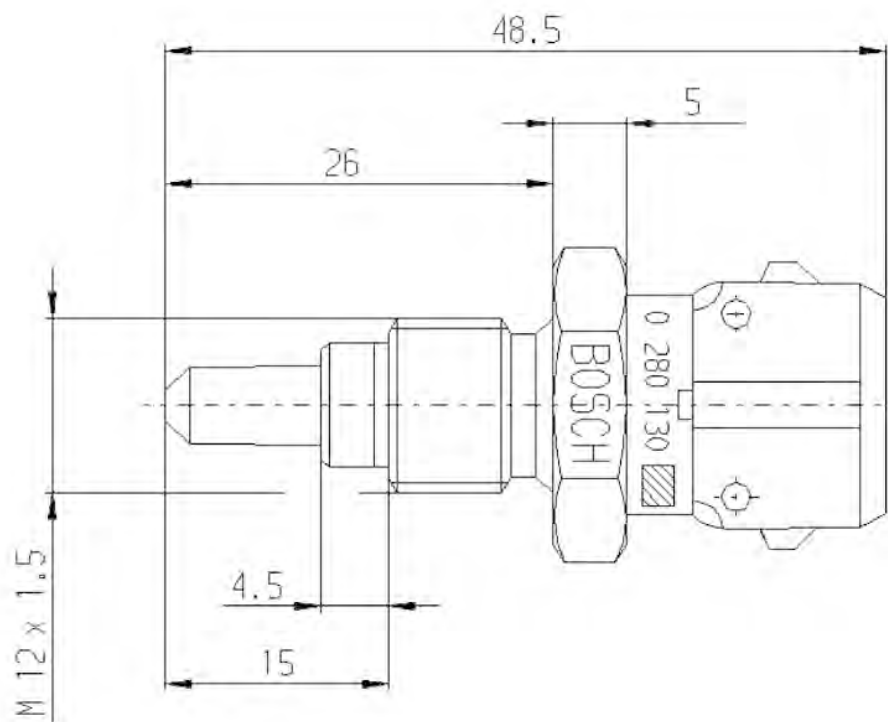
Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

## Ordering Information

### Temperature Sensor NTC M12-L

Order number **0 280 130 039**

## Dimensions



## Temperature Sensor PT 200E



4

### Features

- ▶ Exhaust gas temperature measurements
- ▶ Wide measurement range: -40 to 1,000°C
- ▶ Short response time

The PT 200E is designed to measure exhaust gas temperatures up to 1,000°C.

The sensor element has a positive temperature coefficient. This means, that with increasing ambient temperature the conductivity decreases and the resistance rises. The opened housing exposes the sensor directly into the gas flow in order to improve its performance. The main benefit of the sensor is a very robust and compact design and its wide measurement range.

### Application

Application	-40 to 1,000°C
Storage temp. range	0 to 100°C

### Technical Specifications

#### Mechanical Data

Male thread	M14x1.5
Wrench size	19 mm
Weight w/o wire	55 g

#### Electrical Data

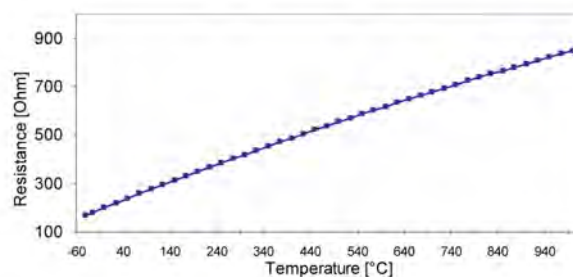
Characteristic	PTC
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#### Characteristic

Accuracy at -40 to 200°C	± 3°C
Relative resistance tolerance at > 200°C	± 1.5 %

### Characteristic Application

T [°C]	R [Ω]
-40	170
-25	181
0	201
25	220
50	239
75	257
100	276
150	313
200	349
250	385
300	420
350	454
400	488
450	521
500	554
550	586
600	618
650	649
700	679
750	709
800	738
850	767
900	795



### Connectors and Wires

Connector	ASL 6-06-05PD-HE
Mating connector	ASL 0-06-05SD-HE
Pin 1	n.c.
Pin 2	SIG+
Pin 3	SIG-
Pin 4	n.c.
Pin 5	n.c.

Wire size	AWG 24
Wire length	15 to 100 cm
Please specify the required wire length with your order.	
Various motorsports and automotive connectors are available on request.	

### Installation Notes

The PT 200E can be connected directly to most control units using a pull-up resistor (typically 1 or 3 k $\Omega$ ).

Please check the offer drawing for a correct mounting orientation.

Please use the mounting part for a correct fixation of the sensor (not included, available on request).

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

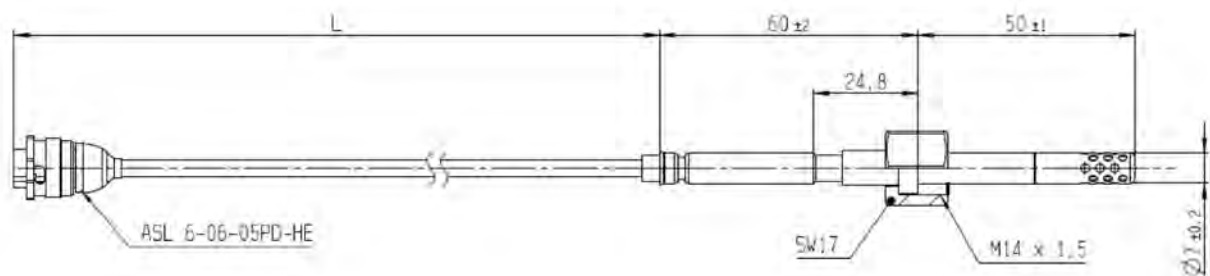
### Ordering Information

**Temperature Sensor PT 200E**  
Order number **F 02U V00 811-01**

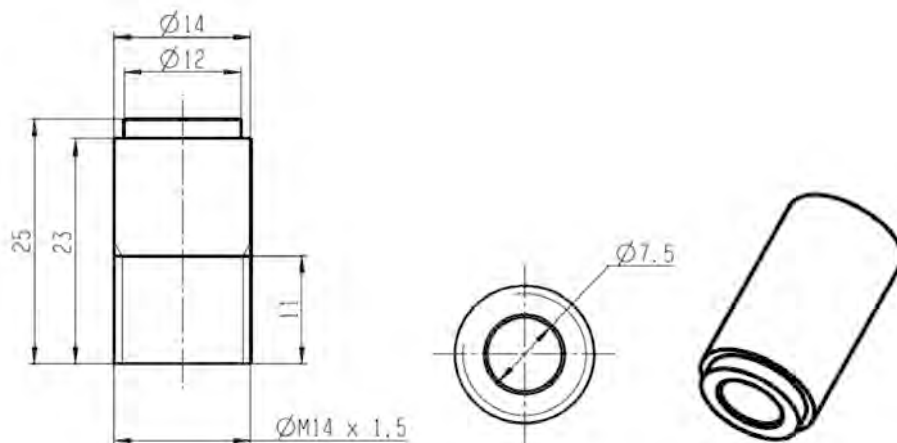
#### Accessories

**Temperature Sensor PT 200E Adapter**  
Order number **F 02U 000 847-01**

### Dimensions



Temperature Sensor PT 200E



Temperature Sensor PT 200E Adapter

## Temperature Sensors Infrared TI-16-r/-s



4

### Features

- ▶ Non-contact temperature measurement
- ▶ Measurement range: 0 to 160°C
- ▶ Analog output (0 to 5 V)
- ▶ Compact size and robust housing

This infrared temperature sensor is designed for non-contact surface temperature measurement of various parts (e.g. tires or cylinder heads) based on IR radiation.

Using ruggedized silicon-coated optics with internal electronics and cabling packaged inside 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 to 160°C
Operating temp. range (sensing head)	-20 to 120°C
Operating temp. range (electronics)	-20 to 70°C
Storage temperature range	-40 to 85°C
Relative humidity	10 to 95 %
Max. vibration any axis	30 m/s <sup>2</sup> at 11 to 200 Hz 500 m/s <sup>2</sup> , 11 ms shock

### Technical Specifications

#### Variations

	TI-16-r	TI-16-s
Optimized for measuring of	Rubber	Steel
Emissivity (predefined)	0.95	0.80

#### Mechanical Data

Male thread	M12x1 mm
Wrench size	14 mm
Length housing	28 mm
Weight with wire 1 m	42 g

#### Electrical Data

Power supply $U_s$	5 to 28 V
Max power supply $U_s$	28 V
Full scale output $U_A$	0 to 5 V
Current $I_S$	9 mA

#### Characteristic

Emissivity (predefined)	Please see Variations
Optical resolution	10 : 1
Spectral range	8 to 14 $\mu$ m
Compensated range	-20 to 120°C
Temperature resolution at $T_{obj} < 100^\circ\text{C}$	0.1°C
System accuracy at 23°C $t_{amb}$ or max. value	$\pm 1.5^\circ\text{C}$ or 1.5 %
Repeatability at 23°C $t_{amb}$ or max. value	$\pm 0.75^\circ\text{C}$ or 0.75 %
Sensitivity	31.25 mV/°C
Offset	0 mV

#### Connectors and Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Pin 4	Prg
Pin 5	Scr

Various motorsport and automotive connectors are available on request.

Sleeve	Viton
Wire size	AWG 26

Wire length L 70 to 100 cm

Please specify the requested wire length with your order.

### Installation Notes

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 160°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-circuits.

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 at our homepage.

### Ordering Information

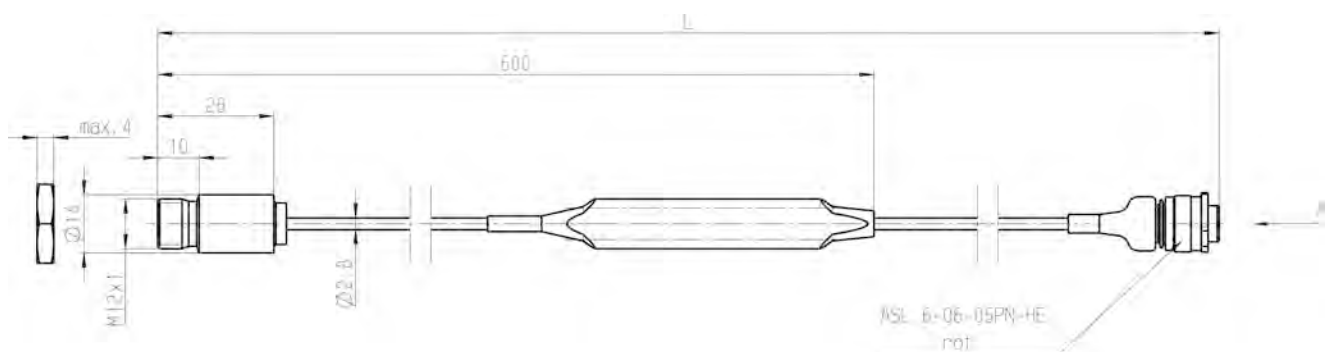
#### TI-16-r

Order number **F 01T A21 207-01**

#### TI-16-s

Order number **F 01T A21 209-01**

### Dimensions



## Temperature Sensors Infrared TI-100-s/-c



4

### Features

- ▶ Non-contact temperature measurement
- ▶ Measurement range: 0 to 1,000°C
- ▶ Analog output (0 to 5 V)
- ▶ Compact size and robust housing

This infrared temperature sensor is designed for non-contact surface temperature measurement of various parts (e.g. tires or cylinder heads) based on IR radiation.

Using ruggedized silicon-coated optics with internal electronics and cabling packaged inside 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 to 1,000°C
Operating temp. range (sensing head)	-20 to 120°C
Operating temp. range (electronics)	-20 to 70°C
Storage temperature range	-40 to 85°C
Relative humidity	10 to 95 %
Max. vibration any axis	30 m/s <sup>2</sup> at 11 to 200 Hz 500 m/s <sup>2</sup> , 11 ms shock

### Technical Specifications

#### Variations

	TI-100-s	TI-100-C
Optimized for measuring of	Steel	Carbon
Emissivity (predefined)	0.80	0.75

#### Mechanical Data

Male thread	M12x1 mm
Wrench size	14 mm
Length housing	28 mm
Weight with wire 1 m	42 g

#### Electrical Data

Power supply $U_s$	5 to 28 V
Max power supply $U_s$	28 V
Full scale output $U_A$	0 to 5 V
Current $I_S$	9 mA

#### Characteristic

Emissivity (predefined)	Please see Variations
Optical resolution	10 : 1
Spectral range	8 to 14 $\mu$ m
Compensated range	-20 to 120°C
Temperature resolution at $T_{obj} < 100^\circ\text{C}$	0.1°C
System accuracy at 23°C $t_{amb}$ or max. value	$\pm 1.5^\circ\text{C}$ or 1.5 %
Repeatability at 23°C $t_{amb}$ or max. value	$\pm 0.75^\circ\text{C}$ or 0.75 %
Sensitivity	31.25 mV/°C
Offset	0 mV

#### Connectors and Wires

Connector	ASL 6-06-05PN-HE
Mating connector	ASL 0-06-05SN-HE
Pin 1	$U_s$
Pin 2	Gnd
Pin 3	Sig
Pin 4	Prg
Pin 5	Scr

Various motorsport and automotive connectors are available on request.

Sleeve	Viton
Wire size	AWG 26



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Wire length L                      70 to 100 cm

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Please specify the requested wire length with your order.

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### Installation Notes

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The TI-100 can be connected directly to most control units and data logging systems.

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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-circuits.

---

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!

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Please find further application hints in the offer drawing at our homepage.

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### Ordering Information

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#### **TI-100-s**

Order number **F 01T A21 210-01**

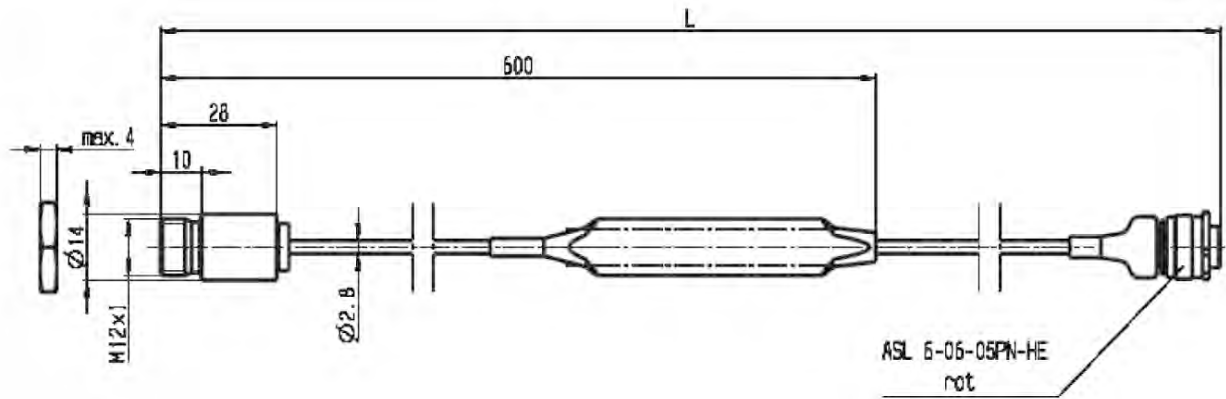
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#### **TI-100-c**

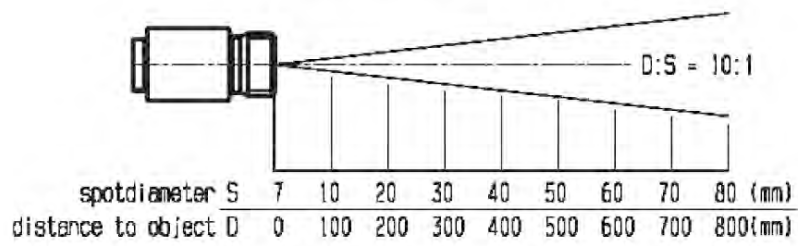
Order number **F 01T A21 211-01**

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Dimensions



Optical chart



## Thermocouple Probe TCP K



### Features

- ▶ Thermocouple Type K
- ▶ Thermo material: NiCr-Ni
- ▶ Measurement range: -200 to 1,000°C (1,300°C)
- ▶ Flexible mounting depth
- ▶ Analog output (Thermo voltage)

This sensor is designed to measure exhaust gas temperatures up to 1,300°C.

Thermocouples are temperature sensors, which generates a small temperature corresponding voltage, due to their thermo electrical behaviour, without any additional external energy. The mantle thermocouple has a metal mantle which includes two inner wires made of thermo material (NiCr-Ni). The wires are isolated.

The main feature and benefit of this sensor is a very quick response time, the combination of high quality production part and robust design with metal housing and motorsport connector.

### Application

Application	-200 to 1,000°C (1,300)°C
Max. vibration	800 m/s <sup>2</sup> at 5 to 500 Hz

### Technical Specifications

#### Mechanical Data

Male thread	See adapter
Wrench size	See adapter
Installation torque	See adapter
Weight with wire	47 g
Sensor tip bend radius	R 20

#### Electrical Data

Voltage supply	NiCr/Ni Typ K
Full scale output	DIN IEC 584-1

### Characteristic Application

Accuracy (max. value) ± 1.5 °C or 0.004 \* t

T [°C]	U [mV]
-200	-5.891
-100	-3.554
0	0.000
100	4.096
200	8.138
300	12.209
400	16.397
500	20.644
600	24.905
700	29.129
800	33.275
900	37.326
1,000	41.276
1,100	45.119
1,200	48.838
1,300	52.410

### Connectors and Wires

Connector	ASL 6-06-05PD-HE
Mating connector	ASL 0-06-05SD-HE
Pin 1	-
Pin 2	Sig+
Pin 3	Sig-
Pin 4	-
Pin 5	Src
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 75 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

### Installation Notes

The TCP K can be connected to Bosch Motorsport ECUs with thermocouple inputs (w/o pull-up resistant) or to external devices, which amplify the sensor voltage.

Recommended max. continuous utilization temperature 1,000°C, short-term utilization temperature 1,300°C.

The sensor can be mounted individually according to the customer request.

The sensor tip is flexible/ bendable and can be fixed by a special adapter (B 261 209 159-01).

The length of the sensor tip can be modified on request.

Any mounting orientation is possible.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for the Bosch Data Logging System at our homepage.

### Ordering Information

#### Thermocouple Probe TCP K

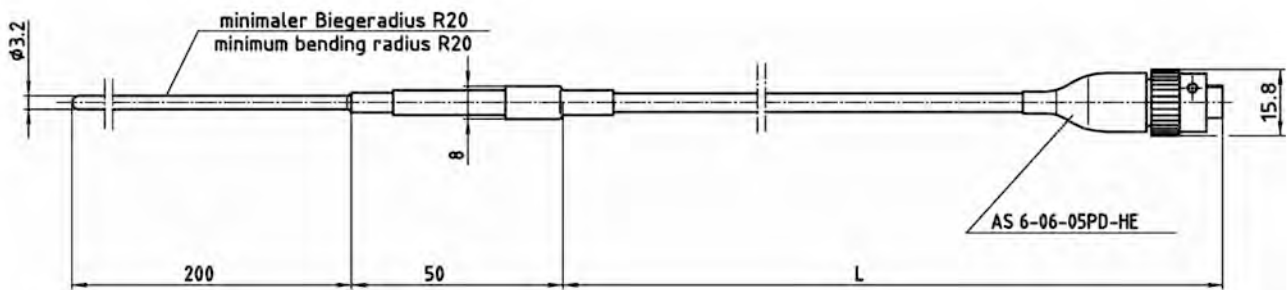
Order number **B 261 209 385-01**

#### Accessories

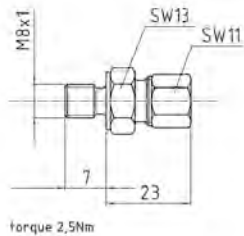
#### Thermocouple Probe TCP K Adapter

Order number **B 261 209 159-01**

### Dimensions



Thermocouple Probe TCP K



Thermocouple Probe TCP K Adapter

## Thermocouple Probe TCP KA



### Features

- ▶ Thermocouple Type K
- ▶ Thermo material: NiCr-Ni
- ▶ Measurement range: 0 to 1,250°C
- ▶ Analog output (0 to 5 V)

This sensor is designed to measure exhaust gas temperatures up to 1,250°C.

