

Bosch Motorsport
Equipment for High Performance Vehicles
Edition 2014



BOSCH

Invented for life



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

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01 Engine Control Units

1

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Gasoline Engine Control Units

Sport Line ECUs

Type	Engine Control Unit MS 3 Sport	Engine Control Unit MS 3 Sport GT3 Cup	Engine Control Unit MS 4 Sport
			
Max. Cyl./bank	6/2	6/2	8[GDI 6]/2
Control strategy	Alpha/n	Alpha/n	Alpha/n
Lambda ctrl	Dual	Dual	Dual
Turbo boost ctrl	-	-	Opt.
Knock ctrl	Opt.	+	Opt.
El. Throttle ctrl	Opt.	+	Opt.
Traction ctrl	Opt.	+	Opt.
GDI support	-	-	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	Dual	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.

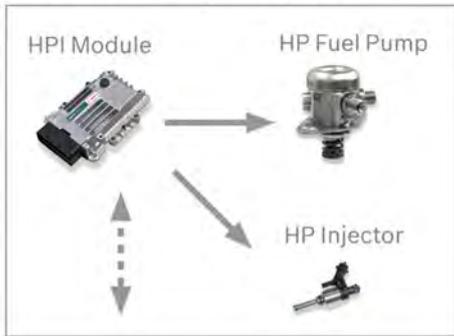
Example for a typical Sport Line system

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 MSA-Box II connects to the PC over USB and to the ECU via a CAN/K-Line link. The display DDU 7 is configured over Ethernet with the software RaceCon. 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

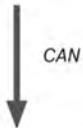
Gasoline Direct Injection (GDI)



ECU MS 3 Sport, MS 4 Sport

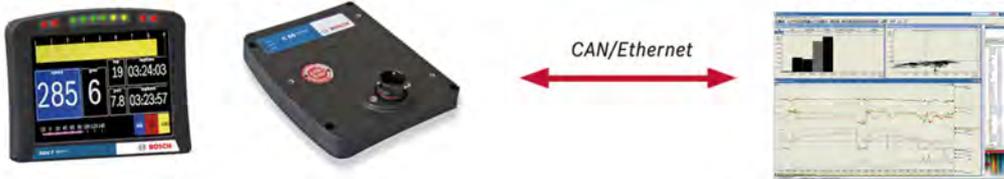
Communication Interface
MSA-Box II

Calibration Software
Modas Sport



Display DDU 7 or Logger C 50

Configuration and Analysis
Software WinDarab



Sport Line ECUs

Type	Engine Control Unit MS 3 Sport	Engine Control Unit MS 3 Sport GT3 Cup	Engine Control Unit MS 4 Sport
			
Max. Cyl./bank	6/2	6/2	8[GDI 6]/2
Control strategy	Alpha/n	Alpha/n	Alpha/n
Lambda ctrl	Dual	Dual	Dual
Turbo boost ctrl	-	-	Opt.
Knock ctrl	Opt.	+	Opt.
El. Throttle ctrl	Opt.	+	Opt.
Traction ctrl	Opt.	+	Opt.
GDI support	-	-	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

The MS 3 Sport is the first Bosch engine management system to be manufactured with full hybrid technology. Therefore it is very small, lightly 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 www.bosch-motorsport.com)

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

Power supply

Full operation 9 to 16 V

Recommended 11 to 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
-----------------------------	------------------

Variable Valve Timing VVT SW upgrade	F 02U V00 395-01
--------------------------------------	------------------

Environment (not included)

Programming interface 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
---------------	------------------

Mating connectors (not included)

Mating connector I	D 261 205 139-01
--------------------	------------------

Mating connector II	D 261 205 140-01
---------------------	------------------

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**

Software Options

SW Upgrade Traction Control

Order number **F 01T A20 052-01**

SW Upgrade Knock Control

Order number **F 01T A20 053-01**

SW Upgrade EI. Throttle Control

Order number **F 01T A20 051-01**

Engine Control Unit MS 3 Sport GT3 Cup



Features

- ▶ Free and full access to the ECU
- ▶ No wiring changes necessary
- ▶ Support for 3rd party displays via CAN
- ▶ Plug and play with base “safe” calibration
- ▶ Pre-configured workbases for free Bosch Motorsport calibration tools

The MS 3 Sport GT3 Cup Motorsports ECU enables you to optimize the software of Ex-Porsche GT3 Cup cars by getting full access to the ECU, allowing you to adapt it to any engine hardware changes. The software offers additional features and comes with a base calibration.

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	Inclusive
Electronic throttle control	Inclusive
Traction control	Inclusive
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 www.bosch-motorsport.com)

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

Power supply

Full operation 9 to 16 V

Recommended 11 to 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

Environment (not included)

Programming interface 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

Mating connectors (not included)

Mating connector I	D 261 205 139-01
Mating connector II	D 261 205 140-01

Communication

1 K-line serial interface

1 CAN interface

Ordering Information**Engine Control Unit MS 3 Sport GT3 Cup**

Delivery with Porsche GT3 specific base calibration.
Order number **F 02UV0U 082-01**

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 www.bosch-motor-sport.com)

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
Power supply	
Full operation	10 to 18 V
Recommended	11 to 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 (not included)

Programming interface 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

Mating connectors (not included)

Mating connector I	D 261 205 344-01
Mating connector II	D 261 205 345-01

Installation Notes

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

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

Communication

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

Ordering Information**Engine Control Unit MS 4 Sport**

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

Engine Control Unit MS 4 Sport GDI

Only in combination with HPI 5
Order number **F 02U V01 138-01**

Engine Control Unit MS 4 Sport Turbo

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

Engine Control Unit MS 4 Sport Turbo GDI

Only in combination with HPI 5
Order number **F 02U V01 000-01**

Engine Control Unit MS 4 Sport Motorcycle

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

Software Options**SW Upgrade Traction Control**

Order number **F 01T A20 052-01**

SW Upgrade Knock Control

Order number **F 01T A20 053-01**

SW Upgrade El. Throttle Control

Order number **F 01T A20 051-01**

SW Upgrade Advanced Turbo Control

Order number **F 02U V00 781-01**

SW Upgrade Variable Valve Timing

Order number **F 02U V00 395-01**

SW Upgrade ETC & Blipper

Order number **F 02U V00 780-01**

MS 4 Sport Variations

1

Type	Engine Control Unit MS 4 Sport	Engine Control Unit MS 4 Sport GDI	Engine Control Unit MS 4 Sport Turbo	Engine Control Unit MS 4 Sport Turbo GDI	Engine Control Unit MS 4 Sport Motorcycle
					
Max. Cyl./bank	8/2	6/2	8/2	6/2	4/2
GDI support	-	+	-	+	-
ABS M4 interface	+	+	+	+	-
Turbo boost ctrl	-	-	+	+	-
Advanced 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 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.

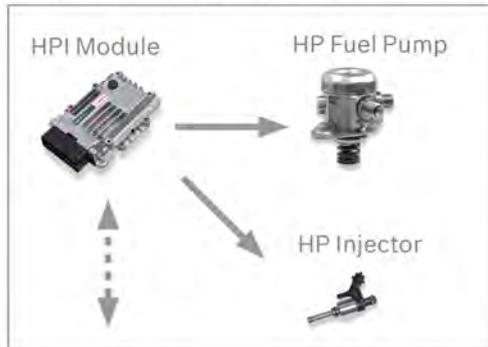
Example for a typical Performance Line system

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

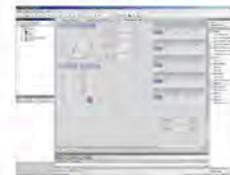
USB

Ethernet/
CAN

Display DDU 8 or Logger C 60



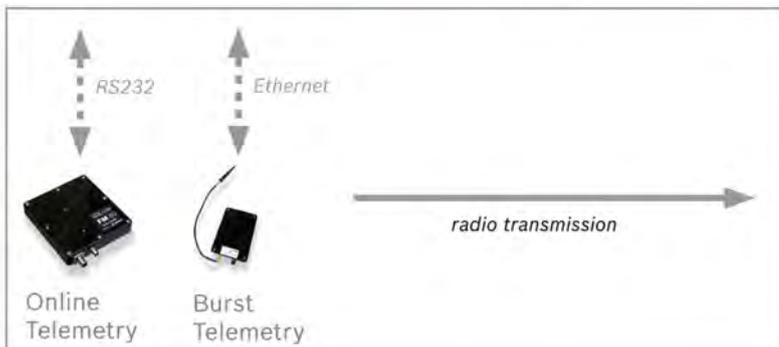
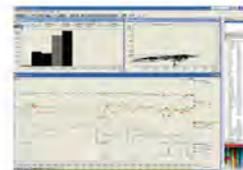
Configuration Software
RaceCon



Ethernet

Ethernet

Data Analysis Software
WinDarab



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	Dual	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 www.bosch-motorsport.com)

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Temp. range (at internal sensors)	-20 to 85°C

Electrical Data

Approx. power cons. (w/o loads) 9 W at 14 V

Power supply

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
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Environment (not included)

Programming interface MSA-Box II	F 02U V00 327-02
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Data logger C 60	F 02U V00 875-02
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Display DDU 8	F 02U V00 873-05
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Mating connectors (not included)

Mating connector blue AS 6-18-35 SB	F 02U 000 474-01
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Mating connector red AS 6-18-35 SN	F 02U 000 472-01
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Installation Notes

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

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

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 www.bosch-motorsport.com)

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

Protection Classification IP67 to DIN 40050, Section 9, Issue 2008

Temp. range (at internal sensors) -20 to 85°C

Electrical Data

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

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 kcps, 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

1 sensor supply 10 V/100 mA

1 protected Ubat output 1 A

6 diagnostic outputs with selectable internal signals

1 time base reference synch-in/out

Software

Modas Sport Calibration Software	Inclusive
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Environment (not included)

Programming interface MSA-Box II	F 02U V00 327-02
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Data logger C 60	F 02U V00 875-02
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Display DDU 8	F 02U V00 873-05
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Mating connectors (not included)

Mating connector yellow AS 6-16-35 SA	F 02U 000 467-01
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Mating connector blue AS 6-16-35 SB	F 02U 000 468-01
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Mating connector red AS 6-16-35 SN	F 02U 000 466-01
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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.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

Communication

2 x 100 Mbps Ethernet interfaces

1 x RS232 serial interface

3 x 1 Mbps CAN interfaces

1 x LIN interface

Ordering Information

Engine Control Unit MS 5.1

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

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 www.bosch-motorsport.com)

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Weight (approx.)	1,270 g
Temp. range (at internal sensors)	-20 to 65°C

Electrical Data

Approx. power cons. (w/o loads)	13 W at 14 V
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Power Supply

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
1 sensor supply 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

Environment (not included)

Programming interface MSA-Box II	F 02U V00 327-02
Data logger C 60	F 02U V00 875-02
Display DDU 8	F 02U V00 873-05

Mating connectors (not included)

Mating connector yellow AS 6-16-35 SA	F 02U 000 467-01
Mating connector blue AS 6-16-35 SB	F 02U 000 468-01
Mating connector red 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.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

Communication

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

Ordering Information

Engine Control Unit MS 5.5
Order number **F 02U V00 285-04**

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 www.bosch-motorsport.com)

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Temp. range (at internal sensors)	-20 to 85°C

Electrical Data

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

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 ksps, 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 (± 100 mA)
2 H-bridges (5 A)

3 sensor supplies 5 V/400 mA

1 sensor supply 10 V/100 mA

6 diagnostic outputs with selectable internal signals

12 outputs with configurable function (FPGA)

1 time base reference synch-in/out

Software

Modas Sport Calibration Software	Inclusive
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Environment (not included)

Programming interface MSA-Box II	F 02U V00 327-02
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Data logger C 60	F 02U V00 875-02
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Display DDU 8	F 02U V00 873-05
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Mating connectors (not included)

Mating connector yellow AS 6-16-35 SA	F 02U 000 467-01
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Mating connector blue AS 6-16-35 SB	F 02U 000 468-01
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Mating connector orange AS 6-16-35 SC	F 02U 000 469-01
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Mating connector red AS 6-16-35 SN	F 02U 000 466-01
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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.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

Communication

2 x 100 Mbps Ethernet interfaces

1 x RS232 serial interface

4 x 1 Mbps CAN interfaces

Ordering Information

Engine Control Unit MS 5.2

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

Diesel ECUs

1

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

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

Engines with the following numbers of cylinders are supported:	3, 4, 5, 6, 8, < 3 on request
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 www.bosch-motor-sport.com)

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Weight	1,780 g
Temperature range	-20 to 85°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 V, 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 (not included)

Programming interface MSA-Box II	F 02U V00 327-01
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

Mating connectors (not included)

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 ECUs we recommend calibration support from Bosch Motorsport.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

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**

Software Options

SW Upgrade Traction Control

Order number **F 02U V00 778-01**

SW Upgrade Chassis

Order number **F 02U V00 779-01**

SW Upgrade Two Bank Hydraulic Control

Order number **F 02U V00 949-01**

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

Engines with the following numbers of cylinders are supported:	3, 4, 5, 6, < 3 on request
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 www.bosch-motor-sport.com)

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Weight	1,780 g
Temperature range	-20 to 85°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 V, 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 (not included)

Programming interface MSA-Box II	F 02U V00 327-01
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

Mating connectors (not included)

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 ECUs we recommend calibration support from Bosch Motorsport.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

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 023-03**

Software Options

SW Upgrade Traction Control

Order number **F 02U V00 778-01**

SW Upgrade Chassis

Order number **F 02U V00 779-01**

SW Upgrade Two Bank Hydraulic Control

Order number **F 02U V00 949-01**

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. 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-motor-sport.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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
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 (not included)

Programming interface MSA-Box II	F 02U V00 327-01
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

Mating connectors (not included)

Mating connector I AS 6-18-35 SA	F 02U 000 473-01
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
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 ECUs we recommend calibration support from Bosch Motorsport.

Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

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**

Diesel System Components	40
Electronic Throttle Body	43
Fuel Pressure Regulators	46
Fuel Pumps	61
HP Injection Power Stages	75
Ignition Coils	81
Ignition Modules	149
Injection Valves	155

Diesel System Components

2



- 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
- The base output level and the desired output level for the 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	Approx. 500.00 €	Approx. 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.

Electronic Throttle Body



Features

- ▶ Many bore diameters available
- ▶ Throttle position sensor is redundant
- ▶ For flex-fuel, CNG, LPG
- ▶ Idle default position

The throttle body is designed to control the fresh air of spark ignition engines in combination with an electronic throttle control system. ETB applications with flex-fuel, CNG and LPG are permissible if injected in the air flow after the throttle body.

A typical ETC system includes the following components: electronic throttle body, accelerator pedal module and electronic control unit.

You will find the available bore diameters in the variations table.

Application

Temperature range	-40 to 140°C
Max. vibration	50 to 250 m/s ² at 50 Hz to 2 kHz

Technical Specifications

Mechanical Data

Available bore diameters	32 mm
	40 mm
	46 mm
	50 mm
	52 mm
	54 mm
	60 mm
	68 mm
	82 mm

Electrical Data

Supply voltage	6 to 16 V
Supply voltage sensor	5 ± 0.2 V
Max. allowed generator current	<10.0 A

Characteristic

Output signal I	0 to 5 V for 0 to 90°
Output signal II	5 to 0 V for 0 to 90°

Connectors and Wires

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

Installation Notes

For correct mounting please respect the hints on the next page "Mounting position".

The ETB can be connected directly to control units with ETC functionality.

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

Two redundant sensors control the up to date throttle position.

All ETBs have an idle air position.

Ordering Information

Electronic Throttle Body 32 mm
Order number **0 280 750 148**

Electronic Throttle Body 40 mm
Order number **0 280 750 149**

Electronic Throttle Body 46 mm
Order number **F 02U V01 171-01**

Electronic Throttle Body 50 mm
Order number **0 280 Y05 107-10**

Electronic Throttle Body 52 mm
Order number **F 02U V01 184-01**

Electronic Throttle Body 54 mm
Order number **0 280 750 150**

Electronic Throttle Body 60 mm
Order number **0 280 750 151**

Electronic Throttle Body 68 mm
Order number **0 280 750 003**

Electronic Throttle Body 82 mm
Order number **0 280 750 101**

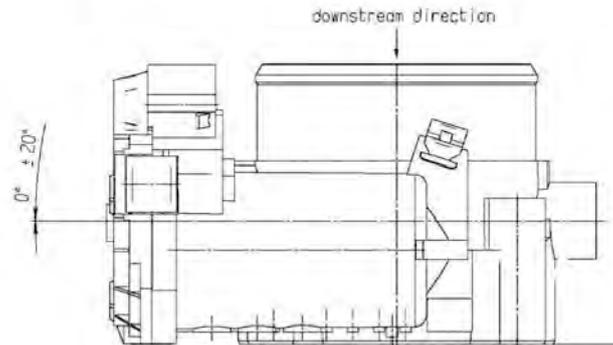
Dimensions

Mounting position

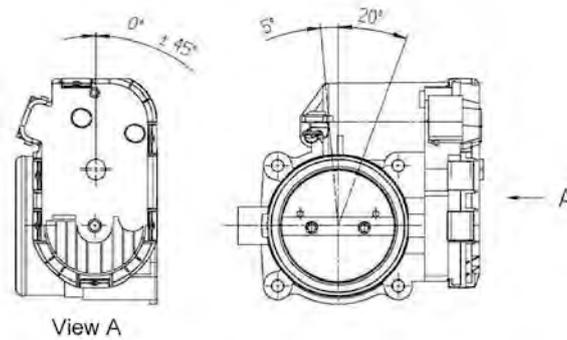
2

Mounting position of the Throttle Actuator

- Horizontal inclination of the Throttle shaft: $\pm 20^\circ$
- Horizontal inclination of the cover: $\pm 180^\circ$
- Mounting positions which deviate from this need separate testing.
- It has to be prevented that when mounted in the vehicle, no condensed moisture can soak into the Throttle shaft bore holes (e.g. from the crankcase ventilation)



IN CASE OF MOUNTING POSITION WITH DC-MOTOR ON TOP
A COMBINATION OF THE ANGLES SHOWN BELOW IS NOT ALLOWED!



Variations

Order number	0 280 750 148	0 280 750 149	F 02U V01 171-01	0 280 Y05 107-10	F 02U V01 184-01
Bore diameter (mm)	32	40	46	50	52
Connector	D 261 205 358-01	D 261 205 358-01	D 261 205 356-01	D 261 205 356-01	D 261 205 356-01
Pin 1 A	Motor -	Motor -	Poti 1	Poti 1	Poti 1
Pin 2 B	Poti -	Poti -	Poti -	Poti -	Poti -
Pin 3 C	Poti +	Poti +	Motor -	Motor -	Motor -
Pin 4 D	Motor +	Motor +	Poti 2	Poti 2	Poti 2
Pin 5 E	Poti 2	Poti 2	Motor +	Motor +	Motor +
Pin 6 F	Poti 1	Poti 1	Poti +	Poti +	Poti +
Flange diameter (mm)	40	50	58	58	58
Weight (kg)	0,9	0,9	0,95	0,95	0,95
Max. air flow rate*	394 kg/h at 85° angle	695 kg/h at 85° angle	978 kg/h at 85° angle	Not specified	Not specified
Opening direction **	counterclockwise	counterclockwise	clockwise	counterclockwise	clockwise

Order number	0 280 750 150	0 280 750 151	0 280 750 003	0 280 750 101
--------------	---------------	---------------	---------------	---------------

Bore diameter (mm)	54	60	68	82
Connector	D 261 205 358-01	D 261 205 358-01	D 261 205 356-01	D 261 205 358-01
Pin 1 A	Motor -	Motor -	Poti 1	Motor -
Pin 2 B	Poti -	Poti -	Poti +	Poti -
Pin 3 C	Poti +	Poti +	Motor +	Poti +
Pin 4 D	Motor +	Motor +	Poti 2	Motor +
Pin 5 E	Poti 2	Poti 2	Motor -	Poti 2
Pin 6 F	Poti 1	Poti 1	Poti -	Poti 1
Flange diameter (mm)	70	68,5	75	90
Weight (kg)	0,95	0,95	1,1	1,1
Max. air flow rate*	Not specified	Not specified	Not specified	Not specified
Opening direction **	counterclockwise	counterclockwise	counterclockwise	counterclockwise

* ambient conditions: Air pressure $p=1000$ mbar, Differential pressure $\Delta p=600$ mbar ± 25 mbar, rel. humidity $rF=40$ %, Air temperature $T=24^{\circ}\text{C}$

** Opening direction is related to view A. See drawings on bottom of chapter "Dimensions".

Fuel Pressure Regulator Mini/ Mini M



2

Features

- ▶ 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 ² 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 with clean and silicone free engine oil 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 of the pressure regulator with a medium other than gasoline is not allowed.

Using the FPR Adaptor F 02U V00 735-01 you can rebuild the regulator an inline type.

Ordering Information

Standard version 5 bar

Order number **B 261 208 105-02**

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

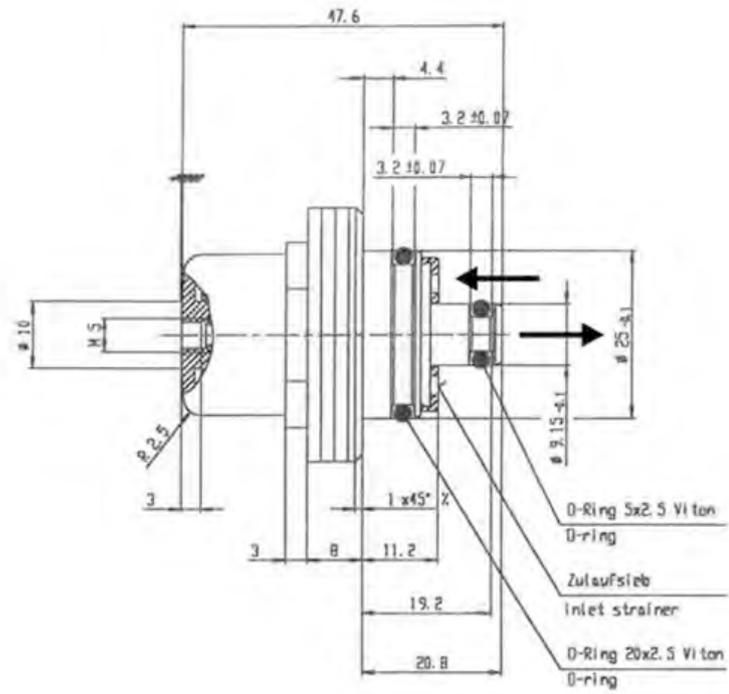
Order number **B 261 208 123-01**

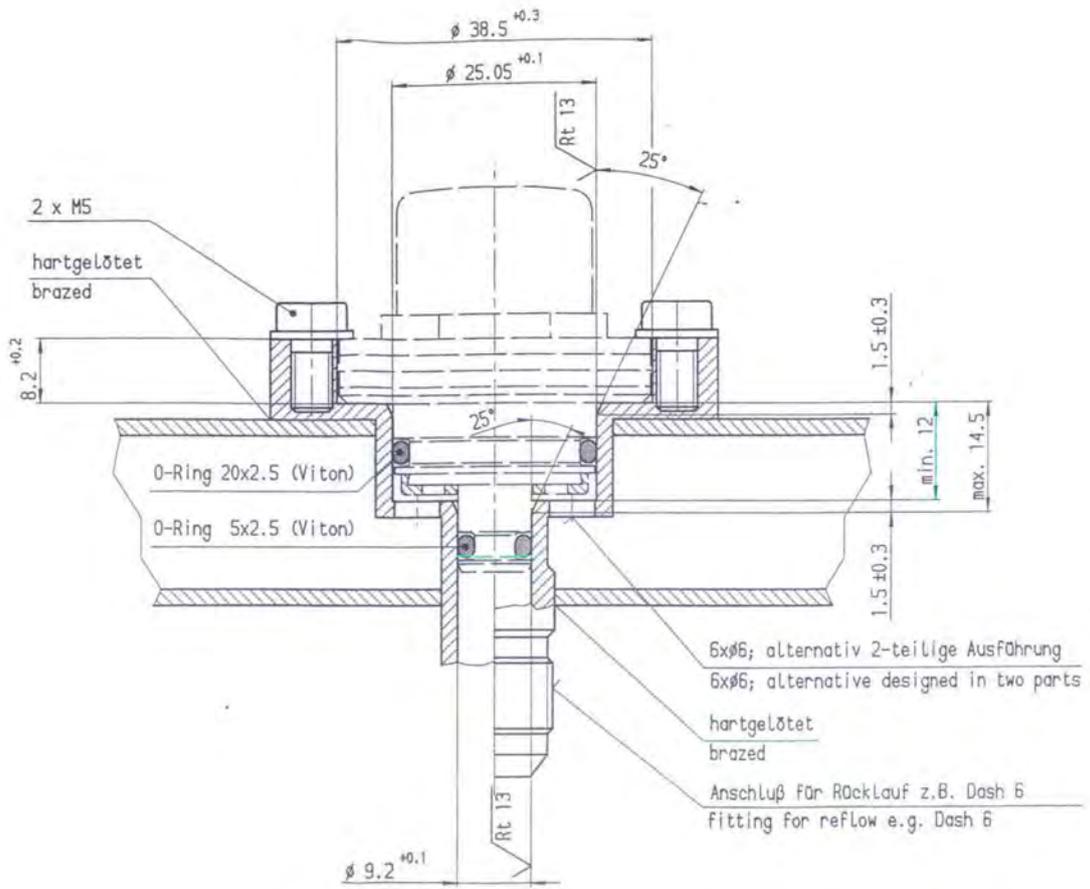
Accessories

FPR Adaptor

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

Dimensions





Installation Recommendation

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 ² 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 with clean and silicone free engine oil 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 of the pressure regulator with a medium other than gasoline 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**

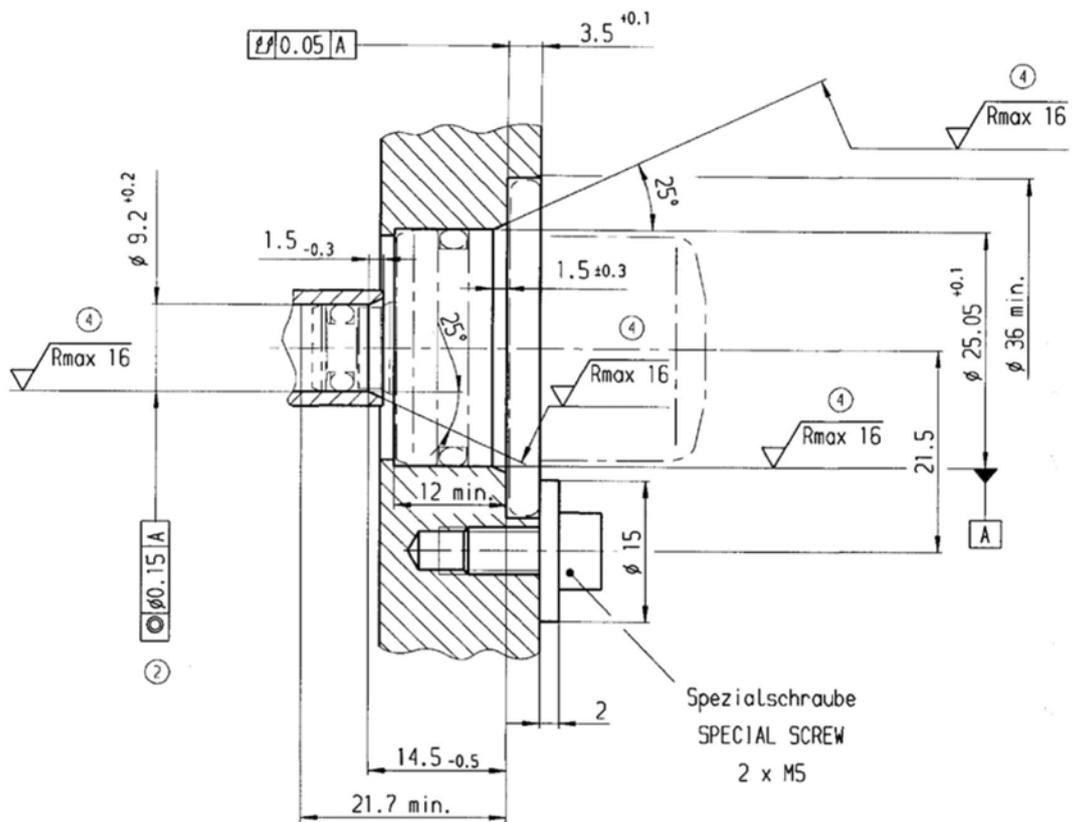
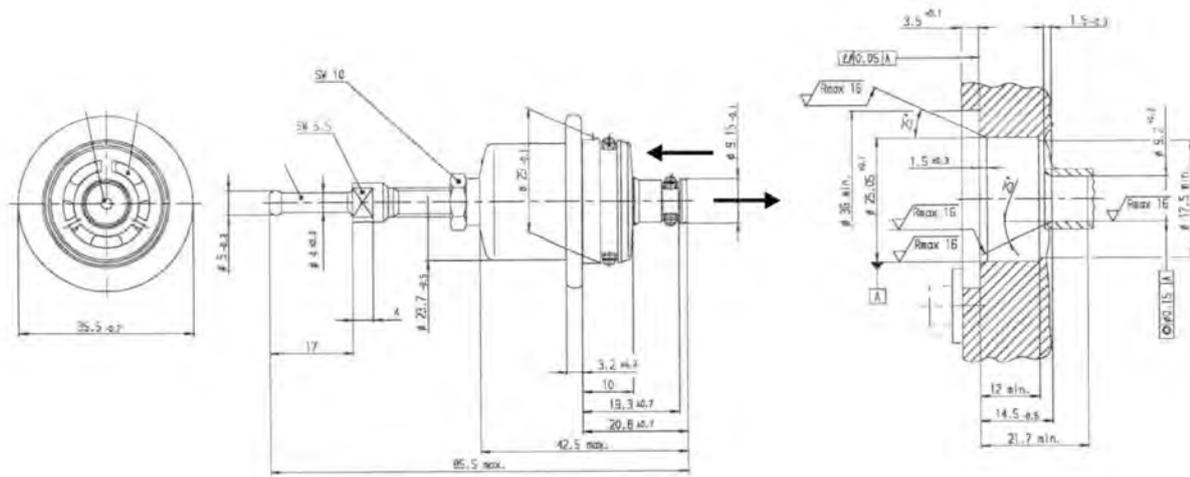
Accessories

FPR Adaptor

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

Dimensions

2



Installation Recommendation

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 ² 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 with clean and silicone free engine oil 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 of the pressure regulator with a medium other than gasoline is not allowed.

Ordering Information

Fuel Pressure Regulator Mini 38

Order number **0 280 160 616**

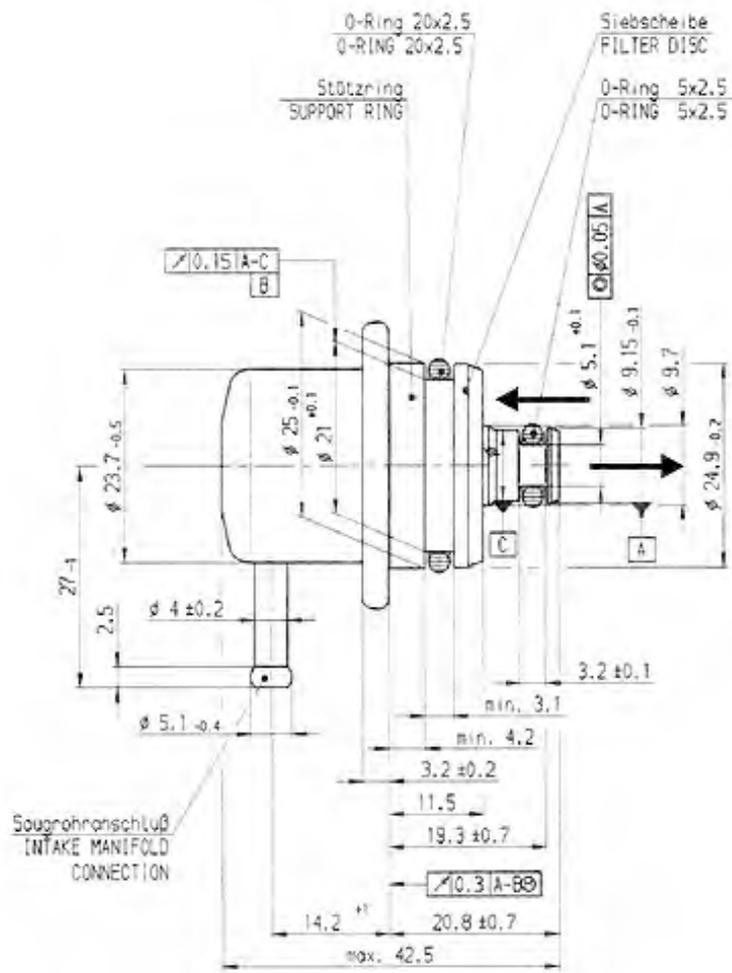
Accessories

FPR Adaptor

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

Dimensions

2



Fuel Pressure Regulator Mini 5



2

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 ² 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 with clean and silicone free engine oil 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 of the pressure regulator with a medium other than gasoline is not allowed.