Thermocouples are temperature sensors, which supply a temperature corresponding voltage, due to its thermoelectric behavior, without any additional external energy source. The mantle thermocouple has a metal mantle which includes two inner wires made of thermo material (Ni CrSi - NiSi). The wires are isolated. The voltage is amplified by an electronic circuit, which is powered by 12 V and supplies an output signal from 0 to 5 V. Please note that the operating temperature of the external electronics is from 0 to 120°C.

The main feature and benefit of this sensor is the combination of high quality production part, robust design and its integrated amplifier.

### Application

Application	0 to 1,250°C
Operating temp. range (ext. electronics)	0 to 120°C

### Technical Specifications

#### Mechanical Data

Male thread	M12x1
Wrench size	17 mm
Installation torque	15 Nm
Weight with wire	85 g
Length	250 mm

### Electrical Data

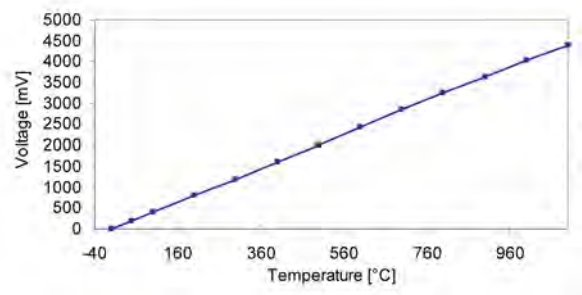
Voltage supply	12 V
Full scale output	0 to 5 V

### Characteristic Application

Measuring range	0 to 1,250°C
-----------------	--------------

T [°C]	U [mV]
--------	--------

0	0
50	197
100	399
200	793
300	1,190
400	1,598
500	2,012
600	2,427
700	2,839
800	3,243
900	3,638
1,000	4,022
1,100	4,396
1,200	4,759
1,250	5,000



### Connectors and Wires

Connector	F 02U B00 292-01
Mating connector	D 261 205 357
Pin 1	Sig
Pin 2	Gnd
Pin 3	U <sub>s</sub>
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 75 cm

## Installation Notes

The TCP KA can be connected to Bosch Motorsport ECUs with a 0 to 5 V analog signal input (w/o pull-up resistor) or to external data logging devices.

The sensor can be mounted individually according to the customer's request.

Please note that the operating temperature range of the external electronics is from 0 to 120°C.

Recommended bending radius of the wire of the sensor element is minimum 20 mm to ensure the sensor works properly and for a longer lifespan of the sensor.

Any mounting orientation is possible.

Please find further application hints in the offer drawing and free download of the sensor configuration file (\*.sdf) for Bosch Data Logging System at our homepage.

## Ordering Information

### Thermocouple Probe TCP KA

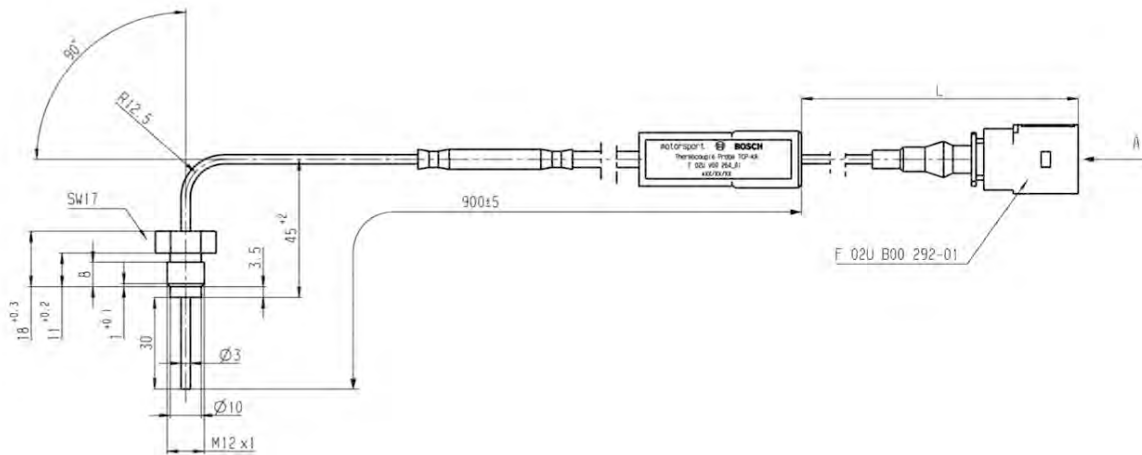
Order number **F 02U V00 264-01**

### Accessories

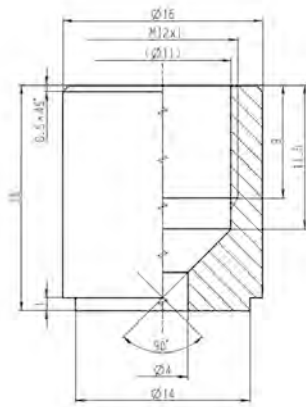
### Thermocouple Probe TCP KA Adapter

Order number **F 02U V01 185-01**

## Dimensions



Thermocouple Probe TCP KA



*Thermocouple Probe TCP KA Adapter*

## Wire Potentiometer WP 35



4

### Features

- ▶ Measurement range 0 to 38 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 35 is a wire potentiometer which is designed to measure position, direction, or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 38 mm
Temperature range	-65 to 125°C
Max. wire acceleration	290 m/s <sup>2</sup>
Max. wire tension	1.7 N
Shock	1,000 m/s <sup>2</sup> for 6 ms
Vibration	150 m/s <sup>2</sup> at 10 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	15 g
Possible mechanical range	38.1 mm
Mounting	2 x 2-56 UNC
Tightening torque	2.5 Nm
Life expectancy	5 x 10 <sup>6</sup> cycles
Protection	IP54
Dimensions	19.1 x 19.1 x 9.7 mm

#### Electrical Data

Power supply	5 V
Power supply max.	35 V
Nominal resistance	5 kΩ
Resistance tolerance	10 %
Non-linearity	1 %
Max. current	12 mA

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

#### Installation Notes

The WP 35 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of  $\pm 5$  to  $10^\circ$  from normal direction to avoid damaging the housing.

Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

Please find further application hints in the offer drawing at our homepage.

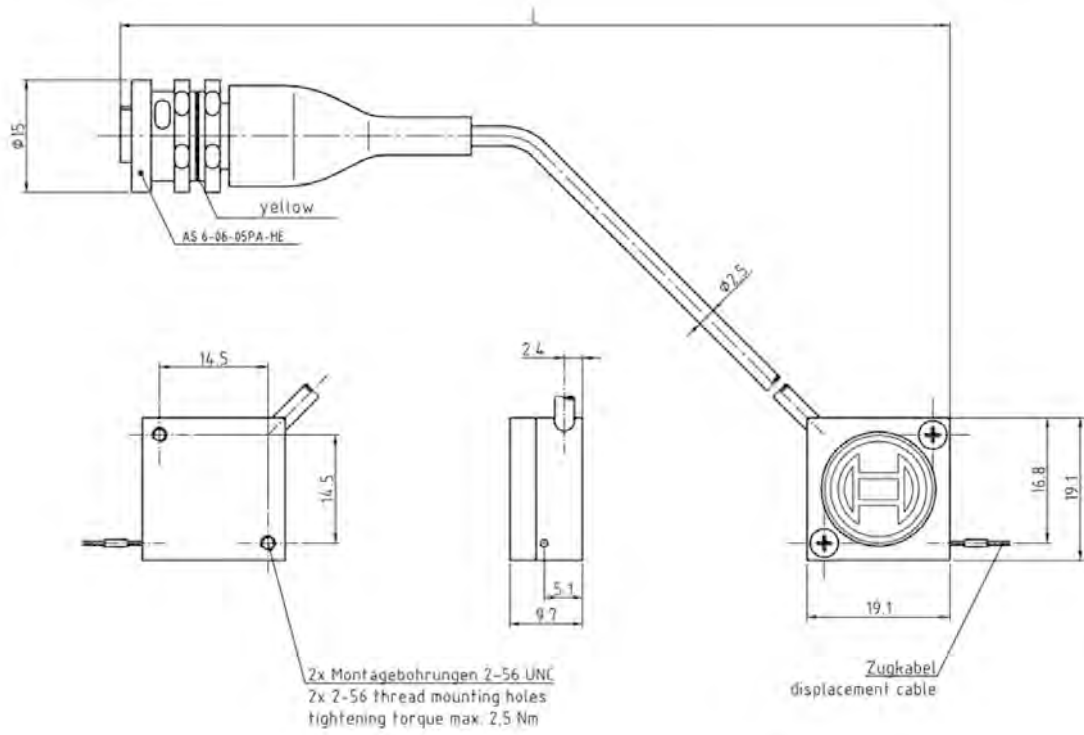
#### Ordering Information

##### Wire Potentiometer WP 35

Order number **B 261 209 541**



## Dimensions



## Wire Potentiometer WP 50



4

### Features

- ▶ Measurement range: 0 to 50 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 50 is a wire potentiometer which is designed to measure position, direction, or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 50 mm
Temperature range	-65 to 125°C
Max. wire acceleration	400 m/s <sup>2</sup>
Max. wire tension	3.3 N
Shock	1,000 m/s <sup>2</sup> for 6 ms
Vibration	150 m/s <sup>2</sup> at 10 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	15 g
Possible mechanical range	50.8 mm
Mounting	2 x 2-56 UNC
Tightening torque	2.5 Nm
Life expectancy	100 x 10 <sup>6</sup> cycles

Protection	IP54
Dimensions	Ø 24.4 x 11.4 mm

#### Electrical Data

Power supply	5 V
Power supply max.	35 V
Nominal resistance	5 kΩ
Resistance tolerance	10 %
Non-linearity	0.5 %
Max. current	12 mA

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

### Installation Notes

The WP 50 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of  $\pm 5$  to  $10^\circ$  from normal direction to avoid damaging the housing.

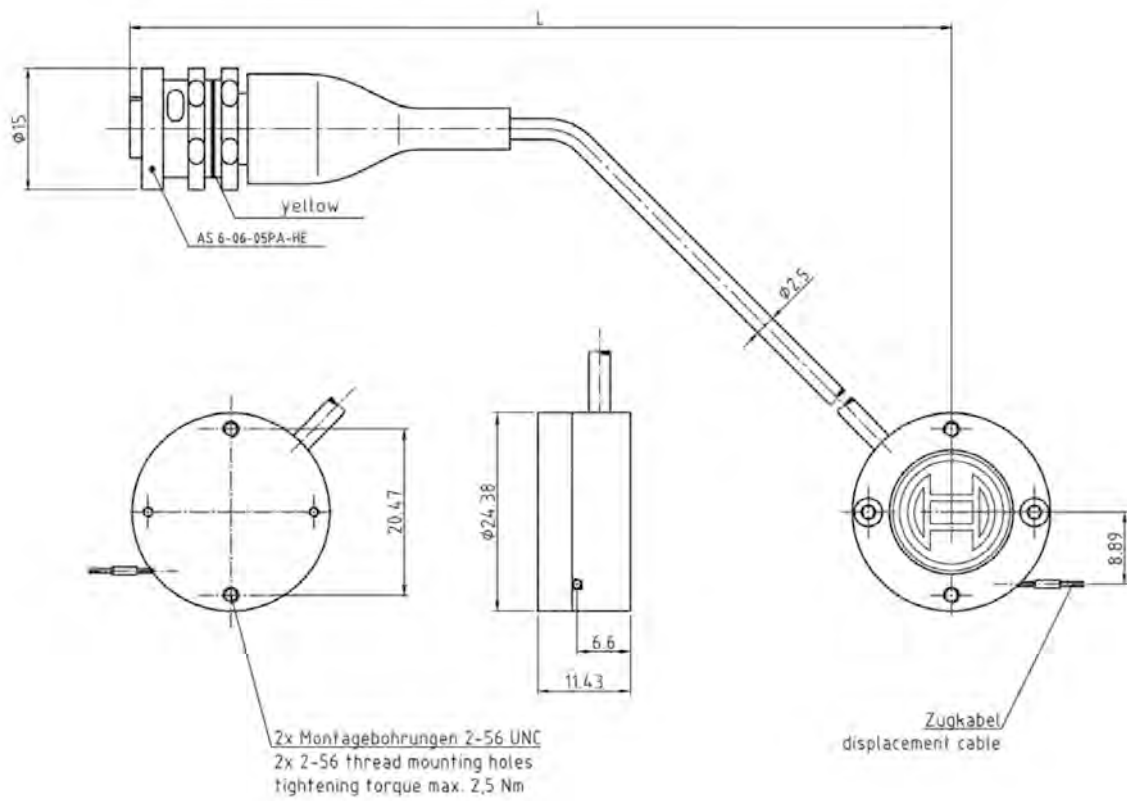
Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Wire Potentiometer WP 50**  
Order number **B 261 209 542**

## Dimensions



## Wire Potentiometer WP 75



4

### Features

- ▶ Measurement range: 0 to 75 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 75 is a wire potentiometer which is designed to measure position, direction, or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 75 mm
Temperature range	-65 to 125°C
Max. wire acceleration	170 m/s <sup>2</sup>
Max. wire tension	2.8 N
Shock	1,000 m/s <sup>2</sup> for 6 ms
Vibration	150 m/s <sup>2</sup> at 10 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	28 g
Possible mechanical range	76.2 mm
Mounting	2 x 2-56 UNC
Tightening torque	2.5 Nm
Life expectancy	100 x 10 <sup>6</sup> cycles

Protection	IP54
Dimensions	Ø 24.4 x 11.4 mm

#### Electrical Data

Power supply	5 V
Power supply max.	35 V
Nominal resistance	5 kΩ
Resistance tolerance	10 %
Non-linearity	0.5 %
Max. current	12 mA

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

### Installation Notes

The WP 75 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of ± 5 to 10° from normal direction to avoid damaging the housing.

Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

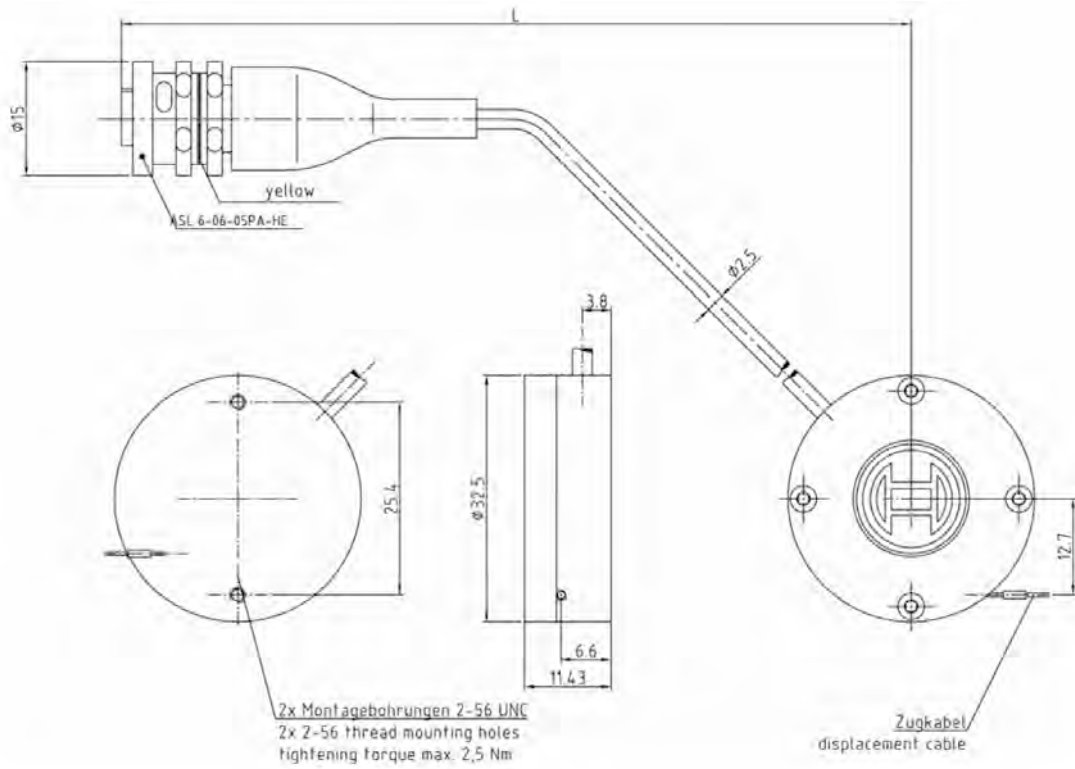
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Wire Potentiometer WP 75

Order number **B 261 209 543**

## Dimensions



## Wire Potentiometer WP 100



4

### Features

- ▶ Measurement range: 0 to 100 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 100 is a wire potentiometer which is designed to measure position, direction, or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 100 mm
Temperature range	-65 to 125°C
Max. wire acceleration	90 m/s <sup>2</sup>
Max. wire tension	3.3 N
Shock	1,000 m/s <sup>2</sup> for 6 ms
Vibration	150 m/s <sup>2</sup> at 10 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	57 g
Possible mechanical range	101.6 mm
Mounting	2 x 2-56 UNC
Tightening torque	2.5 Nm
Life expectancy	100 x 10 <sup>6</sup> cycles
Protection	IP54
Dimensions	Ø 43.3 x 12.5 mm

#### Electrical Data

Power supply	5 V
Power supply max.	35 V
Nominal resistance	5 kΩ
Resistance tolerance	10 %
Non-linearity	0.5 %
Max. current	12 mA

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

#### Installation Notes

The WP 100 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of  $\pm 5$  to  $10^\circ$  from normal direction to avoid damaging the housing.

Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

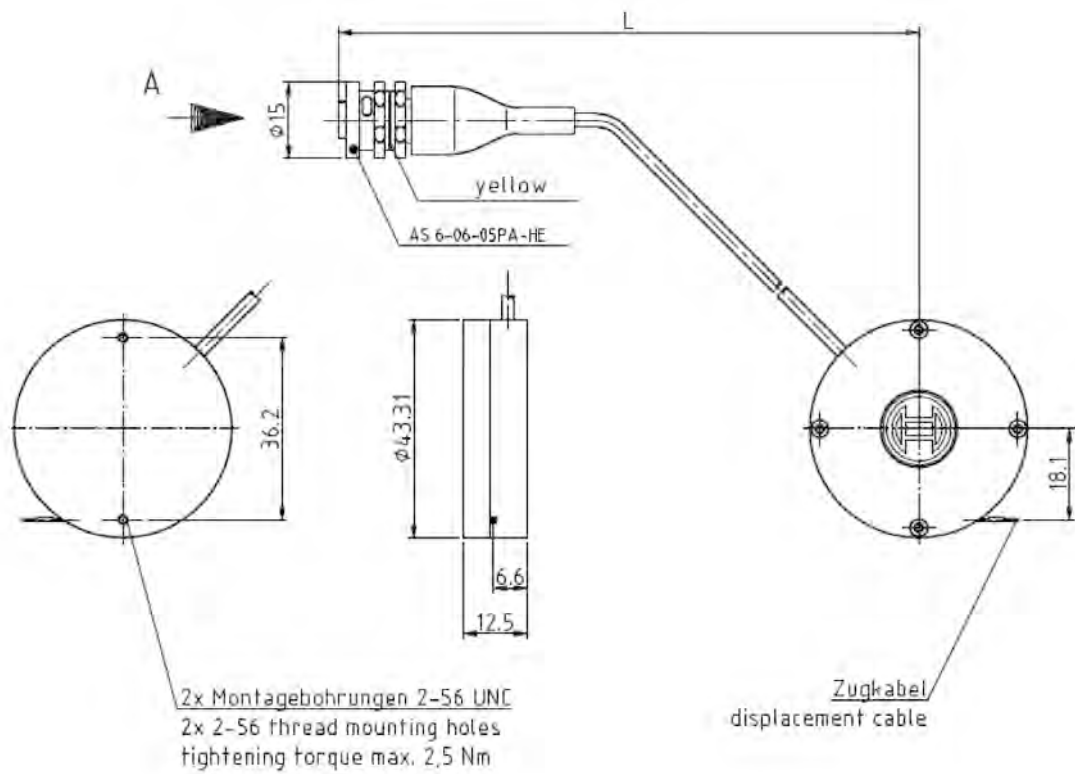
Please find further application hints in the offer drawing at our homepage.

#### Ordering Information

##### Wire Potentiometer WP 100

Order number **B 261 209 544**

## Dimensions



## Wire Potentiometer WP 120



4

### Features

- ▶ Measurement range: 0 to 120 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 120 is a wire potentiometer which is designed to measure position, direction or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 120 mm
Temperature range	-15 to 60°C
Max. wire tension	2.2 N

### Technical Specifications

#### Mechanical Data

Weight w/o wire	85 g
Possible mechanical range	120 mm
Mounting	2 x Ø 4 & Ø 4.8
Life expectancy	1 x 10 <sup>6</sup> cycles
Dimensions	45.7 x 44.5 x 59.7 mm

#### Electrical Data

Power supply	5 V
Power supply max.	25 V
Nominal resistance	1 kΩ

Resistance tolerance	0.15 %
Non-linearity	1 %

### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

### Installation Notes

The WP 120 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of  $\pm 5$  to  $10^\circ$  from normal direction to avoid damaging the housing.

Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

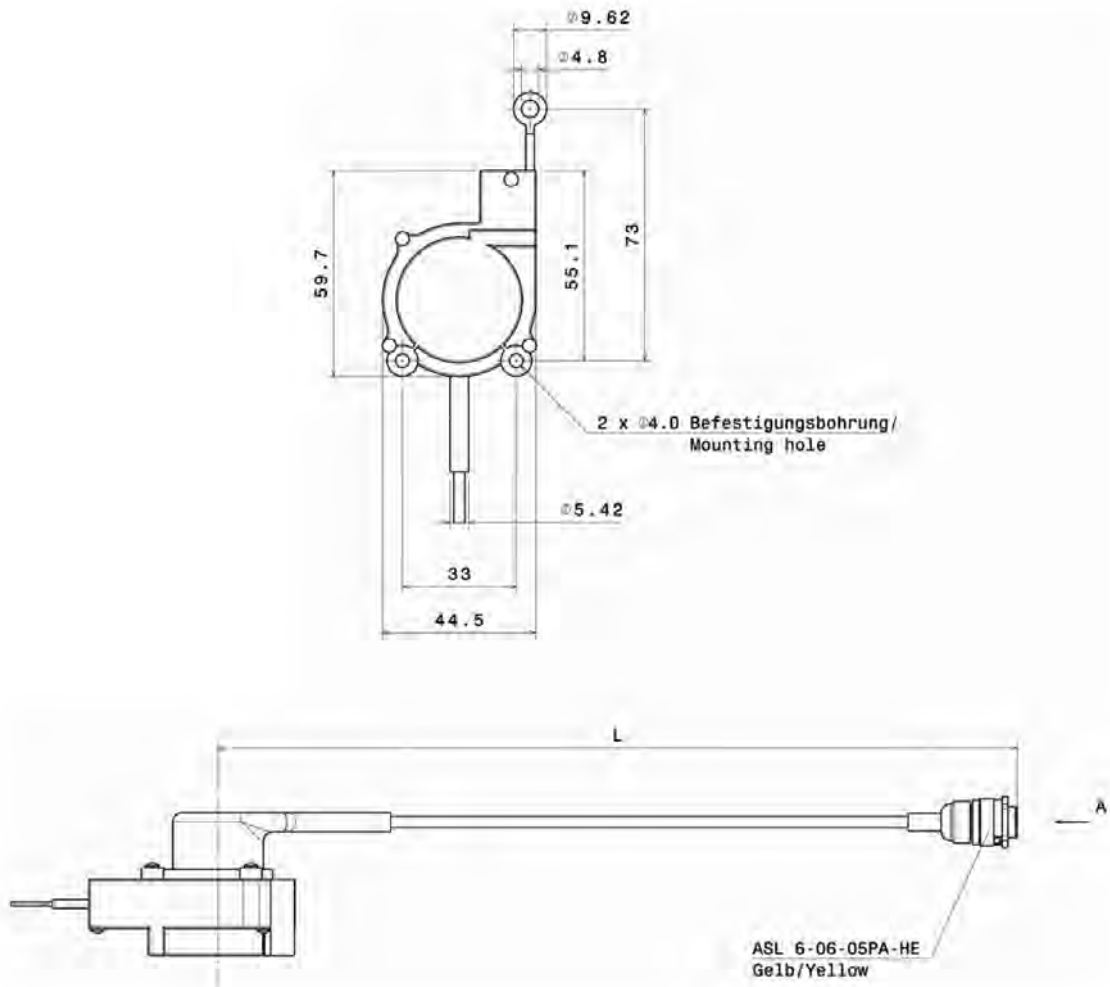
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

**Wire Potentiometer WP 120**  
Order number **F 01T A21 250**



## Dimensions



## Wire Potentiometer WP 125



4

### Features

- ▶ Measurement range: 0 to 125 mm
- ▶ Compact design
- ▶ Analog output: 0 to 5 V

The WP 125 is a wire potentiometer which is designed to measure position, direction, or rate of motion of moving mechanical components.

This sensor converts mechanical movement into electrical signal using a stainless steel cable wound on a threaded drum that is coupled to a precision rotary sensor. Hence the electrical output is proportional to the distance travelled.

The advantage of this WP is its compact style which allows for flexible and easy installation. Due to its small size, precise measurement is possible even in difficult applications.

### Application

Application	0 to 125 mm
Temperature range	-65 to 125°C
Max. wire acceleration	80 m/s <sup>2</sup>
Max. wire tension	2.8 N
Shock	1,000 m/s <sup>2</sup> for 6 ms
Vibration	150 m/s <sup>2</sup> at 10 to 2,000 Hz

### Technical Specifications

#### Mechanical Data

Weight w/o wire	85 g
Possible mechanical range	127.5 mm
Mounting	2 x 2-56 UNC
Tightening torque	2.5 Nm

Life expectancy	100 x 10 <sup>6</sup> cycles
Protection	IP54
Dimensions	Ø 50.5 x 13.2 mm

#### Electrical Data

Power supply	5 V
Power supply max.	35 V
Nominal resistance	5 kΩ
Resistance tolerance	10 %
Non-linearity	0.5 %
Max. current	12 mA

#### Connectors and Wires

Connector	ASL 6-06-05PA-HE
Connector loom	ASL 0-06-05SA-HE
Pin 1	U <sub>s</sub>
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 45 cm

Various motorsport and automotive connectors are available on request.

Please specify the requested wire length with your order.

### Installation Notes

The WP 125 can be connected directly to most electronic control units and data logging systems.

Holder for specific mounting orientation is available on request.

The angle of the displacement wire should be in the range of  $\pm 5$  to  $10^\circ$  from normal direction to avoid damaging the housing.

Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

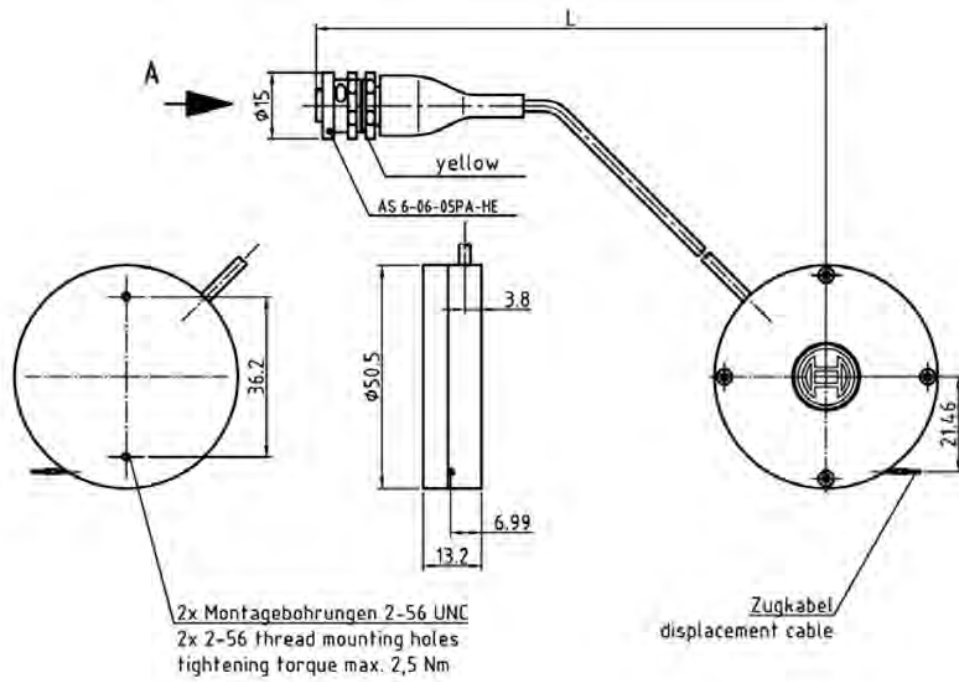
Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### Wire Potentiometer WP 125

Order number **B 261 209 545**

## Dimensions





# Brake Control

5

ABS M4 Kit

348

## ABS M4 Kit



5

### Features

- Suitable for front-wheel, rear-wheel and four-wheel drive vehicles

The ABS M4 kit is developed for the operation in front-, rear- or 4-wheel drive vehicles. A vehicle specific wire harness is included in the kit. The ABS M4 is specifically adapted for motorsports use. Individual car parameters can be calibrated with software free of charge.

### Technical Specifications

#### Variations

ABS M4 Kit 1	ABS M4 Kit 2
Customer specific wire harness with motorsport connectors, wheel speed sensors with production-type connectors	Customer specific wire harness with motorsport connectors, wheel speed sensors with motorsport connectors

#### Mechanical Data

##### Hydraulic unit with attached ECU

Vibration damped circuit board

38 pin connector

2 hydraulic valves per wheel

2 brake circuits (front and rear)

2 hydraulic high pressure pumps

2 hydraulic accumulators 3 cm<sup>3</sup>/each

Standard fittings 2 x master cylinders M12 x 1  
4 x brake cylinders M10 x 1

Size 125 x 80.3 x 129.6 mm

Weight 1,850 g

Operating temperature -30 to 130°C

Max. shock 50 g less than 6 ms

#### Electrical Data

Supply voltage	8 to 16 V, max. 26 V for 5 min
Max. peak voltage	35 V for 200 ms
Power consumption	8 W stand-by, 230 W in operation

#### Inputs

4 active wheel speed DF11

Brake pressure (front brake circuit)

Longitudinal acceleration

Lateral acceleration

Yaw rate

Brake light switch

12 position function switch:	<ul style="list-style-type: none"> <li>• 9 switch positions pre-configured</li> <li>• 2 switch positions programmable</li> <li>• 1 switch position for ABS function OFF</li> </ul>
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#### Outputs

ABS warning light (MIL)

Control of internal ABS valves

Control of pump motor

#### Optional Accessories

Additional package ASR (Traction control), includes software, map switch and CAN module	on request
Additional package EBD (Electronic Brake force Distribution)	on request
Communication interface MSA Box II	F 02U V00 327-01
Wheel speed signal splitters:	
<ul style="list-style-type: none"> <li>• Single, without connectors</li> </ul>	F 02U V00 225-01
<ul style="list-style-type: none"> <li>• Single, motorsport connectors</li> </ul>	F 02U V00 209-01
<ul style="list-style-type: none"> <li>• Quad, 2 motorsport connectors</li> </ul>	F 02U V00 203-03
<ul style="list-style-type: none"> <li>• Quad, 1 motorsport connector</li> </ul>	F 02U V00 335-03
Data logger C 50	F 02U V01 164-01
Display DDU 7	F 02U V01 130-01

#### Communication

CAN interface

#### Content of Kit

Hydraulic unit with attached ECU

Pressure sensor

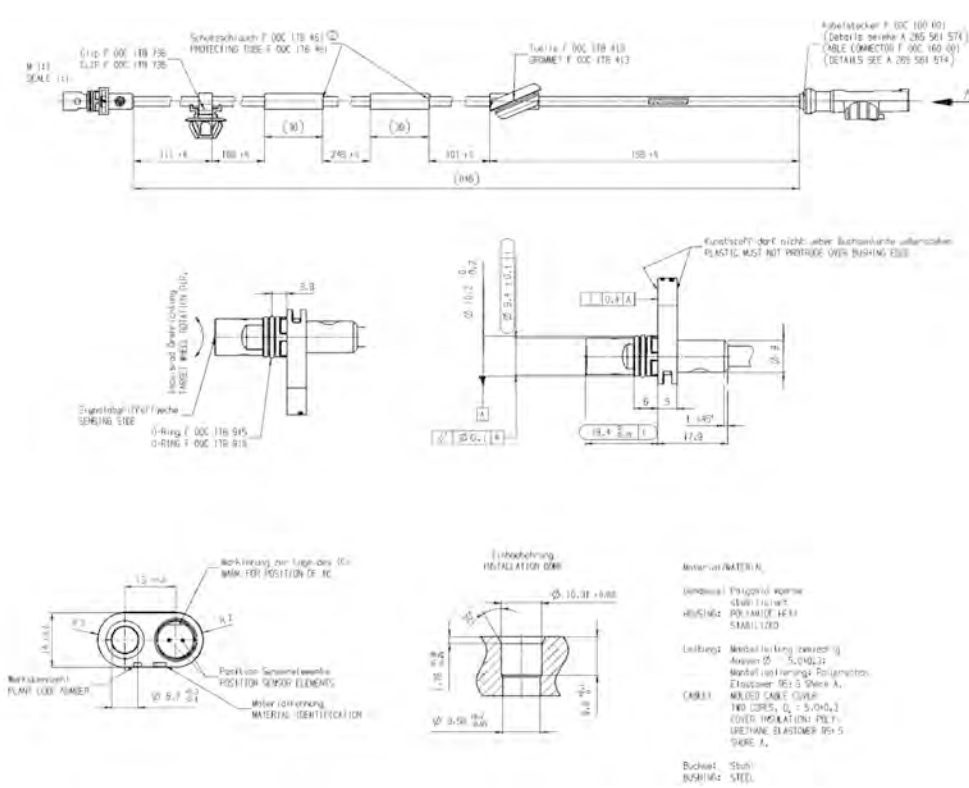
- Yaw/acceleration sensor
- 12 position function switch
- 4 wheel speed sensors DF11 standard
- ABS warning light
- Vehicle specific wire harness
- Vibrations damping boards

**Ordering Information**

**ABS M4 Kit 1**  
 Order number **F 02U V00 289-01**

**ABS M4 Kit 2**  
 Order number **F 02U V00 290-01**

**Dimensions**



*Wheel Speed Sensor*





# Displays

6

Displays

352

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## Display DDU 7



6

### Features

- ▶ Freely programmable dash logger
- ▶ Large trans-reflective multi colour display
- ▶ Light weight synthetic material housing
- ▶ Recording on USB flash drive (opt.)

The display DDU 7 integrates a programmable colour dash board display with a data logging system for motorsport applications. This allows for synchronized acquisition and visualization of engine data from the ECU and chassis data from 6 analogue and 4 digital input channels. Additional input devices can be connected via Ethernet and CAN buses. Recorded data from the internal 2 GB flash memory can be downloaded via high speed Ethernet.

### Application

Display	<ul style="list-style-type: none"> <li>• 5,7" graphic colour display</li> <li>• 12 user configurable display pages</li> <li>• 10 multicolor freely configurable (RGB) LEDs</li> </ul>
Resolution	640 x 480 pixel
Supported image file formats	Bmp, gif, jpg, png, tif
Converters	8 kHz AD converters with digital low pass filter
Configurable math channels	
User configurable CAN in/out messages	
Acquisition rate	up to 1,000 Hz for all channels
Online data compression	
Data acquisition	up to 100 kB/s

Recording channels	up to 720
Upload rate	1,000 kB/s
Internal storage capacity	2 GB
FM 40 long range telemetry support, GSM telemetry support	
RS232 GPS input	

### Technical Specifications

#### Mechanical Data

Size	148 x 126 x 32 mm
Weight	440 g
Dust and splash water proof housing	
Operating temperature (internal)	-20 to 60°C
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

#### Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	14 W at 14 V

#### Inputs

Page/brightness selection	2
Analog channels	6
Wheel speed inputs (Hall-effect)	4
Input range	0 to 5 V
Resolution	12 bit
Switchable pull up resistor	3 kOhm
DF 11 inputs	On request

#### Environment

External switch for page selection, 12 steps	B 261 209 658
External switch for brightness adjustment or page selection, 6 steps	B 261 209 659
USB flash drive and connector are available on request	

#### Software Upgrade 1

CCP-Master (ASAP2 file from ECU manufacturer required)	F 02U V01 134-01
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#### Software Upgrade 2

USB-Port unlocked (Rugged USB flash drive 2 GB Bosch File System (BFS) format included, works with Bosch File System (BFS) preformatted USB Flash drive only)	F 02U V01 133-02
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Adapter cable to USB-Port included	F 02U V01 343-01
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Adapter for wiring harness included	F 02U 002 996-01
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### Connectors and Wires

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Motorsport connector, AS 2-14-35PN at DDU7	37 pins
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Mating connector, AS 6-14-35SN	F02U 000 453-01
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### Communication

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CAN interfaces	2
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Ethernet 100BaseT	1
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Laptrigger input	1
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RS232	Telemetry, GPS
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Configuration via RaceCon	Over Ethernet or MSA-Box II
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### Ordering Information

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#### Display DDU 7

Order number **F 02U V01 130-01**

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## Display DDU 8



6

### Features

- ▶ Full programmable multi colour display
- ▶ 2 GB dash logger (opt.)
- ▶ Recording on USB flash drive (opt.)
- ▶ Multi colour (RGB) gearshift lights

The display DDU 8 integrates a programmable full color dash board display with a data logging system for motorsports applications. This allows for synchronized acquisition and visualization of engine data from the ECU and chassis data from up to 24 analog and 4 digital input channels. Additional input devices can be connected via the ethernet and CAN buses. Recorded data from the internal 2 GB logger (opt.) can be downloaded via high-speed ethernet or via wireless connection with the BT 60 burst telemetry system.