Ordering Information

Fuel Pressure Regulator Mini 5

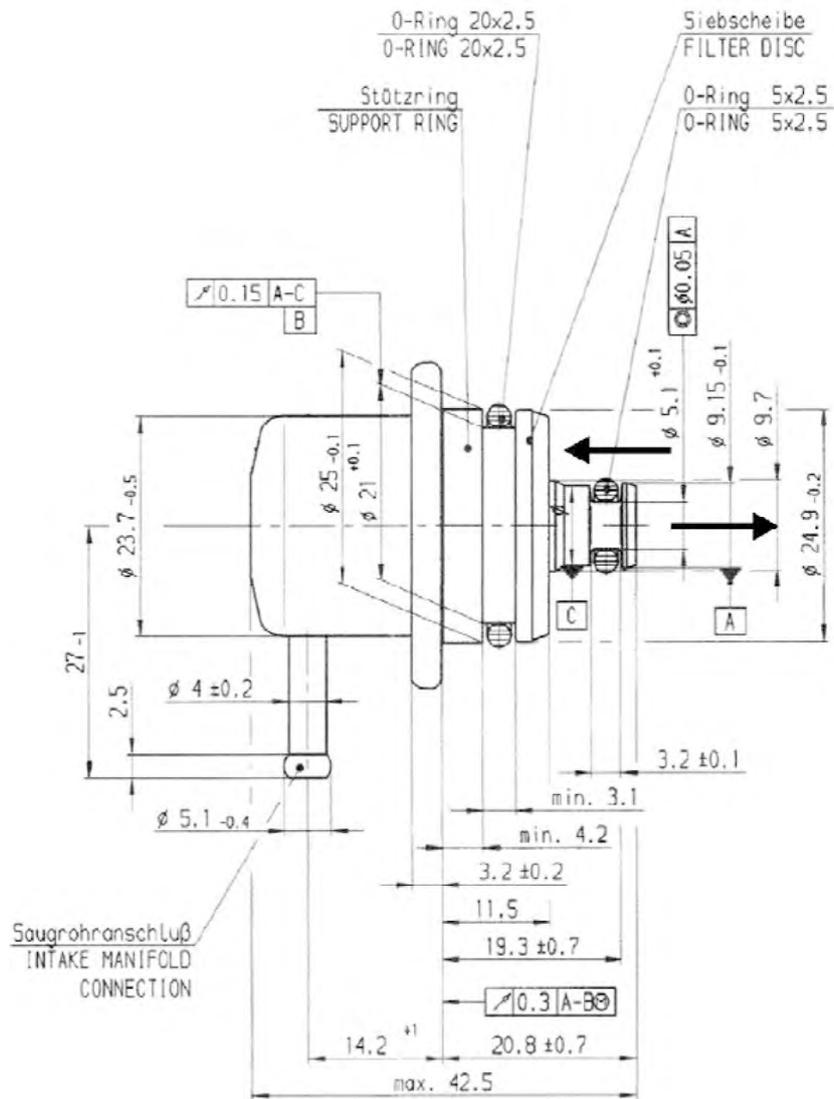
Order number **O 280 B02 722-02**

Accessories

FPR Adaptor

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

Dimensions



FPR Adaptor



Features

- ▶ Aluminum housing
- ▶ Fits to production type regulators and Motorsport regulators (FPR Mini, Mini 38, Mini 5, Mini A)

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 ² 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

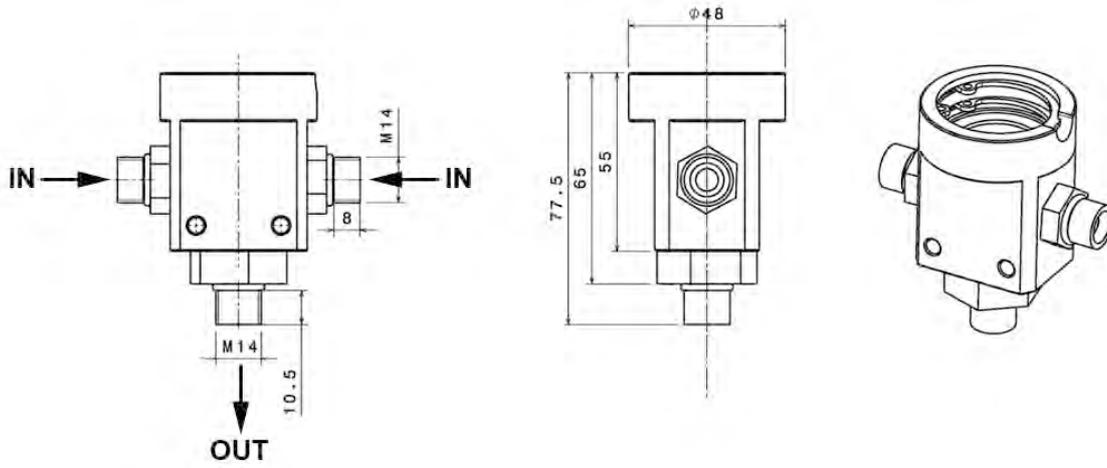
Ordering Information

FPR Adaptor

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

Dimensions

2



HP Control Valve DSV



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
-----------	---------------------------------

Ordering Information

HP Control Valve DSV

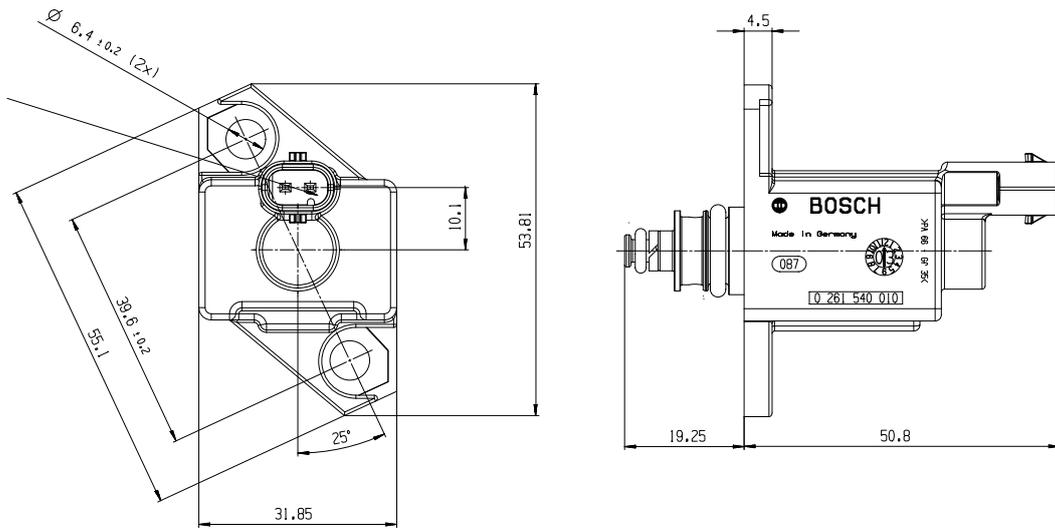
Connector ASL 1-06-05SB-HE
Order number **B 261 209 805-02**

HP Control Valve DSV

Without connector
Order number **B 261 209 806-02**

Dimensions

2



Fuel Pump FP 100



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 (shortens lifetime). The main benefit of the FP 100 over a production type pump is the high delivery rate.

Application

Fuel pressure	5 bar
Delivery rate at 5 bar and 22°C	118 ± 3 l/h at 14 V
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 ² at 18 to 60 Hz

Technical Specifications

Mechanical Data

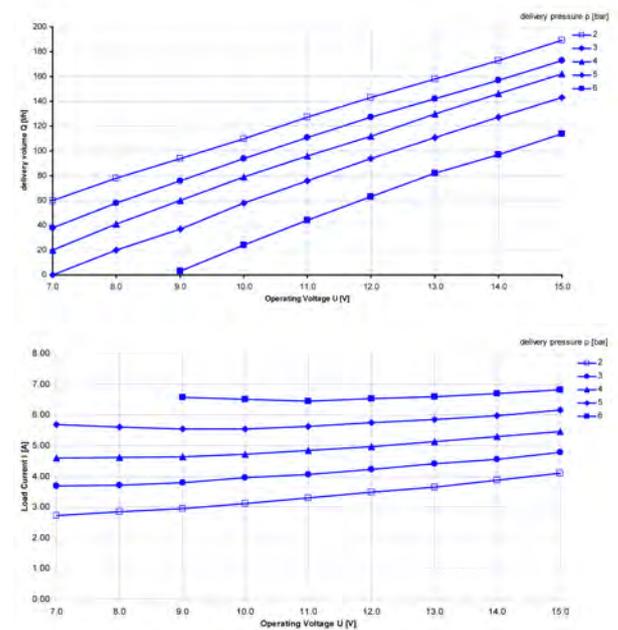
Diameter	54 mm
Length	185 mm
Weight	725 g
Mounting	Clamping

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.

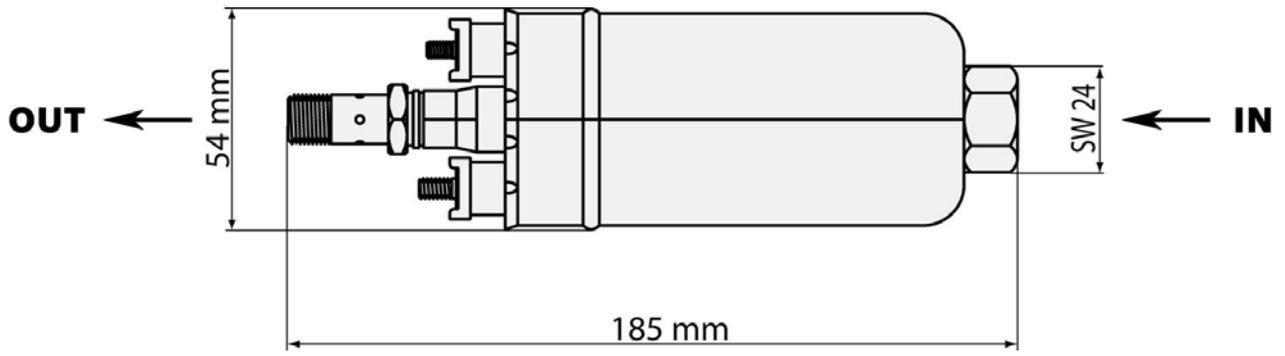
Please find further application hints in the offer drawing at our homepage.

Ordering Information

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

Dimensions

2



Fuel Pump FP 165



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 (shortens lifetime!). 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 at 14 V
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 ² at 18 to 60 Hz

Technical Specifications

Mechanical Data

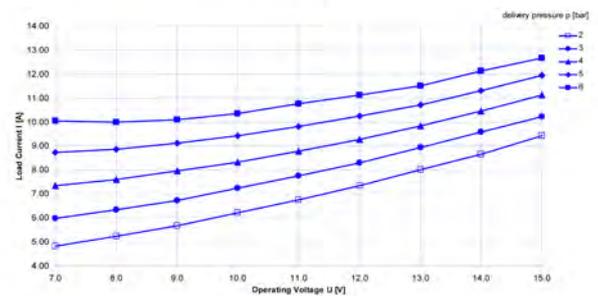
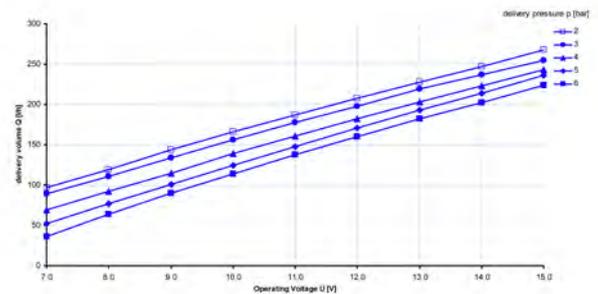
Diameter	60 mm
Length	168 mm
Weight	980 g
Mounting	Clamping

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.

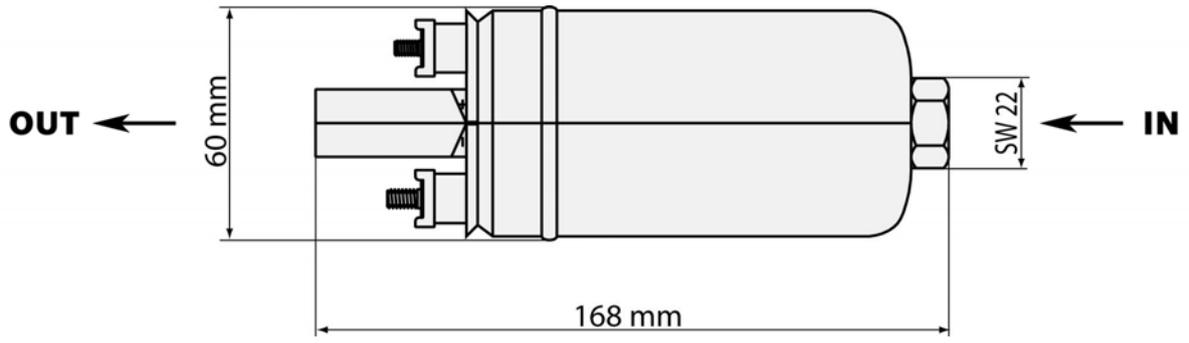
Please use within the specified limit values only.

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



2

Fuel Pump FP 200



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 (shortens lifetime!). 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 at 14 V
Delivery rate at 8 bar and 22°C	220 ± 5 l/h at 14 V
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 ² at 18 to 60 Hz

Technical Specifications

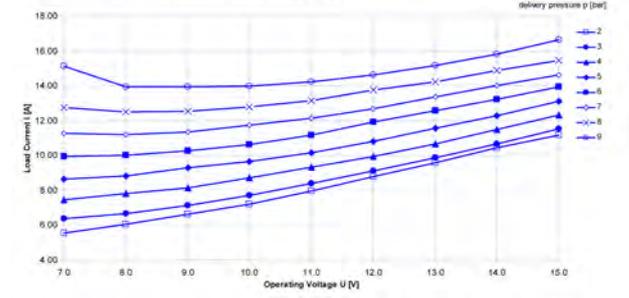
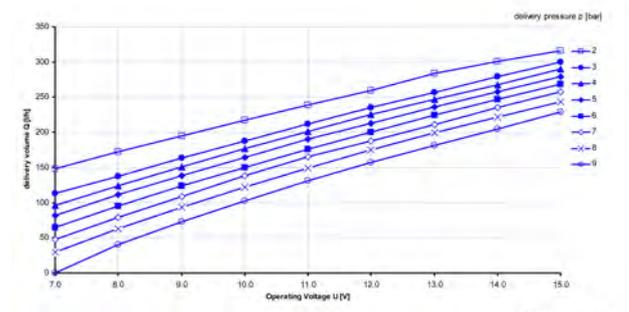
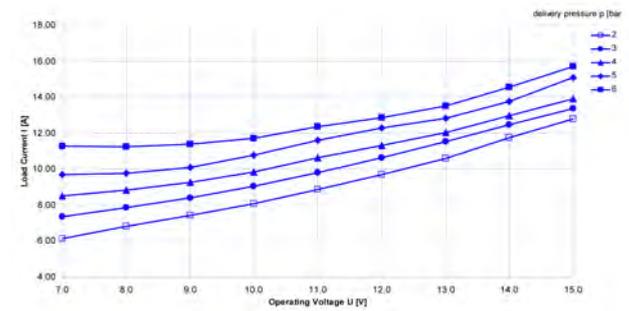
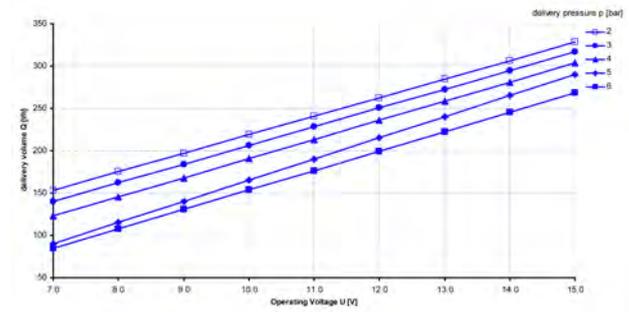
Mechanical Data	
Diameter	60 mm
Length	196 mm
Weight	1,030 g
Mounting	Clamping

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.

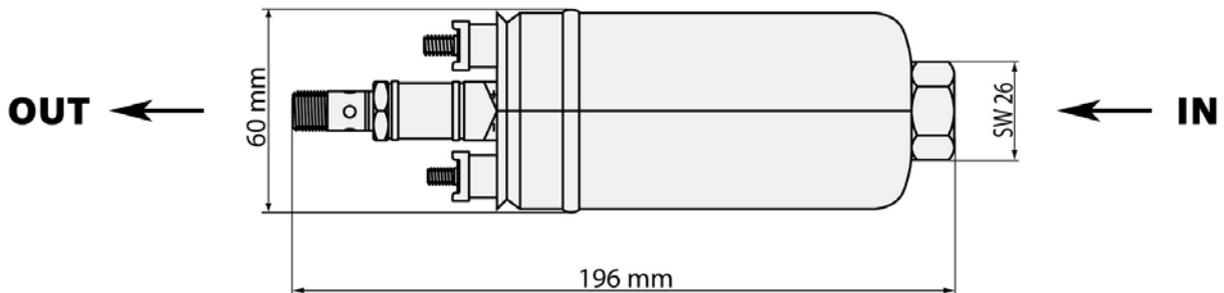
Please find further application hints in the offer drawing at our homepage.

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



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 at 14 V
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 ² at 18 to 60 Hz

Technical Specifications

Mechanical Data

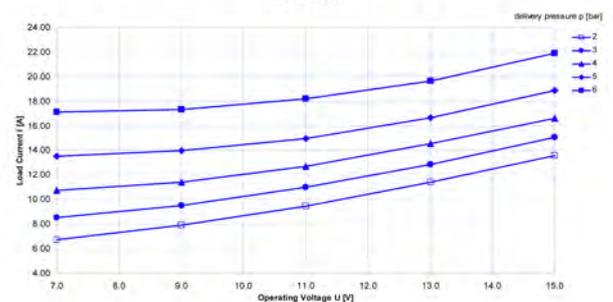
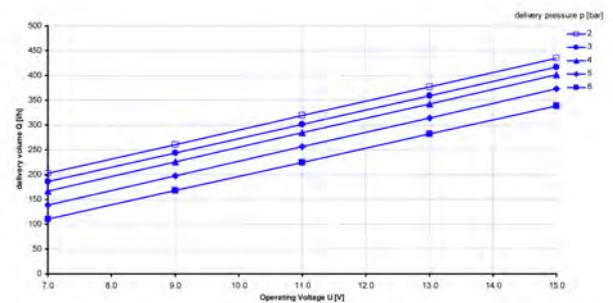
Diameter	50 mm
Length	174 mm
Weight FP 300	714 g
Mounting	Clamping

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
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.

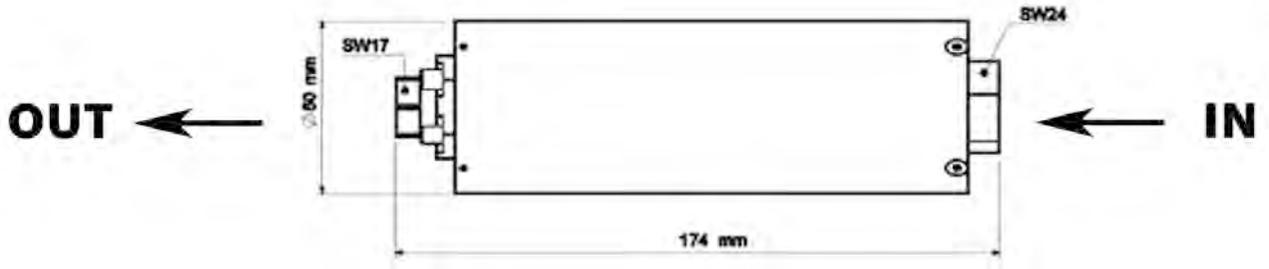
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Fuel Pump FP 300

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

Dimensions



Fuel Pump FP 300L



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 at 14 V
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 ² at 18 to 60 Hz

Technical Specifications

Mechanical Data

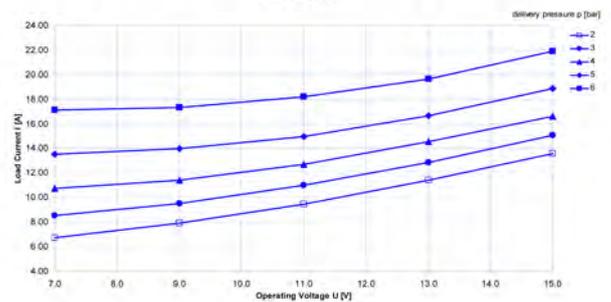
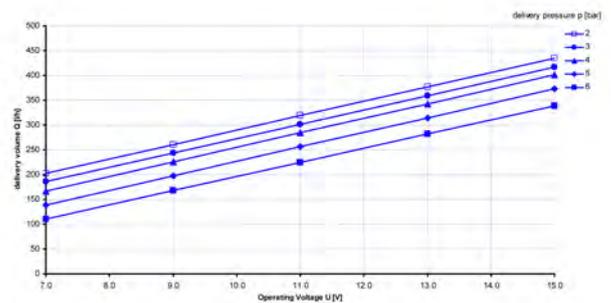
Diameter	50 mm
Length	174 mm
Weight	670 g
Mounting	Clamping

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

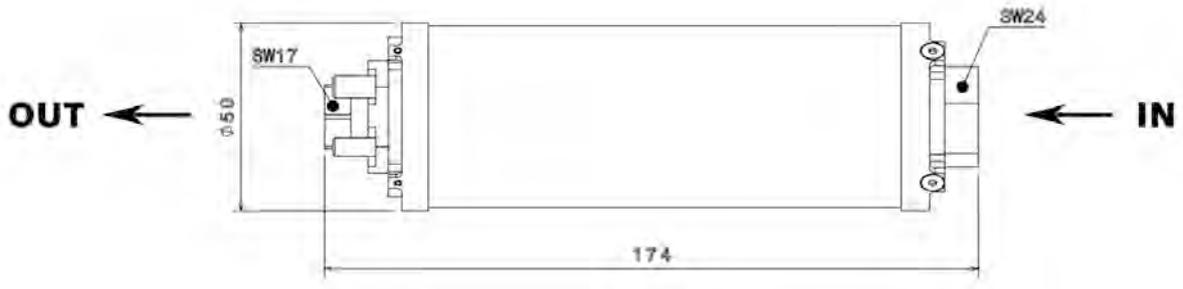
Installation Notes

- 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



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 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^2

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**

Accessories

Flat tappet (26 mm)

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

Roller tappet (26 mm)

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

HP Fuel Pump HDP 5-FD



Features

- ▶ Max. 200 bar
- ▶ Max. 1.1 cm³/rot_{cam}
- ▶ 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 ³ /rot _{cam} (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 ²

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 223-03**

Accessories

Flat tappet (26 mm)

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

Roller tappet (26 mm)

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

HP Fuel Pump HDP 5-LW



2

Features

- ▶ Max. 500 bar
- ▶ Max. 1.1 cm³/rot_{cam}
- ▶ Integrated control valve
- ▶ 585 g
- ▶ Internal Pressure Relief Valve PRV

The HDP 5-LW is a compact high pressure single piston pump with a light weight housing. 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.

The HDP 5-LW is equipped with an internal pressure relief valve to limit the maximum fuel pressure. This pump does not require a fuel return line into the fuel tank. The pump has an integrated demand control for metering the amount of fuel supplied into the high pressure fuel system. It can be ordered with a compact connector or a motorsports 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	PRV	Connector
HDP 5-LW	600 bar	Compact
HDP 5-LW	600 bar	Motorsports

HDP 5-LW	Customer specific	Compact
HDP 5-LW	Customer specific	Motorsports

Mechanical Data

Theoretical fuel delivery	0.5 to 1.1 cm ³ /rot _{cam}
Nominal pressure	Max. 500 bar
PRV	Please see Variations
Weight	585 g without wire
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 ²

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-LW

Compact connector, max 500 bar, PRV 600 bar
Order number **0 261 B19 274-02**

HDP 5-LW

Motorsports connector, max. 500 bar, PRV 600 bar
Order number **on request**

HDP 5-LW

Compact connector, PRV customer specific
Order number **on request**

HDP 5-LW

Motorsports connector, PRV customer specific
Order number **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 www.bosch-motor-sport.com)

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

Connectors and Wires

Mating connector	D 261 205 373-01
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Communication

1 CAN (500 kBaud)
1 K-Line

Ordering Information

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

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

HPI 5



2

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 HPI 5 is mainly designed to drive the Bosch high pressure pump HDP 5, but there are also variations for Hitachi HDP available. 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

Hitachi HDP Gen 1 and Gen 3 variations available

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
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Communication

1 CAN (1 MBaud)

Ordering Information

HPI 5

Optimized for Bosch HDP 5
Order number **F 02U V00 929-02**

HPI 5

Optimized for Hitachi HDP Gen 1
Order number **F 02U V01 055-02**

HPI 5

Optimized for Hitachi HDP Gen 3
Order number **F 02U V00 906-02**

HPI 5-M 4C



Features

- ▶ Max. 4 cylinders
- ▶ Max. 15,000 rpm (4 cyl. operation)
- ▶ 400 g

The injector power stage HPI 5-M 4C is a device for driving injectors and high pressure pumps for gasoline direct injection. Combined with a suitable ECU up to 4 injectors can be driven. Overlapping injection of injectors is possible. The HPI 5-M is mainly designed to drive the Bosch high pressure pump HDP 5. Communication between main ECU and the HPI 5-M is realized via CAN interface.

Application

Max. number of cylinders	4
Max. rpm (4 cyl. operation)	15,000

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

Technical Specifications

Mechanical Data

Aluminum housing	
Each connector pin individually filtered	
Housing temperature	-25 to 100°C
Size (incl. connectors)	167 x 97 x 39 mm
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Weight	400 g

Electrical Data

Voltage supply	14 V
Operating voltage	12 to 16 V

Operation voltage (engine start)	6.5 to 16 V
Nominal voltage	14 V

Connectors and Wires

Mating connector	AS 616-26SN
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Communication

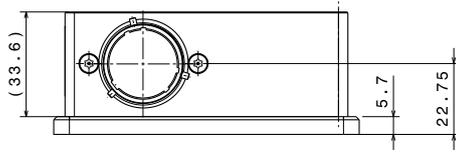
1 CAN (1 MBaud)

Ordering Information

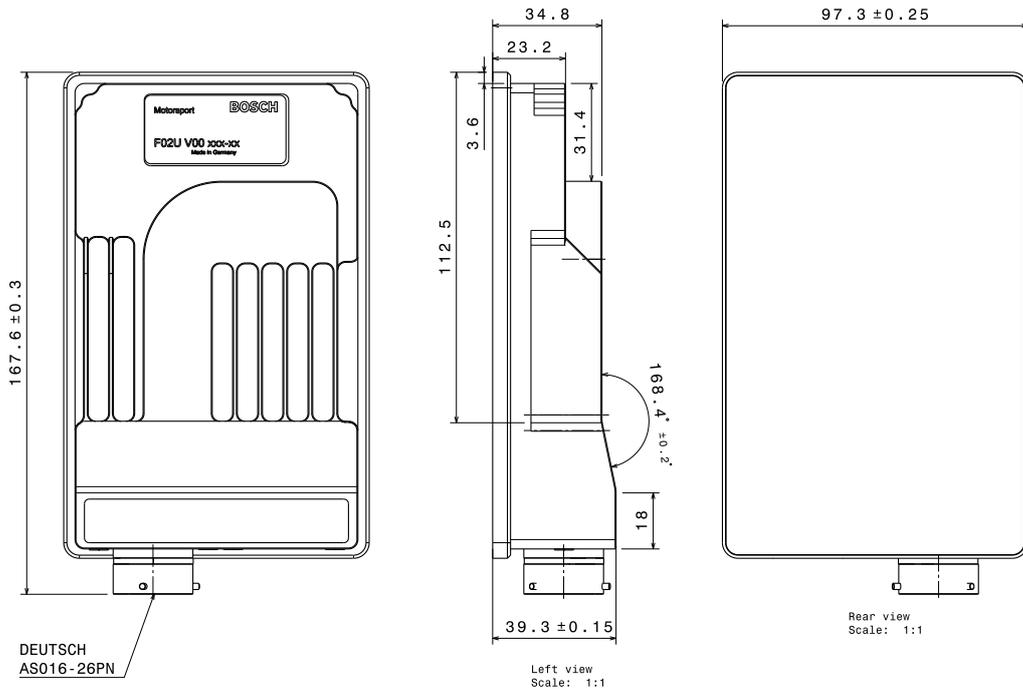
HPI 5-M 4C
Order number **F 02U V01 629-01**

Dimensions

2



Bottom view
Scale: 1:1

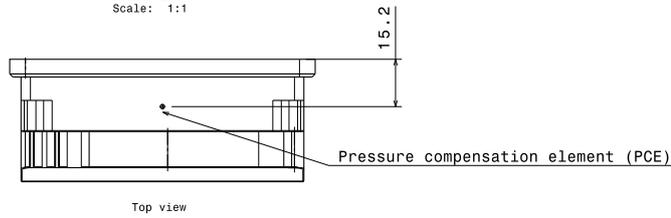


DEUTSCH
AS016-26PN

Front view
Scale: 1:1

Left view
Scale: 1:1

Rear view
Scale: 1:1



Top view

HPI 5-M 8C



Features

- ▶ Max. 8 cylinders
- ▶ Max. 8,000 rpm (8 cyl. operation)
- ▶ 440 g

The injector power stage HPI 5-M 8C 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 HPI 5-M is mainly designed to drive the Bosch high pressure pump HDP 5. Communication between main ECU and the HPI 5-M is realized via CAN interface.

Application

Max. number of cylinders	8
Max. rpm (8 cyl. operation)	8,000
Max. rpm (6 cyl. operation)	9,500

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

Technical Specifications

Mechanical Data

Aluminum housing	
Each connector pin individually filtered	
Housing temperature	-25 to 100°C
Size (incl. connectors)	167 x 97 x 39 mm
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Weight	440 g

Electrical Data

Voltage supply	14 V
Operating voltage	12 to 16 V
Operation voltage (engine start)	6.5 to 16 V
Nominal voltage	14 V

Connectors and Wires

Mating connector	AS 616-26SN AS 614-19SN
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Communication

1 CAN (1 MBaud)

Ordering Information

HPI 5-M 8C

Order number **F 02U V01 630-01**

Single Fire Coil PS



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 coil 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 ² 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 _{ce} =600 V) respectively BIP372
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Connectors and Wires

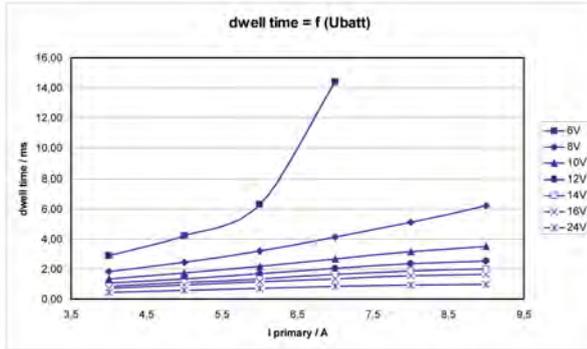
Connector	AMP C-O-28 44 25
Mating connector	D 261 205 350-01
Pin 1	ECU ignition power stage
Pin 2	Engine GND
Pin 3	U _{batt}
Pin 4	N.a.