As a base system the DDU 8 is sold as display only. Software upgrades for the DDU 8 (field upgradable by entering a key) activate data logger functionality, additional recording on USB flash drive, CCP-master and additional input channels.

### Application

Display	<ul style="list-style-type: none"> <li>• 5" graphic colour display</li> <li>• Multiple user configurable display pages</li> <li>• 10 multi colour (RGB) gearshift lights</li> </ul>
Resolution	800 x 480 high resolution pixel
Supported image file formats	Bmp, gif, jpg, png, tif
Converters	8 kHz AD converters with digital low pass filter
Configurable math channels	
User configurable CAN in/out messages	
Acquisition rate	Max. 1,000 Hz for all channels

Online data compression	
Data acquisition rate	Max. 200 kB/s
Recording channels	Max. 720
Upload rate	1,000 kB/s
3-port network switch	
CCP-master, data acquisition from ECU that support CAN calibration protocol	

### Technical Specifications

#### Mechanical Data

Size	161 x 111 x 31 (49) mm
Weight	675 g
Operating temperature (internal)	-20 to 60°C
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

#### Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	14 W at 14 V

#### Inputs

Page/brightness selection	2
Analog channels	4
Input range	0 to 5 V
Resolution	12 bit
Switchable pull up resistor	3 kΩ

#### Outputs

PWM outputs (Low side switch 2 A each)	4
Sensor supply 5 V/350 mA	1

#### Software

Configuration via RaceCon over Ethernet or MSA-Box II

#### Environment

External switch for page selection, 12 steps	B 261 209 658
External switch for brightness adjustment or page selection, 6 steps	B 261 209 659

USB flash drive and connector are available on request.

#### Software Upgrade 1

Activation of internal data logger	2 GB
Telemetry support	BT 60
Long range telemetry support	FM 40

Interface for telemetry (on yellow connector)	RS232
	F 02U V00 701-01
<b>Software Upgrade 2</b>	
Yellow connector unlocked	
GPS input	
Additional analog channels	20
Additional rotational channels (Input Hall/inductive)	4
Additional sensor supplies 5 V/350 mA	3
Additional sensor supply 10 V/350 mA	1
Additional sensor supply 12 V/1 A non regulated	1
Interface for GPS	RS232
	F 02U V00 702-01
<b>Software Upgrade 3</b>	
CCP-Master (ASAP2 file from ECU manufacturer required)	F 02U V00 796-01
<b>Software Upgrade 4</b>	
USB-Port unlocked (Rugged USB flash drive 2 GB Bosch File System (BFS) format included, works with Bosch File System (BFS) preformatted USB Flash drive only)	F 02U V00 871-02
Adapter cable to USB-Port included	F 02U V01 343-01
Adapter for wiring harness included	F 02U 002 996-01
<b>Connectors and Wires</b>	
Motorsport connectors, double density	2 x 41 pins
Mating connector (red) AS DD 6-12-41SN	F 02U 002 216-01
Mating connector (yellow) AS DD 6-12-41SA	F 02U 004 180-01
<b>Installation Notes</b>	
Internal battery for data preservation included	
Required service interval: 12 months (replacement of internal battery)	
<b>Communication</b>	
CAN interfaces	2
Ethernet 100BaseT	3
Lap trigger input (on yellow connector, always open)	1

**Ordering Information****Display DDU 8**Order number **F 02U V00 873-05**



# Data Logging Systems

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<b>Data Loggers</b>	<b>358</b>
<b>Telemetry</b>	<b>369</b>
<b>Telemetry Accessories</b>	<b>384</b>
<b>Lap Trigger Systems</b>	<b>389</b>

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## Data Logger CardMemory C 40/C 40 Plus



7

### Features

- ▶ Data storage on compact flash card
- ▶ Data transfer via CAN
- ▶ Extended models available

The CardMemory is a device used for data logging. The basic model C 40 is designed for data transfer via CAN for Bosch Motorsport 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 removable compact flash card (not included). The memory adapter (red) is included in delivery.

### Application

Compatible ECUs

MS 3 Sport

MS 4 Sport

MS 4.4 Sport

### Technical Specifications

#### Mechanical Data

Aluminum housing

Flexible housing fixation points

Size 150 x 90 x 22 mm

Weight 330 g

Operating temperature -40 to 75°C

Max. vibration 15 g sinus at 20 Hz to 2 kHz for t < 5 h

#### Electrical Data

Max. power consumption 7 W at 14 V

1 microcontroller with 16 bit organization

Real time clock

Non volatile flash card memory

Total calculation capacity approximately 10 MIPS

#### Optional Functionality

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 realized with an additional software tool.

#### Environment

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 1,024 MB F 01E B01 108-01

Flash card 2,048 MB F 01E B01 109-01

Memory adapter (red; incl.) B 261 206 864-01

C 40 adapter cable B 261 209 433

#### Connectors and wires

Mating connector C 40 ASO ASO-14-35 SN

Mating connector C 40 Plus ASO ASO-14-35 SN

### Installation Notes

Important: Removable storage media must be inspected and serviced at regular intervals. Flash cards are slower and age faster than hard drives. We recommend checking flash cards regularly and replacing them after two years.

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

### Communication

1 CAN interface

### Ordering Information

#### Data Logger CardMemory C 40

Order number **F 01T A20 403**

#### Data Logger CardMemory C 40 Plus

Order number **B 261 206 860**

#### Data Logger CardMemory C 40 Plus incl. SW Chassis Adjust

Order number **B 261 206 880-02**



## Data Logger CardMemory C 55



### Features

- ▶ Data storage on compact flash card
- ▶ Data recording via Ethernet or FireWire
- ▶ Telemetry-compatible

The CardMemory C 55 is a device used for data logging and DLS system management. The measured data are stored on a removable compact flash card (not included). The memory adapter (red) is included in delivery. The C 55 supports two parallel measurement configurations and recording rates from 1 s to 1 ms. Data from different Bosch ECUs can be recorded via the Ethernet and FireWire buses. For sensor signal acquisition up to eight MSI 55 devices connected via FireWire are supported.

Long range as well as high-speed burst telemetry is possible utilizing the FM 40 and BT 60 devices.

### Application

Compatible ECUs

MS 5.0

MS 5.1

MS 5.5

MS 5.2

MS 15.1

MS 15.2

### Technical Specifications

#### Mechanical Data

Aluminum housing

Size 157 x 92 x 30 mm

Weight 500 g

Operating temperature	-20 to 65°C
Max. vibration	Vibration Profile 1 (See Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

#### Electrical Data

Max. power consumption 20 W at 14 V

Real time clock

Non volatile flash card memory

#### Environment

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 1,024 MB F 01E B01 108-01

Flash card 2,048 MB F 01E B01 109-01

Memory adapter (red; incl.) B 261 206 864-01

#### Installation Notes

Important: Removable storage media must be inspected and serviced at regular intervals. Flash cards are slower and age faster than hard drives. We recommend checking flash cards regularly and replacing them after two years.

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

#### Communication

1 CAN interface

2 FireWire interfaces

2 Ethernet interfaces (100 MBit)

#### Ordering Information

**Data Logger CardMemory C 55**

Order number **F 01E B01 630-02**

## Data Logging Accessories



### Flash card adapter

Order number **B 261 205 814-01**

### Software Chassis Adjust

Order number **B 261 206 870**

### C 40 adapter wire

Order number **B 261 209 433**

7

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

Compact flash cards are offered with a storage capacity of up to 2,048 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 wiring harness it is possible to calibrate further sensors for chassis data logging. To connect memory C 40 to the vehicle wiring harness the special C 40 adapter wire is necessary.

### Application

Humidity	5 to 95 %, non condensing
Vibration	15 g peak to peak
Shock	Max. 2.0 g

### Installation Notes

Important: Removable storage media must be inspected and serviced at regular intervals. Flash cards are slower and age faster than hard drives. We recommend checking flash cards regularly and replacing them after two years.

### Ordering Information

#### Flash card 128 MB

Order number **F 01E B01 105-01**

#### Flash card 256 MB

Order number **F 01E B01 106-01**

#### Flash card 512 MB

Order number **F 01E B01 107-01**

#### Flash card 1,024 MB

Order number **F 01E B01 108-01**

#### Flash card 2,048 MB

Order number **F 01E B01 109-01**

#### Memory adapter (red)

Order number **B 261 206 864-01**

## Data Logger C 50



### Features

- ▶ Freely programmable dash logger
- ▶ Light weight synthetic material housing
- ▶ Recording on USB flash drive (opt.)
- ▶ One motorsports connector

The data logger C 50 is a data logging system for motorsport applications. It allows for synchronized acquisition of engine data from the ECU and chassis data from 6 analog and 4 digital wheel speed input channels. Additional input devices can be connected via Ethernet and CAN buses. Recorded data from the internal 2 GB flash memory can be downloaded via high speed Ethernet.

### Application

Converters	8 kHz AD converters with digital low pass filter
Configurable math channels	
User configurable CAN in/out messages	
Acquisition rate	Max. 1,000 Hz for all channels
Online data compression	
Data acquisition	Max. 100 kB/s
Recording channels	Max. 720
Upload rate	1,000 kB/s
Internal storage capacity	2 GB
FM 40 long range telemetry support, GSM telemetry support	
RS232 GPS input	

### Technical Specifications

#### Mechanical Data

Size	148 x 126 x 16 mm
Weight	300 g
Operating temperature (internal)	-20 to 60°C
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

#### Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	14 W at 14 V

#### Inputs

Analog channels	6
Wheel speed input (Hall-effect)	4
Input range	0 to 5 V
Resolution	12 bit
Switchable pull up resistor	3 kΩ
DF11 inputs	On request

#### Environment

USB flash drive and connector are available on request

#### Software Upgrade 1

CCP-Master (ASAP2 file from ECU manufacturer required)	F 02U V01 134-01
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#### Software Upgrade 2

USB-Port unlocked (Rugged USB flash drive 2 GB Bosch File System (BFS) format included, works with Bosch File System (BFS) preformatted USB Flash drive only)	F 02U V01 133-02
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Adapter cable to USB-Port included	F 02U V01 343-01
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Adapter for wiring harness included	F 02U 002 996-01
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#### Connectors and Wires

Motorsport connector, AS 2-14-35PN at C 50	37 pins
Mating connector, AS 6-14-35SN	F02U 000 453-01

#### Communication

CAN interfaces	2
Ethernet 100BaseT	1
Lap trigger input	1

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RS232	Telemetry, GPS
Configuration via RaceCon	Over Ethernet or MSA-Box II

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### Ordering Information

**Data Logger C 50**  
Order number **F 02U V01 164-01**

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## Data Logger C 60



### Features

- ▶ Compact and light weight data logger
- ▶ Aluminum housing
- ▶ Recording on USB flash drive (opt.)
- ▶ Two motorsports connectors

The data logger C 60 is a compact and light weight data logging system for motorsport applications. This allows for synchronized acquisition of engine data from the ECU and chassis data from up to 26 analog and 4 digital input channels. Additional input devices can be connected via Ethernet and CAN buses. Recorded data from the internal 2 GB flash memory can be downloaded via high speed Ethernet or via wireless connection with the BT 60 burst telemetry system.

As a base system the C 60 is sold as data logger only. The software upgrades for the C 60 (field upgradable by entering a key) activate additional recording on USB Flash drive, CCP-Master and additional input channels.

### Application

Converters	8 kHz AD converters with digital low pass filter
Configurable math channels	
User configurable CAN in/out messages	
Acquisition rate	Max. 1,000 Hz for all channels
Online data compression	
Data acquisition rate	Max. 200 kB/s
Recording channels	Max. 720
Upload rate	1,000 kB/s
Internal storage capacity	2 GB
3-port network switch	
BT 60 WLAN burst telemetry support	

FM 40 long range telemetry support, GSM telemetry support

RS232 GPS input

CCP-Master, data acquisition from ECU that support CAN calibration protocol

### Technical Specifications

#### Mechanical Data

Size	105 x 34.5 x 137.5 mm
Weight	495 g
Operating temperature	-20 to 65°C
Max. vibration	Vibration profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

#### Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	10 W at 14 V

#### Inputs

Analog channels	6
Input range	0 to 5 V
Resolution	12 bit
Switchable pull up resistor	3 kΩ

#### Outputs

PWM outputs (low side switch 2 A each)	4
Sensor supply 5 V (350 mA each)	1

#### Environment

USB Flash drive and connector are available on request

#### Software Upgrade 1

GPS input	
Additional analog channels	20
Rotational channels (input Hall/ inductive)	4
Additional sensor supply 5 V (350 mA each)	3
Sensor supply 10 V (350 mA each)	1
Sensor supply 12 V (1 A, non regulated)	1
RS232	GPS
	F 02U V00 703-01

#### Software Upgrade 2

CCP-Master (ASAP 2 file from ECU manufacturer required)	F 02U V00 797-01
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**Software Upgrade 3**

USB-Port unlocked (Rugged USB flash drive 2 GB Bosch File System (BFS) format included, works with Bosch File System (BFS) preformatted USB Flash drive only)	F 02U V00 872-02
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Adapter cable to USB-Port included	F 02U V01 343-01
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Adapter for wiring harness included	F 02U 002 996-01
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**Connectors and wires**

Auto sport connectors double density	2 x 41 pins
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Mating connector I AS-DD 6-12-41SN	F 02U 002 216-01
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Mating connector II AS-DD 6-12-41SA	F 02U 004 180-01
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**Installation Notes**

Internal battery for data preservation included.

Required service interval 12 months (internal battery is replaced).

**Communication**

Configuration via RaceCon over Ethernet or MSA-Box II

CAN interfaces	2
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Ethernet 100BaseT	3
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RS232	Telemetry
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Lap trigger input	1
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**Ordering Information****Data Logger C 60**

Order number **F 02U V00 875-02**

## Data Logging System DLS

The Data Logging System (DLS) is a scalable, versatile, and flexible measurement system for conditioning and acquisition of sensor data in a race car. The DLS product family consists of several hardware and software components which allow easy adoption to various measurement requirements.

Core component of the DLS is the C 55 data logger. It performs system configuration and management tasks and also serves as a communication hub for the PC configuration software. The C 55 communicates via its network interfaces with the ECU and up to eight MSI 55 sensor interface boxes to enable synchronized acquisition of engine and chassis data. The MSI 55 sensor interfaces provide high quality signal conditioning and data conversion functionality.

Additionally the FM 40 telemetry transmitter and the BT 60 burst telemetry device can be connected.

### Technical Specifications

High measuring accuracy by 12 bits A/D converter resolution and ten-fold oversampling

High recording rate up to 1 ms

High recording duration by CF card up to 1 GB

Online compression of measurement data

Highly linear analog and digital filters

Modular concept allows scalable system

Synchronized acquisition of ECU and chassis channels

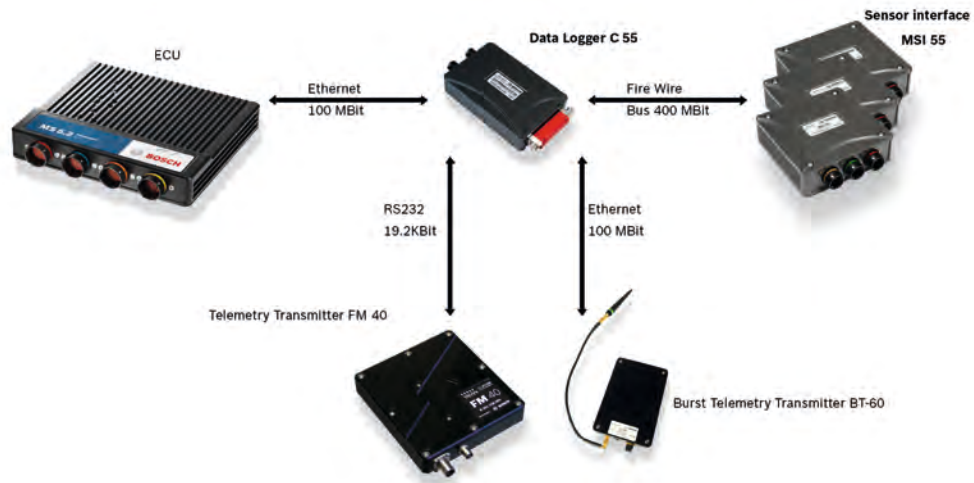
Connectivity and data transfer via telemetry

Online calibration and system diagnosis with RaceCon (included)

### Components

Data logger, system manager	C 55
Burst telemetry	BT 60, BR 60
Online telemetry	FM 40
Modular sensor interface	MSI 55
DLS configuration software	RaceCon
System software	RaceCon, WinDarab

Dimensions





## Modular Sensor Interface MSI 55



### Features

- ▶ Compact sensor interface
- ▶ 16 input channels
- ▶ Each channel individually configurable

The MSI 55 is a high quality signal conditioning and data acquisition unit for analogue and digital sensors. The MSI 55 offers 16 configurable analog inputs. Each analog input channel features a 4th order analog prefilter, 10 x oversampling and highly linear digital filtering. The cut-off frequency of the digital filters is automatically adjusted to match the acquisition rate. The latency of the digital filters is corrected during recoding, yielding zero filter delay in the recorded data. The evaluation of each MSI measurement channel is individually configurable. Data is sent via FireWire interface to the C 55 data logger.

### Application

High quality signal conditioning and data acquisition unit  
For analogue and digital sensors

### Technical Specifications

#### Mechanical Data

Size	120 x 117 x 38 mm
Weight	600 g
Aluminum housing	
Filtered connectors of motorsports design with high pin density	
Vibration damped printed circuit boards	
Operating temperature	-20 to 65 °C
Max. vibration	15 g sinus at 1,200 Hz for t < 5h

#### Electrical Data

Max. power consumption	20 W at 14 V
16 bit digital signal processor, 150 MIPS	
Required power supply	8 at 18 V
4 differential analog inputs with switchable amplifier and switchable pull-up resistor	
12 single ended analog inputs with switchable pull-up resistor	
All analog inputs offer analog and digital anti-aliasing filter and 12 bit ADC resolution	
4 frequency inputs 0 to 25.5 kHz for inductive sensor / Hall-effect sensor	
2 digital I/O	
2 PWM outputs 100 mA	
5 V sensor power supply	
3 to 10 V configurable sensor power supply	
12 V sensor power supply	

#### Communication

Freely configurable 1 Mbit CAN Bus

#### Ordering Information

**Modular Sensor Interface MSI 55**  
Order number **F 01T A20 024-01**

## Modular Sensor Interface M 60



## 7

### Features

- ▶ Compact sensor interface
- ▶ 30 input channels
- ▶ Each channel individually configurable

The M 60 is a compact and light weight sensor interface unit for analog and digital sensors. Up to eight M 60 can be used to expand the number of input channels of the data loggers C 55 or C 60 as well as the display DDU 8. The M 60 are linked via high-speed Ethernet interface. This allows for synchronized acquisition of data from the different units and the ECU.

The M 60 offers 26 analog inputs, four rotational inputs, four pwm outputs and two independent CAN buses. Each analog input channel features an analog pre-filter, 8x oversampling and highly linear digital filtering. The cut-of frequency of the digital filter is automatically adjusted to match the acquisition rate. The latency of the digital filters is corrected during recording, yielding zero filter delay in the recorded data.

The evaluation of each M 60 measurement channel is individually configurable with the PC configuration tool RaceCon.

### Application

8 kHz AD converters with digital low pass filter

Configurable math channels

User configurable CAN in/out messages

Max. 1,000 Hz acquisition rate for all channels

3-port network switch

### Technical Specifications

#### Mechanical Data

Size	105 x 34.5 x 137.5 (149) mm
Weight	495 g

Operating temperature	-20 to 65°C
Max. vibration	Vibration Profile 1 (See Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )

#### Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	10 W at 14 V

#### Inputs

Analog channels	26
Input range	0 to 5 V
Resolution	12 bit
Switchable pull up resistor	3 kΩ
Rotational channels (default Hall, Inductive as option)	4

#### Outputs

PWM outputs (low side switch 2 A each)	4
Sensor supply 5 V (350 mA each)	4
Sensor supply 10 V (350 mA each)	1
Sensor supply 12 V (1 A, non regulated)	1

#### Connectors and wires

Auto sport connectors double density	2 x 41 pins
Mating connector I AS DD 6-12-41SN	F 02U 002 216-01
Mating connector II AS DD 6-12-41SA	F 02U 004 180-01

#### Communication

Configuration via RaceCon over Ethernet or MSA-Box II	
CAN interfaces	2
Ethernet 100BaseT	3

#### Ordering Information

##### Modular Sensor Interface M 60

Order number **F 02U V00 882-01**

## Online Telemetry System Overview

The Bosch Motorsport Online Telemetry System enables the transmission of online measurement data from a car on a racetrack. The vehicle part of the system consists of a data logger (C 40, C 55 or C 60) and the FM 40 telemetry transmitter. From the data logger data is sent via a RS232 connection to the FM 40. The FM 40 adds framing and error correction information to the data stream and modulates its RF output which is fed via an antenna wire to the TX antenna.

In the pits, the RF signal is picked up by an RX antenna connected to the pit receiver box. Inside the receiver box, the signal is filtered and amplified by a low noise filter amplifier. It is then sent to a UHF modem. The modem demodulates the data stream and performs error correction, if necessary. The output stream passes the data converter and is transferred via a connection wire to the server PC in the garage. This PC decodes the car's telemetry stream and distributes the information over the pit network.

Due to the high transmission power of 1 to 10 W of the Bosch FM 40 telemetry transmitter, near 100 % coverage is achieved on most tracks, even under race conditions with high RF interference.

### Application

Transmission of online measurement data

### Components

Telemetry transmitter FM 40

Data logger C 40, C 55 or C 60

Pit receiver box

### Functions

Good data quality even under race conditions with high RF interference.

### Technical Specifications

High transmission power of 1 to 10 W

Near 100 % coverage on most tracks

Framing and error correction

### Environmet

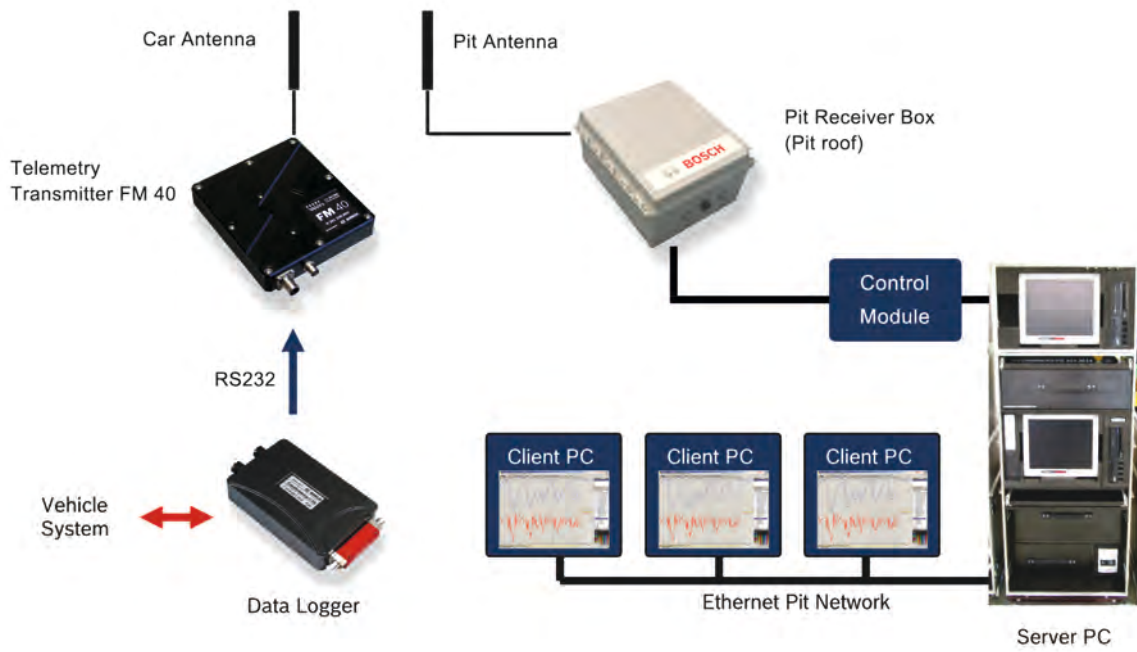
Car antenna

Pit antenna

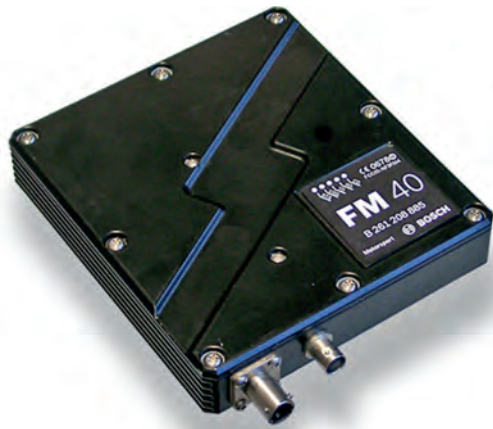
Server PC

Ethernet pit network

Dimensions



## Telemetry Unit FM 40



### Features

- ▶ 750 g
- ▶ 1 to 10 W transmission power

The FM 40 is a half-duplex radio modem suitable for real-time telemetry transmission from a car on the race-track.

The unit is offered in different hardware versions for several frequency bands in the 430 to 470 MHz range. Within the selected band, the transmission frequency is software programmable in a  $\pm 1$  MHz range. The high RF output power of up to 10 W gives excellent range and good track coverage.

From the data acquisition system transmit data is fed into the FM 40 via a RS232 interface. Typically the FM 40 is operated as an unidirectional telemetry transmitter. For other applications, half duplex bidirectional operation is also possible.

### Application

International standard	I-ETS 300 220, ETS 300 113, FCC
------------------------	---------------------------------

### Technical Specifications

#### Mechanical Data

Size	151 x 138 x 28 mm
------	-------------------

Weight	720 g
--------	-------

Housing with LED indicators

Car antenna compatible to existing Bosch telemetry systems.

Max. vibration	60 m/s <sup>2</sup> at 20 Hz to 2 kHz
----------------	---------------------------------------

#### Electrical Data

Half duplex radio modem (bidirectional)

Internal data buffer and protocol management

Frequency range	430 to 470 MHz (hardware adjustable)
	F(center) $\pm$ 1 MHz (software programmable)
Transmission power	1 to 10 W
Receiver sensitivity	-116 dBm error detection and forward error correction (FEC)
RF channel bandwidth	12,5 kHz at 9.6 kbps 25 kHz at 19.2 kbps
Data interface	RS232
Data rate	9.6 / 19.2 kbps
Required power supply	10 to 18 V
Max. power consumption	25 W at 14 V
Max. current	< 2,5 A
Operation temperature range	0 to 60°C

### Connectors and Wires

RF	BNC female
Power / data	CGK SOT 8N35 PN

### Ordering Information

**Telemetry Unit FM 40**  
Order number **B 261 208 898-01**

## Pit Receiver Box



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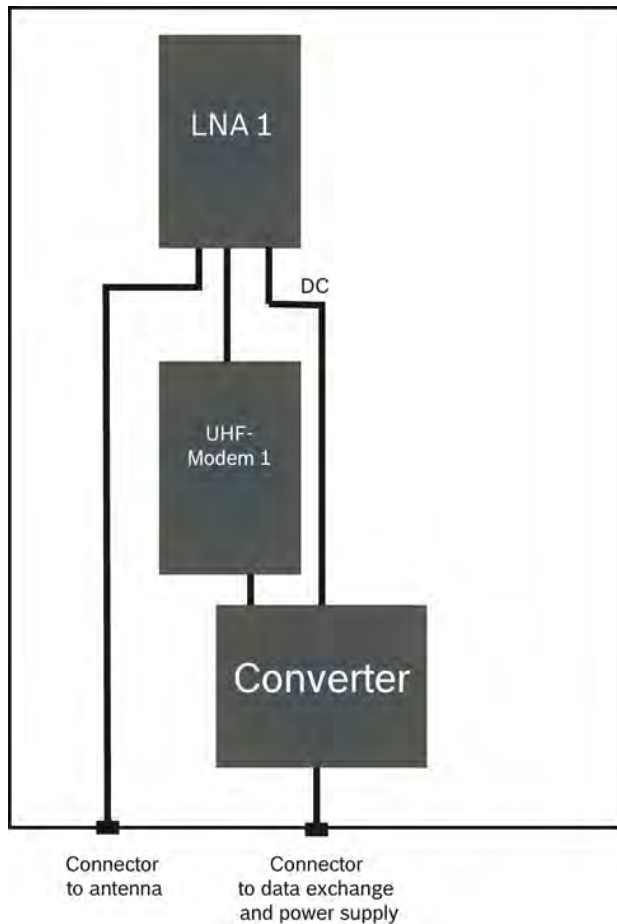
The Pit Receiver Box integrates all electronic components necessary to receive telemetry data from a car equipped with a FM 40 transmitter in one weatherproof package. Typically the receiver box is mounted on the pit roof as close as possible to the RX antenna, thus minimizing cable loss. The connection wire to the receiving PC in the garage, which can be up to 50 m long, also supplies power to the Pit Receiver Box. Different versions of the receiver box are offered to support several system configurations.

## Application

### Pit Receiver Box 1

The Box 1 contains all electronic components and wires necessary to receive data from a single car, preassembled in a weatherproof box.

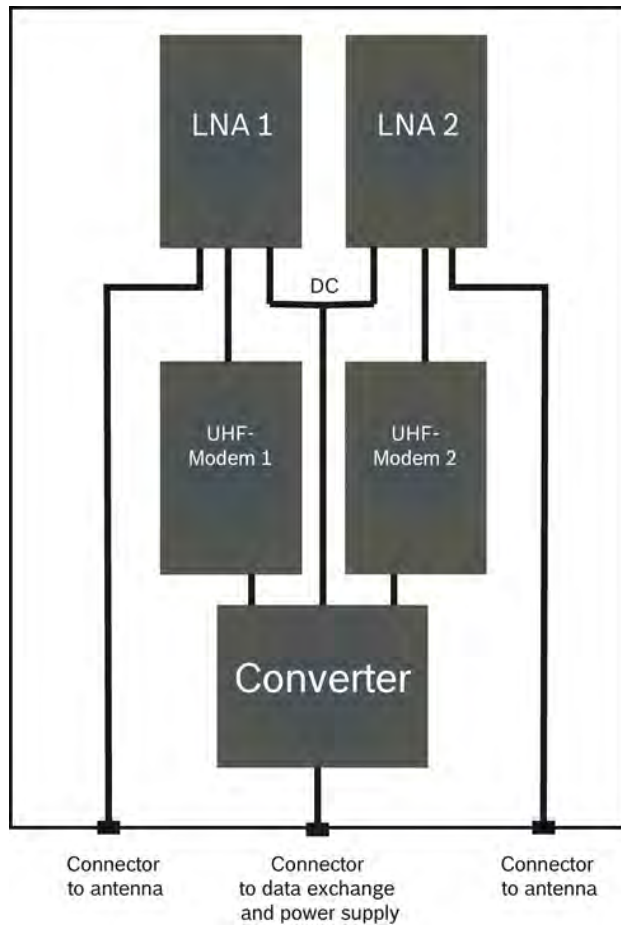
The external RX antenna is connected to a low noise filter amplifier (LNA 1). The amplified signal is then fed into the UHF receiver which decodes the data stream. The data converter is used to transmit the data via the connection cable to the server PC in the garage.



*Scheme Pit Receiver Box 1*

**Pit Receiver Box 1/R**

The Box 1/R includes two separate receiver systems which enable the parallel reception of two telemetry data streams. Two RX antennas can be connected to the twin low noise filter amplifiers (LNA 1, LNA 2). Typical applications are the reception of telemetry data from two cars or a system configuration with one car and a telemetry relay station.

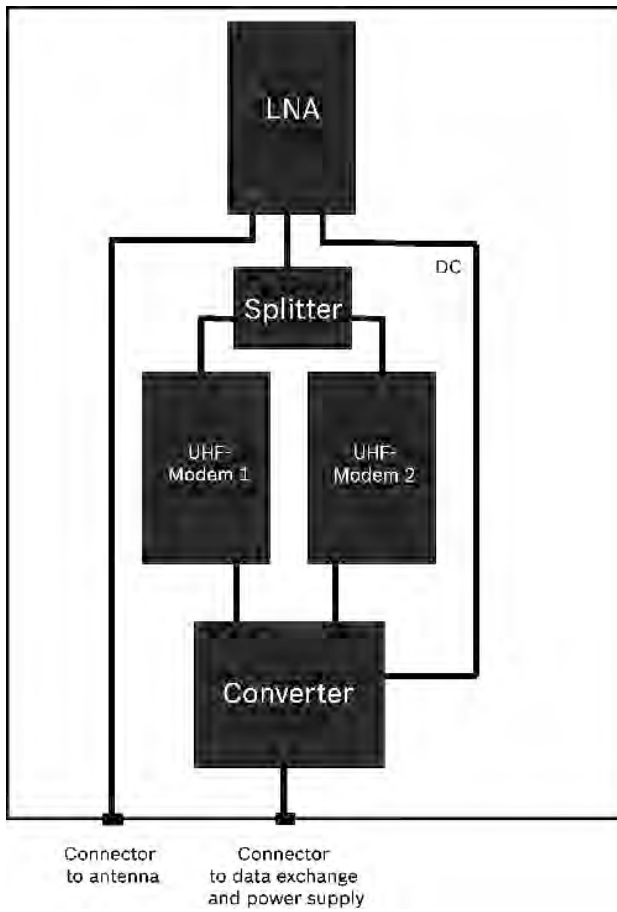


*Scheme Pit Receiver Box 1/R*



**Pit Receiver Box 2**

The Pit Receiver Box 2 contains two UHF receivers fed by a single RX antenna and low noise filter amplifier (LNA). This enables parallel telemetry data reception from two cars, provided both transmitters operate in the same frequency band.



*Scheme Pit Receiver Box 2*

## Technical Specifications

### Mechanical Data

Weight	4.2 kg
Max. distance receiver box to PC (with wire B 261 209 481)	50 m
Working temperature range	-20° to 50° C

### Electrical Data

Frequency range	400 to 470 MHz
Working frequency band	fc ±1 MHz
Channel spacing	12.5/25 kHz
Sensitivity	≤ -116 dBm at BER 10-3
Serial interface	RS232 (19.2 kBit/s, no parity, 8 data bit, 1 stop bit, no flow control)
Radio data rate	19.2 kbps (25 kHz channel) 9.6 kbps (12.5 kHz channel)
Operating voltage	12 V (10 to 14 V)
Power consumption	Approx. 7 W

### Connectors and Wires

Data and power connector	Motorsports type
Antenna connector	BNC (Jack) 50 Ω

## Ordering Information

### Pit Receiver Box 1

Order number **F 01T A20 451-01**

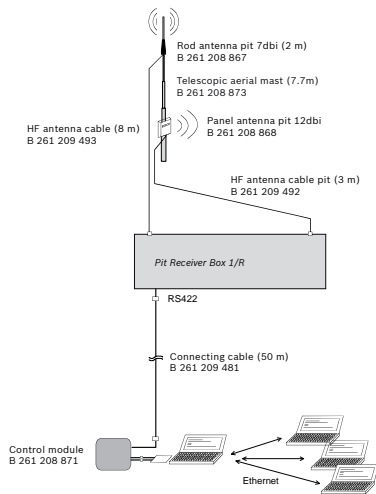
### Pit Receiver Box 1/R

Order number **F 01T A20 453**

### Pit Receiver Box 2

Order number **F 01T A20 455**

## Pit Receiver Package 1



The Pit Receiver Package 1 contains antennas, rf wires, data wires and the controller box, i.e. everything that is required to start operation.

### Technical Specifications

#### Package Parts

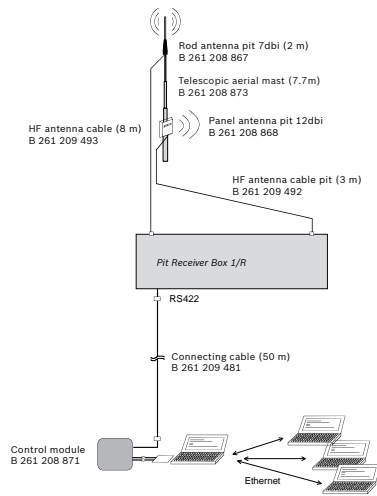
Pit Receiver Box 1	F 01T A20 451
HF antenna wire (8 m)	B 261 209 493
Rod antenna pit 7 dbi (2 m)	B 261 208 867
Connecting wire (50 m)	B 261 209 481
Control module RS 232 / RS 422 pit	B 261 208 871
Telescopic aerial mast (7.7 m)	B 261 208 873

### Ordering Information

#### Pit Receiver Package 1

Order number **F 01T A20 452**

## Pit Receiver Package 1/R



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The Pit Receiver Package 1/R contains antennas, rf wires, data wires and the controller box, i.e. everything that is required to start operation.

### Technical Specifications

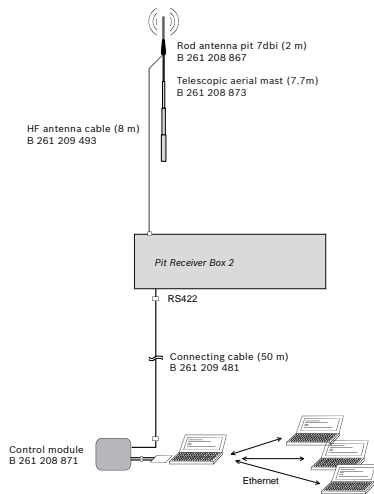
#### Package Parts

Pit Receiver Box 1/R	F 01T A20 453
HF antenna wire (8 m)	B 261 209 493
Rod antenna pit 7 dbi (2 m)	B 261 208 867
HF antenna wire pit (3 m)	B 261 209 492
Panel antenna pit 12 dBi	B 261 208 868
Connecting wire (50 m)	B 261 209 481
Control module RS 232 / RS 422 pit	B 261 208 871
Telescopic aerial mast (7.7 m)	B 261 208 873

### Ordering Information

**Pit Receiver Package 1/R**  
Order number **F 01T A20 454**

## Pit Receiver Package 2



The Pit Receiver Package 2 contains antennas, rf wires, data wires and the controller box, i.e. everything that is required to start operations.