Various motorsport and automotive connectors are available on request.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	2.90	4.20	6.30	14.4	-	-
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

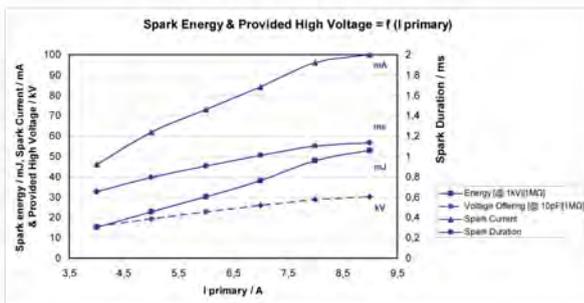
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil PS requires an ECU with integrated ignition power stage, 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 in the offer drawing at our homepage.

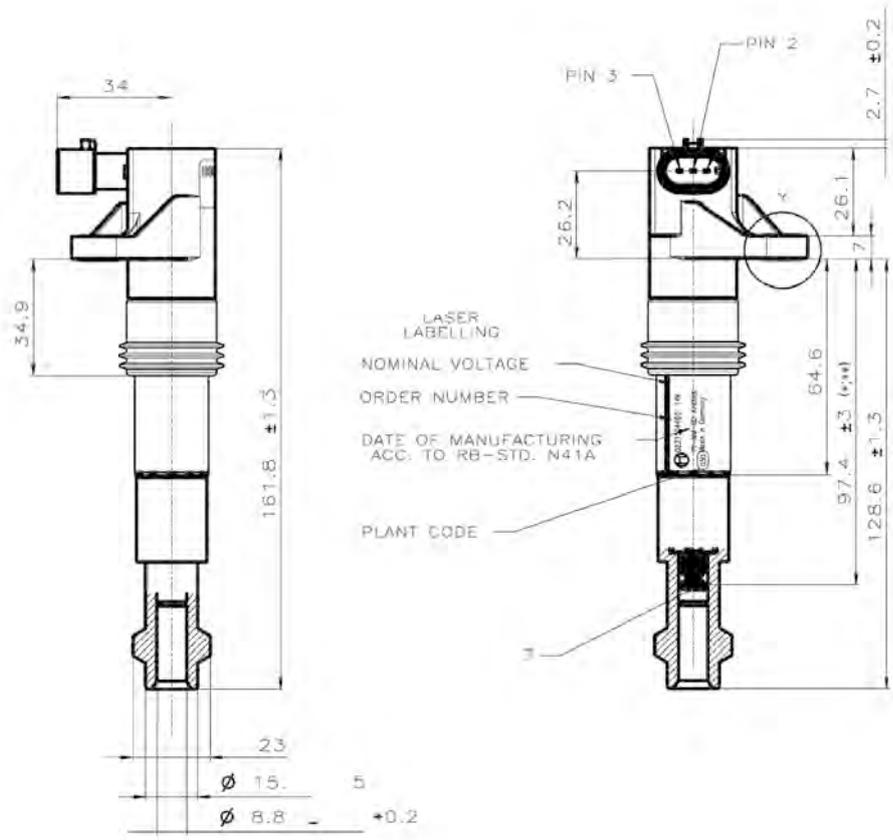
In case of ignition-caused malfunctions, please use screened sensor wires.

Ordering Information

Single Fire Coil PS

Order number **0 221 504 460**

Dimensions



Single Fire Coil PS-T



2

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 coil 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 ² 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

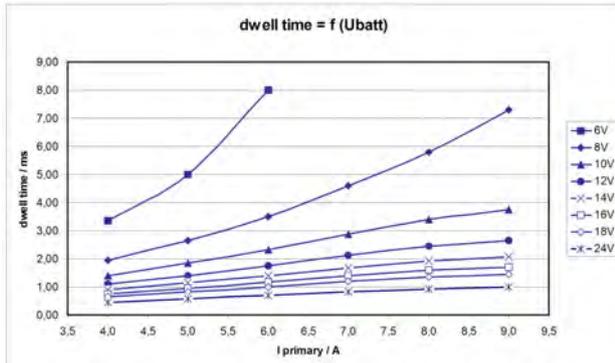
Connector	Bosch Compact
Mating connector 4-pole Compact	D 261 205 336-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	Engine GND
Pin 4	U _{batt}

Various motorsport and automotive connectors are available on request.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	4.0A	5.0A	6.0A	7.0A	8.0A	9.0A
6V	2.90	4.20	6.30	14.4	-	-
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

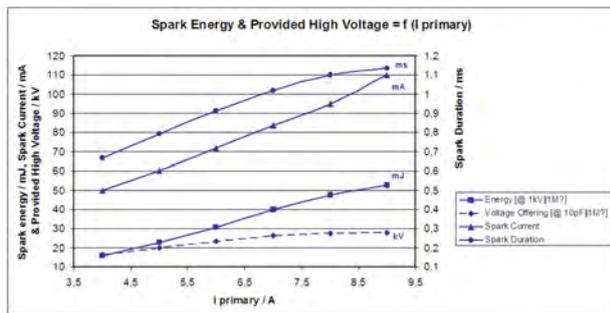
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil 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.

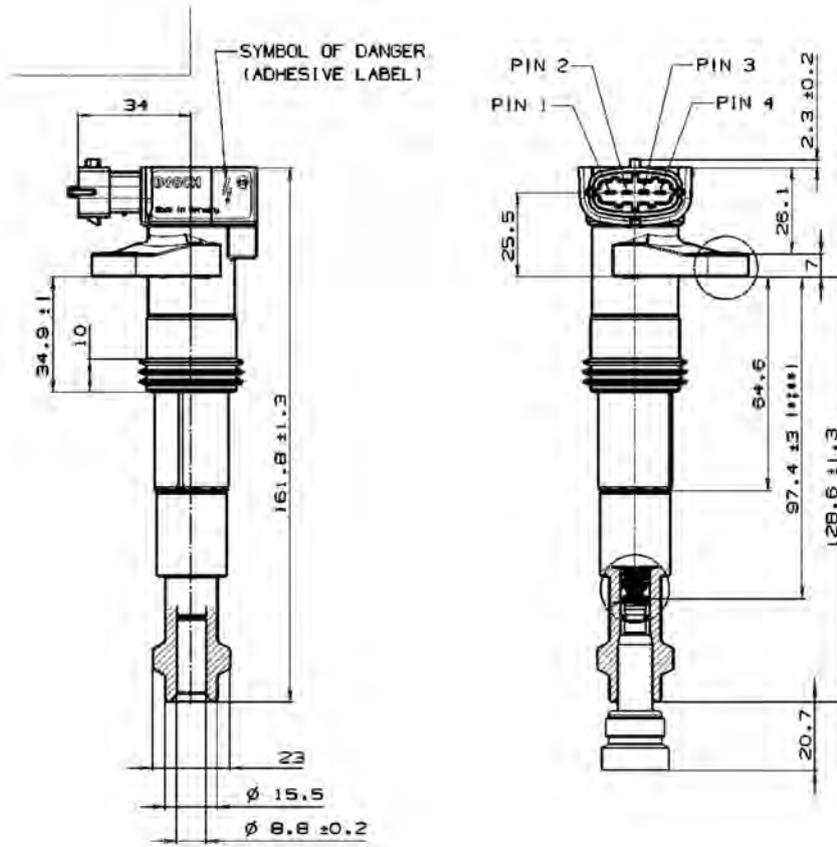
In case of ignition-caused malfunctions, please use screened sensor wires.

Ordering Information

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

Dimensions

2



Single Fire Coil P35



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 coil P35 has no integrated transistor and requires an ECU with internal ignition power stages. The 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	140.5 mm
Weight	194 to 205 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition power stage
Pin 2	Engine GND
Pin 3	U _{batt}

Various motorsport and automotive connectors are available on request.

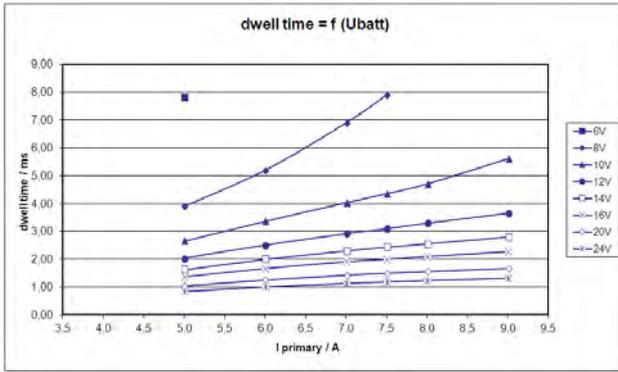
Spark plug connector	140.5 mm
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Please specify the required wire length with your order.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0A	6.0A	7.0A	7.5A	8.0A	9.0A
6V	7.80					
8V	3.90	5.20	6.90	7.90		
10V	2.65	3.36	4.03	4.35	4.70	5.60
12V	2.04	2.51	2.92	3.10	3.30	3.66
14V	1.63	2.00	2.30	2.43	2.55	2.79
16V	1.37	1.67	1.91	2.00	2.10	2.27
18V	1.19	1.43	1.63	1.70	1.78	1.91
20V	1.04	1.25	1.42	1.49	1.55	1.66
22V	0.93	1.11	1.26	1.33	1.37	1.46
24V	0.84	1.00	1.13	1.18	1.23	1.31

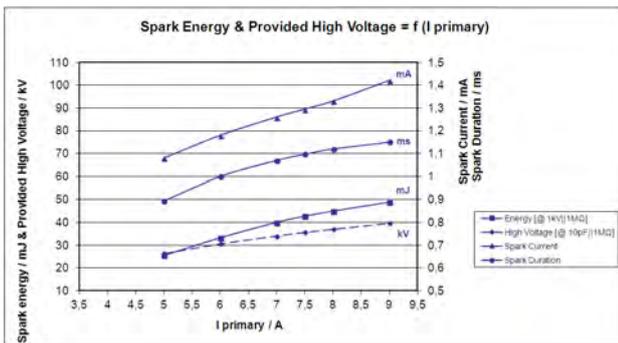
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

Spark energy and provided high voltage

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	25.6 mJ	0.894 ms	68 mA	26.4 kV
6 A	33.3 mJ	1 ms	78 mA	30.7 kV
7 A	40 mJ	1.07 ms	86 mA	34 kV
7.5 A	42.7 mJ	1.097 ms	89.5 mA	35.7 kV
8 A	44.9 mJ	1.12 ms	93 mA	37 kV
9 A	48.8 mJ	1.15 ms	102 mA	39.6 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 coil P35 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.

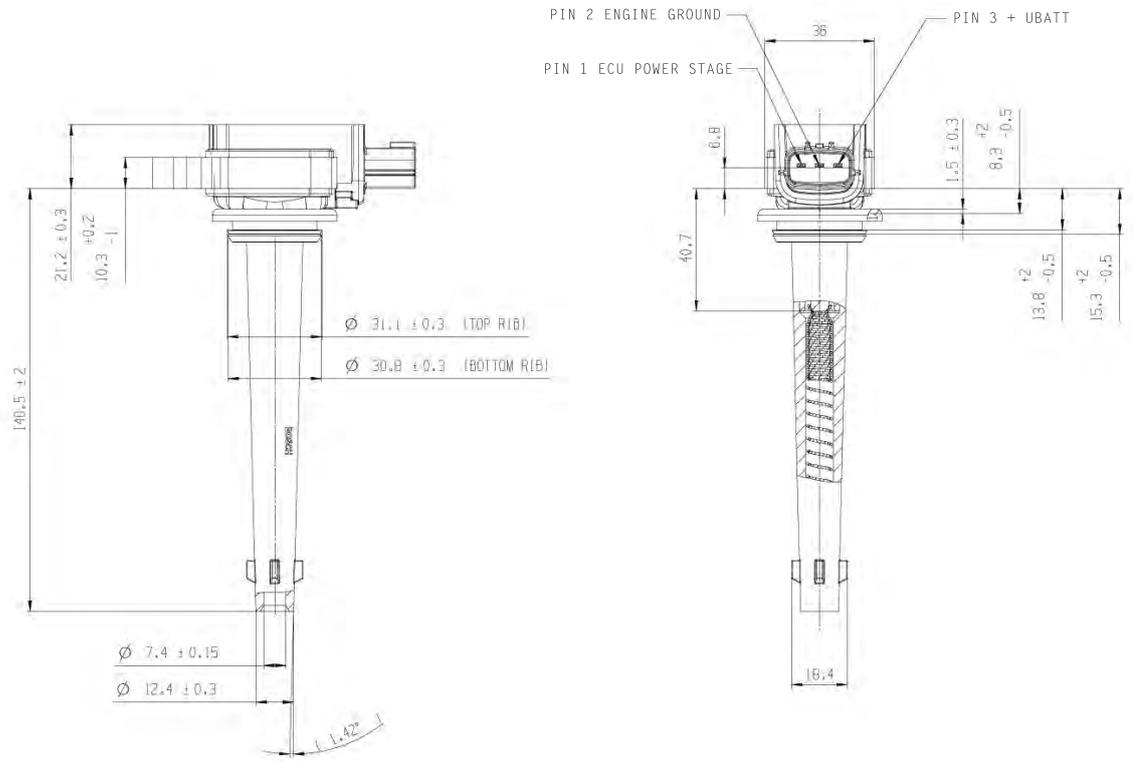
In case of ignition-caused malfunctions, please use screened sensor wires.

Ordering Information

Single Fire Coil P35

Order number 0 221 504 030

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 coil P35-T has an integrated transistor and requires an ECU with internal ignition drivers with 10 mA to 20 mA current output. The 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	140.5 mm
Weight	194 to 205 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

Electrical Data

Primary resistance with wire	Incapable of measurement
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
Power stage	Integrated

Characteristic

Measured with power stage	BIP 373
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Connectors and Wires

Connector	Sumitomo
Mating connector 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition signal
Pin 2	ECUGND
Pin 3	U _{batt}

Various motorsport and automotive connectors are available on request.

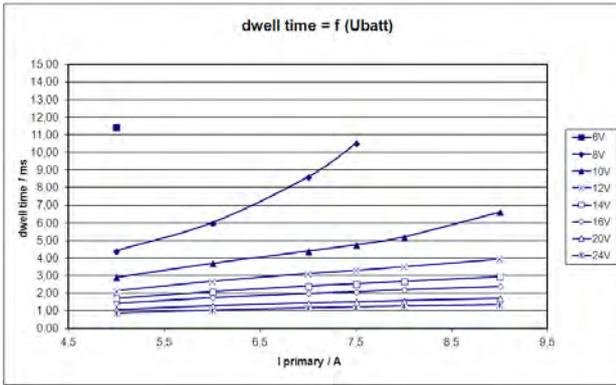
Spark plug connector	140.5 mm
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Please specify the required wire length with your order.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0A	6.0A	7.0A	7.5A	8.0A	9.0A
6V	11.40					
8V	4.40	6.00	8.0	10.0		
10V	2.90	3.70	4.0	4.5	5.0	6.0
12V	2.14	2.68	3.2	3.0	3.1	3.4
14V	1.73	2.11	2.3	2.5	2.9	2.5
16V	1.44	1.75	1.9	2.9	2.0	2.8
18V	1.24	1.50	1.9	1.8	1.5	2.0
20V	1.09	1.30	1.7	1.3	1.0	1.2
22V	0.97	1.6	1.0	1.7	1.2	1.1
24V	0.87	1.4	1.7	1.2	1.7	1.5

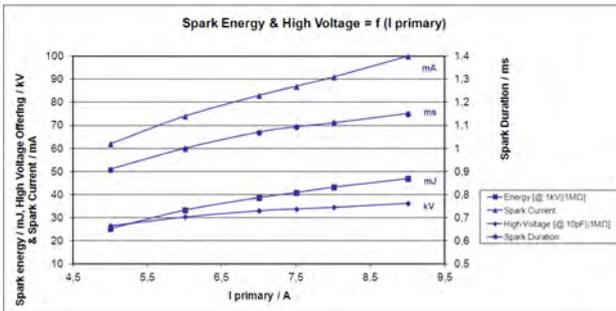
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

Spark energy and provided high voltage

I prim.	Spark energy	-duration	-current	Hi voltage
5 A	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
7.5 A	41 mJ	1.093 ms	87 mA	33.8 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 coil P35-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.

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

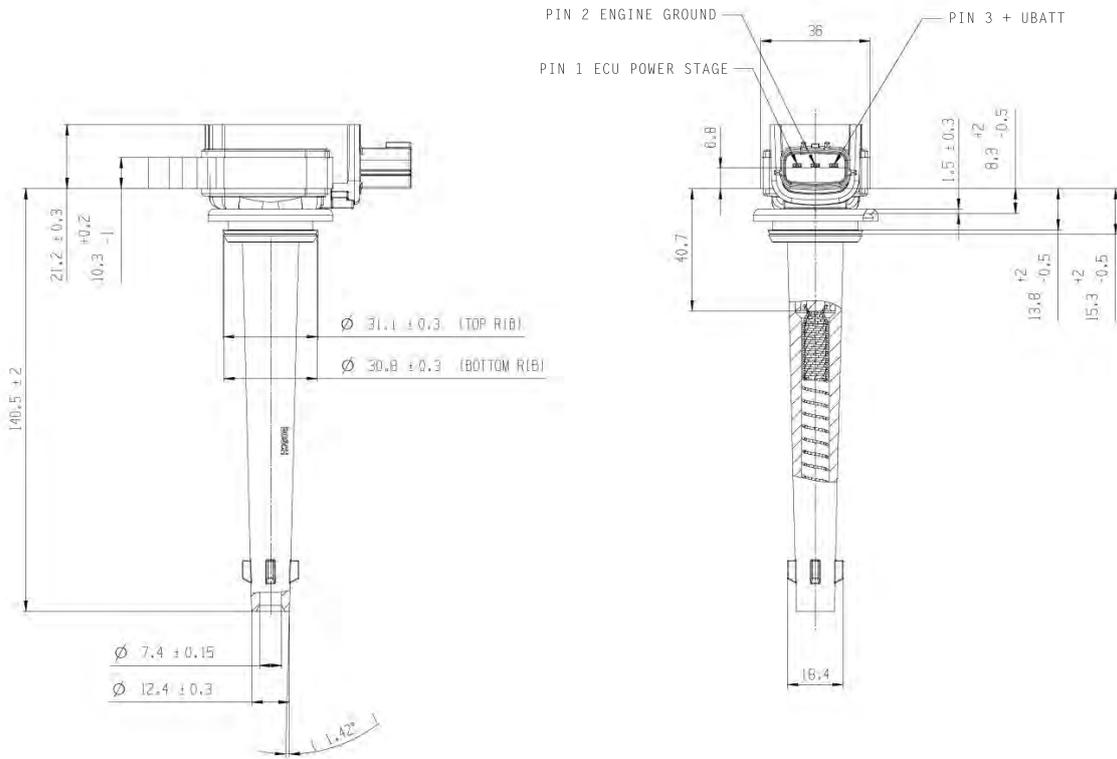
Ordering Information

Single Fire Coil P35-T

Order number **0 221 604 014**

Dimensions

2



Single Fire Coil P35-E8



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.

This coil has no integrated transistor and requires an ECU with internal ignition power stages.

The coil is for spark plugs with ceramic diameter of $d=8$ mm.

The 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	85 to 225 mm
Weight	194 to 250 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 8 mm	

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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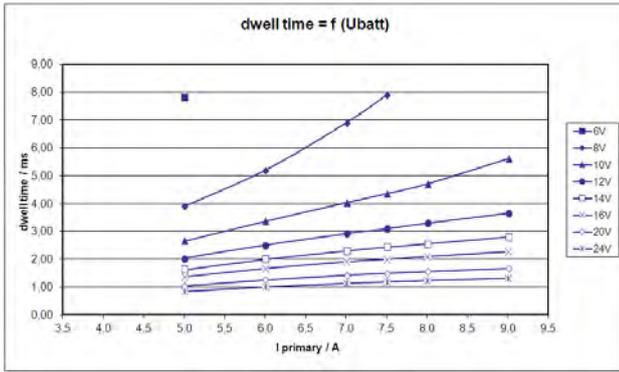
Connectors and Wires

Connector	Sumitomo
Mating connector 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition power stage
Pin 2	Engine GND
Pin 3	U _{batt}

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	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

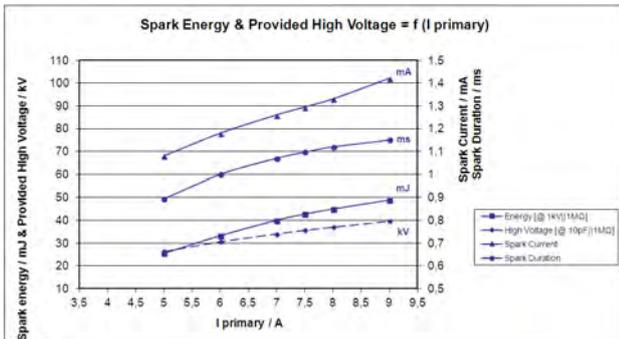
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil 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.

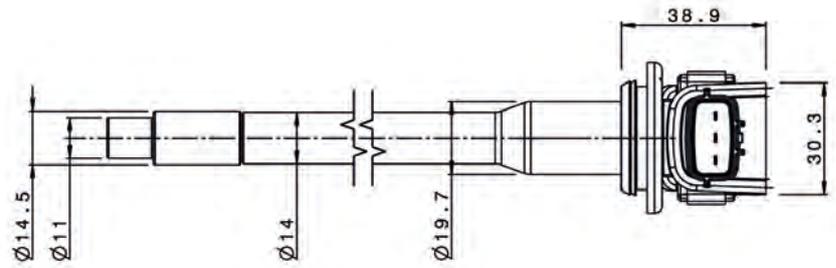
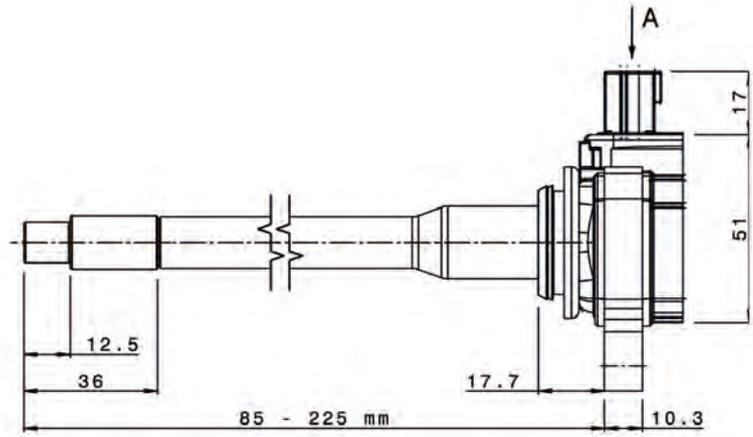
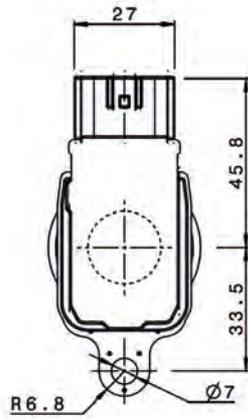
Ordering Information

Single Fire Coil P35-E8

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

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

Dimensions



Single Fire Coil P35-E10

2



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.

This coil has no integrated transistor and requires an ECU with internal ignition power stages.

The coil is for spark plugs with ceramic diameter of $d=10$ 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	110 to 225 mm
Weight	194 to 250 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition power stage
Pin 2	Engine GND
Pin 3	U_{batt}

Characteristic dwell times [ms]

U_{batt}	$I_{primary}$					
	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

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

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 coil 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.

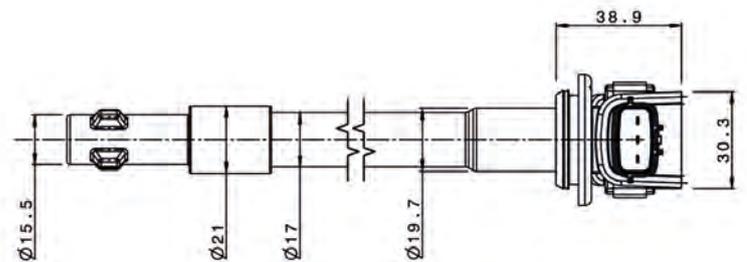
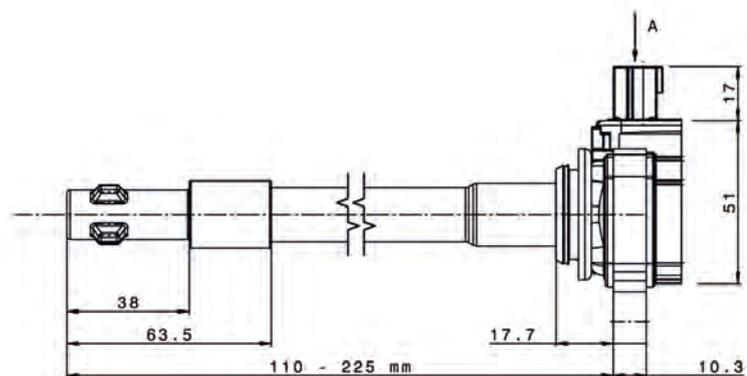
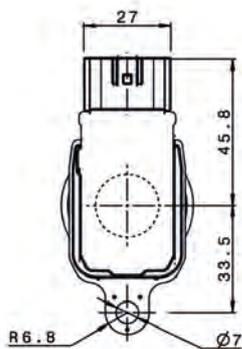
Ordering Information

Single Fire Coil 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-TE8

2



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

This coil is for spark plugs with ceramic diameter of d=8 mm.

The 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	85 to 225 mm
Weight	194 to 250 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 8 mm	

Electrical Data

Primary resistance with wire	Incapable of measurement
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
Power stage	Integrated

Characteristic

Measured with internal power stage	BIP 373
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Connectors and Wires

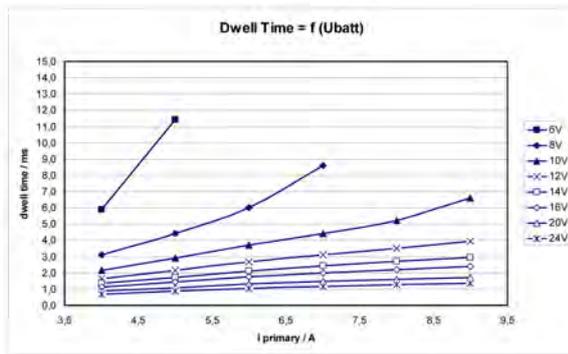
Connector	Sumitomo
Mating connector 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	U _{batt}

Various motorsport and automotive connectors are available on request.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	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

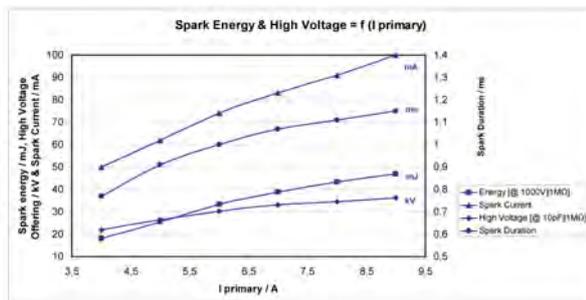
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil 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

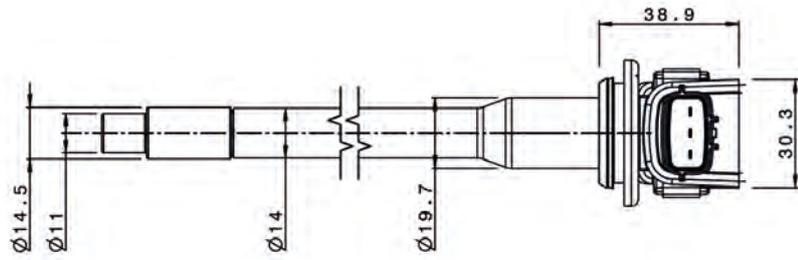
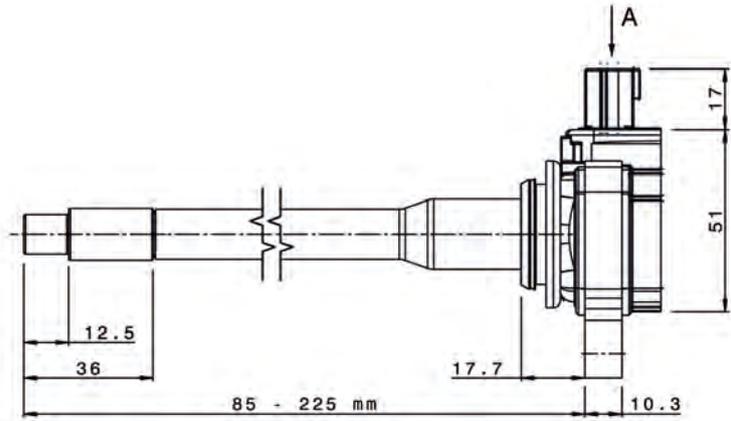
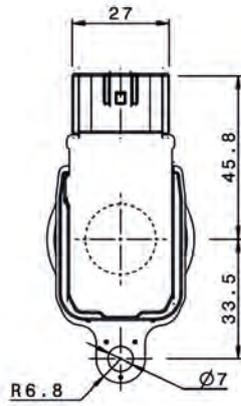
Single Fire Coil P35-TE8

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

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

Dimensions

2



Single Fire Coil P35-TE10



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

This coil is for spark plugs with ceramic diameter of d=10 mm.

The 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	110 to 225 mm
Weight	194 to 250 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

Electrical Data

Primary resistance with wire	Incapable of measurement
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
Power stage	Integrated

Characteristic

Measured with internal power stage	BIP 373
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Connectors and Wires

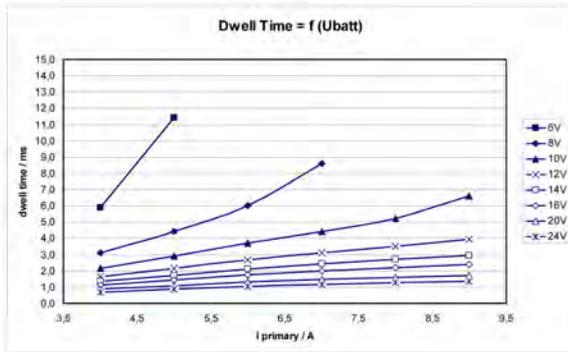
Connector	Sumitomo
Mating connector 3-pole Sumitomo	D 261 205 367-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	U _{batt}

Various motorsport and automotive connectors are available on request.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	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

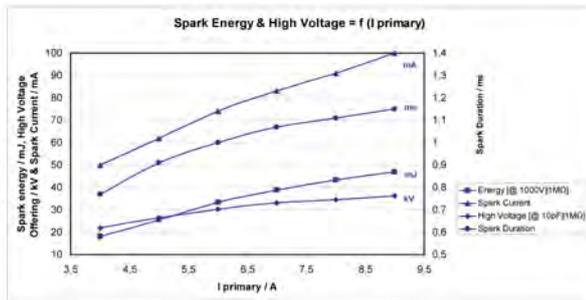
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil 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.