### Technical Specifications

#### Package Parts

Pit Receiver Box 2	F 01T A20 455
HF antenna wire (8 m)	B 261 209 493
Rod antenna pit 7 dbi (2 m)	B 261 208 867
Connecting wire (50 m)	B 261 209 481
Control module RS 232 / RS 422 pit	B 261 208 871
Telescopic aerial mast (7.7 m)	B 261 208 873

### Ordering Information

#### Pit Receiver Package 2

Order number **F 01T A20 456**

## Burst Telemetry System Overview

The Bosch Motorsport Burst Telemetry System ideally complements the FM 40 long range telemetry. High-resolution measurement data, as stored in the data logger of the data acquisition system, is transferred automatically to the pit server PC when the car passes the pits or the car is in the garage. This gives two advantages: high resolution measurement data is already available in the pit network while the car is still out on track, enabling instant analysis and saving valuable track time. While the car is in the garage, the burst telemetry system gives a significant handling advantage: measurement data is transferred automatically to the pit server PC, e.g. after engine test runs. The RF system operates in the license-free 5.1 ... 5.8 GHz ISM band. The 32 selectable non-overlapping channels allow great flexibility in channel selection. The robust OFDM transmission scheme in combination with the high-quality band filter yield excellent performance even in environments with high RF noise. Typically good data reception can be achieved in a radius of approx. 300 m around the pit station, depending on antenna location and track topology. If necessary, reception range can be extended by an optional remote receiver station. During the running lap, the data acquisition system stores engine and chassis data in non-volatile memory. When a laptrigger is received, the current file is closed and data is prepared for burst transmission. As soon as the car reaches the reception range of the pit receiver, data transmission starts automatically. An intelligent algorithm chooses the lapfile to transmit and resumes transmission if the link has been interrupted. Typically 6 Mbytes of measurement data can be transferred per lap during a race. The bi-directional transmission scheme ensures error-free reception. Privacy of measurement data is ensured by 128-bit WEP encryption.

7

### Application

6 MB measurement per lap

Bidirectional transmission scheme

Privacy ensured by 128-bit WEP encryption

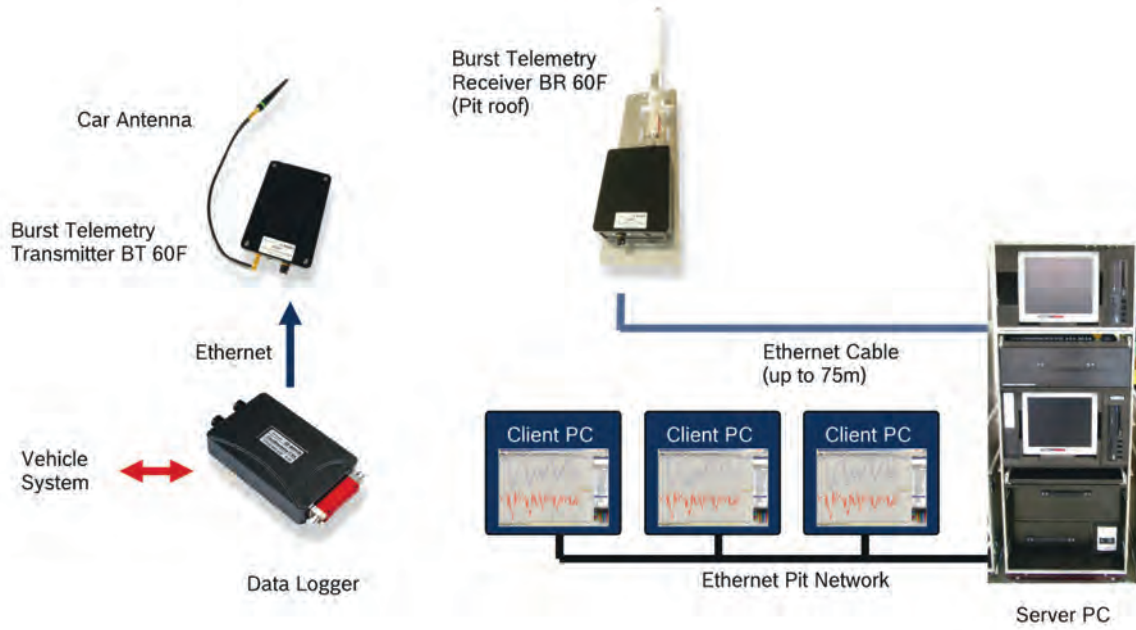
### Technical Specifications

32 selectable non-overlapping channels

Operates in license-free 5.1 to 5.8 MHz band

Best reception 300 m around pit

Dimensions



## Burst Telemetry Pit Module BR 60F



7

### Features

- ▶ 1250 g
- ▶ +26 dBm transmission power
- ▶ Max. 3.5 W

The BR 60F pit module is the stationary component of the Bosch Motorsport Burst Telemetry System. The high gain omnidirectional antenna is mounted directly at the receiver, minimizing wire loss. The weatherproof housing allows outdoor mounting of the unit, e.g. on the pit roof. 12 V DC power and 100 MBit Ethernet connection to the pit server PC is supplied via the connecting wire, which can be up to 75m long. The system operates in the 5.1 to 5.8 GHz ISM band and offers 32 non-overlapping channels. The high quality band filter eliminates out-of-band RF noise. This enables fully encrypted high speed data transmission at 12 MBit under race conditions. A directional antenna is available as an option.

### Application

Radio air interface	IEEE 802.11a
Wireless approvals	FCC Part 15.247, IC RS210, CE
Encryptions	WEP/WPA

### Technical Specifications

#### Mechanical Data

Size (overall incl. antenna)	705 x 145 x 47 mm
Weight	1,250 g
Max. vibration	Vibration profile 1
Temperature range	-20 to +85 °C

#### Electrical Data

Radio modem	Full duplex (bidirectional)
Transmission power	+26 dBm
Receiver sensitivity	-91 dBm at 12 Mbps
Frequency range	5.1 to 5.8 GHz ISM Band
Air data rate	Typ. 12 (max. 54) Mbps
Data interface	Ethernet TP10/100
Antenna	Gain = 10 dBi; Omni directional
Power supply	8 to 18 V
Max. power consumption	3.5 W
Rated current	0.25 A at 12 VDC

#### Connectors and Wires

Interface connector	AS008-35SA (Deutsch)
---------------------	----------------------

### Ordering Information

#### Burst Telemetry Pit Module BR 60F

Order number **F 02U V00 047-02**

#### Accessories

##### Radio modem (inclusive)

Order number **F 02U V00 048-01**

##### Antenna (inclusive)

Order number **F 02U V00 131-01**

##### Antenna filter (inclusive)

Order number **F 02U V00 132-01**

##### Fitting system (inclusive)

Order number **F 02U V00 133-01**

##### Interface cable to the pit PC (inclusive)

Order number **B 261 209 744-01**



## Burst Telemetry Car Module BT 60F



### Features

- ▶ 370 g
- ▶ +26 dBm transmission power
- ▶ Max. 3.5 W

The BT 60F car module is the vehicle component of the Bosch Motorsport Burst Telemetry System. The compact and lightweight unit receives measurement data via a 100 MBit Ethernet connection from the data acquisition system and communicates with the pit module over the RF antenna. The system operates in the 5.1 to 5.8 GHz ISM band and offers 32 non-overlapping channels. An internal high quality band filter eliminates out-of-band RF noise, which enables fully encrypted high speed data transmission at 12 MBit under race conditions. Online diagnosis and performance monitoring is possible via the data acquisition system.

### Application

Radio air interface	IEEE 802.11a
Wireless approvals	FCC Part 15.247, IC RS210, CE
Encryption	WEP/WPA

### Technical Specifications

#### Mechanical Data

Size	139 x 96 x 22 mm
Weight	370 g
Max. Vibration	Vibration profile 1
Temperature range	-20 to 85°C

#### Electrical Data

Radio modem	Full duplex (bidirectional)
Transmission power	+26 dBm
Receiver sensitivity	-91 dBm at 12 Mbps
Frequency range	5.1 to 5.8 GHz ISM Band
Air data rate	Typ. 12 (max. 54) Mbps
Data interface	Ethernet TP10/100
Antenna	Gain = 3 dBi; Omni directional
Power supply	8 to 18 V
Max. power consumption	3.5 W
Rated current	0.25 A at 12 VDC

#### Connectors and Wires

Antenna connector	SMA(f)
Interface connector	AS008-35SA (Deutsch)

#### Ordering Information

##### Burst Telemetry Car Module BT 60F

Order number **F 02U V00 038-02**

##### Accessories

##### Radio modem (inclusive)

Order number **F 02U V00 039-02**

##### Antenna 5 dBi (inclusive)

Order number **F 02U V00 442-01**

##### Antenna socket (inclusive)

Order number **F 02U V00 041-01**

##### Antenna cable (inclusive)

Order number **F 02U V00 042-01**

## FM 40 Tester



The FM 40 Tester is used to check the performance of telemetry components installed in the car which includes the FM 40 in conjunction with the RF wire and the antenna. The FM 40 tester indicates RF output power as well as defective RF wires or car antennas enabling quick detection of faulty components.

### Technical Specifications

#### Electrical Data

Transmission power	1 to 15 (60) W
VSWR	1 to 6
Frequency band	VHF / UHF

#### Connectors and Wires

RF	BNC male / female
----	-------------------

### Ordering Information

#### FM 40 Tester

Order number **B 261 208 894-01**

## Telemetry Antenna Dummy Load



The telemetry antenna dummy load replaces the telemetry car antenna when running the FM 40 transmitter in the workshop or the garage. It reduces high power RF radiation.

### Technical Specifications

#### Electrical Data

RF power	15 W
VSWR	1.1
Frequency band	VHF / UHF

#### Connectors and Wires

RF	BNC male / female
----	-------------------

### Ordering Information

#### Telemetry Antenna Dummy Load

Order number **B 261 208 900-01**

## Telemetry Car Antenna Single Band



Rugged telemetry antenna for car mounting.

### Technical Specifications

Frequency band	UHF
Type	1/4λ
Pattern (hor.)	omni
Length	150 mm

### Connectors and Wires

RF	BNC male
----	----------

### Ordering Information

**Telemetry Car Antenna Single Band**  
Order number **B 261 208 888-01**

## Telemetry Car Antenna Dual Band



Rugged telemetry antenna for car mounting.

### Technical Specifications

Frequency band	VHF / UHF
Gain	1/4λ / 5/8λ
Pattern (hor.)	omni
Length	440 mm

### Connectors and Wires

RF	BNC male
----	----------

### Ordering Information

**Telemetry Car Antenna Dual Band**  
Order number **B 261 208 862**

## Antenna Cable Kit



7

RF wire for the installation of telemetry antennas in the car. Intended for single hole mounting.

### Technical Specifications

Length	Max. 2m (tbd.)
Drill hole diameter	12,5 mm
Attenuation	Max. 0.7 dB at 2 m, 450 MHz

### Connectors and Wires

RF	BNC male / female
----	-------------------

### Ordering Information

**Antenna Cable Kit**  
Order number **B 261 209 490-01**

## Lap Trigger IR-02 Receiver



### Ordering Information

#### IR-02 Receiver KPSE 6E8 3AP DN A34

Order number **B 261 206 884-03**

#### IR-02 Receiver ASL-6-06-05PD-HE

Order number **B 261-206 887-01**

#### IR-02 Receiver KPTA 6E6-4P-C-DN

Order number **B 261 206 888-01**

### Features

- ▶ Infrared
- ▶ 39 g
- ▶ 15 m working range
- ▶ Different connectors available

This lap trigger system consists of an infrared transmitter station and a receiver 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.

The receiver output signal pin is switched to ground for 20 ms when the car passes the main transmitter.

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

### Technical Specifications

#### Mechanical Data

Size 42 x 20 x 10 mm

Weight 39 g

Aluminum housing

#### Electrical Data

Frequency codes 16

Supply voltage 8 to 16 V

Output voltage 5 V

Working range 15 m

Working temperature -25 to 70°C

### Installation Notes

Same height between receiver and transmitter

Visibility connection between receiver and transmitter

Avoid direct exposure to sunlight

## Lap Trigger IR-02 Transmitter



### Ordering Information

**Lap Trigger IR-02 Transmitter**  
Order number **B 261 206 890-01**

## 7

### Features

- ▶ Infrared
- ▶ 124 g
- ▶ 15 m working range

This lap trigger system consists of an infrared transmitter station and a receiver 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.

The receiver output signal pin is switched to ground for 20 ms when the car passes the main transmitter.

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

### Technical Specifications

#### Mechanical Data

Size with diode 90 x 40 x 28 mm

Weight 124 g

Aluminum housing

#### Electrical Data

Frequency codes 16 plus 16 offset codes for section times

Supply voltage 8 to 16 V

Working range 15 m

Working temperature -25 to 70°C

### Installation Notes

Same height between receiver and transmitter

Visibility connection between receiver and transmitter

Avoid direct exposure to sunlight



## Lap Trigger HF 58 Receiver



### Features

- ▶ High reliability, even in bad weather conditions
- ▶ 16 independent channels
- ▶ Main and sub trigger

This lap trigger system HF 58 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.

### Application

Antenna gain	6 dBi
Angle azimuth	40°
Angle elevation	90°
Sensitivity	-60 dBm
Packet size	32 Bit
Packet repetition frequency	0,5 ms
Working frequency band	5,795 to 5,815 GHz
Frequency channels	16
Output driver (switching to GND)	10 mA
Output signal main trigger (Puls)	20 ms active low
Output signal sub trigger (Puls)	40 ms active low
Max. vibration	Vibration Profile 1

### Functions

The transmitter sends coded signals across the race track via the directional antenna. The receiver at the race car permanently checks 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 0.5 seconds avoiding a multiple trigger signal. When a trigger is detected the output pin goes low for a certain time:

- 20 msec low at main trigger
- 40 msec low at sub trigger

Standard output configuration: Low side switch with internal pull-up (R = 2.5 kOhm to +5 VDC). External pull-up to VBat allowed

### Technical Specifications

#### Mechanical Data

Size	86 x 20 x 69 mm
Weight	150 g
Ambient temperature	-20 to 85°C

#### Electrical Data

Power consumption	1.3 W
Supply voltage	6 to 18 V

#### Connectors and Wires

Connector	ASX0-02-03PN
Pin 1	Power supply +
Pin 2	GND
Pin 3	Trigger out

### Installation Notes

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

Positioning of the receiver inside the car: The connector side has to be positioned in direction to the front or back of the car as shown in drawing No. 2 (see Dimensions). It must not be positioned with the connector pointing up- or downwards.

Green or blue indicator flashes when it detects a trigger condition.

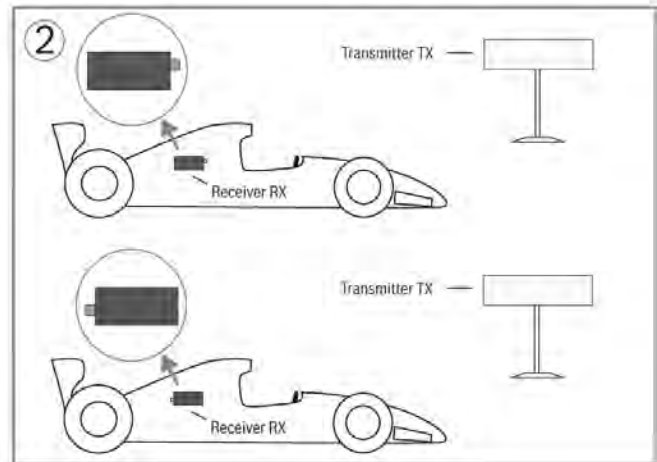
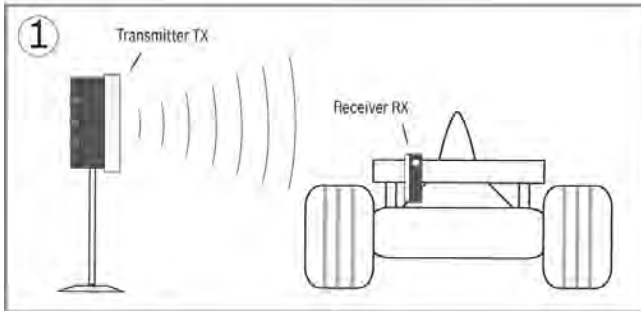
### Ordering Information

**Lap Trigger HF 58 Receiver**  
Order number **F 02U V00 946-03**

## Dimensions

### Positioning of the receiver inside the car

- ① The white antenna radome must be turned to the transmitter side.
- ② The connector has to be positioned in direction of the front or back of the car. It must not be positioned with the connector pointing up- or downwards.



## Lap Trigger HF 58 Transmitter



### Features

- ▶ High reliability, even in bad weather conditions
- ▶ 16 independent channels
- ▶ Main and sub trigger
- ▶ Internal Li-ion battery optional
- ▶ External supply possible

This lap trigger system HF 58 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.

### Application

Working frequency band	5,795 to 5,815 GHz
Frequency channels	16
Angle azimuth	11°
Angle elevation	90°
Transmission power	+10 dBm
Antenna gain	15 dBi
Side lobe suppression	>30 dB

### Functions

The transmitter sends coded signals across the race track via the directional antenna. The receiver at the race car permanently checks the signal parameters. If the trigger condition is detected, the receiver generates the appropriate beacon signal (main/sub trigger). The trigger point is located at broadside of the transmitter antenna.

### Technical Specifications

#### Mechanical Data

Size	70 x 340 x 100 mm
Weight	1,020 g
Ambient temperature	-20 to 60°C

#### Option: internal accumulator

Additional weight	350 g
-------------------	-------

Charging time	< 4 h
Running time	ca. 30 h

#### Electrical Data

Power consumption	1.5 W
Supply voltage	6 to 18 V

#### Connectors and Wires

Connector	ASL 0-06-05PD-HE
Pin 1	Power supply +
Pin 2	GND
Pin 3	Charge input +
Pin 4	n.c.
Pin 5	n.c.

#### Installation Notes

The white antenna radome points to the car as shown in the drawing (see Dimensions) and must not be mounted behind metallic covers or carbon fiber filled elements.

Red LED shows low battery condition.