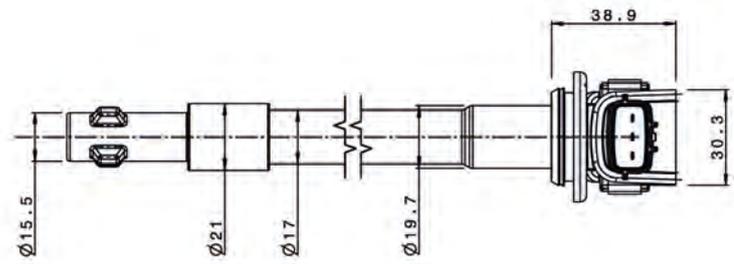
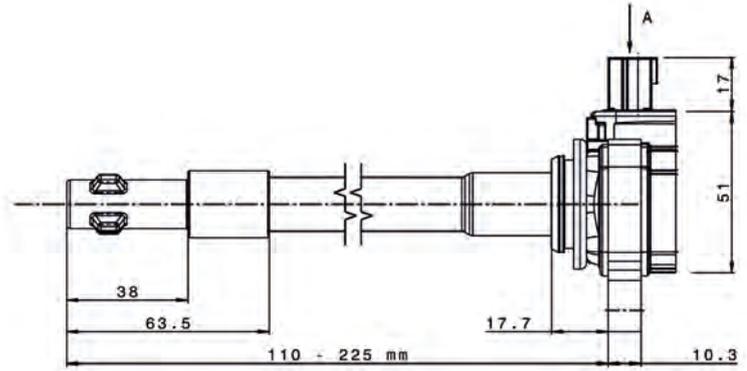
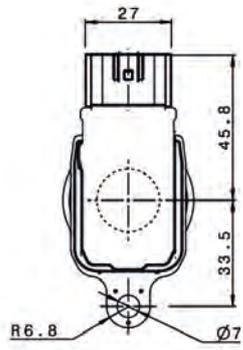
Ordering Information

Single Fire Coil P35-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 coil P50 requires an ECU with internal ignition power stages for each single fire coil.

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 ² at 5 to 2,000 Hz	≤ 800 m/s ² 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 _{ce} = 600 V)
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Connectors and Wires

Connector	Bosch Compact
Mating connector 3-pole Compact	D 261 205 335-01
Pin 1	ECU ignition power stage
Pin 2	Engine GND
Pin 3	U _{batt}

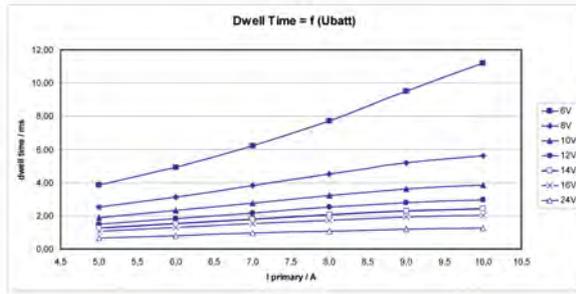
Various motorsport and automotive connectors are available on request.

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

U _{batt}	I _{primary}					
	5.0A	6.0A	7.0A	8.0A	9.0A	10A
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

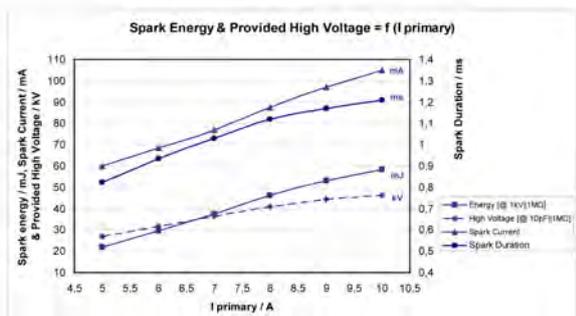
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil 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 drawing at our homepage.

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

Ordering Information

Coil P50

Order number **0 221 504 001**

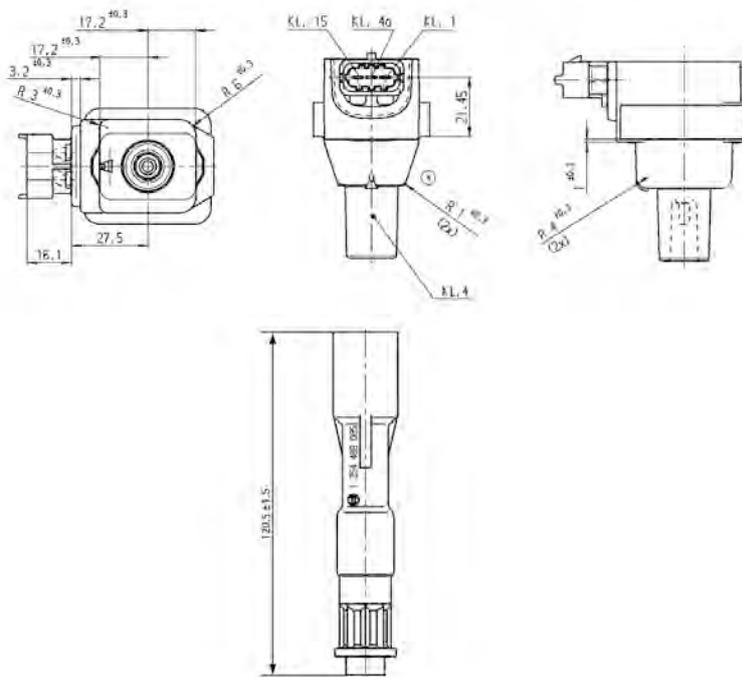
Coil P50-M

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 coil 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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	180 mm
Weight w/o wire	< 222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 1 kΩ resistance
Suppression diode / EFU	Integrated

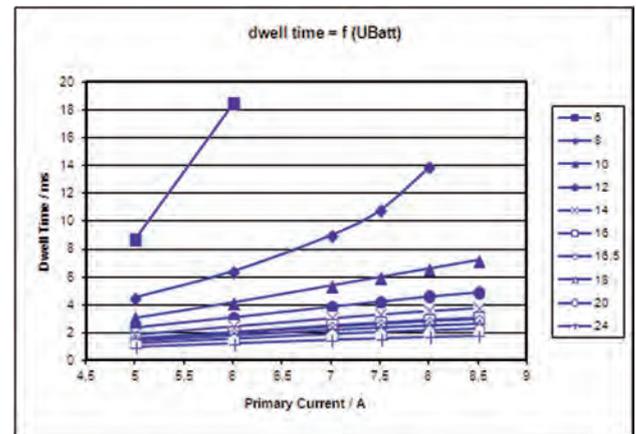
Characteristic

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 ignition power stage

Characteristic dwell times [ms]

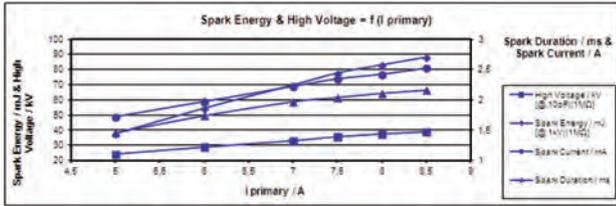


Dwell time

U_{batt}	I primary					
	5.0A	6.0A	7.0A	7.5A	8.0A	8.5A
6V	8.74	18.5				
8V	4.5	6.4	9	10.8	13.9	
10V	3.1	4.2	5.4	6	6.6	7.2
12V	2.36	3.1	3.88	4.25	4.63	4.92
14V	1.9	2.48	3.05	3.32	3.57	3.77
16V	1.61	2.06	2.53	2.73	2.93	3.08
18V	1.55	2	2.43	2.62	2.81	2.95
20V	1.39	1.77	2.16	2.33	2.48	2.6
22V	1.22	1.54	1.88	2.02	2.15	2.26
24V	0.97	1.23	1.49	1.6	1.71	1.78

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 coil 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.

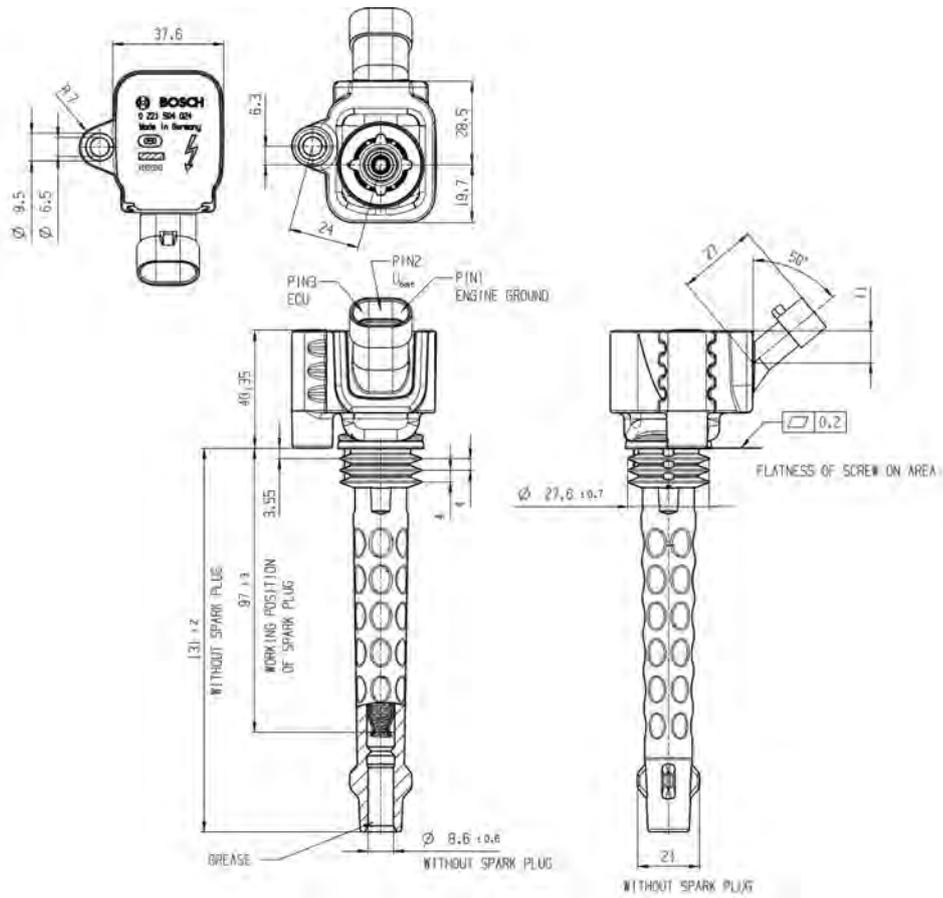
In case of ignition-caused malfunctions, please use screened sensor wires.

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 coil 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 ² at 5 to 2,000 Hz

Technical Specifications

Mechanical Data

Length	143 mm
Weight	222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 1 kΩ resistance
Integrated suppression diode / EFU	

Integrated power stage

Characteristic

Measured with power stage	BIP 385
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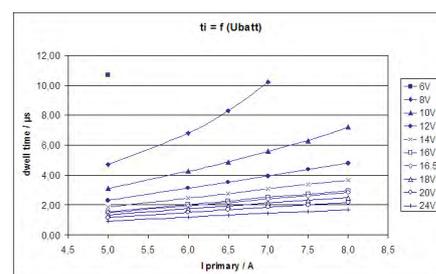
Connectors and Wires

Connector	Tyco 0-1488991-1
Mating connector	F 02U B00 555-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	U _{batt}

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0 A	5.5 A	6.0 A	6.5 A	7.0 A	7.5 A
Max. 1000 /min	10	9	8	7	6	5
6V	10.7	11.6				
8V	4.7	5.4	6.8	8.3	10.2	
10V	3.1	3.55	4.25	4.87	5.6	6.3
12V	2.32	2.66	3.12	3.51	3.94	4.36
14V	1.86	2.1	2.45	2.75	3.07	3.36
16V	1.55	1.77	2.03	2.26	2.51	2.73
16.5V	1.49	1.7	1.95	2.17	2.40	2.61
18V	1.34	1.51	1.73	1.92	2.13	2.31
20V	1.16	1.33	1.51	1.67	1.85	2.0
24V	0.93	1.05	1.19	1.32	1.45	1.57

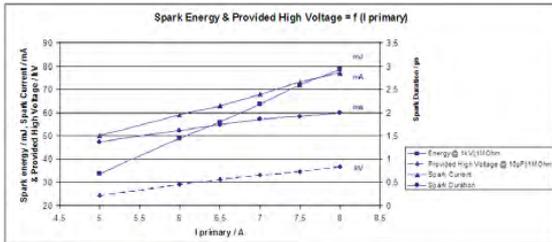
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil P65-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.

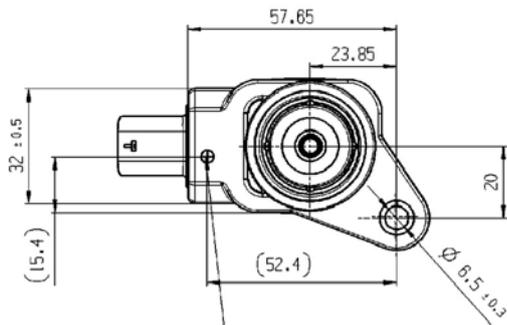
Please find further application hints in the offer drawing at our homepage.

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

Ordering Information**Single Fire Coil P65-T**

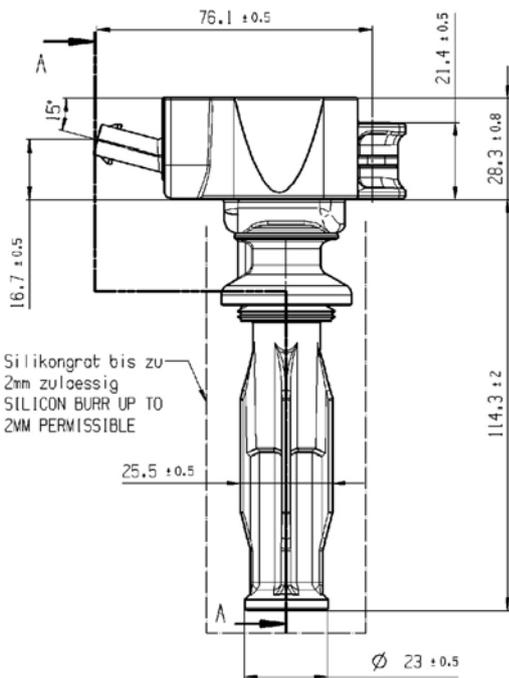
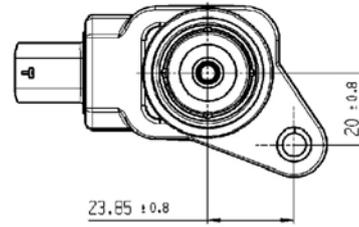
Order number **0 221 604 024**

Dimensions



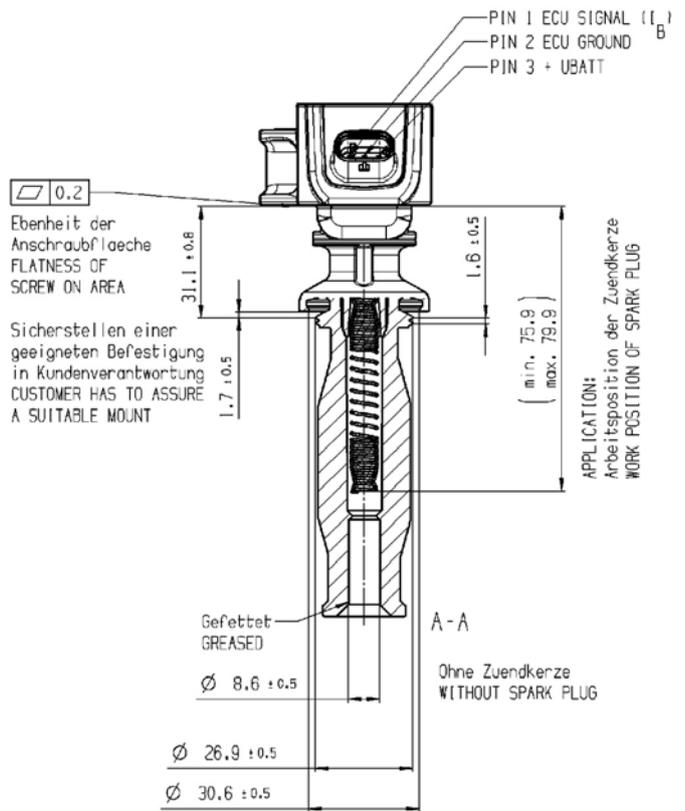
Temperatur-Messpunkt
Endstufe
TEMPERATURE MEASURING
POINT POWER STAGE

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

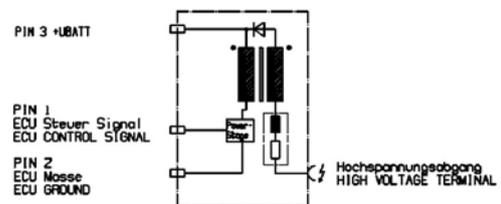


Silikongrat bis zu
2mm zulässig
SILICON BURR UP TO
2MM PERMISSIBLE

Ohne Zündkerze
WITHOUT SPARK PLUG



Schaltbild
CIRCUIT DIAGRAM:



Single Fire Coil P65-E8



Features

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

For this single fire coil the customer can define the length of the spark plug connector. This coil has no integrated transistor and requires an ECU with internal ignition power stages. The coil is for spark plugs with ceramic diameter $d=8$ mm. The coil benefits from series production ensuring robustness.

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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	75 to 225 mm
Weight w/o wire	< 222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 8 mm	

Electrical Data

Primary resistance	570 m Ω
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.9 kV/ μ s
Max. high voltage at 1 M Ω 10 pF	≤ 35 kV
Spark current	≤ 74 mA
Spark duration at 1 kV 1 M Ω	≤ 2.0 ms
Noise suppression	Inductive and 1 k Ω resistance
Suppression diode / EFU	Integrated

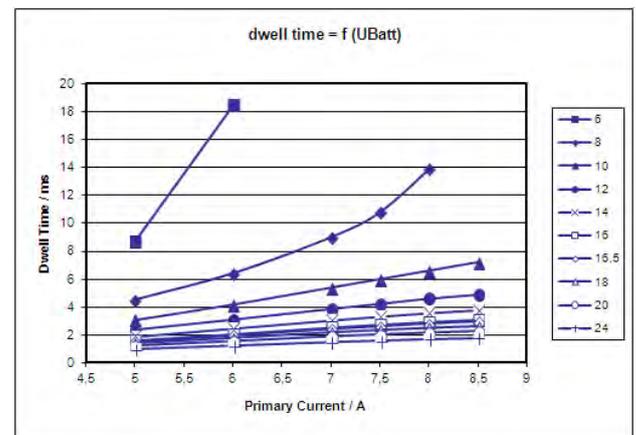
Characteristic

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

Connector	Tyco AMP
Mating connector	D 261 205 350-01
Pin 1	Engine GND
Pin 2	U_{batt}
Pin 3	ECU ignition power stage

Characteristic dwell times [ms]



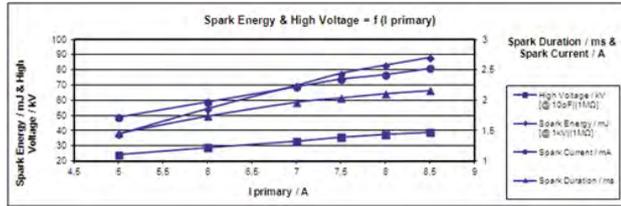
Dwell time

U_{batt}	$I_{primary}$					
	5.0A	6.0A	7.0A	7.5A	8.0A	8.5A
6V	8.74	18.5				
8V	4.5	6.4	9	10.8	13.9	
10V	3.1	4.2	5.4	6	6.6	7.2
12V	2.36	3.1	3.88	4.25	4.63	4.92
14V	1.9	2.48	3.05	3.32	3.57	3.77
16V	1.61	2.06	2.53	2.73	2.93	3.08
18V	1.55	2	2.43	2.62	2.81	2.95
20V	1.39	1.77	2.16	2.33	2.48	2.6

22V	1.22	1.54	1.88	2.02	2.15	2.26
24V	0.97	1.23	1.49	1.6	1.71	1.78

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 coil P65-E8 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.

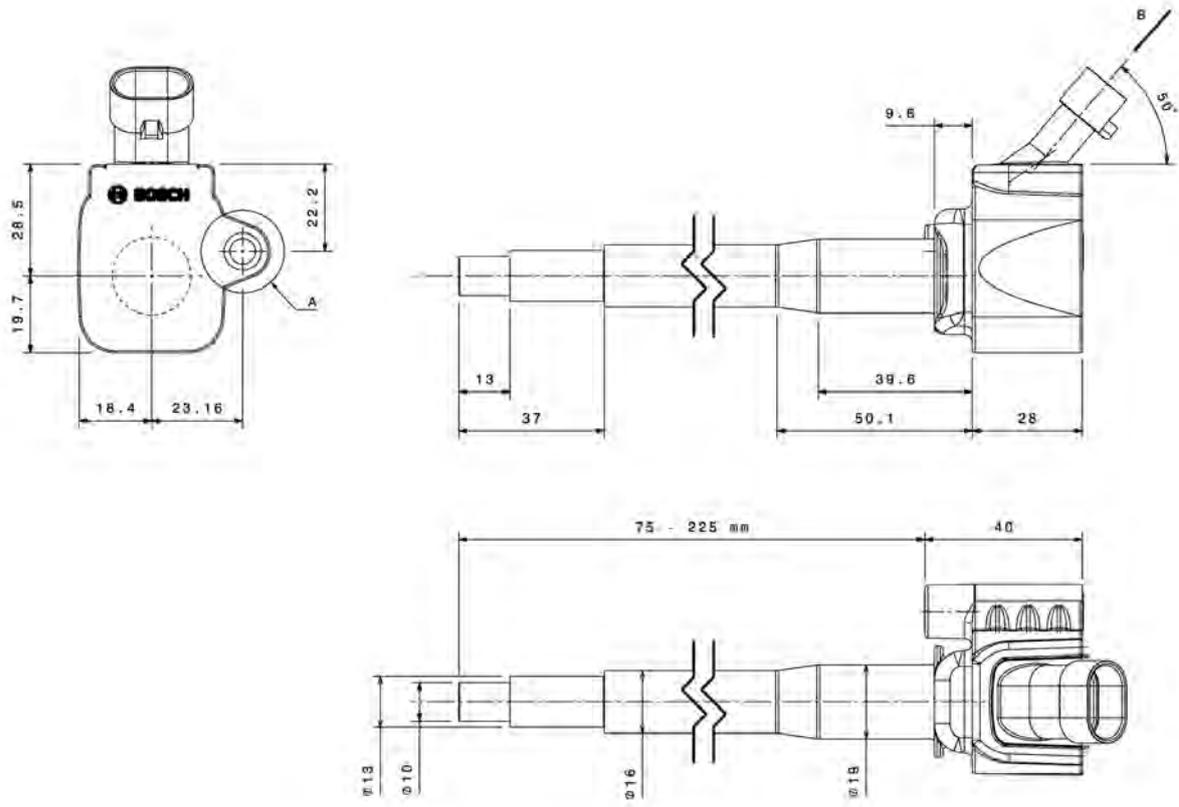
Ordering Information

Single Fire Coil P65-E8

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

Order number **F 02U V01 702-01**

Dimensions



Single Fire Coil P65-E10



2

Features

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

For this single fire coil the customer can define the length of the spark plug connector. This coil has no integrated transistor and requires an ECU with internal ignition power stages. The coil is for spark plugs with ceramic diameter $d=10$ mm. The coil benefits from series production ensuring robustness.

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 ² at 5 to 2,500 Hz

Technical Specifications

Mechanical Data

Length	102 to 225 mm
Weight w/o wire	< 222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

Electrical Data

Primary resistance	570 m Ω
Secondary resistance	Incapable of measurement
High voltage rise time	≤ 1.9 kV/ μ s
Max. high voltage at 1 M Ω 10 pF	≤ 35 kV
Spark current	≤ 74 mA
Spark duration at 1 kV 1 M Ω	≤ 2.0 ms
Noise suppression	Inductive and 1 k Ω resistance
Suppression diode / EFU	Integrated

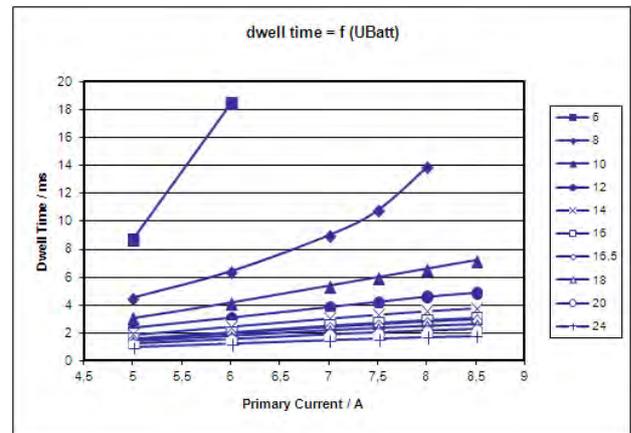
Characteristic

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

Connector	Tyco AMP
Mating connector	D 261 205 350-01
Pin 1	Engine GND
Pin 2	U_{batt}
Pin 3	ECU ignition power stage

Characteristic dwell times [ms]



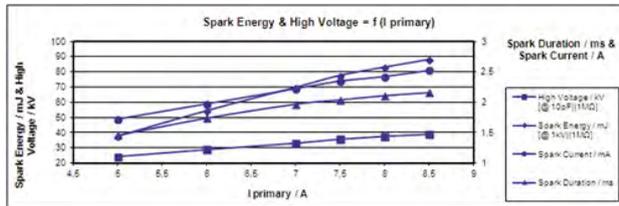
Dwell time

U_{batt}	$I_{primary}$					
	5.0A	6.0A	7.0A	7.5A	8.0A	8.5A
6V	8.74	18.5				
8V	4.5	6.4	9	10.8	13.9	
10V	3.1	4.2	5.4	6	6.6	7.2
12V	2.36	3.1	3.88	4.25	4.63	4.92
14V	1.9	2.48	3.05	3.32	3.57	3.77
16V	1.61	2.06	2.53	2.73	2.93	3.08
18V	1.55	2	2.43	2.62	2.81	2.95
20V	1.39	1.77	2.16	2.33	2.48	2.6

22V	1.22	1.54	1.88	2.02	2.15	2.26
24V	0.97	1.23	1.49	1.6	1.71	1.78

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 coil P65-E10 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-E10

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

Order number **F 02U V01 703-01**

Single Fire Coil P65-TE8



Features

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

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

The coil P65-TE8 has an integrated transistor and requires an ECU with internal ignition drivers with 10 mA to 20 mA current output.

The coil is for spark plugs with ceramic diameter of 8 mm.

The coil benefits from series production ensuring robustness.

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 ² at 5 to 2,000 Hz

Technical Specifications

Mechanical Data

Length	87 to 225 mm
Weight	222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 8 mm	

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 1 kΩ resistance
Integrated suppression diode / EFU	
Integrated power stage	

Characteristic

Measured with internal power stage	BIP 385
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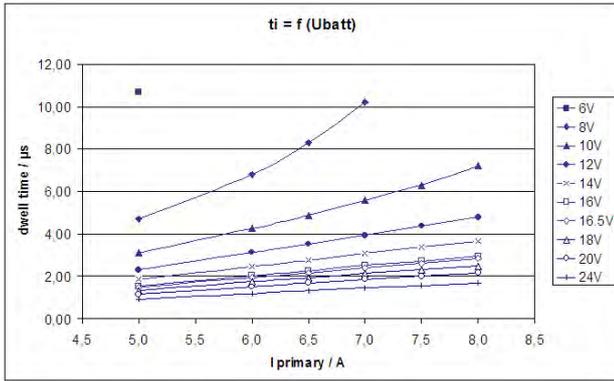
Connectors and Wires

Connector	Tyco 0-1488991-1
Mating connector	F 02U B00 555-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	U _{batt}

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0 A	5.5 A	6.0 A	6.5 A	7.0 A	7.5 A
Max. 1000 /min	10	9	8	7	6	5
6V	10.7	11.6				
8V	4.7	5.4	6.8	8.3	10.2	
10V	3.1	3.55	4.25	4.87	5.6	6.3
12V	2.32	2.66	3.12	3.51	3.94	4.36
14V	1.86	2.1	2.45	2.75	3.07	3.36
16V	1.55	1.77	2.03	2.26	2.51	2.73
16.5V	1.49	1.7	1.95	2.17	2.40	2.61
18V	1.34	1.51	1.73	1.92	2.13	2.31
20V	1.16	1.33	1.51	1.67	1.85	2.0
24V	0.93	1.05	1.19	1.32	1.45	1.57

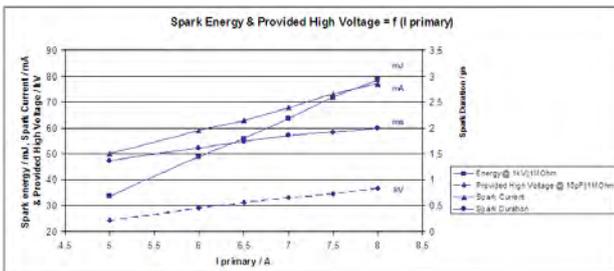
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil P65-TE8 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.

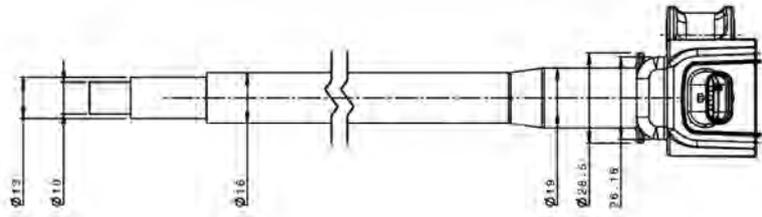
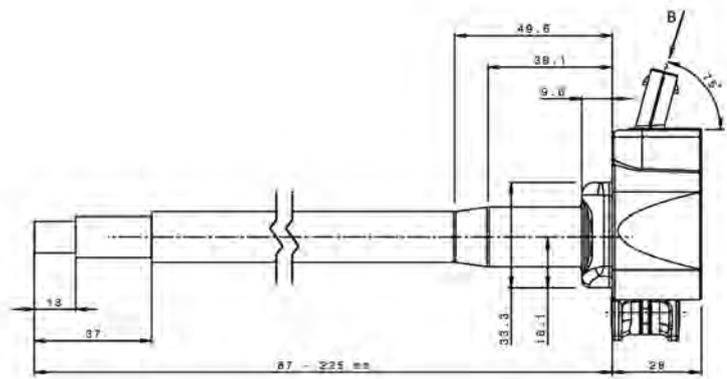
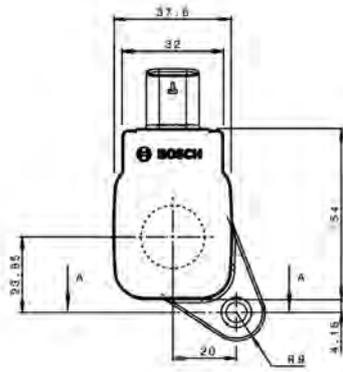
Ordering Information

Single Fire Coil P65-TE8

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

Order number **F 02U V01 705-01**

Dimensions



Single Fire Coil P65-TE10



2

Features

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

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

The P65-TE10 has an integrated transistor and requires an ECU with internal ignition drivers with 10 mA to 20 mA current output.

The coil is for spark plugs with ceramic diameter of 10 mm.

The coil benefits from series production ensuring robustness.

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 ² at 5 to 2,000 Hz

Technical Specifications

Mechanical Data

Length	114 to 225 mm
Weight	222 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 1 kΩ resistance
Integrated suppression diode / EFU	
Integrated power stage	

Characteristic

Measured with internal power stage	BIP 385
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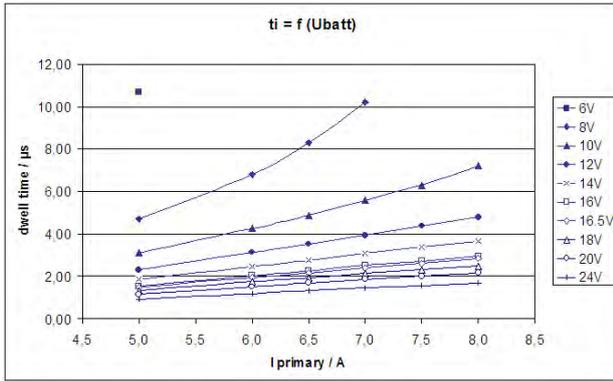
Connectors and Wires

Connector	Tyco 0-1488991-1
Mating connector	F 02U B00 555-01
Pin 1	ECU ignition signal
Pin 2	ECU GND
Pin 3	U _{batt}

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0A	5.5A	6.0A	6.5A	7.0A	7.5A
Max. 1000 /min	10	9	8	7	6	5
6V	10.7	11.6				
8V	4.7	5.4	6.8	8.3	10.2	
10V	3.1	3.55	4.25	4.87	5.6	6.3
12V	2.32	2.66	3.12	3.51	3.94	4.36
14V	1.86	2.1	2.45	2.75	3.07	3.36
16V	1.55	1.77	2.03	2.26	2.51	2.73
16.5V	1.49	1.7	1.95	2.17	2.40	2.61
18V	1.34	1.51	1.73	1.92	2.13	2.31
20V	1.16	1.33	1.51	1.67	1.85	2.0
24V	0.93	1.05	1.19	1.32	1.45	1.57

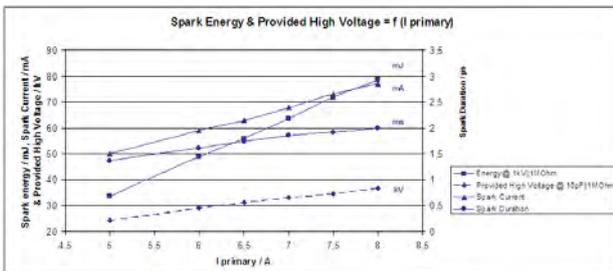
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 coil P65-TE10 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

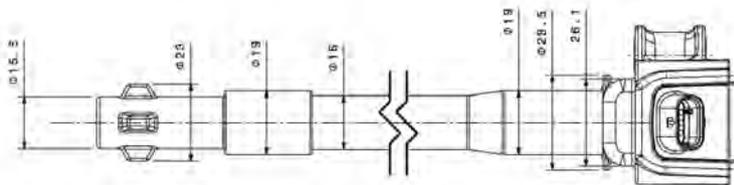
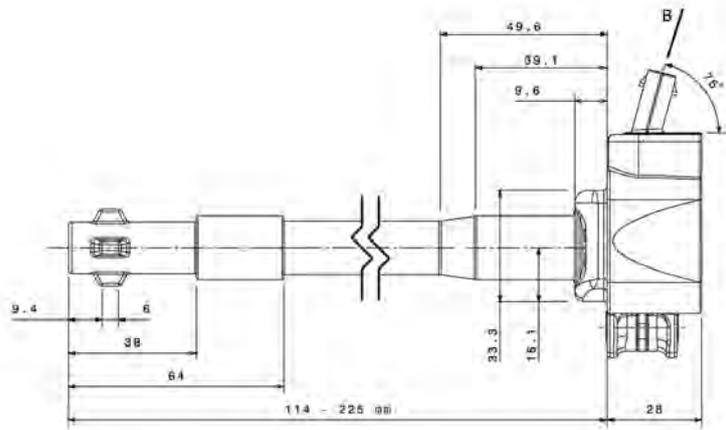
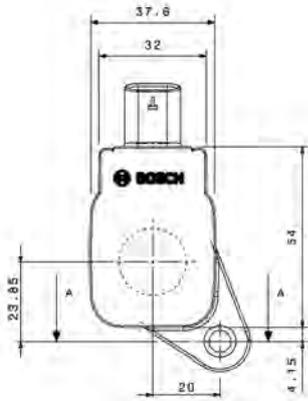
Single Fire Coil P65-TE10

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

Order number **F 02U V01 706-01**

Dimensions

2



Twin Single Fire Coil 2x1



Features

- ▶ Max. 35 kV
- ▶ $2 \times \leq 50 \text{ mJ}$
- ▶ Max. 2.1 kV/ μs
- ▶ 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 requires an ECU with separated ignition power stages for every coil (2 per Twin Single Fire Coil 2x1).

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

Characteristic

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

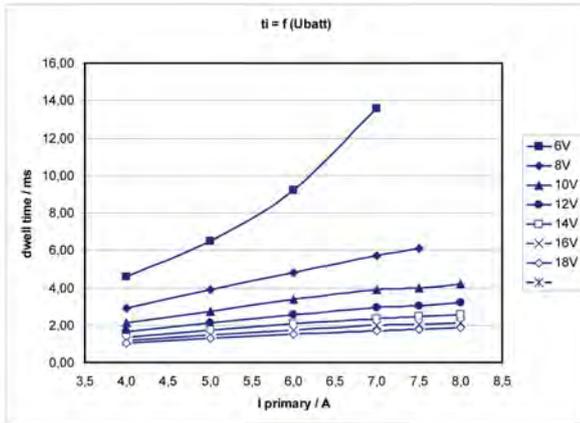
Connector	Bosch Compact
Mating connector 3-pole Compact	D 261 205 335-01
Pin 1	Coil 2 (b) ECU Ignition Power Stage
Pin 2	U_{batt}
Pin 3	Coil 1 (a) ECU Ignition Power Stage

Various motorsport and automotive connectors are available on request.

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

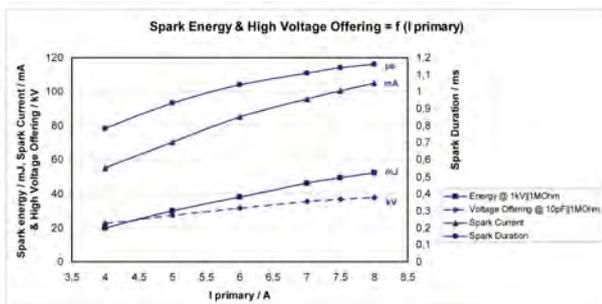
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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.

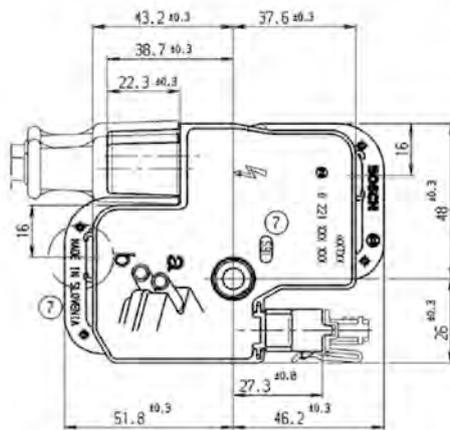
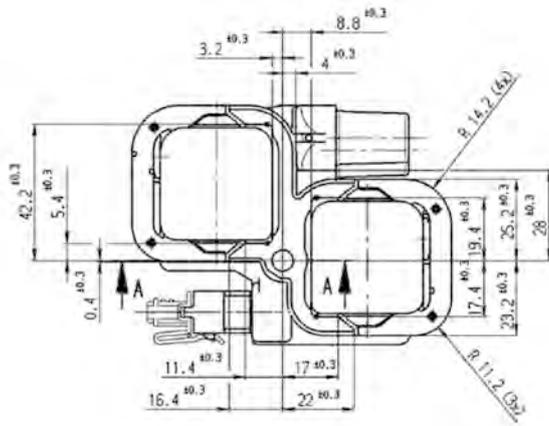
In case of ignition-caused malfunctions, please use screened sensor wires.

Ordering Information

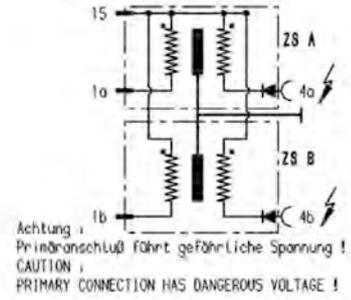
Twin Single Fire Coil 2x1

Order number **0 221 503 035**

Dimensions



Schaltbild
CIRCUIT DIAGRAM



Double Fire Coil 2x2



2

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 ² 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 _{ce} =600 V)
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Connectors and Wires

Connector	Bosch Jetronic
Mating connector 3-pole Jetronic	D 261 205 289-01
Pin 1	Coil 2 ECU Ignition Power Stage
Pin 2	U _{batt}
Pin 3	Coil 1 ECU Ignition Power Stage

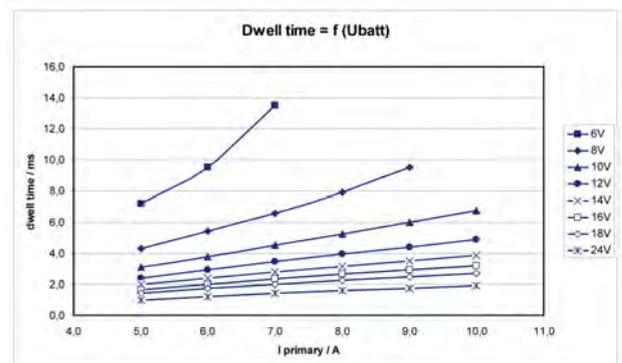
Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0 A	6.0 A	7.0 A	8.0 A	9.0 A	10 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

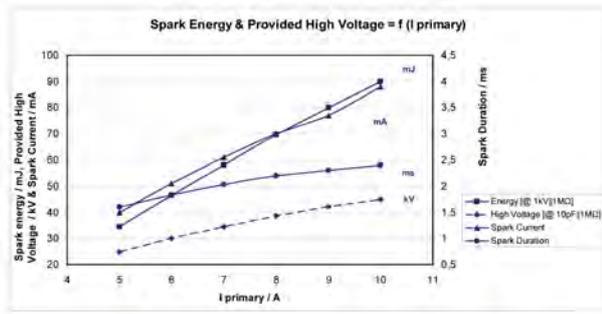
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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.

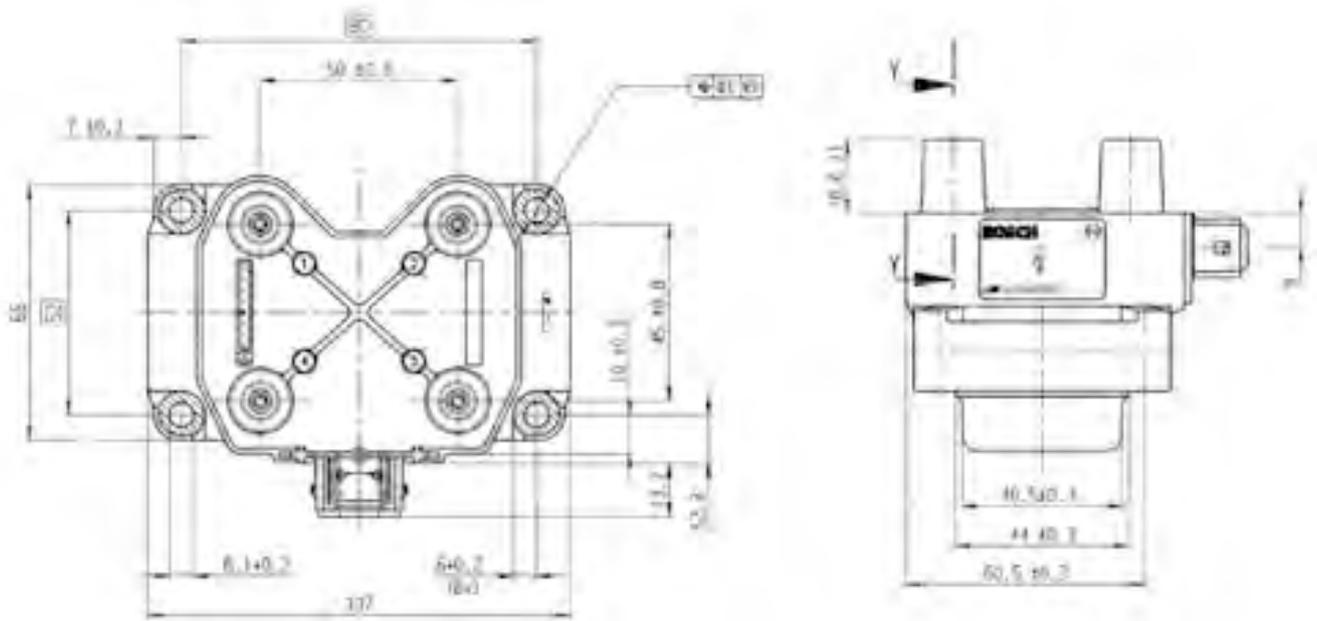
In case of ignition-caused malfunctions, please use screened sensor wires.

Ordering Information**Double Fire Coil 2x2**

Order number **0 221 503 407**

Dimensions

2



Double Fire Coil 3x2



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 ² 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 _{ce} = 600 V)
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Connectors and Wires

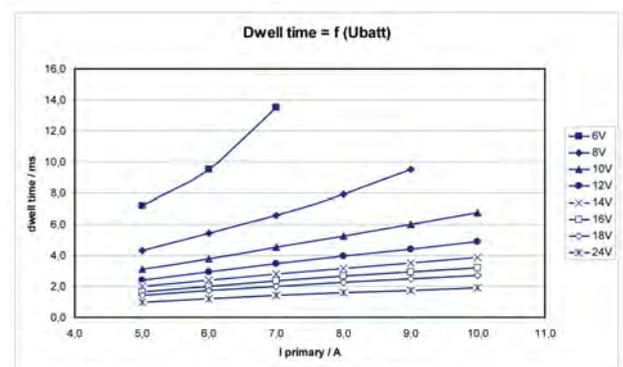
Connector	Bosch Jetronic
Mating connector 3-pole Jetronic	D 261 205 351-01
Pin 1	Coil 3 ECU Ignition Power Stage
Pin 2	Coil 2 ECU Ignition Power Stage
Pin 3	Coil 1 ECU Ignition Power Stage
Pin 4	U _{batt}

Various motorsport and automotive connectors are available on request.

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	5.0 A	6.0 A	7.0 A	8.0 A	9.0 A	10 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

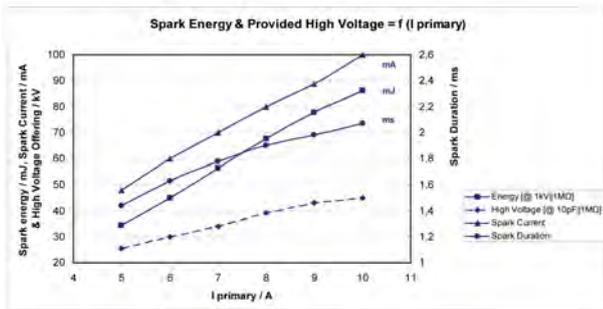
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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.

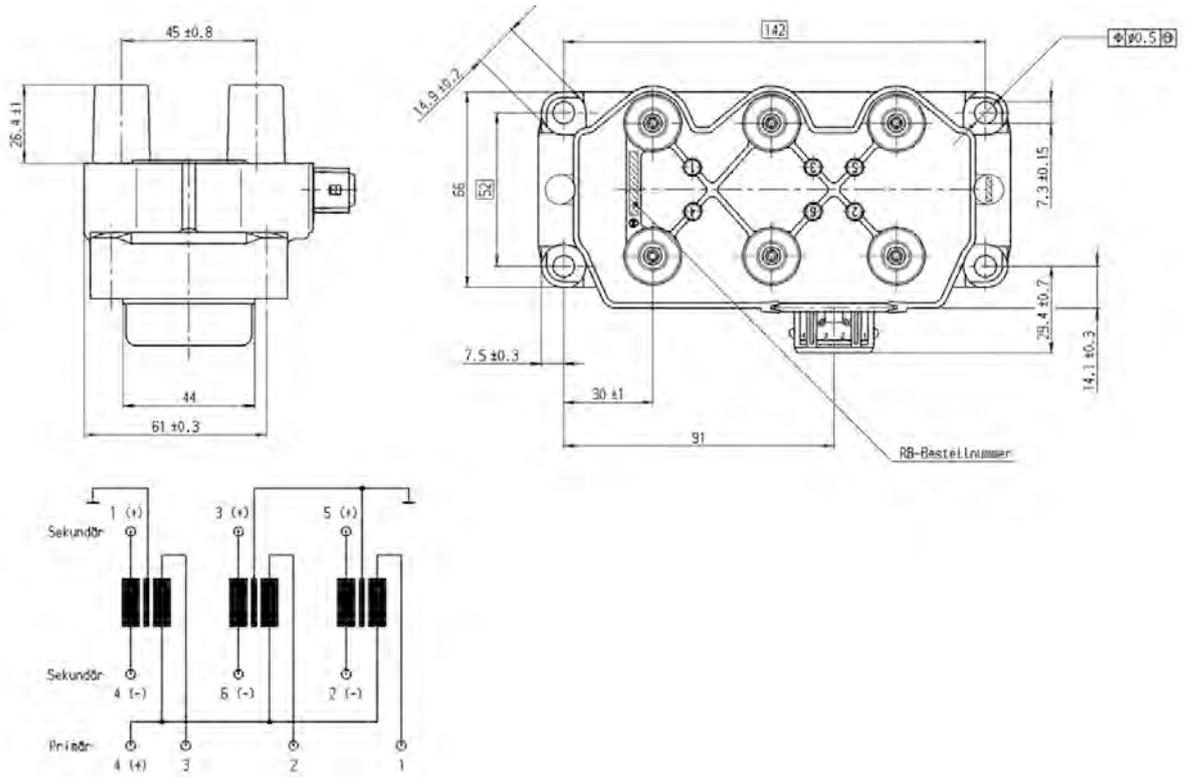
Please find further application hints in the offer drawing at our home-page.

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

Ordering Information**Double Fire Coil 3x2**

Order number **0 221 503 002**

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

The main benefits of this high performance coil are its robustness in hard racing applications and high 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 ² 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 _{ce} = 600 V)
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Connectors and Wires

Connector	Open end
Mating connector	-
Pin 1	U _{batt} red
Pin 2	ECU power stage white (blue with optional ionic current measurement)
Pin 3	Engine GND black
Pin 4	Optional ionic current signal screen wire white

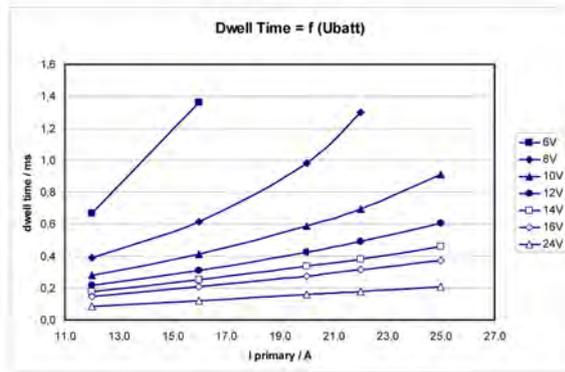
Various motorsport and automotive connectors are available on request.

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

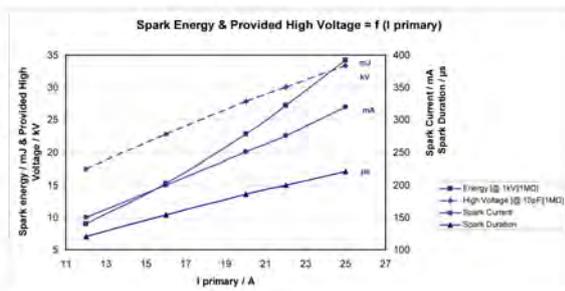
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

Spark energy and provided high voltage

I prim.	Spark energy	-duration	-current	Hi voltage
12 A	9 mJ	120 μ s	150 mA	17.5 kV
16 A	15.2 mJ	154 μ s	200 mA	22.8 kV
20 A	22.8 mJ	186 μ s	250 mA	27.8 kV
22 A	27.2 mJ	200 μ s	275 mA	30 kV
25 A	34.2 mJ	221 μ s	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 coil S19 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 113-02**

Single Fire Coil S22/S22-T



Features

- ▶ Max. 25 kV
- ▶ Max. 60 mJ
- ▶ Max. 5.0 kV/μs
- ▶ Max. 10,000 1/min (higher with reduced dwell time)

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 coil S22 has no integrated transistor and requires an ECU with internal ignition power stages. The coil S22-T has an integrated transistor and requires an ECU with internal ignition drivers.

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 ² 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 _{batt} red	U _{batt} 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 _{ce} = 600 V)	IGBT IRF5036S (U _{ce} = 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 _{batt} red
Pin 2	Please see Variations
Pin 3	Please see Variations
Pin 4	Please see Variations
Pin 5	Please see Variations

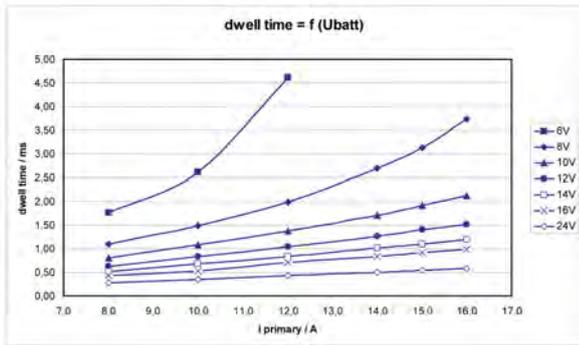
Various motorsport and automotive connectors are available on request.

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 _{batt}	I _{primary}					
	8A	10A	12A	14A	15A	16A
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

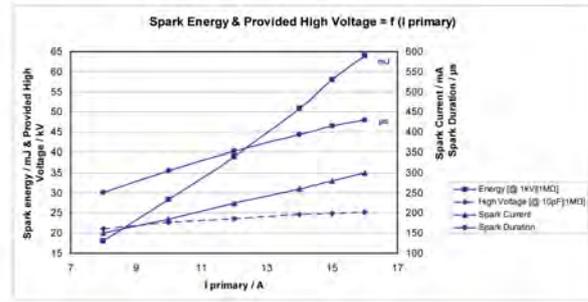
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



Dwell time

Spark energy and provided high voltage

I _{prim.}	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 coil S22 has no integrated transistor and requires an ECU with internal ignition power stages, e.g. IGBT IRG4BC40S.

The coil S22-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.

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 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

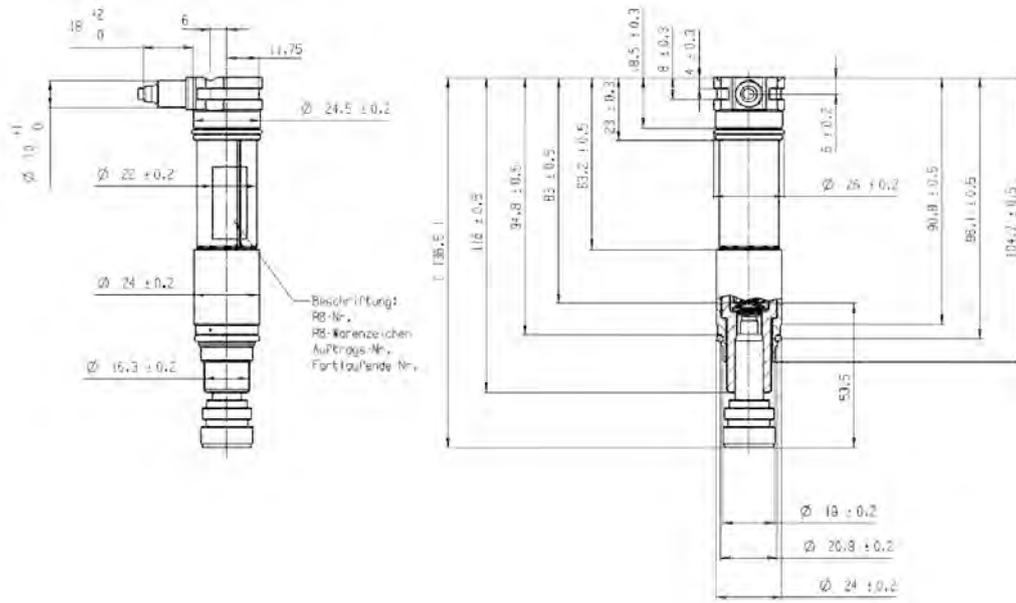
Order number **0 221 B00 115-02**

Coil S22-T

Integrated transistor

Order number **0 221 B00 116-02**

Dimensions



Single Fire Coil C90i-pro

2



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 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 ² 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
Ionic current measurement	+

Characteristic

Measured with power stage	IGBT IRG4BC40S (U _{ce} =600 V)
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Connectors and Wires

Connector	On request
Mating connector	On request
Pin 1	U _{batt} red
Pin 2	ECU ignition power stage blue
Pin 3	Engine GND black
Pin 4	Ionic current signal white
Wire length	100 cm
Wire size	AWG 20/22
For spark plugs	Ceramic diameter d = 10 mm

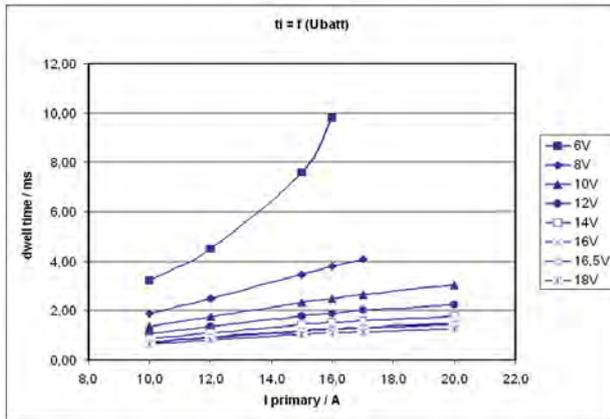
Various motorsport and automotive connectors are available on request.

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

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	10.0A	12.0A	15.0A	16.0a	17.0A	20.0A
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
16.5V	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

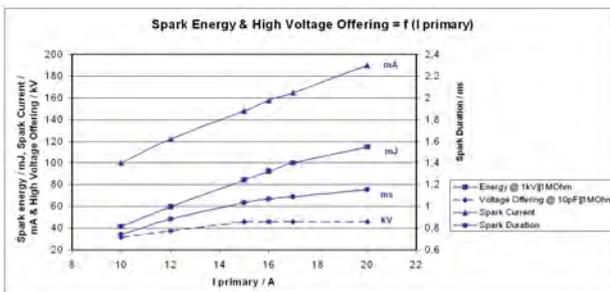
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 I_{prim} = 16 A may reduce the lifetime.

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

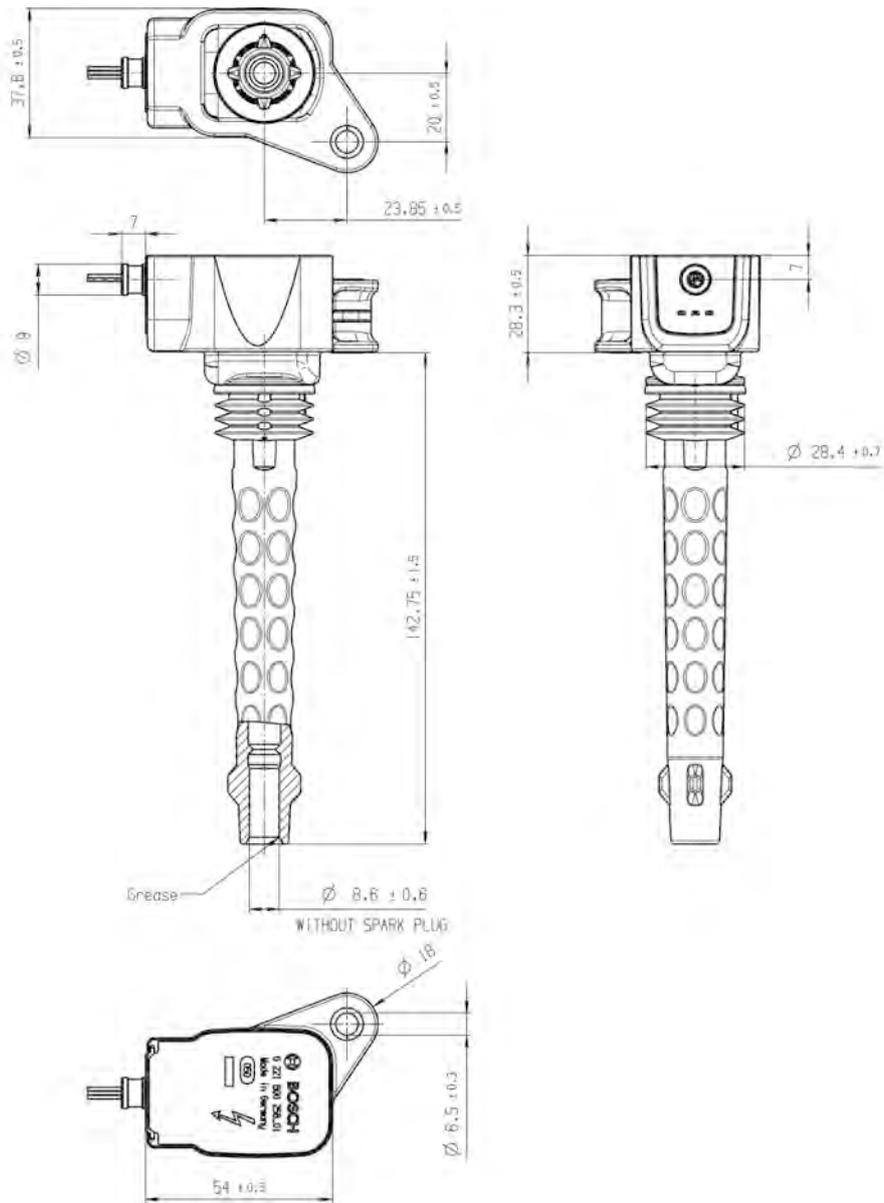
Ordering Information

Single Fire Coil C90i-pro

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

Dimensions

2



Single Fire Coil C90i-E8



Features

- ▶ Max. 40 kV
- ▶ Max. 90 mJ
- ▶ Max. 5.0 kV/μs
- ▶ Fits to spark plugs with a ceramic diameter of 8 mm
- ▶ 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-E8 provides the possibility of ionic current measurement. For this single fire coil the customer can define the length of the spark plug connector.

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 ² at 50 to 2,000 Hz

Technical Specifications

Mechanical Data

Length	80 to 220 mm
Weight w/o wire	< 230 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 8 mm	

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 and 1 kΩ resistance
Suppression diode / EFU	Internal

Characteristic

Measured with power stage	IGBT IRG4BC40S (U _{ce} =600 V)
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Connectors and Wires

Connector	On request
Mating connector	On request
Pin 1	U _{batt} red
Pin 2	ECU ignition power stage blue
Pin 3	Engine GND black
Pin 4	Ionic current signal white
Wire length	100 cm
Wire size	AWG 20/22

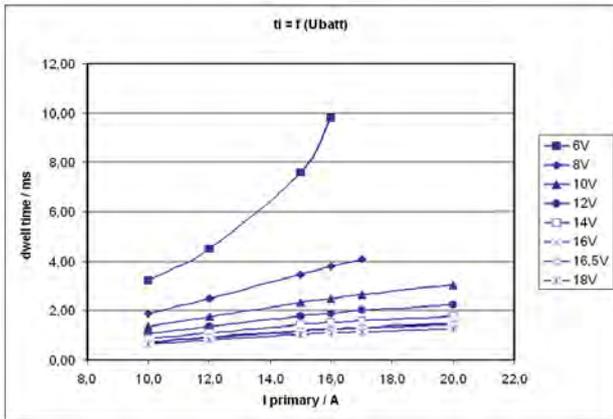
Various motorsport and automotive connectors are available on request.

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

Characteristic dwell times [ms]

U _{batt}	I _{primary}					
	10 A	12 A	15 A	16 A	17 A	20 A
6 V	3.2	4.5	7.6	9.8		
8 V	1.88	2.49	3.47	3.79	4.10	
10 V	1.35	1.76	2.34	2.51	2.67	3.05
12 V	1.06	1.35	1.77	1.89	2.00	2.24
14 V	0.87	1.11	1.43	1.52	1.60	1.79
16 V	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
18 V	0.64	0.81	1.03	1.10	1.15	1.27

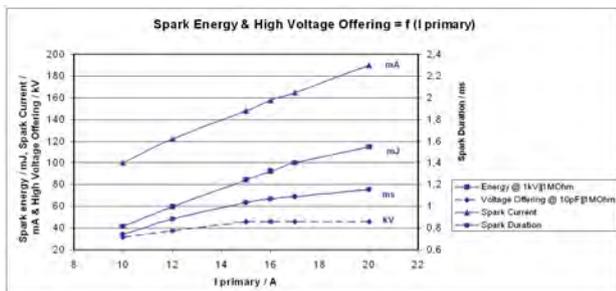
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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.