Charge control shows:

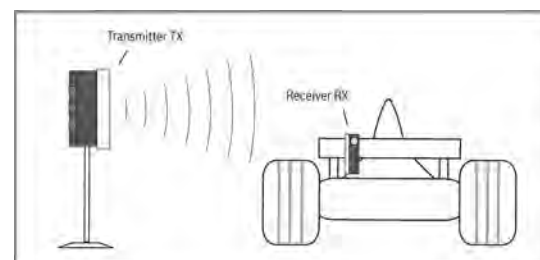
- blue when charging
- green when battery full
- red on power or battery failure

#### Ordering Information

**Lap Trigger HF 58 Transmitter**  
Order number **F 02U V00 945-02**

**Lap Trigger HF 58 Transmitter with internal battery and charger**  
Order number **F 02U V01 042-02**

#### Dimensions





# Software

8

**Calibration** 396

**Simulation** 399

**Analysis** 400

## Modas



Approx. 100 MB free HD space

VGA monitor (min. 1,024 x 768)

### Operating systems

Windows XP 32 Bit, Vista 32 Bit

## Ordering Information

### Modas

Order number **Free download at [www.bosch-motor-sport.com](http://www.bosch-motor-sport.com)**

## 8

### Features

#### ► Software tool for measuring and calibrating

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

### Functions

Online measurement and calibration

Universal use for different ECUs

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

#### Project (Data) management

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

#### Programming system

Programming and management of calibration data

#### Calibrations system

Visualization and manipulation of parameters

#### Diagnosis system

Visualization, processing, documentation and evaluation of diagnosis data

### Technical Specifications

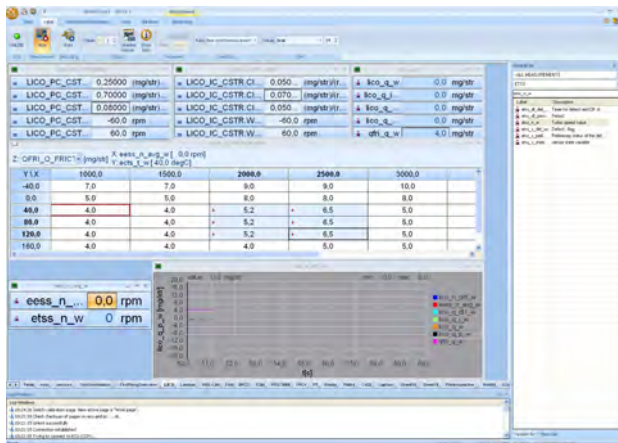
#### Function requirements

##### PC

IBM PC compatible, min. 1.6 GHz

Approx. 512 MB RAM

# Modas Sport



## Features

### ► Calibration software tool for Bosch ECUs

Modas Sport is the calibration tool for Bosch Motorsport ECUs. It integrates a lot of meaningful features to manage our engine control units at the dyno and the racetrack.

## Functions

Calibration tool for MS 3, MS 4.x, MS 5.x, MS 15, MS 3 Sport, MS 4 Sport, MS 15 Sport

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

### Measuring system

Numeric data visualization

Bitwise, decimal, hexadecimal data visualization

Recording of measurement data (needs WinDarab to analyze)

Oscilloscope (graphic data visualization)

### Calibration system

Visualization and manipulation of parameters (calibration data)

Parameter file manager

Data file manager (copy & compare)

Macro manager

Potiboard support integrated

### Administration

Work base management

Integrated K-Line flashing tool

Intuitive design, easy to use, based on latest technology

## Technical Specifications

### Function requirements

#### PC

IBM PC compatible, min. 1.6 GHz

Approx. 512 MB RAM

Approx. 100 MB free hard disc space

VGA monitor (min. 1,024 x 768)

#### Operating systems

Windows XP 32 Bit, Vista 32 Bit

### Optional Accessories

MSA-Box II F 02U V00 327-02

WinDarab Free data analysis Software On request

## Communication

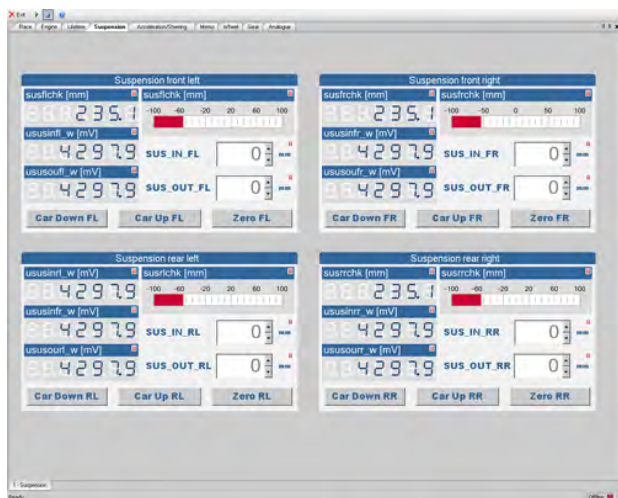
CAN (CCP), K-Line (KWP2000)

## Ordering Information

### Modas Sport

Order number **Free download at [www.bosch-motorsport.com](http://www.bosch-motorsport.com)**

## RaceCon



### Technical Specifications

#### Environment

##### PC

IBM PC Pentium/AMD Athlon compatible, min. 1.6 GHz

Min. 2 GB RAM

Min. 1 GB free hard disc space

VGA/WGA monitor (min. 1,024 x 768)

Windows XP 32 Bit, Vista 32 Bit

#### Optional Accessories

MSA-Box II

F 02U V00 327-02

### Ordering Information

#### RaceCon

Order number **bundled with Bosch Motorsport hardware**

8

### Features

- An all integrated software tool for configuration and calibration

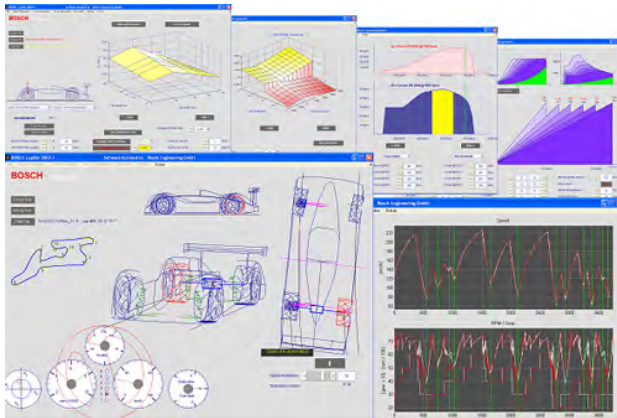
RaceCon is an all integrated software tool for configuration and calibration of Bosch Motorsport hardware products, such as ECUs, displays, loggers. The communication is based on Bosch Motorsport MSA-Box interface.

### Functions

- Calibration of ECU maps and curves
- ECU data file up- and download
- Parameter file up- and download
- Diagnostic functionality for Bosch Motorsport ECUs
- Data file / Work base management
- Integrated flash functionality
- Integrated Bosch sensor database
- Configuration of Bosch Motorsport displays
- Configuration of Bosch Motorsport data loggers
- Configuration of Bosch Motorsport DLS system
- Configuration of Bosch Motorsport CAN modules
- Communication via K-Line/CAN/Ethernet (KWP/CCP/XCP)
- CAN communication log functionality (Baud rate changeable)
- Quick data access over Race Mode
- Intuitive design, easy to use



## LapSim



### Features

- ▶ Professional simulation tool
- ▶ Basic / Chassis / Engine versions available

#### 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 behavior can be gained. Due to the direct link with the simulation model, vehicle parameters can be validated like aerodynamics, tire behavior, engine power, as well as driver performance. The visualization of the vehicle behavior 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.

### Functions

#### Data Analysis

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

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

Direct comparison between several outings and/or simulation model.

3D Animation of vehicle behavior 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 tire model. Tire parameters can easily be determined out of on-car recorded data. No tire 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 optimization

#### Engine Simulation model

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

Normally aspirated 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 to 10,000 rpm range

### Ordering Information

#### LapSim Chassis Basic Version

Order number **Free download at [www.bosch-motor-sport.com](http://www.bosch-motor-sport.com)**

#### LapSim Chassis License

Order number **B 261 206 432-01**

#### LapSim Engine License

Order number **F 01T A20 056-01**

#### LapSim Chassis and Engine License

Order number **F 01T A20 057-01**

#### Upgrade LapSim Engine License

Order number **F 01T A20 058**

#### Upgrade LapSim Chassis License

Order number **F 01T A20 059**

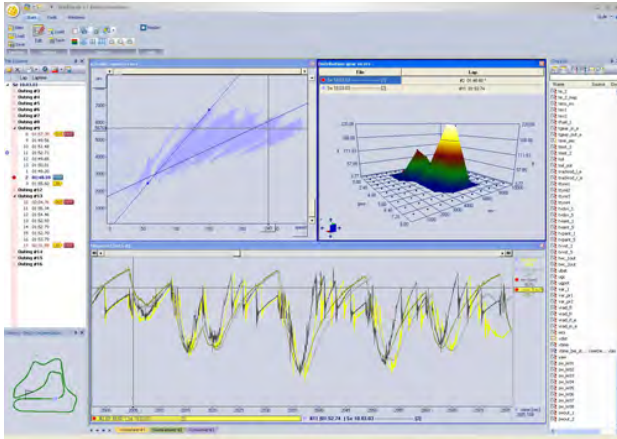
#### Update LapSim Chassis or Engine

Order number **F 02U V00 287-01**

#### Update LapSim Chassis and Engine

Order number **F 02U V00 288-01**

## WinDarab V7



### Features

- ▶ State of the art user interface
- ▶ Versatile diagrams
- ▶ Numerous analysis functions
- ▶ Customizable mathematical channels and filters
- ▶ Software based license without dongle

WinDarab V7 is an evaluation tool for monitoring and analyzing of logged data specially designed for motorsports use. Monitor vehicle data using online telemetry and compare logged data by reading out your data logger. WinDarab V7 features a state of the art user interface and reads out both engine and chassis data. The follower of WinDarab V6 offers simplified and ergonomic handling as well as new features and a revised license system to work without a dongle. To fit to your demand in an optimal way we offer WinDarab V7 in a Free, Light and Expert variation. The enormous bandwidth of features makes WinDarab V7 a perfect evaluation tool for motorsports engineers.

### Functions

#### Diagrams

- Oscilloscope
- X-/Y-plot to create scatterbands
- Histogram
- 3D-diagram

#### Analysis

- Overlay of different laps
- Time or distance based analysis
- Absolute and relative values
- One-touch channel statistics (min./max., avg., etc.)
- Regression lines, user defined lines

Lap reports and lap based comparisons

Replay offline data in realtime

#### Advanced Analysis

- User defined math channels
- User defined conditions to filter data
- FFT analysis

#### Racetracks

- Racetrack creation based on v/acc or GPS data
- Racetrack segmentation

#### Telemetry

- Replay online data in realtime
- Gauges for realtime visualization

#### User Interface

- Flexible display setup and arrangement
- Storable display setup and arrangement
- Lap browser

#### Data Transmission

- Direct data input without intermediate hardware
- Protection/encryption of logged data files
- ASCII import and export

#### License System

- Dongle-free working in all WinDarab V7 variations
- Activation/update via internet
- Annual maintenance for up-to-date versions

### Environment

#### PC

- IBM PC Pentium/AMD Athlon compatible, min. 1.6 GHz
- Min. 1 GB RAM
- Min. 1 GB free HD space
- VGA / WGA monitor (min. 1,024 x 768)

#### Operating systems

Windows XP SP3 (32 bit / 64 bit), Vista (32 bit / 64 bit), Windows 7 (32 bit / 64 bit)

### Technical Specifications

#### Variations

	Free	Light	Expert
Max. open files	2	4	unlimited
Max. measuring data windows	1	2	unlimited

Max. areas in measuring data windows	2	4	unlimited
Views histogram	+	+	+
Views x/y-plot	+	+	+
Views Distribution	-	+	+
Views min/max-tables	-	+	+
Views Fourier-transformation	-	+	+
Views outing report	-	8/1*	unlimited
Views lap analysis	-	-	+
Views flowcharts	-	-	+
Views instrument panel	+	+	+
User defined physical units	+	+	+
Language support German/English	+	+	+
Racetrack generation via speed/lateral G or GPS	+	+	+
ASCII export	+	+	+
Matlab import (separated tool)	+	+	+
Extras functions/cond.	-	-	+
Extras differences	-	+	+
Extras settings/comments	-	-	+
Measuring data window view options	-	-	+
Desktop load/save	+	+	+
Telemetry	-	+	+
<i>*8 columns / 1 window</i>			

### Ordering Information

#### WinDarab Free

Order number **free download on our website**

#### WinDarab Light

Order number **F 02U V01 307-01**

#### WinDarab Expert

Order number **F 02U V01 308-01**



<b>Communication Interface</b>	<b>404</b>
<b>Expansion Modules</b>	<b>405</b>
<b>Relay</b>	<b>412</b>
<b>Switches</b>	<b>414</b>
<b>Wiring Harnesses</b>	<b>415</b>
<b>Wiper Motor</b>	<b>416</b>

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## MSA-Box II



### Features

- Communication interface for PC-supported calibration on K-line, CAN or Ethernet interface

The MSA-Box II is the low cost unit for PC-supported calibration and configuration on Ethernet, K-Line or CAN interface of an ECU.

The MSA-Box II 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 Ethernet, K-Line or CAN-interface of the diagnosis interface.

### Technical Specifications

#### Mechanical Data

Size 84 x 38 x 25 mm

Temperature range 0 to 70°C

Compact design

Fully suitable for motor vehicle use

All inputs and outputs to the PC with galvanic separation

#### Electrical Data

Input voltage (vehicle side) 8 to 32 V

Power supply through the connection to the ECU from board mains with galvanic separation

Power consumption (powered by USB) Typ. 0.5 W

USB USB 2.0, high speed (480 MBit/sec)

Ethernet 100 MBit/sec

K-Line 300 Bd up to 320 kBd

CAN 10 kBit/s up to 1 MBit/s

Operating Systems Windows XP 32 Bit, Vista 32 Bit

#### Connectors and Wires

Connector AS 6-12-35PN F 02U 000 441-01

Mating connector AS 0-12-35SN F 02U 000 258-01

Pin 1	Terminal 30 (permanent pos)
Pin 2	Terminal 15 (switch pos)
Pin 3	GND
Pin 4	CAN_High
Pin 10	K-Line
Pin 8	RxD+
Pin 9	RxD-
Pin 11	TxD+
Pin 12	TxD-
Pin 16	CAN_Low
Pin 22	SCR
Diagnosis wire length	2 m
USB wire length	0.5 m

### Ordering Information

#### MSA-Box II

Order number **F 02U V00 327-02**

## AWS LSU 4.9



### Features

- ▶ Lambda interface
- ▶ 80 g

The AWS LSU 4.9 is used in combination with the lambda sensor (Mini-)LSU 4.9. The box is able to supply two (Mini-)LSU 4.9 lambda sensors. 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.

Please note: Lambda sensors are not part of the AWS LSU 4.9.

### Application

Measuring range	Lambda 0.6 to 2.5
-----------------	-------------------

### Technical Specifications

#### Mechanical Data

Weight	80 g
Size	38 x 43 x 16 mm
Wire length	150 mm
Operating temperature	10 to 60°C

#### Electrical Data

Power Supply	5 to 20 V
Power 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

### Diagnosis

$\Lambda_{\text{Value}} = 0.0069$	Failed sensor (short cut or not connected)
$\Lambda_{\text{Value}} = 0.0686$	Sensor did not reach 600°C (up to 30 sec)
$\Lambda_{\text{Value}} = 0.1373$	Heating period

### CAN-ID

For each sensor 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	0x290
Byte 0	A/F1
Byte 1	
Byte 2	AF/2
Byte 3	
Byte 4	Temp1
Byte 5	Temp2
Byte 6	Heat1
Byte 7	Heat2
$A/F_{\text{Value}}$	$= 0.001 * A/Fx$
$\Lambda_{\text{Value}}$	$= A/F_{\text{Value}} / 14.57$
	$= A/F_{\text{Digits}} / 14,570$
	$= A/F_{\text{Digits}} * 0.00006863418$
Heat Temp	$= \text{Temp}_{\text{Digits}} * 2 + 496.9^{\circ}\text{C}$

### Pin Assignment life connector

Pin	Name	Function
1	GND	Ground
2	GND LSU 1 / 2	Ground LSU heater
3	Vext	External power supply 5 to 20 V
4	LSU heater	External power supply for LSU 1/2 heater
9	CAN H	CAN bus high
10	CAN L	CAN bus low
11	TxD	TxD serial interface
12	RxD	RxD serial interface

### Pin Assignment LSU 1/2 in connector

Pin	Name	Function
1	LSU 1 IP	Inv. Input of pump current amp
2	LSU 1 VM	Virtual ground
3	GND heater 1	Ground for heater 1
4	Vext heater 1	External power supply 5 to 20 V LSU 1

5	LSU 1 IA	Non Inv. Input of pump current amp
6	LSU 1 UN	Inv. Input of pump current control
7	LSU 2 IP	Non Inv. Input of pump current amp
8	LSU 2 VM	Virtual ground
9	GND heater 2	Ground for heater 2
10	Vext heater 2	External power supply 5 to 20 V LSU 2
11	LSU 2 IA	Non Inv. Input of pump current amp
12	LSU 2 UN	Inv. Input of pump current control

### Accessories

Lambda Sensor LSU 4.9

Lambda Sensor LSU 4.9D

Lambda Sensor Mini-LSU 4.9

### Ordering Information

#### AWS LSU 4.9

Order number **F 01E B01 622**



## Extended Module EM-LIN



### Features

- ▶ LIN Master
- ▶ 53 g

The extended module EM-LIN is a LIN-Master designed to allow an on-line adjustment of the alternator regulator parameters e.g. alternator voltage, load response time, cut-off speed and current limitation. The EM-LIN is designed with a microcontroller in combination with a LIN and a CAN transceiver. The electronics power supply is managed by a voltage regulator. In addition, an analog input is accessible on one connector. Its robust aluminum housing provides an effective protection for the electronics. Further functions (e.g. CAN function) and application specific software development is available on request.

### Functions

Application	LIN Master
Compatible regulator type	Bosch LIN-regulator CR652

### Technical Specifications

#### Mechanical Data

Size	85 x 32 x 17.3 mm
Weight	53 g
Max. vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motor-sport.com">www.bosch-motor-sport.com</a> )
Operating temperature	-20 to 85°C
Storage temperature	-20 to 85°C

#### Electrical Data

Power Supply	12 V
Max. power supply (1 min)	25 V

#### Connectors and Wires

<b>Connector 1 (red)</b>	<b>ASU 0-03-05PN-HE</b>
Mating connector	ASU 6-03-05SN-HE
Pin 1	U <sub>s</sub>

Pin 2	GND
Pin 3	-
Pin 4	-
Pin 5	Config
<b>Connector 2 (green)</b>	<b>ASU 0-03-05SD-HE</b>
Mating connector	ASU 6-03-05PD-HE
Pin 1	U <sub>s</sub>
Pin 2	GND
Pin 3	LIN

Please note: the EM-LIN must be powered by one connector only.

### Installation Notes

Please ask for compatibility of this CAN Module with your ECU.