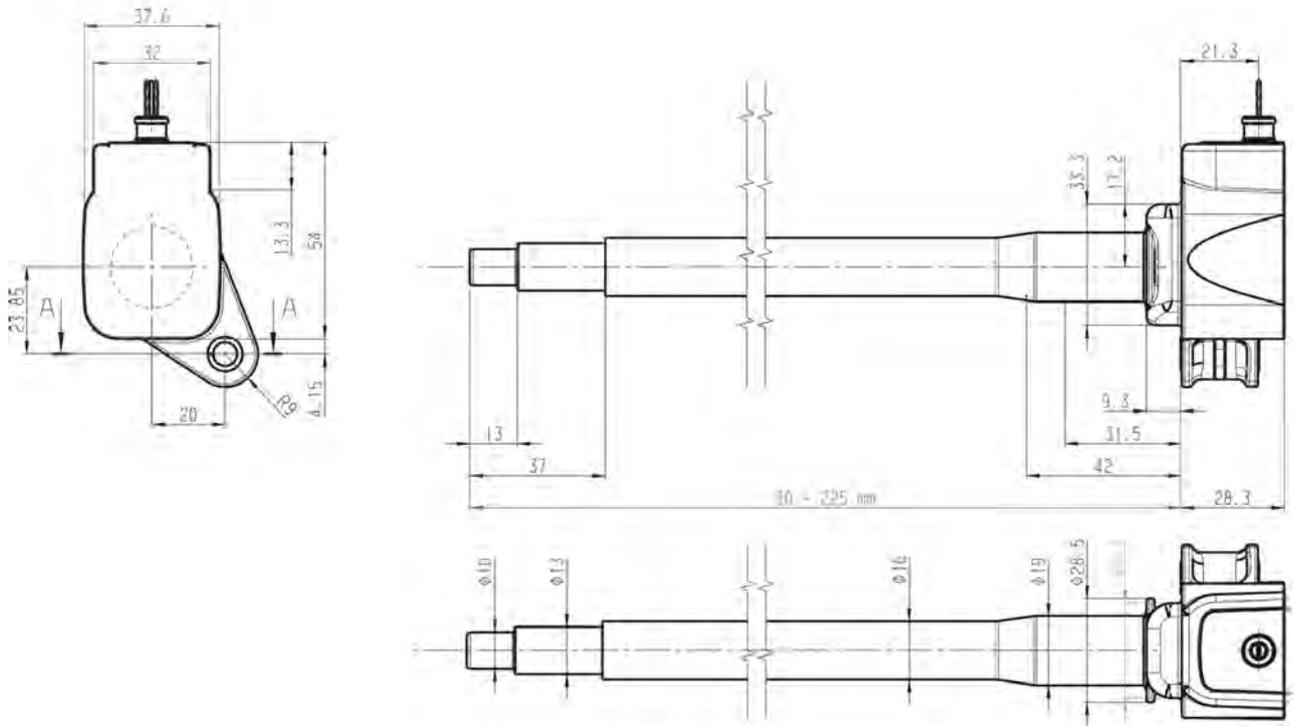
Ordering Information

Single Fire Coil C90i-E8

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

Order number **F 02U V01 368-01**

Dimensions



Single Fire Coil C90i-E10

2



Features

- ▶ Max. 40 kV
- ▶ Max. 90 mJ
- ▶ Max. 5.0 kV/μs
- ▶ Fits to spark plugs with a ceramic diameter of 10 mm
- ▶ 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-E10 provides the possibility of ionic current measurement. For this single fire coil the customer can define the length of the spark plug connector.

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 ² at 50 to 2,000 Hz

Technical Specifications

Mechanical Data

Length	114 to 225 mm
Weight w/o wire	< 230 g
Mounting	Screw fastening
Fits to spark plugs with a ceramic diameter of 10 mm	

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 and 1 kΩ resistance
Suppression diode / EFU	Internal

Characteristic

Measured with power stage	IGBT IRG4BC40S (U _{ce} =600 V)
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Connectors and Wires

Connector	On request
Mating connector	On request
Pin 1	U _{batt} red
Pin 2	ECU ignition power stage blue
Pin 3	Engine GND black
Pin 4	Ionic current signal white
Wire length	100 cm
Wire size	AWG 20/22

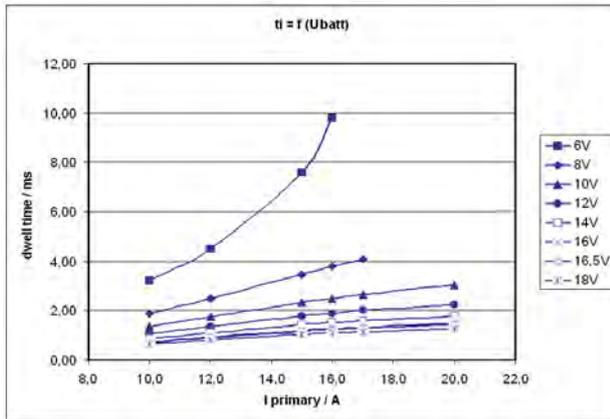
Various motorsport and automotive connectors are available on request.

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

Characteristic dwell times [ms]

U _{batt}	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
16.5V	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

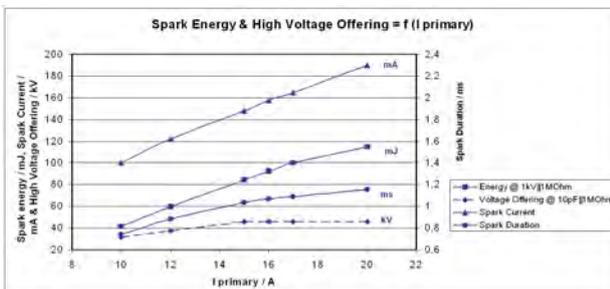
Measured values are without loom resistance. Loom resistance must be less than the primary resistance. The needed dwell time is to be verified through current measurement



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 I_{prim} = 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

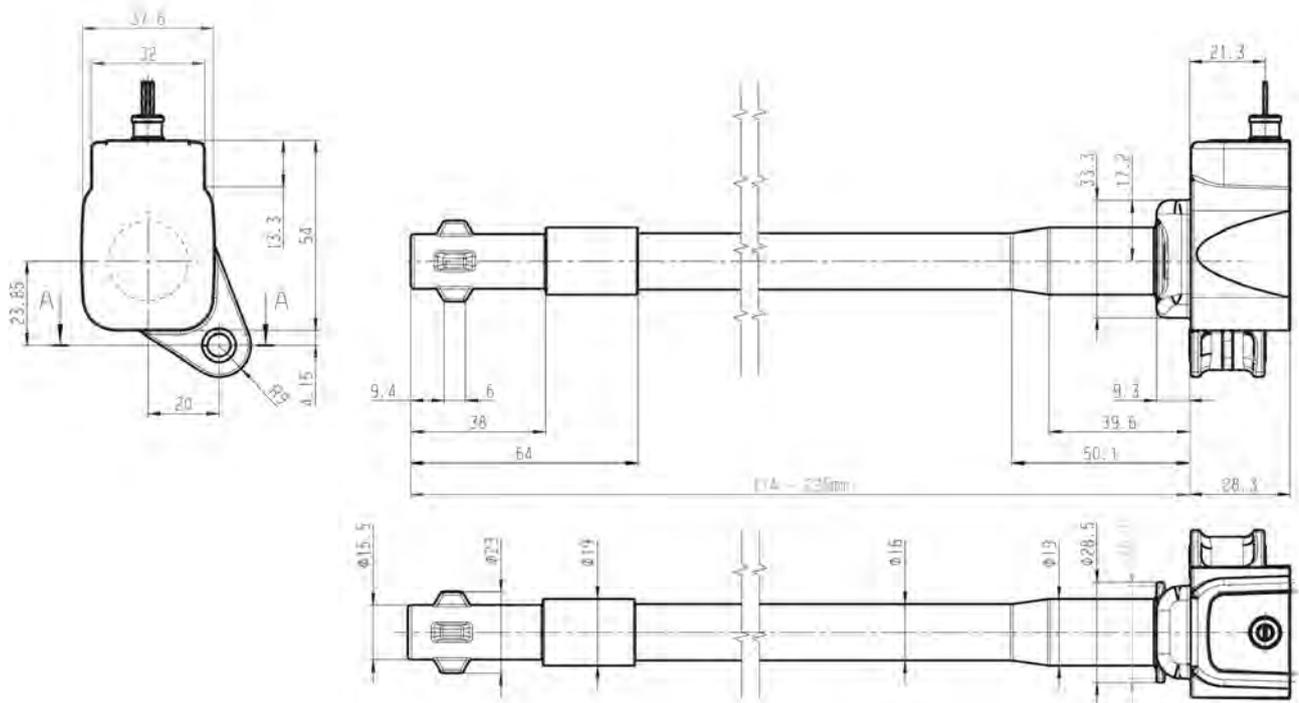
Single Fire Coil C90i-E10

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

Order number **F 02U V01 369-01**

Dimensions

2



Ignition Module IM 3.1



Features

- ▶ Max. 3 cylinders
- ▶ 47 g
- ▶ Fits to all MS 4 ECUs
- ▶ Especially adapted for Coils PS, P35, P50(-M), P65, 2x1, 2x2 and 3x2

This module 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.

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 ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s ² 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 _{Batt} typical	13.5 V
Voltage supply	6 to 16.5 V
I _B high active on	min. 10 mA
I _B low off	0 mA
I _B	10 to 22 mA
I _C typical	≤ 8.5 A
I _C max. at T _U < 120°C	< 10 A
U _{CE} satt at I _C = 5 A	< 3 V
U _{CE} satt at I _C max	< 9 V

Characteristic

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

Connectors and Wires

Connector (Coil T1) Bosch Jetronic 3-pole

Mating connector 3-pole Jetronic D 261 205 289-01

Pin 1 Collector transistor 1

Pin 2 Collector transistor 2

Pin 3 Collector transistor 3

Connector (ECU) Bosch Jetronic 4-pole

Mating connector 4-pole Jetronic D 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 PS, P35, P50(-M), P65, 2x1, 2x2, 3x2 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 do not activate more than one ignition output stage parallel within a module.

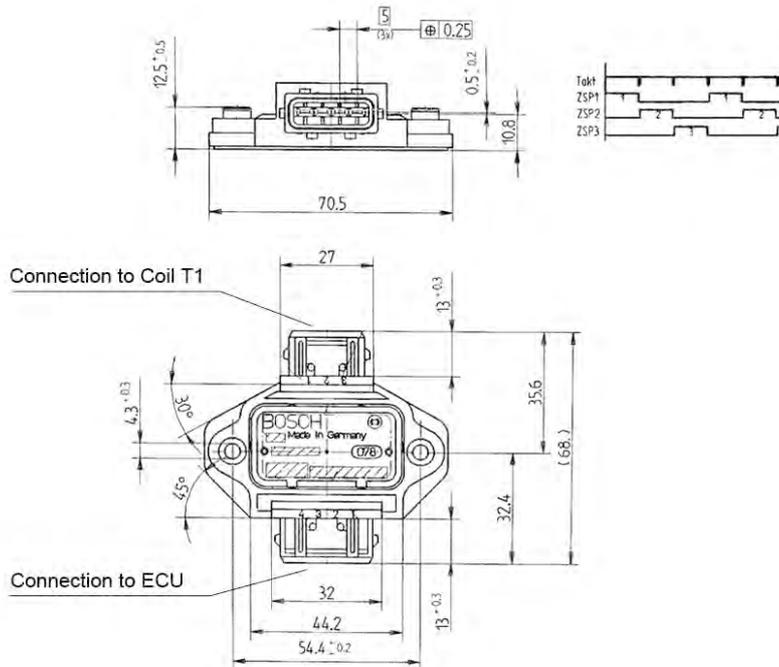
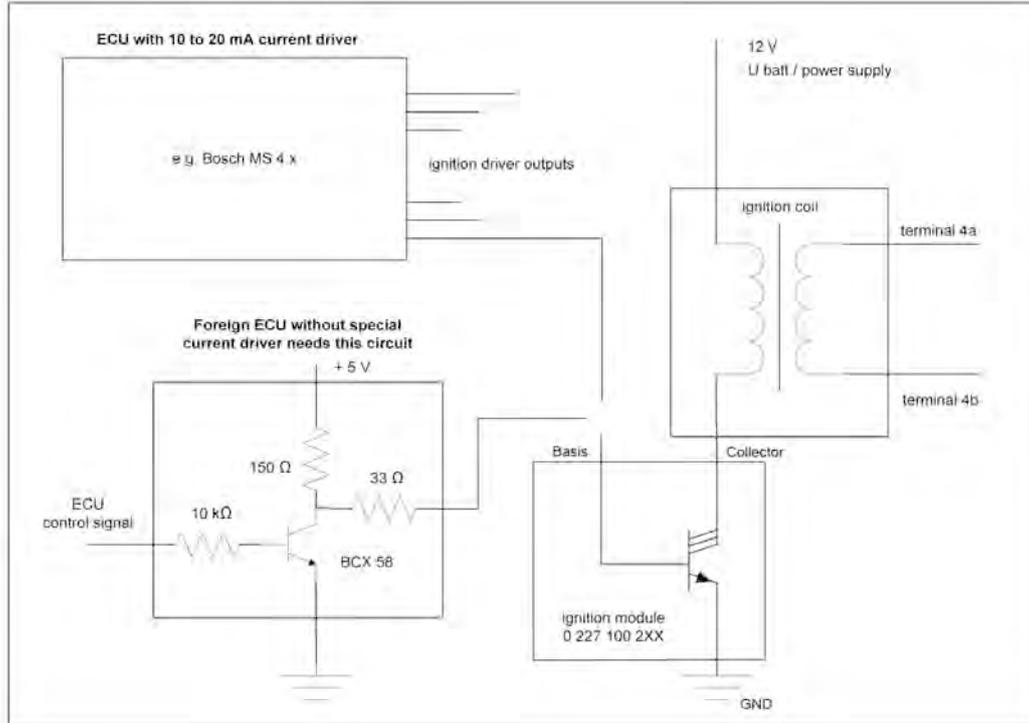
Please find further application hints in the offer drawing at our homepage.

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 Coils PS, P35, P50(-M), P65, 2x1, 2x2 and 3x2

This module 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.

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 ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s ² 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 _{Batt} typical	13.5 V
Voltage supply	6 to 16.5 V

I _B high active on	min. 10 mA
I _B low off	0 mA
I _B	10 to 22 mA
I _C typical	≤ 8.5 A
I _C max. at T _U < 120°C	< 10 A
U _{CE} satt at I _C = 5 A	< 3 V
U _{CE} satt at I _C max	< 9 V

Characteristic

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

Connectors and Wires

Connector	Bosch Jetronic 7-pole
Mating connector 7-pole Jetronic	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 PS, P35, P50(-M), P65, 2x1, 2x2, 3x2 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 do not activate more than one ignition output stage parallel within a module.

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

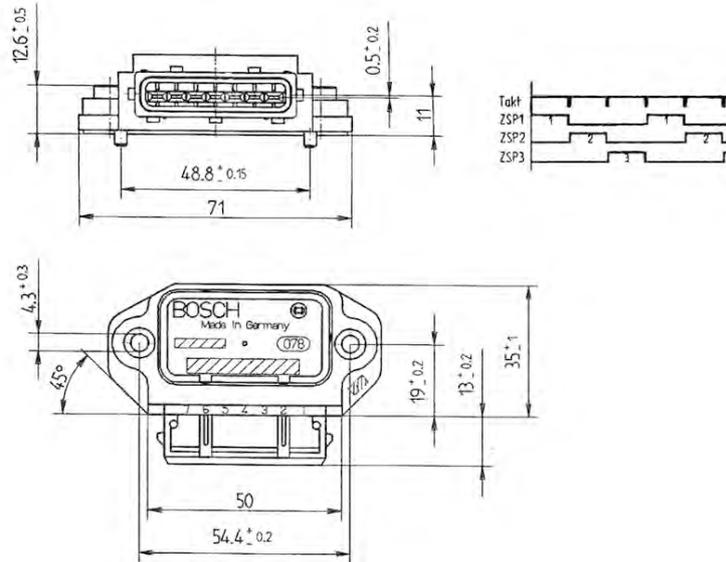
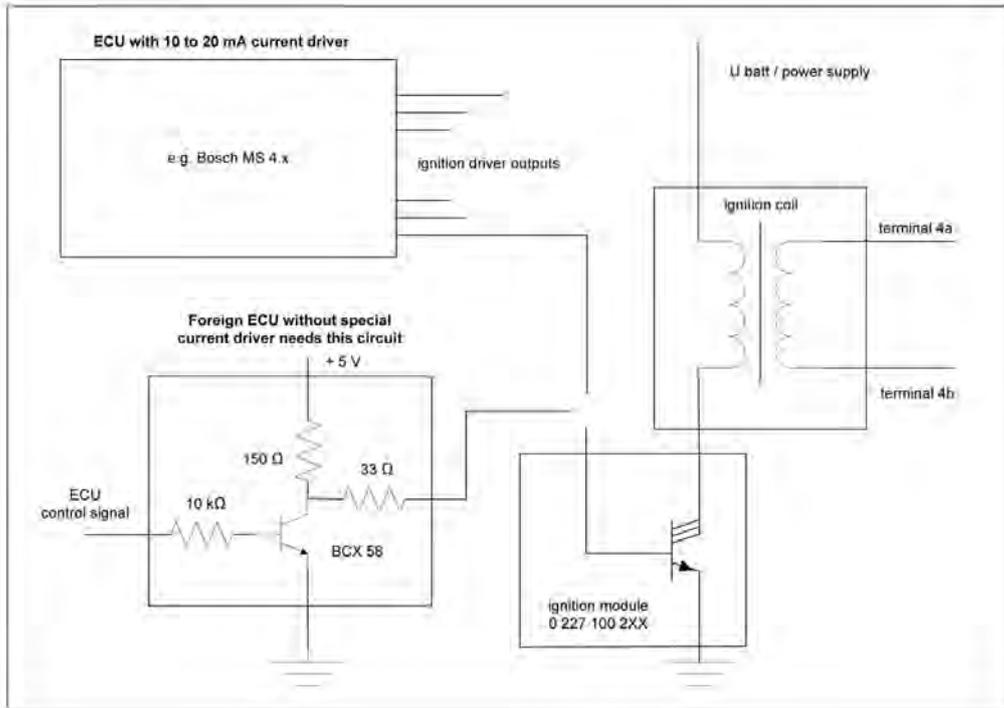
Ordering Information

Ignition Module IM 3.2

Order number **0 227 100 203**

Dimensions

2



Ignition Module IM 4



Features

- ▶ Max. 4 cylinders
- ▶ 54 g
- ▶ Fits to all MS 4 ECUs
- ▶ Especially adapted for Coils PS, P35, P50(-M), P65, 2x1, 2x2 and 3x2

This module 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.

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 ± 30 V
Operating temperature range at measuring point	-40 to 120°C
Storage temperature range	-40 to 130°C
Max. vibration	400 m/s ² 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 _{Batt} typical	13.5 V
Voltage supply	6 to 16.5 V
I _B high active on	min. 10 mA
I _B low off	0 mA
I _B	10 to 22 mA
I _C typical	< 8.5 A
I _C max. at T _U < 120°C	< 10 A
U _{CE} satt at I _C = 5 A	< 3 V
U _{CE} satt at I _C max	< 9 V

Connectors and Wires

Connector (Coil T1) Bosch Jetronic 4-pole

Mating connector Jetronic 4-pole 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

Connector (ECU) Bosch Jetronic 5-pole

Mating connector Jetronic 5-pole 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 PS, P35, P50(-M), P65, 2x1, 2x2, 3x2 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.

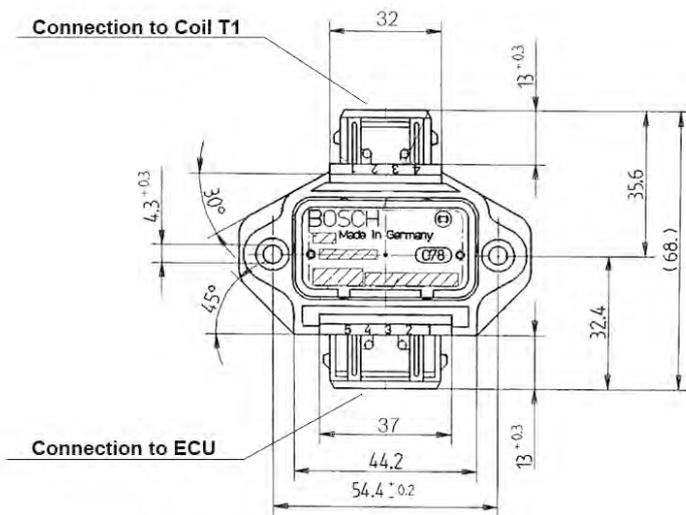
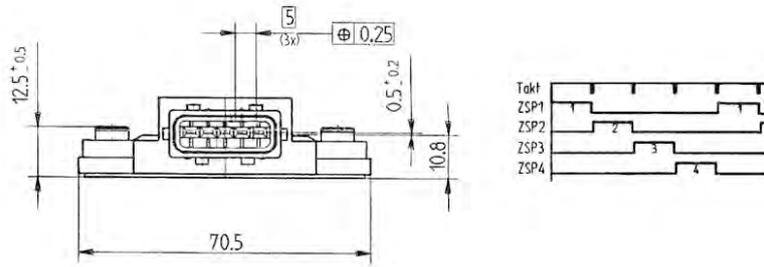
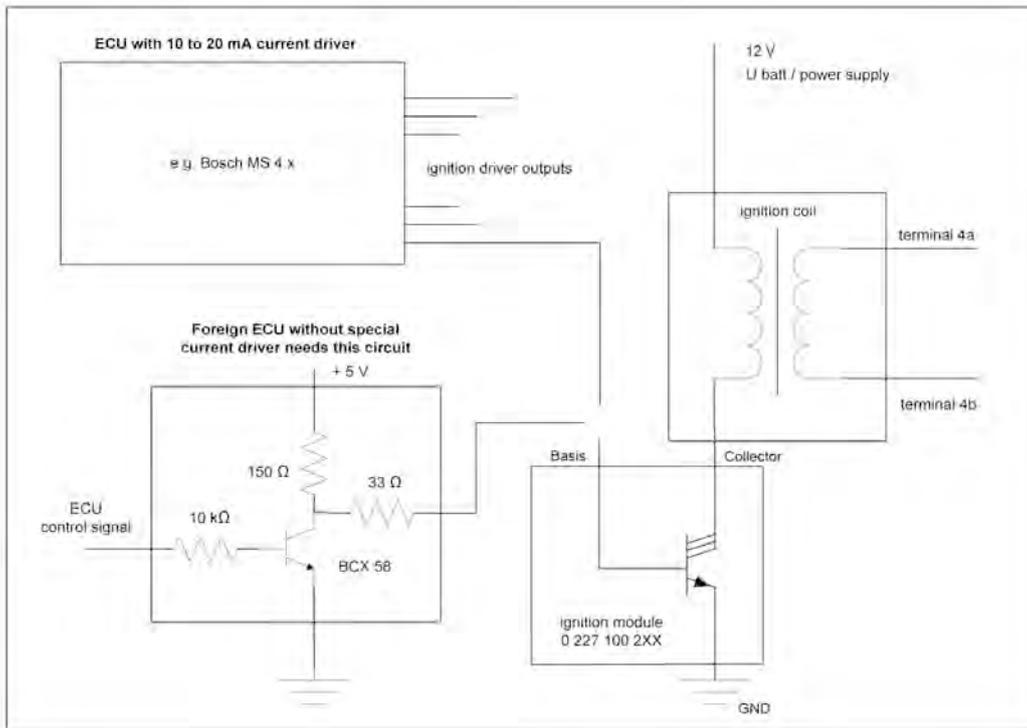
Ordering Information

Ignition Module IM 4

Order number **0 227 100 211**

Dimensions

2



Injection Valve EV 6



Features

- ▶ Single beam or twin beam
- ▶ Flow rate at 3 bar: up to 962 cm³/min
- ▶ 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.

Application

Fuel Filter Requirements

Particle size	≥ 5 μm
Max. particle size	35 μm
Separation rate	≥ 82 %

Technical Specifications

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 ³ /min 92 to 658 g/min
Spray angle α	15 to 70°
Bent angle γ	0 to 20°

Coil resistance	1.2 to 16 Ω
Fuel compatibility	E85 / M100 (after Methanol-operating the valves must be flushed with normal gasoline-fuel)

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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Installation Notes

Please ask for more information before ordering.

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

Ordering Information

EV 6 CS, 116 g/min n-heptane

Order number **0 280 156 194**

EV 6 CL, 261 g/min n-heptane

Order number **0 280 155 868**

EV 6 EL, 261 g/min n-heptane

Order number **0 280 155 830**

EV 6 ES, 269 g/min n-heptane

Order number **0 280 156 063**

EV 6 CS, 310 g/min n-heptane

Order number **0 280 156 012**

EV 6 CS, 658 g/min n-heptane

Order number **B 280 434 499-02**

Accessories

Clip for locking bush of plastic

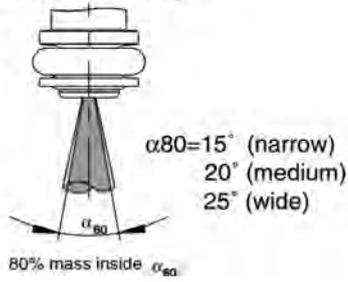
Order number **2 431 314 004**

Clip for locking bush of steel

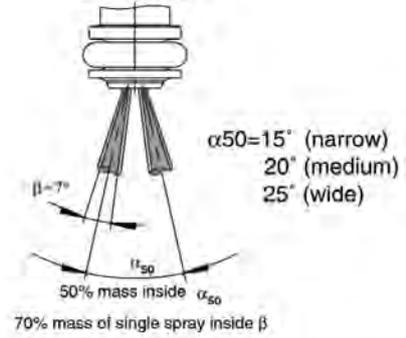
Order number **2 431 314 011**

Dimensions

C: Conical Spray

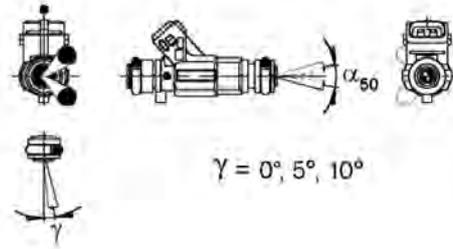
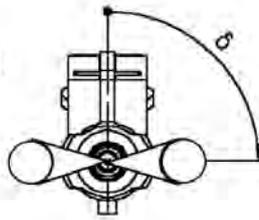


E: 2-Spray

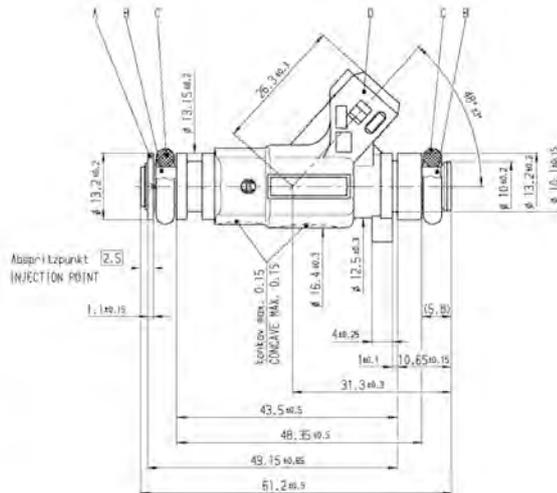
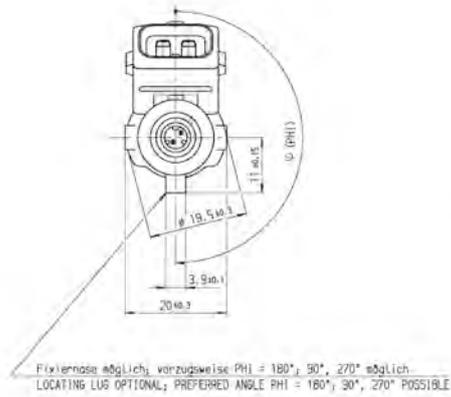


Angle between connection and spray level ($\delta = \text{delta}$):
 (only 2-spray preparation)

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

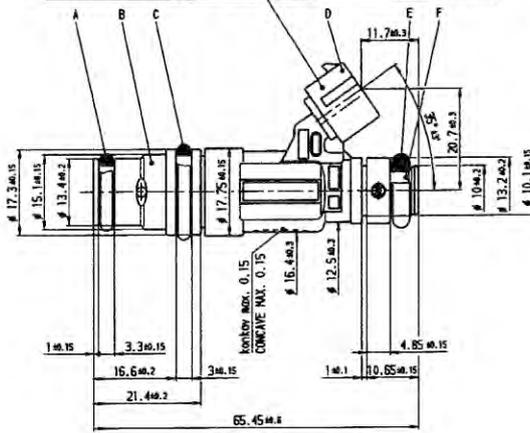


Spray Illustrations

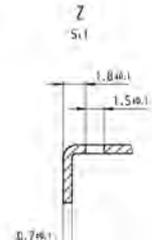
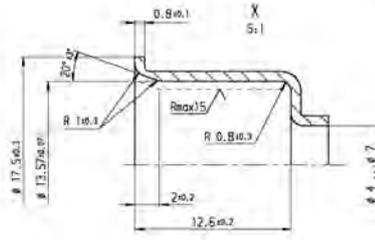
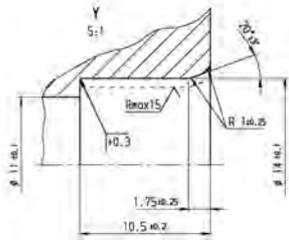


EV6 Standard

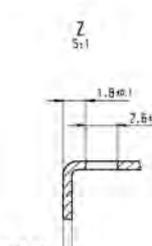
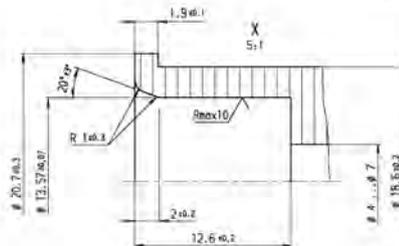
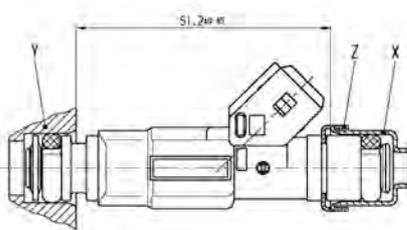
Steckanschluß nach Zeichnung TAB 003 924 Q Blatt 2 Aufw. E vom 21.03.01
 CONNECTOR ACCORDING TO DRAWING TAB 003 924 Q SHEET 2 VERSION E FROM 21.03.01



EV6 Long



Version mit Stahl-Tasse
 VERSION WITH STEEL-CUP



Version mit Kunststoff-Tasse
 VERSION WITH PLASTIC-CUP

Mounting Instructions

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 ³	261 g/382 cm ³	261 g/382 cm ³	269 g/393 cm ³	310 g/453 cm ³
Type	C	C	E	E	C
Housing	S	L	L	L	S
α_{80}	15°	15°	20°	15°	20°
γ	0°	0°	0°	10°	5°
δ	-	-	90°	270°	90°
Resistance	14.5 Ω	12 Ω	12 Ω	12 Ω	12 Ω

Further variations are available on request

Variation of Motorsport valves

Part Nr.	B 280 434 499-02
Flow rate/min	658 g/962 cm ³
Type	C
Housing	S
α_{80}	25°
γ	0°
δ	-
Resistance	12 Ω

Further variations are available on request.

Injection Valve EV 12



Features

- ▶ Single beam or twin beam
- ▶ Flow rate at 3 bar: up to 1,023 cm³/min
- ▶ Spray angle 5 to 60°
- ▶ With extension

EV 12 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. 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 ³ /min 59 to 670 g/min
Spray angle α	5 to 60°
Bent angle γ	0 to 17°
Coil resistance	11 to 16 Ω
Fuel compatibility	E85 / M100 (after Methanol-operating the valves must be flushed with normal gasoline-fuel)

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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Installation Notes

Please ask for more information before ordering.

Ordering Information

EV 12 ES, 120 g/min n-heptane
Order number **0 280 157 002**

EV 12 ES, 193 g/min n-heptane
Order number **0 280 157 012**

EV 12 ES, 217 g/min n-heptane
Order number **0 280 155 897**

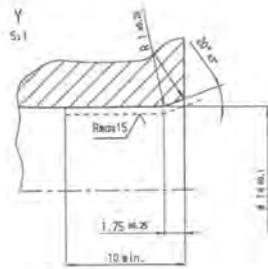
EV 12 ES, 269 g/min n-heptane
Order number **0 280 155 892**

EV 12 ES, 310 g/min n-heptane
Order number **0 280 157 000**

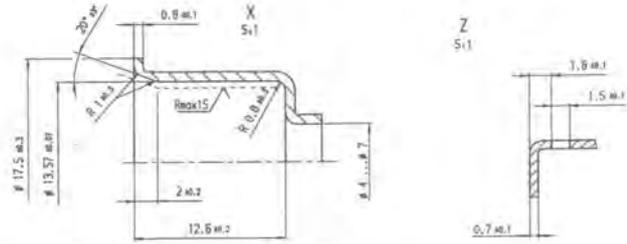
Accessories

Clip for locking bush of plastic
Order number **2 431 314 004**

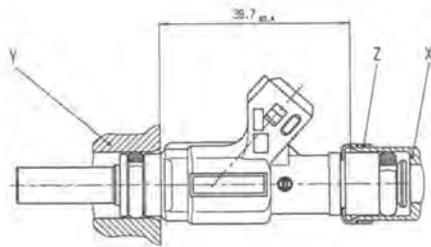
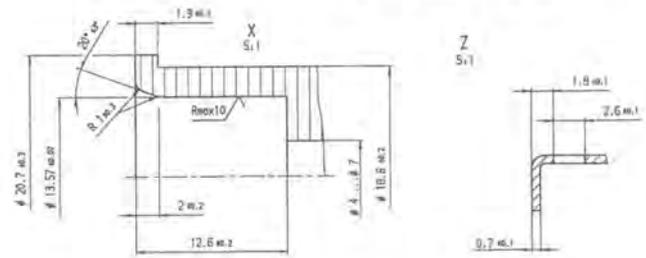
Clip for locking bush of steel
Order number **2 431 314 011**



Version mit Stahl-Tasse
VERSION WITH STEEL-CUP



Version mit Kunststoff-Tasse
VERSION WITH PLASTIC-CUP



Mounting Instructions

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 ³	193 g/282 cm ³	217 g/317 cm ³	269 g/393 cm ³	310 g/453 cm ³
Type	E	E	E	E	E
Housing	S	S	S	S	S
α	15°	15°	15°	15°	15°
γ	10°	10°	10°	10°	10°
δ	270°	270°	270°	270°	270°
Resistance	12 Ω				

Further variations are available on request.

Injection Valve EV 14



Features

- ▶ Conical spray or 2-spray
- ▶ Flow rate at 3 bar: up to 1,023 cm³/min
- ▶ 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 xT are the latest revision of the EV 12.

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 ³ /min 100 to 700 g/min
Spray angle α	15 to 85°
Bent angle γ	0 to 15°
Coil resistance	12 Ω
Fuel compatibility	E85 / M100 (after Methanol-operating the valves must be flushed with normal gasoline-fuel)

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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Installation Notes

Please ask for more information before ordering.

Ordering Information

EV 14 CL, 116 g/min n-heptane

Order number **0 280 158 110**

EV 14 ES, 116 g/min n-heptane

Order number **0 280 158 200**

EV 14 CL, 150 g/min n-heptane

Order number **0 280 158 107**

EV 14 ES, 150 g/min n-heptane

Order number **0 280 158 013**

EV 14 CKxT, 237 g/min n-heptane

Order number **0 280 158 038**

EV 14 EL, 237 g/min n-heptane

Order number **0 280 158 116**

EV 14 CS, 387 g/min n-heptane

Order number **B 280 436 038-09**

EV 14 CS, 387 g/min n-heptane

Order number **B 280 436 038-10**

EV 14 ESxT, 429 g/min n-heptane

Order number **0 280 158 123**

EV 14 CS, 503 g/min n-heptane

Order number **B 280 436 038-08**

EV 14 CKxT, 670 g/min n-heptane

Order number **0 280 158 040**

Accessories

Clip for locking bush of plastic

Order number **2 431 314 021**

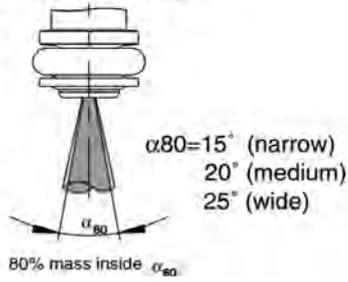
Clip for locking bush of steel

Order number **2 431 314 018**

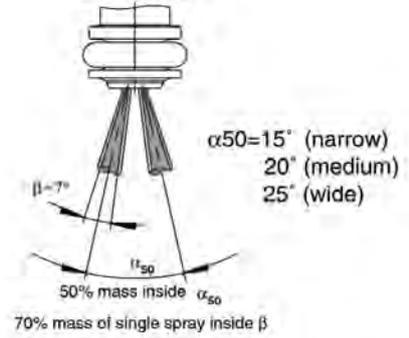
Dimensions

2

C: Conical Spray

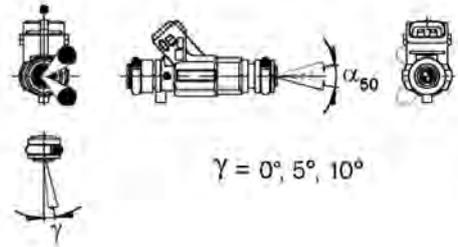
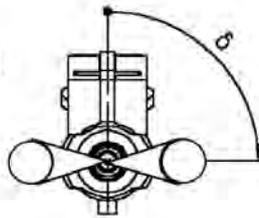


E: 2-Spray

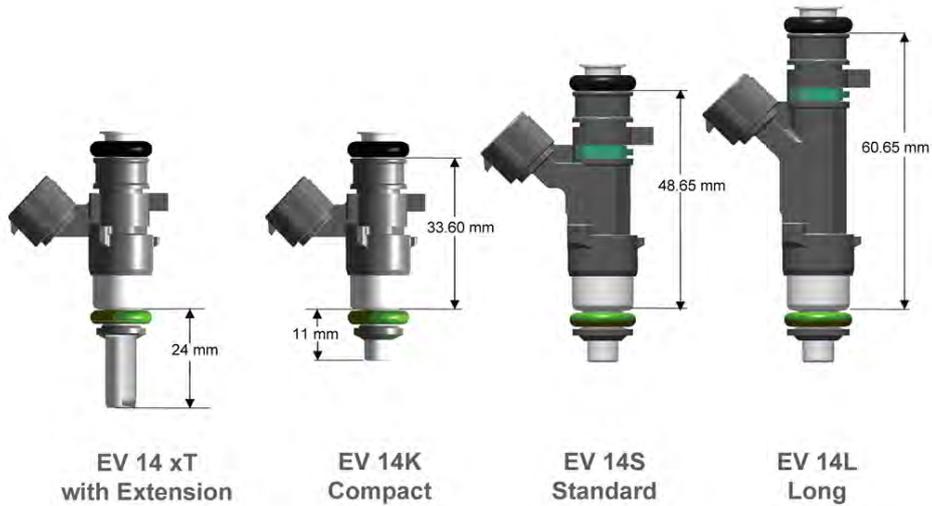


Angle between connection and spray level ($\delta = \text{delta}$):
(only 2-spray preparation)

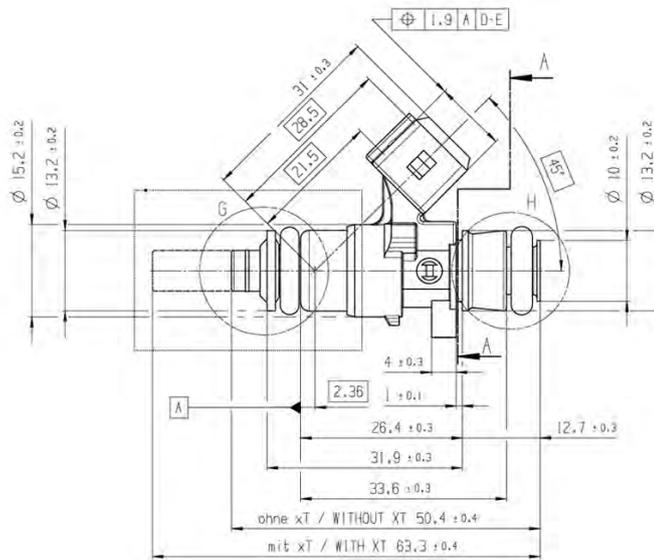
$\delta = 0^\circ - 360^\circ$ possible



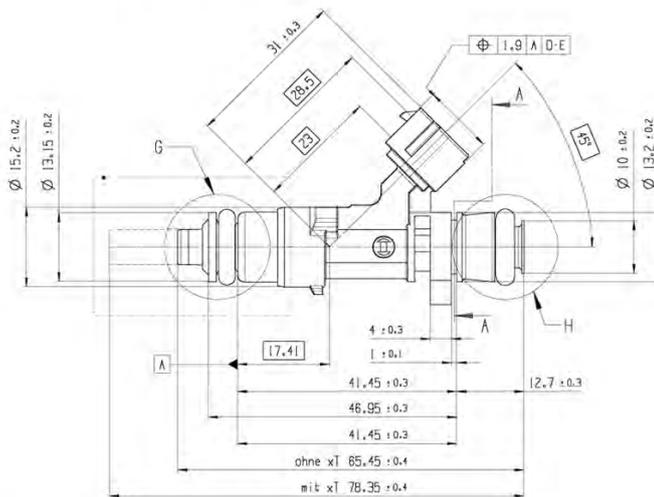
Spray Illustrations



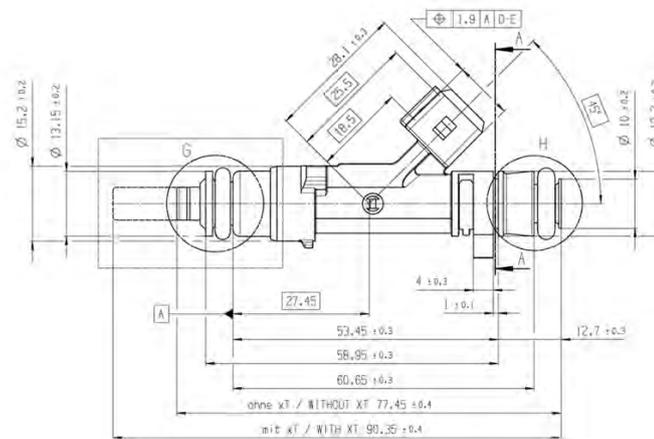
Housing Variations



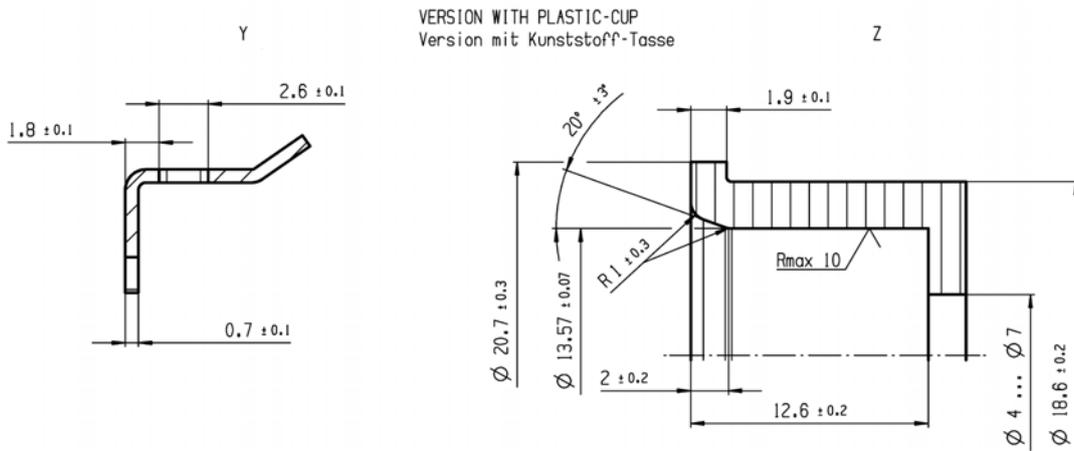
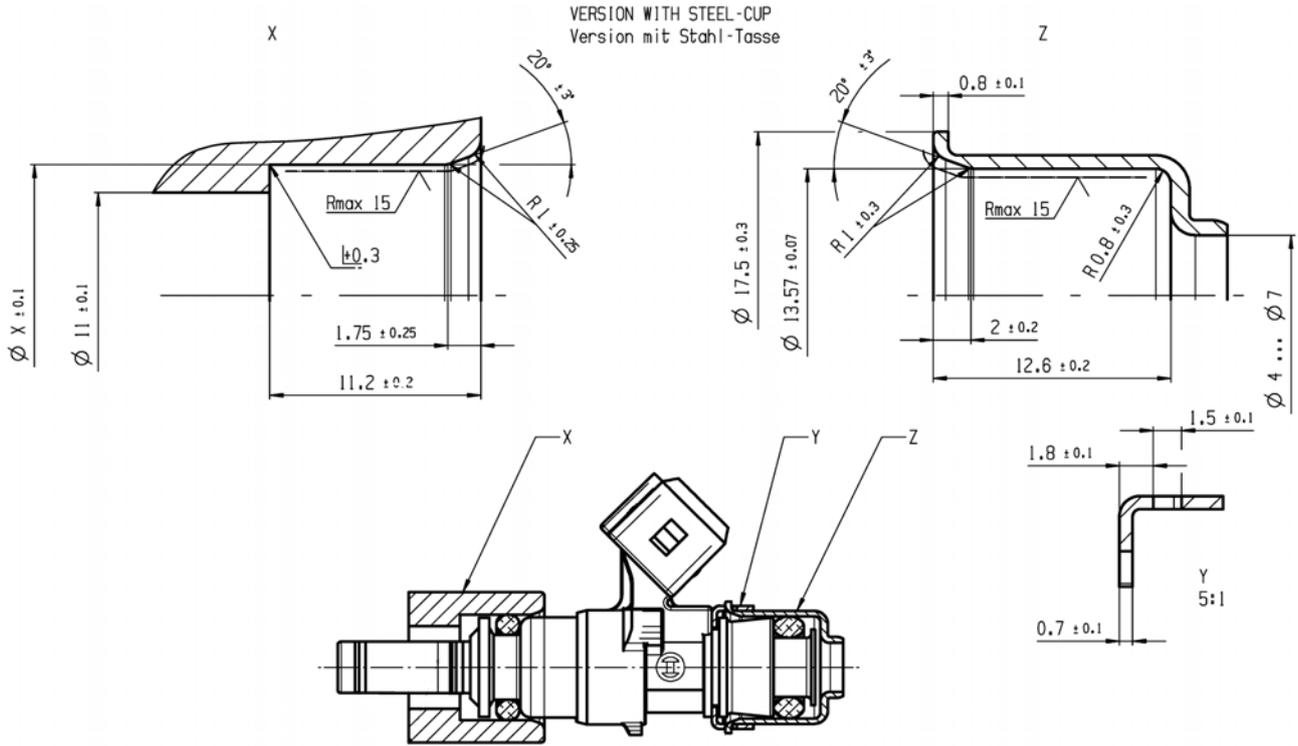
EV 14 Compact



EV 14 Standard



EV 14 Long



Mounting Instructions

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 ³	116 g/170 cm ³	150 g/219 cm ³	150 g/219 cm ³	237 g/347 cm ³
Type	C	E	C	E	C
Housing	L	S	L	S	KxT
α	15°	15°	20°	19°	20°
γ	0°	0°	0°	0°	0°
δ	0°	90°	0°	90°	0°
Resistance	12 Ω				

Part Nr.	0 280 158 116	0 280 158 123	0 280 158 040
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Flow rate/min	237 g/347 cm ³	429 g/627 cm ³	670 g/980 cm ³
Type	E	E	C
Housing	L	SxT	KxT
α	22°	25°	30°
γ	5°	0°	0°
δ	90°	90°	0°
Resistance	12 Ω	12 Ω	12 Ω

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 ³	503 g/736 cm ³	387 g/566 cm ³	387 g/566 cm ³	697 g/1,019 cm ³
Type	C	C	C	C	E
Housing	S	S	S	S	S
α	70°	25°	70°	25°	20°
γ	0°	0°	0°	0°	0°
δ	-	-	-	-	90°
Resistance	12 Ω				

Further variations are available on request.

Injection Valve EV 14i

(after Methanol-operating, the valves must be flushed with normal gasoline-fuel)



2

Features

- ▶ Flow rate at 3 bar: up to 1,023 cm³/min
- ▶ Spray angle 15 to 85°
- ▶ Extremely small housing
- ▶ Very low weight
- ▶ Special development for motorsports

EV 14i injection valves are the smallest Bosch low pressure injection valves and especially developed for motorsports 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 ³ /min Max. 700 g/min
Spray angle α	15 to 85°
Bent angle γ	0 to 15°
Coil resistance	12 Ω
Fuel compatibility	E85 / M100

Electrical Data

Power supply 6 to 16.5 V

Connectors and Wires

Connectors Div. motorsports connectors

Installation Notes

Injection Valves EV 14i are manufactured on order only and are not on stock. The minimum purchase quantity is 25 pieces per variation.

Please ask for more information before ordering.

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

Ordering Information

EV 14i Ci, 213 g/min n-heptane

Order number **B 280 436 323-03**

EV 14i EixT, 261 g/min n-heptane

Order number **B 280 436 548-01**

EV 14i Ci, 263 g/min n-heptane

Order number **B 280 436 270-03**

EV 14i Ci, 310 g/min n-heptane

Order number **B 280 436 470-01**

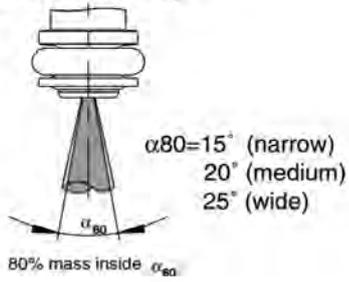
Accessories

Extended tip

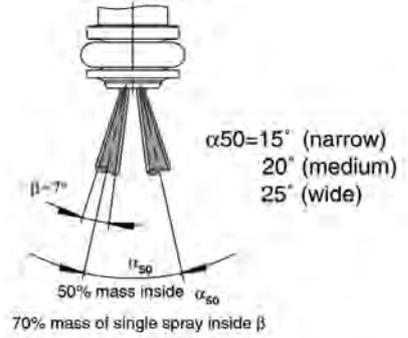
Order number **on request**

Dimensions

C: Conical Spray

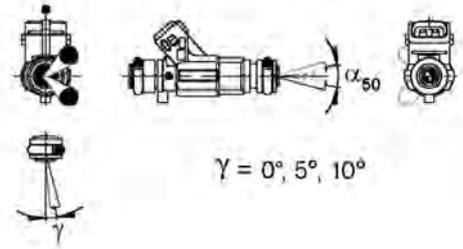
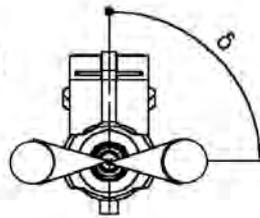


E: 2-Spray

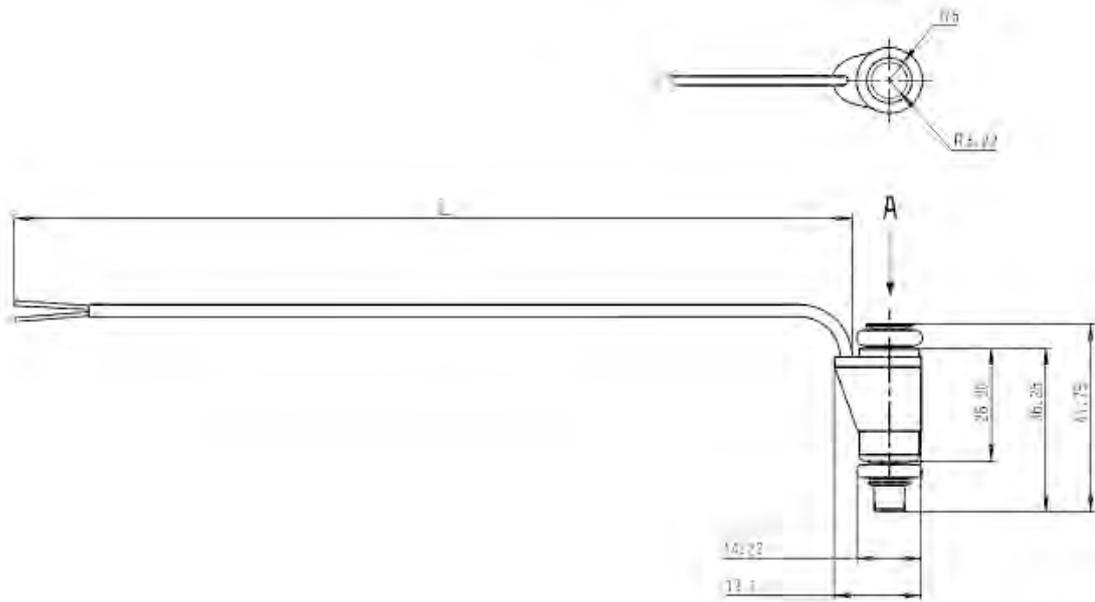


Angle between connection and spray level ($\delta = \text{delta}$):
(only 2-spray preparation)

$\delta = 0^\circ - 360^\circ$ 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	B 280 436 470-01
Flow rate/min	213 g/311 cm ³	263 g/385 cm ³	261 g/382 cm ³	310 g/453 cm ³
Type	C	C	E	C
Housing	i	i	ixT	i
α	85°	25°	20°	50°
γ	0°	0°	15°	0°
δ	0°	0°	90°	0°
Resistance	12 Ω	12 Ω	12 Ω	12 Ω

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 cm³/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 ²

Technical Specifications

Mechanical Data

Weight w/o wire	68 g
Diameter	20.7 mm
Length	87 mm
Flow rate at 100 bar (n-heptane)	up to 1,500 cm ³ /min
Number of holes	4 to 7 holes (typical)
Spray type	Multi hole
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 ³ /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.

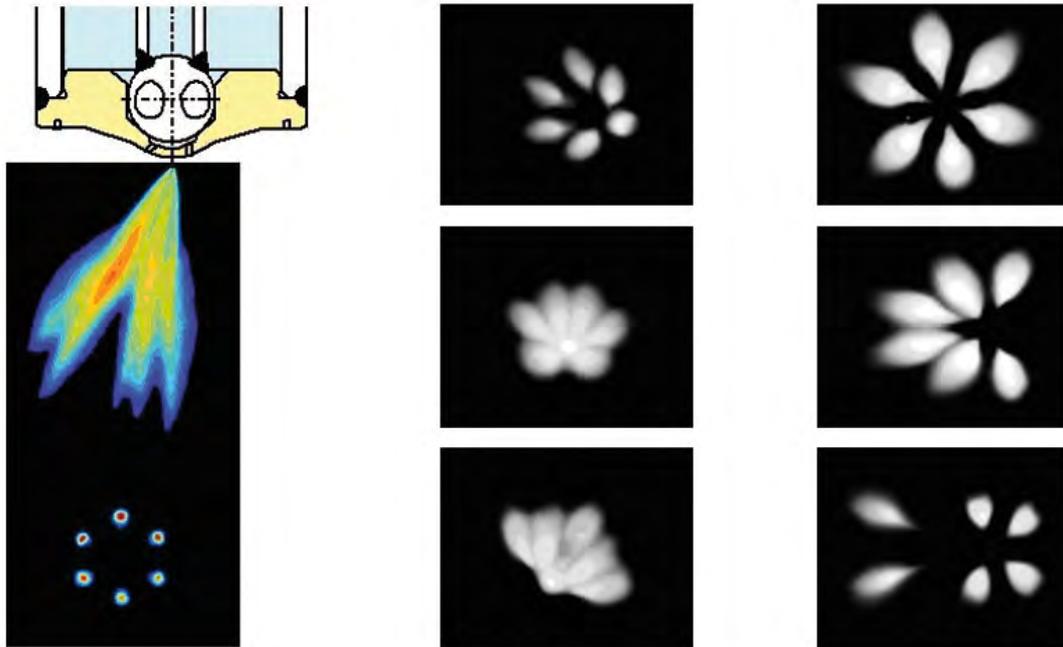
Do not use supersonic cleaning.

Ordering Information

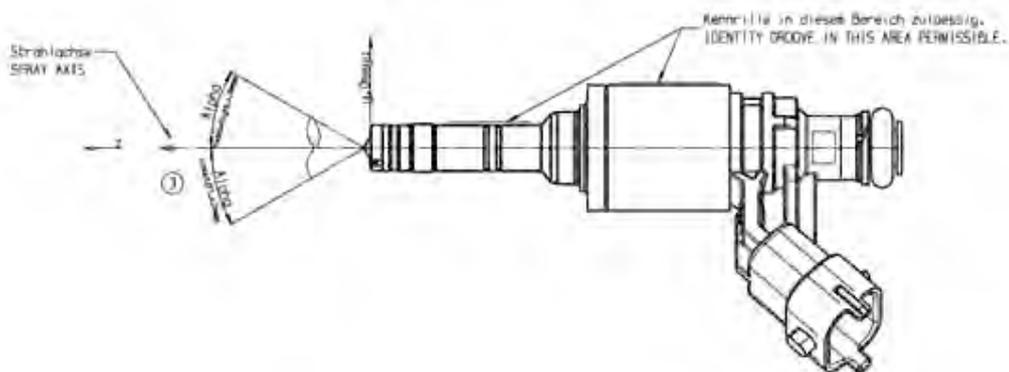
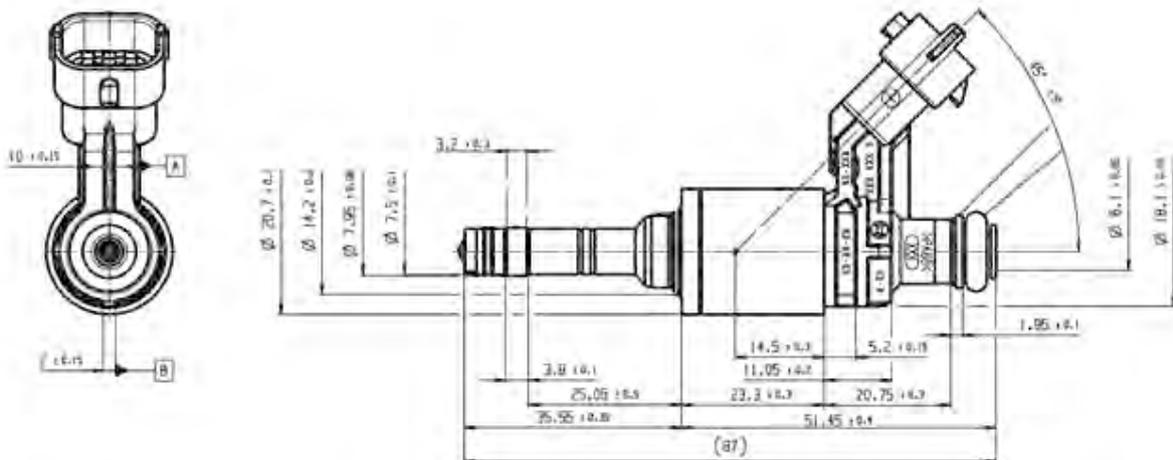
HP Injection Valve HDEV 5.2
Order number **on request**

Dimensions

2



Spray variations, further variations on request



HP Injection Valve HDEV 5.2 LC



Features

- ▶ Max. 200 bar
- ▶ Multi hole
- ▶ Flow rate at 100 bar: up to 1,500 cm³/min (n-heptane)
- ▶ Spray angle 8 to 20°

The HDEV 5.2 LC 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 LC 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 LC 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 ²

Technical Specifications

Mechanical Data

Weight w/o wire	221.5 g
Diameter	20.7 mm
Length	185 mm
Flow rate at 100 bar (n-heptane)	Up to 1,500 cm ³ /min
Number of holes	4 to 7 holes (typical)
Spray type	Multi hole
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 ³ /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	On request
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.

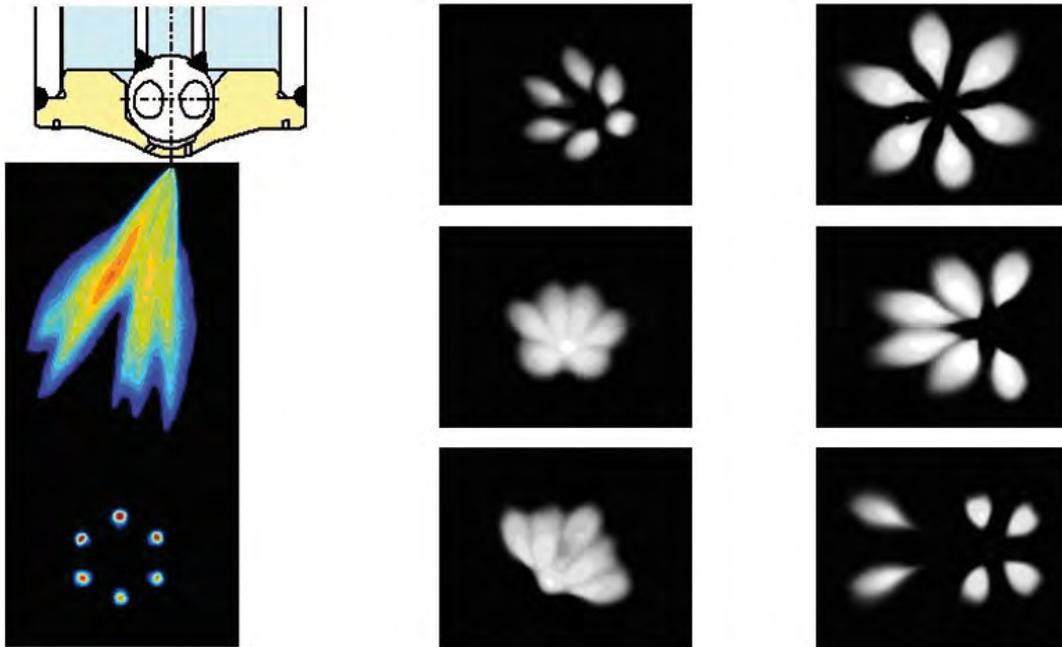
Do not use supersonic cleaning.

Ordering Information

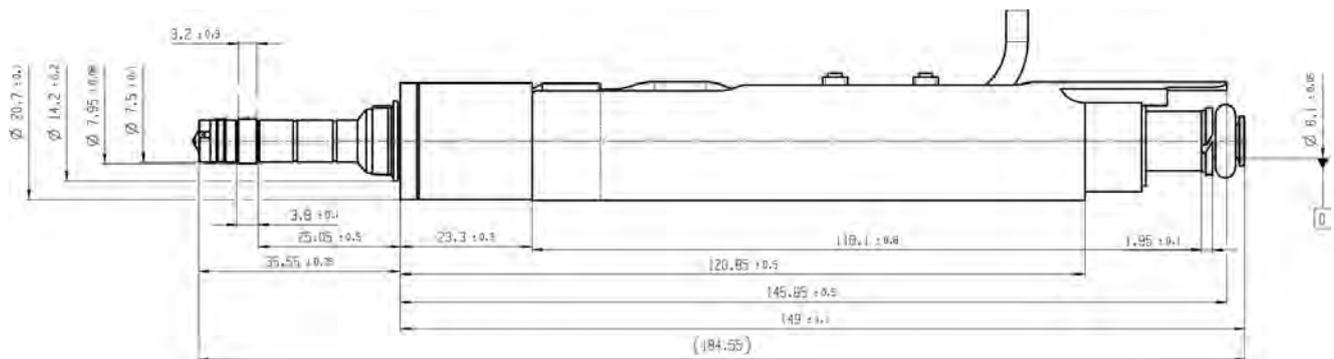
HP Injection Valve HDEV 5.2 LC
Order number **on request**

Dimensions

2



Spray variations, further variations on request



03 Alternators and Starters

3

Alternators 176

Starters 188

Alternator 90 A



3

Features

- ▶ 5,400 g
- ▶ 90 A
- ▶ Clockwise rotation
- ▶ Special light weight aluminum pulley available

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

Application

Temperature range	-10 to 90°C
Vibration protection	high
Installation without rubber mounting.	