### Ordering Information

#### Extended Module EM-LIN

Order number **F 02U V00 609-02**

Dimensions

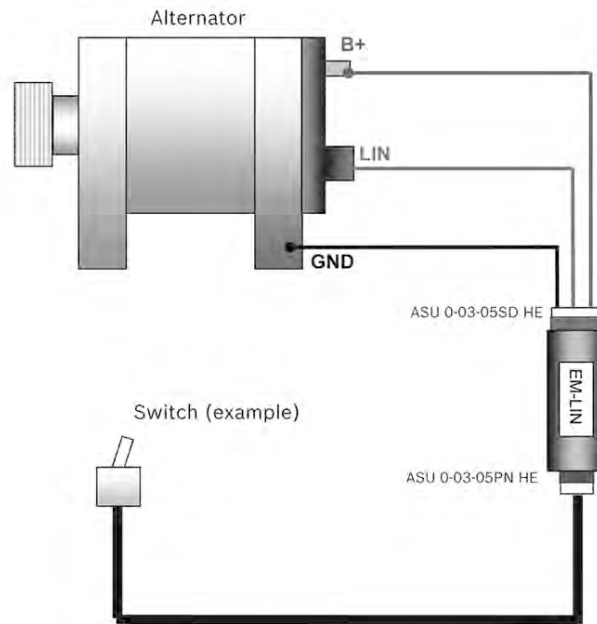


Illustration 1: Possible application to switch between two alternator voltage values

9

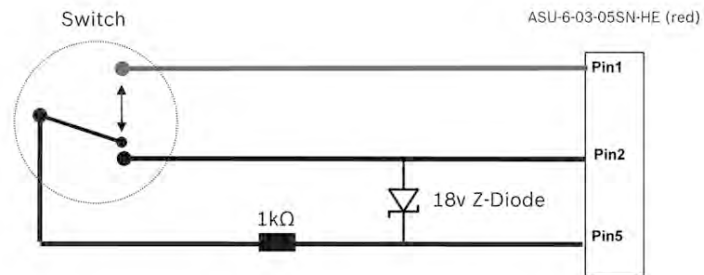
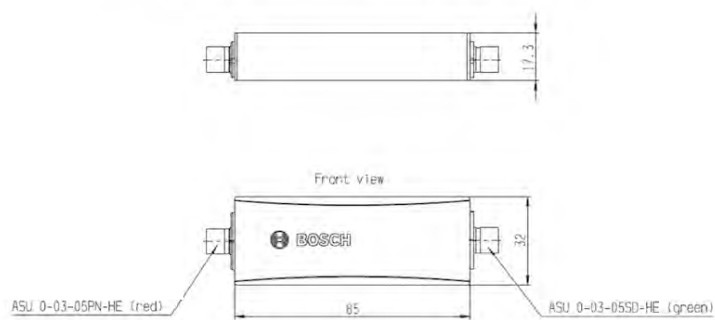


Illustration 2: Recommended switch design (example)



## Lambdatronic LT4



### Features

- ▶ Supply of 4 Bosch lambda sensors, type LSU 4.2, LSU 4.9 or Mini-LSU 4.9

The Lambdatronic LT4 provides controlled pumping current to supply up to 4 Bosch lambda sensors, type LSU 4.2, LSU 4.9 or 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 main feature and benefit of this unit is the combination of the Bosch well known lambda IC and a very compact box size with motorsports specification. Furthermore the analog signal output can be configured freely.

### Functions

Application	Lambda 0.75 to 10.12
Compatible Bosch sensor type	LSU 4.2, LSU 4.9, Mini-LSU 4.9
Channels	4
Heater	Internal

### Technical Specifications

#### Mechanical Data

Weight with wire	98 g
Sealing	100 % humidity
Mounting	Velcro
Size w/o wire (w*l*h)	54 x 59 x 13 mm
Operating temp. range (housing)	-20 to 85°C

Storage temp. range	-20 to 85°C
Max. vibration	Vibration Profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a> )

#### Electrical Data

Power supply $U_s$	(6.5) 10 to 17 V
Max power supply (1 min) $U_s$	Max. 26 V
Thermal dissipation loss	3 W at 14 V
Current $I_s$	5 A
Current $I_s$ (Heating up)	26 A

#### Software

Configuration with Modas	Included
--------------------------	----------

#### Characteristic

Signal output 1	CAN
Signal output 2	4 x 0 to 5 V
CAN- baud rate	1 Mbaud
Signal resolution	2,5 * 10 <sup>-4</sup> lambda
Signal sampling rate	100 Hz
CAN refresh rate	100 Hz

#### Connectors and Wires

Connector	AS 6-14-35PN
Connector loom	AS 1-14-35SN
Sleeve	Viton
Wire size	26
Wire length L	20 cm

#### Pin Assignment

Pin	Function
1	+ 12 V (Battery +)
2	+ 12 V (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 analog out
13	Shield

14	Pump current LSU 1 IP1
15	Virtual GND LSU 1 VM1
16	Heater PWM LSU 1 Uh-1
17	Heater (Batt +) LSU 1 Uh+1
18	Setup current LSU 1 IA1
19	Nernst voltage LSU 1 UN1
20	Pump current LSU 2 IP2
21	Virtual GND LSU 2 VM2
22	Heater PWM LSU 2 Uh-2
23	Heater (Batt. +) LSU 2 Uh+2
24	Setup current LSU 2 IA2
25	Nernst voltage LSU 2 UN2
26	UN1pump current LSU 3 IP3
27	Virtual GND LSU 3 VM3
28	Heater PWM LSU 3 Uh-3
29	Heater (Batt +) LSU 3 Uh+3
30	Setup current LSU 3 IA3
31	Nernst voltage LSU 3 UN3
32	Pump current LSU 4 IP4
33	Virtual GND LSU 4 VM4
34	Heater PWM LSU 4 Uh-4
35	Heater (Batt. +) LSU 4 Uh+4
36	Setup current LSU 4 IA4
37	Nernst voltage LSU 4 UN4

### Installation Notes

The LT4 is designed to supply 4 Bosch lambda sensors, type LSU 4.2, LSU 4.9 or Mini-LSU 4.9

The unit can be connected to any CAN system (500 kBaud) 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.

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 sheet for software documentation (e.g. CAN protocol).

Please find further application hints in the offer drawing at our homepage.

### Communication

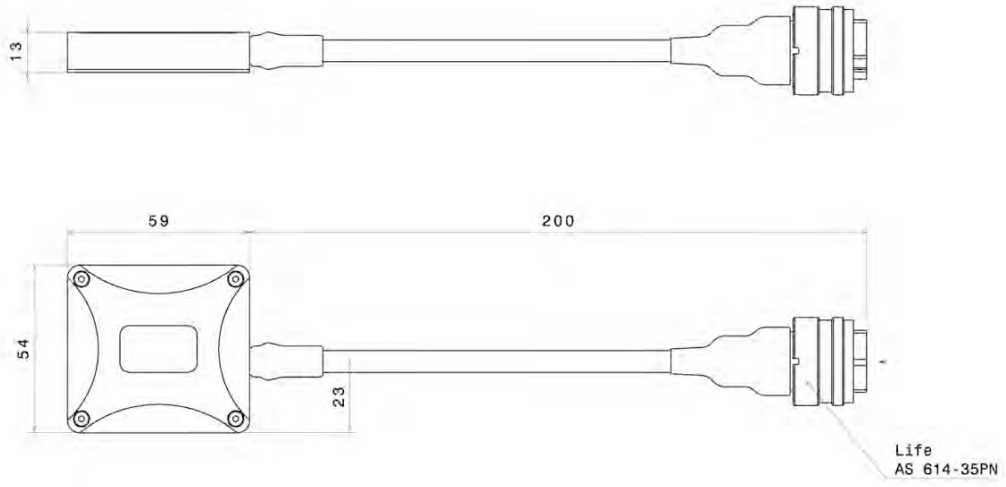
Communication link	K-Line / CAN
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### Ordering Information

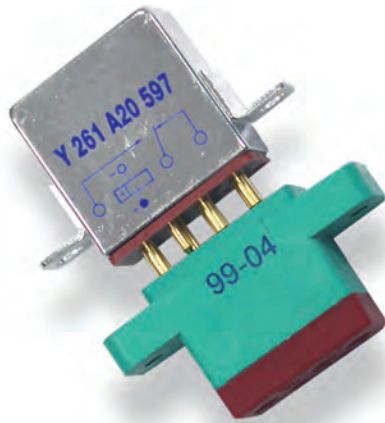
#### Lambdatronic LT4

Order number **F 01T A20 070-05**

Dimensions



## Relay 25 A



250	0.2
350	0.1

### Ordering Information

#### Relay 25 A

Order number **Y 261 A20 597-01**

#### Base

Order number **Y 261 A20 598-01**

### Features

- ▶ 25 A max. current

The relay 25 A is 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.

### Technical Specifications

#### Mechanical Data

Drill hole	3.1 mm
Weight	61 g
Vibration	30 g/70 Hz to 3 kHz
Shock	100 g (11 ms)
Operating temperature	-45 to 125°C

#### Electrical Data

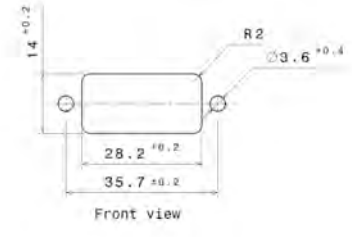
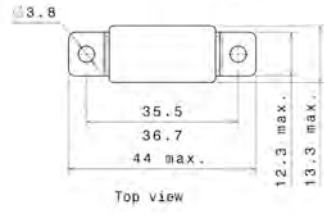
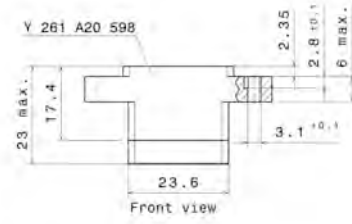
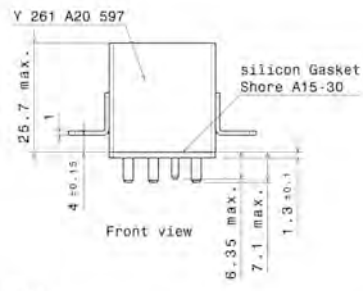
Power Supply	12 to 14.5 V
Min. switches	50,000
Coil resistance at 25°C	80 Ω
Max. current	25 A

#### Current vs. Time characteristic

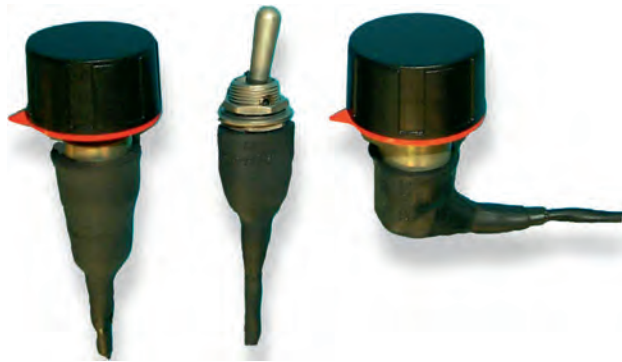
(the relay shall be compatible with a 25 A circuit breaker)

I (A)	t(s)
30	3,600 (1 h)
50	5
100	1.2

Dimensions



## 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 wire equivalent to your individual requirement.

### Functions

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

### Technical Specifications

#### Design

Straight

Angled 90°

#### Options

With integrated resistor network

Lockable

Variable number of steps

Variable form of rotary waver switch

Without end stop

### Ordering Information

#### For MAP function

Straight, ASL 6-06-05PE-HE

Order number **B 261 209 644-01**

#### 4 steps display dimmer DDU

Straight, ASL 6-06-05PE-HE

Order number **B 261 209 646-01**

#### 4 steps LED dimmer DDU

Straight, ASL 6-06-05PE-HE

Order number **B 261 209 647-01**

#### 6 steps for display switch-over

Straight, ASL 6-06-05PE-HE

Order number **B 261 209 659-01**

#### 12 steps

Straight, ASL 6-06-05PE-HE

Order number **B 261 209 643-01**



## Wiring Harnesses



We offer special wiring harnesses for motorsport applications. Our portfolio contents layout, design and production of harnesses, sensors and actuators for motorsport requirements.

Moreover we offer consultancy of loom design and sensor definition. Design and production of prototypes up to mass production is also possible. We do 2D Layout documentation in exchangeable \*.dxf, \*.dwg file format. Naturally we use motorsport connectors (sev. MIL specs) and switches and fuses from aviation and aerospace technology. Full shielded wires for maximum EMC protection are available. All looms are built with cables and wires in aviation & aerospace quality. All looms are tested on a high voltage test bench. Tests under defined vibration profiles are also possible. We also offer several connectors on request.

### Ordering Information

#### Wiring Harnesses

Order number **on request**

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## Wiper Direct Actuator WDA



### Features

#### ► LIN and Analog versions available

The WDA is a wiper motor designed to execute reversing movements instead of rotating 360° like a conventional wiper.

Its function and many operating modes are managed by integrated control electronics. The user is able to control the desired operating mode via LIN [Version LIN] or simply by switching its analogue inputs to ground [Version Analog]. The gear, the motor and the electronics are all installed in the same housing.

The main benefit of this wiper motor is its direct rotation movement which replaces external gears and the possibility of programming the operating speed and end positions of all its function modes, upon request.

### Application

Application -40 to 85°C

### Technical Specifications

#### Variations

##### WDA LIN

Pin 1	LIN
Pin 2	Free
Pin 3	GND
Pin 4	U <sub>s</sub>
LIN speed	19,200 Baud
LIN Version	2.0
LIN description file	On request
Operating modes:	
Stop	
Interval	
Speed 1	
Speed 2	

Single stroke

Service position

#### WDA Analog

Pin 1	AN 2			
Pin 2	AN 1			
Operating modes	Stop	Interval	Speed 1	Speed 2
Pin 3	U <sub>s</sub>	GND	GND	U <sub>s</sub>
Pin 4	U <sub>s</sub>	U <sub>s</sub>	GND	GND

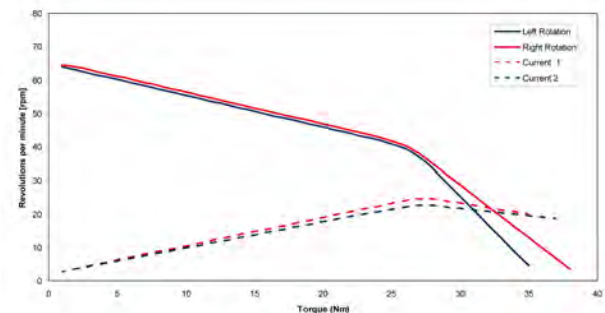
#### Mechanical Data

Max. Vibration	30 % of Vibration Profile 1 or 100 % of Vibration Profile 1 in combination with silentblocks (see Accessories)
Size	104.7 x 174.7 x 117.1 mm
Max. wiping speed	Depends on torque
Max. wiping angle	160°
Max. torque	35 Nm
Weight	1,270 g

#### Electrical Data

Power supply	9 to 16 V
Supply current at 40 cycles/min.	Typ. 3.4 A
Supply current at 60 cycles/min.	Typ. 6.3 A

#### Characteristic



#### Connectors and Wires

Connector	CEP2M-AMP-4
Mating connector	F02U B00 542-01
Various motorsport and automotive connectors available on request	

#### Installation Notes

The WDA LIN can be operated by all ECUs with LIN 2.X Master function. Further information about the LIN-Frame available upon request.

The WDA Analogue can be operated by switching the analogue inputs between ground and voltage supply.

Please contact us to define the desired angle of all the operating modes.

The acceleration values can be exceeded by using silentblocks (F02U 003 027-01).

Please ensure that the environmental conditions do not exceed the specifications.

Please find further application hints in the offer drawing at our homepage.

### Ordering Information

#### WDA LIN

Order number **F 02U V00 838-02**

#### WDA Analog

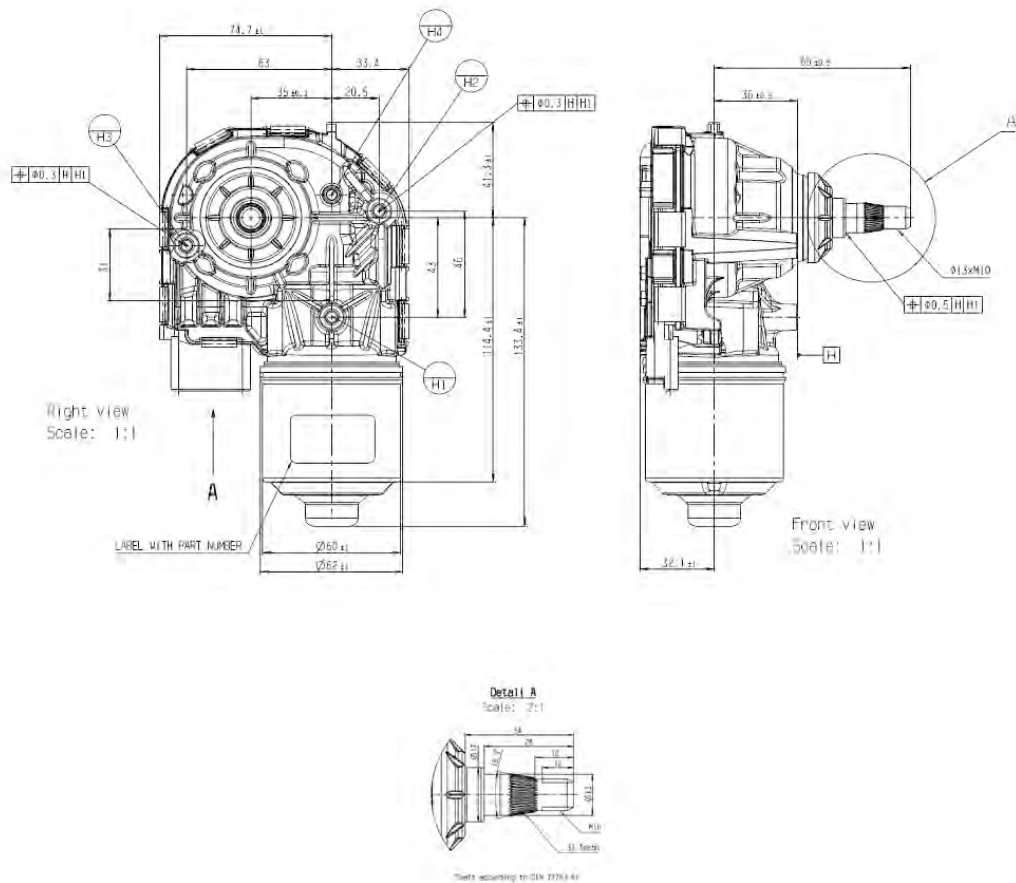
Order number **F 02U V00 938-02**

#### Accessories

##### Silentblock

Order number **F 02U 003 027-01**

### Dimensions





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## General Information

### **ESD, Handling and Transport**

Please be mindful of the specifications concerning ESD. Never grab into the connectors. Please follow the regulations when transporting devices (e.g. ESD packaging materials).

### **Battery**

Some of the devices use Lithium-Ion batteries. Please use extra caution to be certain that the correct removal procedure is followed. Abide by the maintenance cycle schedule to ensure correct operation. Bosch Motorsport recommends maintenance once a year.

### **Installation**

The correct installation extends reliability and durability. Please follow the specifications regarding temperature, humidity, vibration and liquid compatability.

## Vibration Profile 1

### Broadband noise: 8h/direction

Frequency (Hz)	Acceleration density (m/s <sup>2</sup> ) <sup>2</sup> /Hz
20	50.4
55	26.0
180	1.0
300	1.0
360	0.56
1,000	0.6
2,000	0.6

### Sinus: 8h/direction

Frequency (Hz)	Acceleration density (m/s <sup>2</sup> ) <sup>2</sup> /Hz
100	50
180	200
250	200
350	60
2,500	60

## Vibration Profile 2

### Broadband noise: 8h/direction

Frequency (Hz)	Acceleration density (m/s <sup>2</sup> ) <sup>2</sup> /Hz
10	10
50	10
66.7	1
100	1
1,000	0.1
Effective value $a_{\text{Eff}}$	26.9 m/s <sup>2</sup>



## Vibration Profile 3

### Broadband noise

Frequency (Hz)	Acceleration density (m/s <sup>2</sup> ) <sup>2</sup> /Hz
10	14.0
50	7.0
60	3.5
300	0.51
500	45.6
1,500	15.26
Effective value $a_{\text{Eff}}$	168 m/s <sup>2</sup>

### Sinus

Alteration rate of frequency: 1 oct./min

Frequency (Hz)	Amplitude of acceleration (m/s <sup>2</sup> )	Amplitude of oscillation lane (μm)
20	50	
85	50	
85		175
200		175
200	280	
220	280	
300	125	
440	125	



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