Technical Specifications

Mechanical Data

Case material	aluminum
Weight	5,400 g
Current regulator unit	integrated
Rotation	Clockwise
Max. rotations	18,000 x 1/min
Diameter	108 mm
Length without shaft stub	128 mm
Distance between mounting points	154 mm

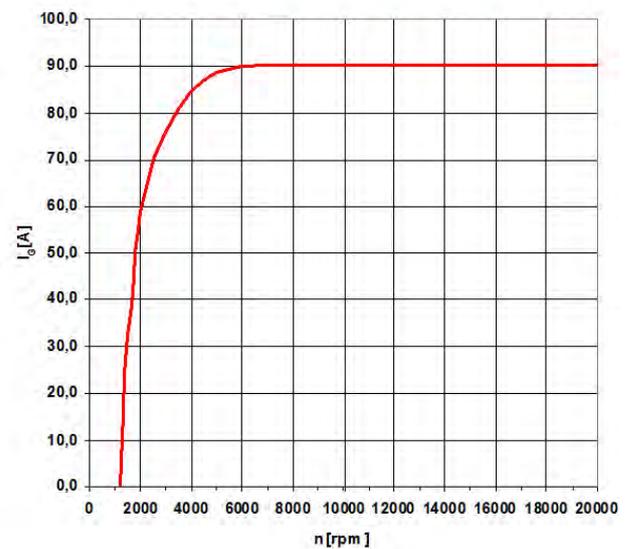
Electrical Data

Rated current	90 A
Output voltage	14 V

Cut-in speed	1,300 x 1/min
Coupling	screws

Characteristic 110 A

Rpm [1/min]	I_G [A] at 25°C
1,000	0
1,300	15.5
1,500	32.5
1,700	44.8
2,000	58.5
3,000	76.0
4,000	85.0
5,000	88.5
6,000	90.0
7,000	90.3
8,000	90.5
9,000	90.5
10,000	90.5
15,000	90.5
20,000	90.5

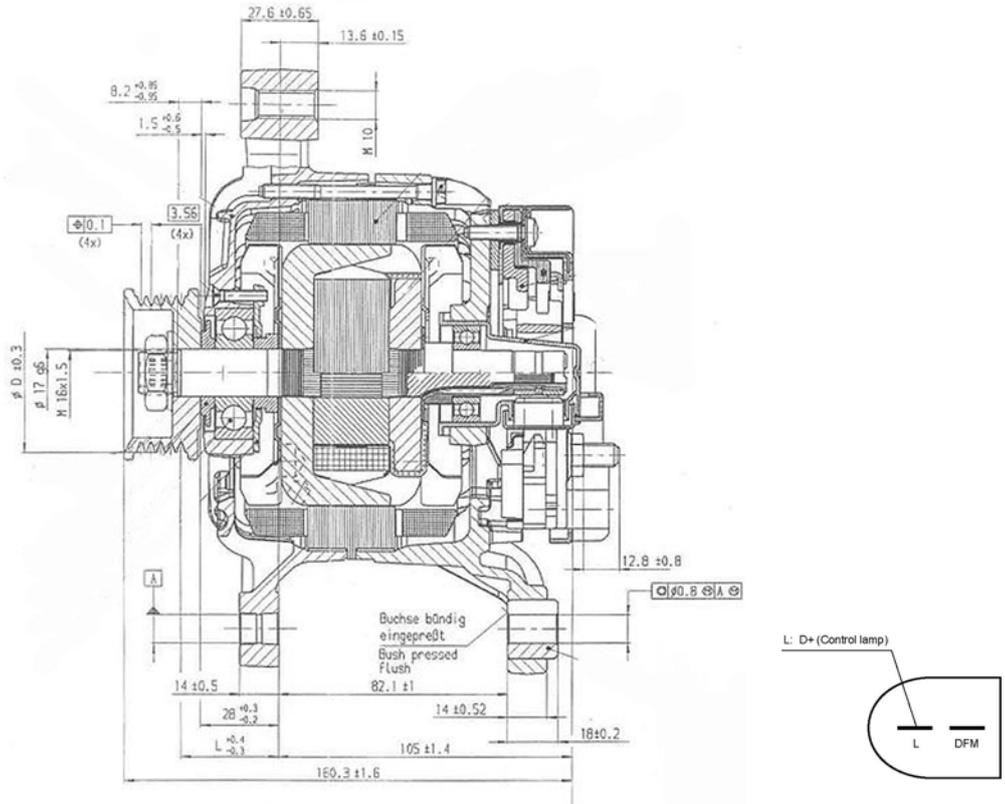


Ordering Information

Alternator 90 A

Order number **0 124 B00 160-01**

Dimensions



Alternator B3



3

Features

- ▶ With multifunctional regulator
- ▶ 4,800 g
- ▶ 210 A *
- ▶ Clockwise rotation

The B3 is a powerful 12 V motorsport alternator. It has an optimized hand wound stator winding (3 phase triangle), high current diodes (special Zener diode chips from Bosch production to retain load-dumps) and an extra fine balanced rotor with double impregnated winding.

The multifunctional regulator (special Bosch developed ASIC) controls the alternator output voltage at 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 * at 10,000 rpm/90°C
Max. ambient temperature	105°C, high current only with supported cooling air
Max. ambient temperature (short-term)	120°C, high current only with supported cooling air
Rotating direction	Clockwise

Technical Specifications

Mechanical Data

Body material	Cast aluminum
Weight w/o pulley	4.8 kg
Max. rotations	18,000 x 1/min
Moment of inertia	22 kg*cm ²
Outer diameter w/o screw	136 mm

Length w/o pulley	117 mm
Battery B+ connection	M8x1.25
Tightening torque at B+	22 Nm

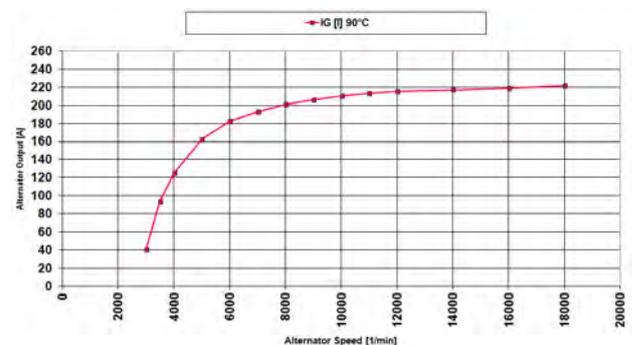
Electrical Data

Regulating voltage	14.2 V
Temperature compensation	-10 mV/K
High temperature cut off derating	-250 mV/K
Excitation resistor (L)	Internal (external on request)
Cut-in-speed	3,000 x 1/min

Characteristic

Rpm [1/min]	I _G [A] at 90°C
3,000	40
3,500	93
4,000	125
5,000	162
6,000	182
7,000	193
8,000	201
9,000	206
10,000	210
11,000	213
12,000	215
14,000	217
16,000	219
18,000	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 electrical resistance connection to vehicle ground.

Operating the alternator is only permitted with the installed regulator and a connected 12 V battery (Lithium battery not proved).

The excitation current can also be realized by an external lamp (on request).

Please find further application hints at our homepage.

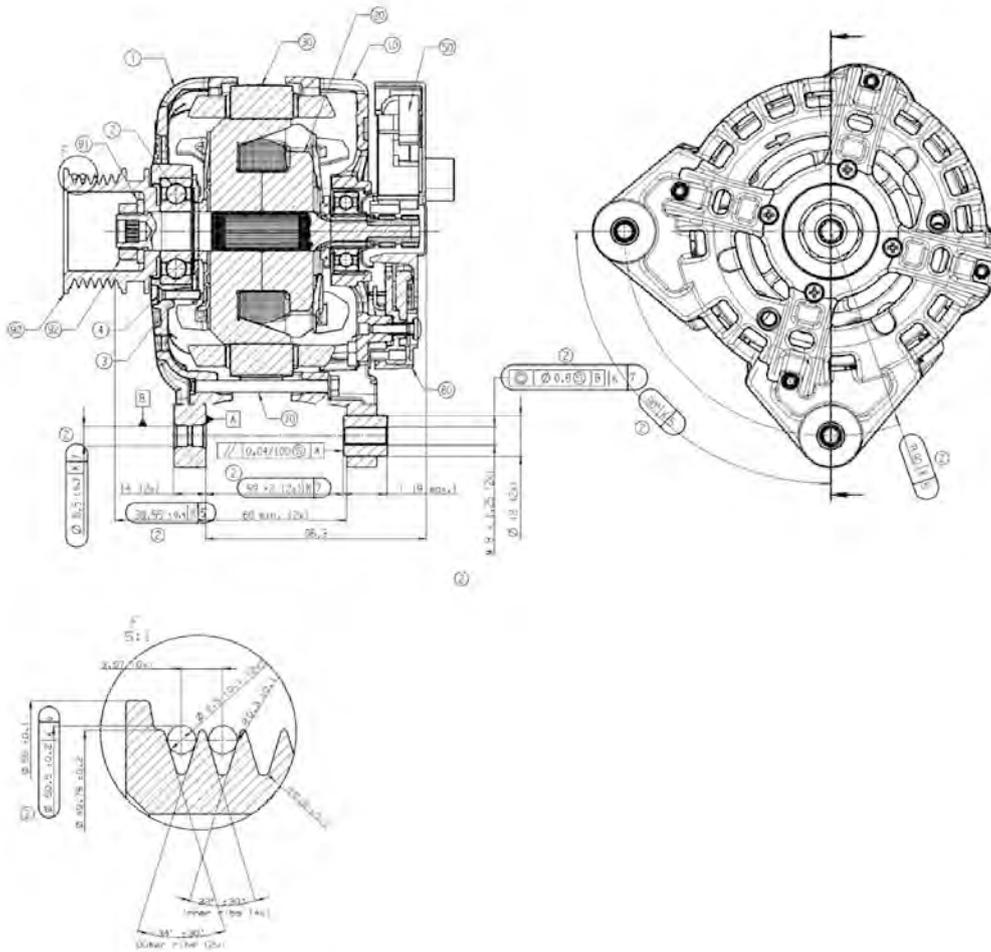
Rectifier diodes are designed and proved for B+ continuous output current of 210 A. The alternator is able to support more current, but this must be restricted for short time to prevent the destroying of rectifier diodes.

Ordering Information

Alternator B3

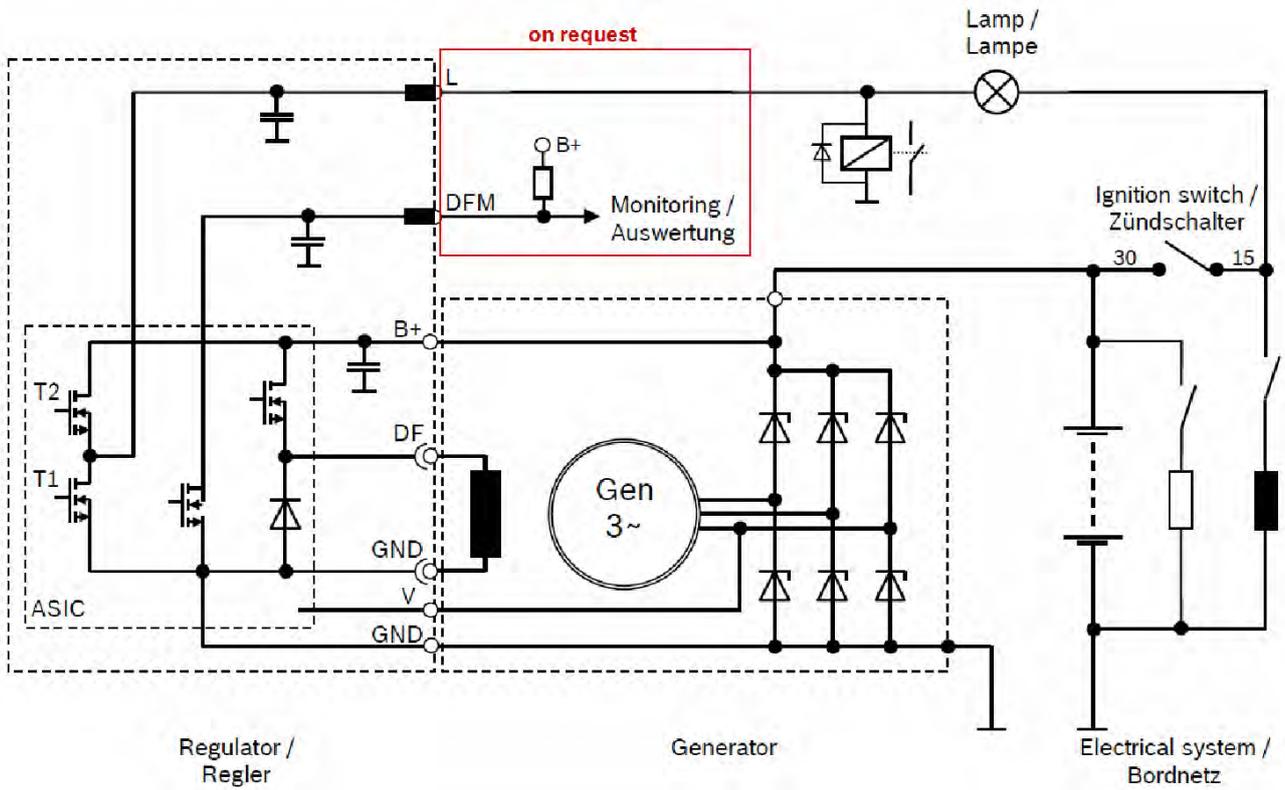
Order number **F 02U V00 646-01**

Dimensions



Principle wiring diagram of the system

Prinzipschaltbild des Systems



Alternator B3 LIN



Features

- ▶ Electrically and mechanically identical with B3
- ▶ Motorsports optimized LIN2.1 regulator with latest ASIC technology
- ▶ 4,800 g
- ▶ 210 A *
- ▶ Clockwise rotation

The B3 LIN is a powerful 12 V motorsport alternator. It has an optimized hand wound stator winding (3 phase triangle), high current diodes (special Zener diode chips from Bosch production to retain load-dumps) and an extra fine balanced rotor with double impregnated winding.

The LIN regulator (special Bosch developed ASIC) controls the alternator output voltage at 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 * at 10,000 rpm/90°C
Max. ambient temperature	105°C, high current only with supported cooling air
Max. ambient temperature (short-term)	120°C, high current only with supported cooling air
Rotating direction	Clockwise
Fixed frequency regulation with pulse width modulation	
Stand-by-mode	
Switching-on via LIN interface	
High side output stage with defined ramp steepness and FET as free-wheeling „diode“	
Emergency start and default mode	

Adjustable set values via LIN interface

Outputs of status information via LIN interface

Technical Specifications

Mechanical Data

Body material	Cast aluminum
Weight w/o pulley	4.8 kg
Max. rotations	18,000 x 1/min
Moment of inertia	22 kg*cm ²
Outer diameter w/o screw	136 mm
Length w/o pulley	117 mm
Battery B+ connection	M8x1.25
Tightening torque at B+	22 Nm

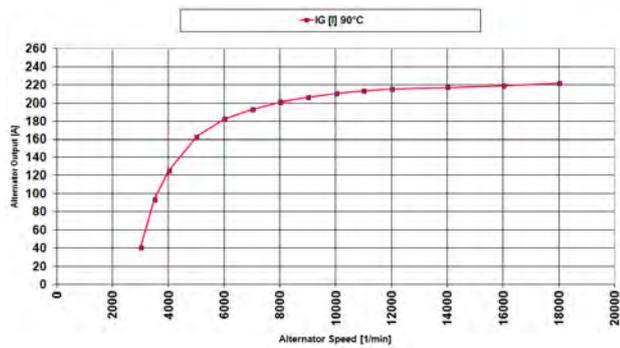
Electrical Data

Regulating voltage	14.2 V
Temperature compensation	-10 mV/K
High temperature cut off derating	-250 mV/K
Excitation resistor (L)	Internal (external on request)
Cut-in-speed	3,000 x 1/min

Characteristic

Rpm [1/min]	I _G [A] at 90°C
3,000	40
3,500	93
4,000	125
5,000	162
6,000	182
7,000	193
8,000	201
9,000	206
10,000	210
11,000	213
12,000	215
14,000	217
16,000	219
18,000	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 electrical resistance connection to vehicle ground.

Operating the alternator is only permitted with the installed regulator and a connected 12 V battery (Lithium battery not proved).

The excitation current can also be realized by an external lamp (on request).

Please find further application hints at our homepage.

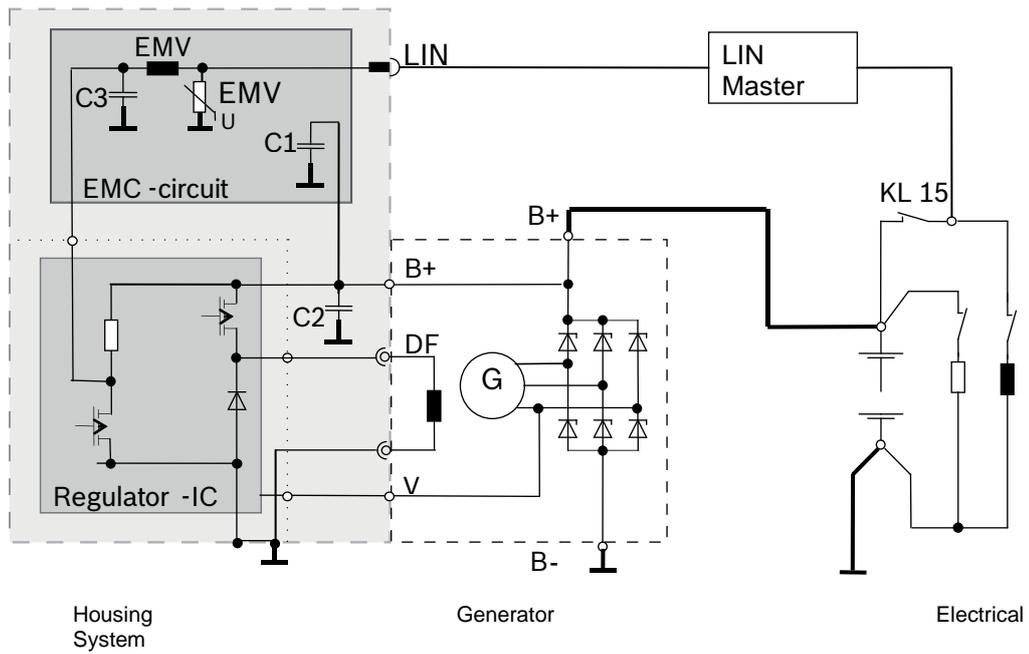
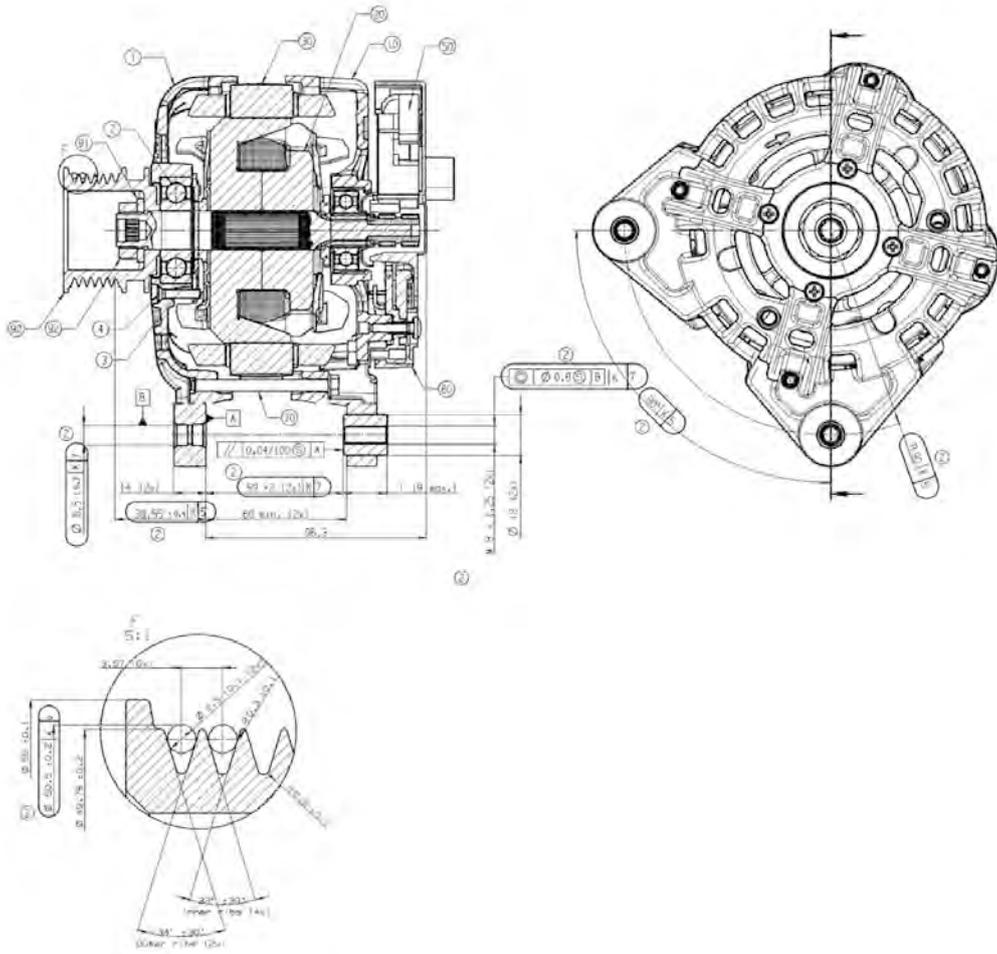
Rectifier diodes are designed and proved for B+ continuous output current of 210 A. The alternator is able to support more current, but this must be restricted for short time to prevent the destroying of rectifier diodes.

Ordering Information

Alternator B3 LIN

Order number **F 02U V01 188-04**

Dimensions



Schematic Diagram

Alternator GCM1



3

Features

- ▶ 3,400 g
- ▶ 110 to 140 A
- ▶ Clockwise or anticlockwise rotation
- ▶ Special light weight aluminum pulley available

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

Application

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

Technical Specifications

Mechanical Data

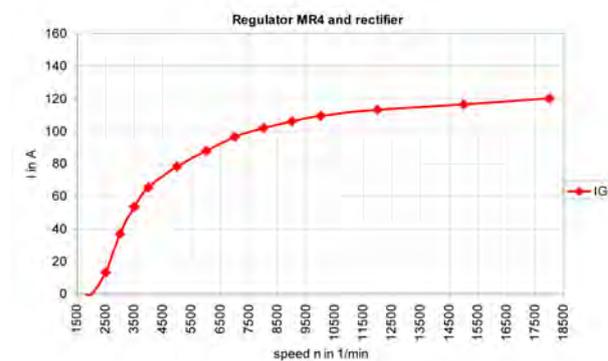
Case material	aluminum
Weight	3,400 g
Current regulator unit	integrated
Max. rotations	18,000 x 1/min
Diameter	108 mm
Length without shaft stub	128 mm
Distance between mounting points	154 mm

Electrical Data

Rated current	110/130/140 A
Output voltage	13.5 V
Cut-in speed	3,000 x 1/min
Coupling	screws
Battery B+	M6
Tightening torque at B+	14 Nm
Control lamp D+	flat-pin connector, see drawing
Internal D+ resistor	only GCM1 140 A Nascar

Characteristic 110 A

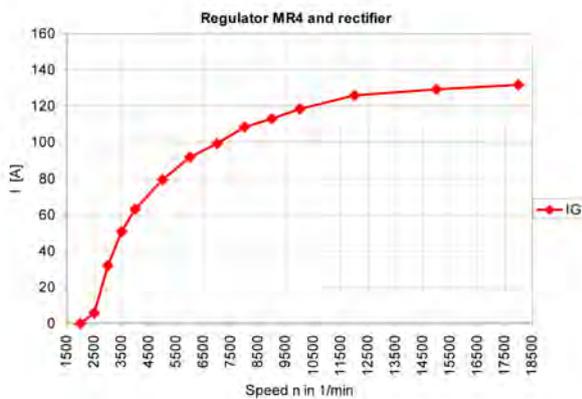
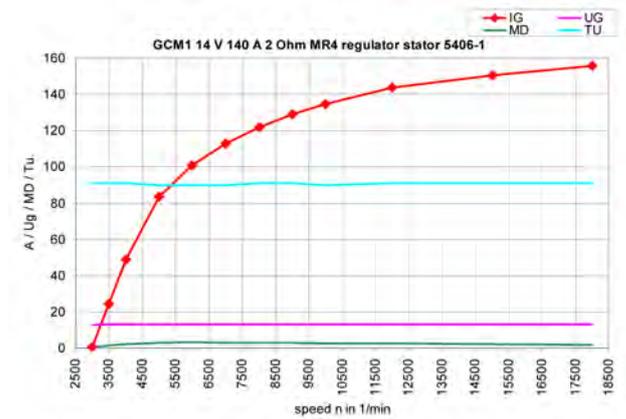
Rpm [1/min]	I_G [A] at 90°C
2,000	0
2,500	13
3,000	37
3,500	54
4,000	65
5,000	78
6,000	88
7,000	96
8,000	102
9,000	105
10,000	108
12,000	113
15,000	117
18,000	120



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 _g [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 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. The alternator fans are not able to generate negative pressure. It is possible to use external blower to support the alternator. Debris at alternator cooling area can reduce cooling effect. This could also shorten the alternator service life. Installation without rubber mounting.

Ordering Information

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

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

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

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

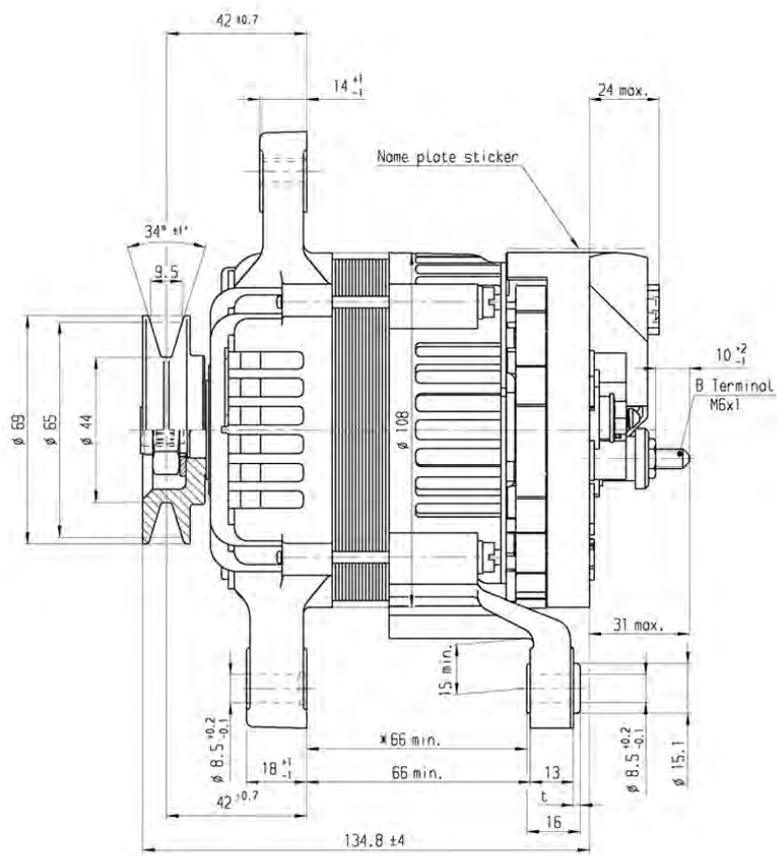
140 A anticlockwise rotation
Order number **F 01E B01 857-02**

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

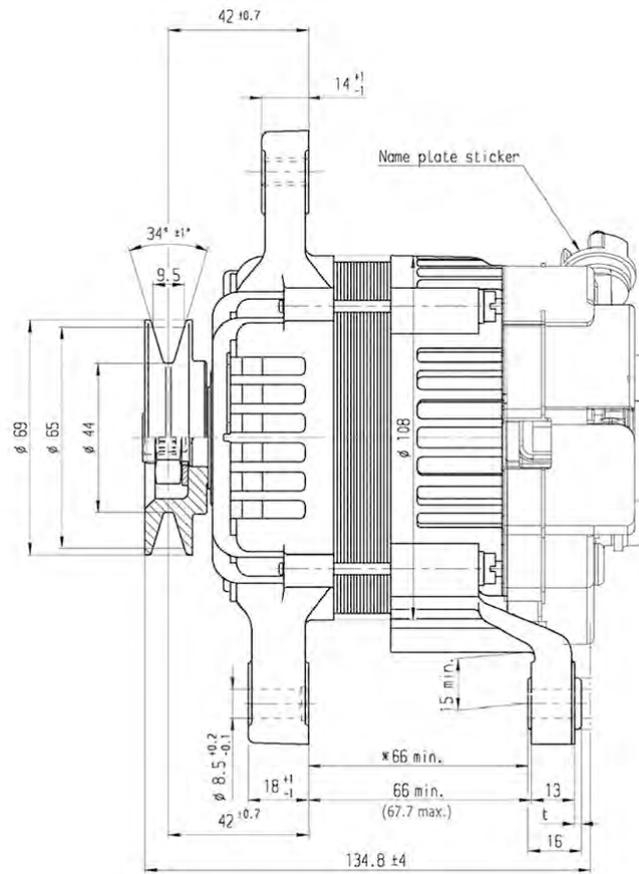
140 A Nascar clockwise rotation
Order number **F 02U V00 004-05**

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**

Starter 1.7 kW



3

Features

- ▶ 1.7 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	3,700 g
Revolutions	3,600 x 1/min
Module	2,11

Electrical Data

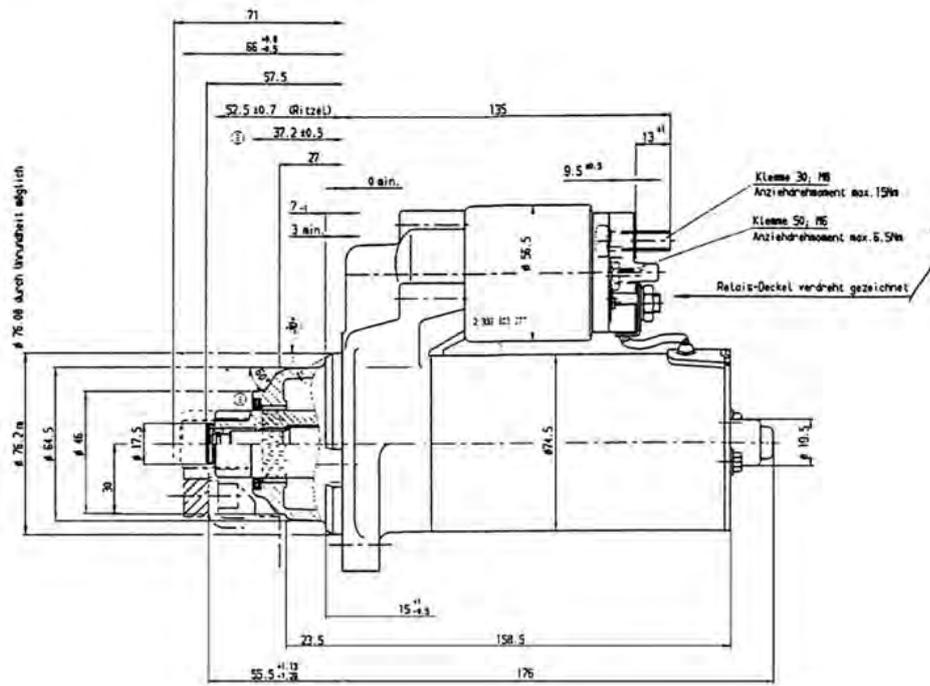
Performance	1.7 kW
-------------	--------

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

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
Module	2,11

Electrical Data

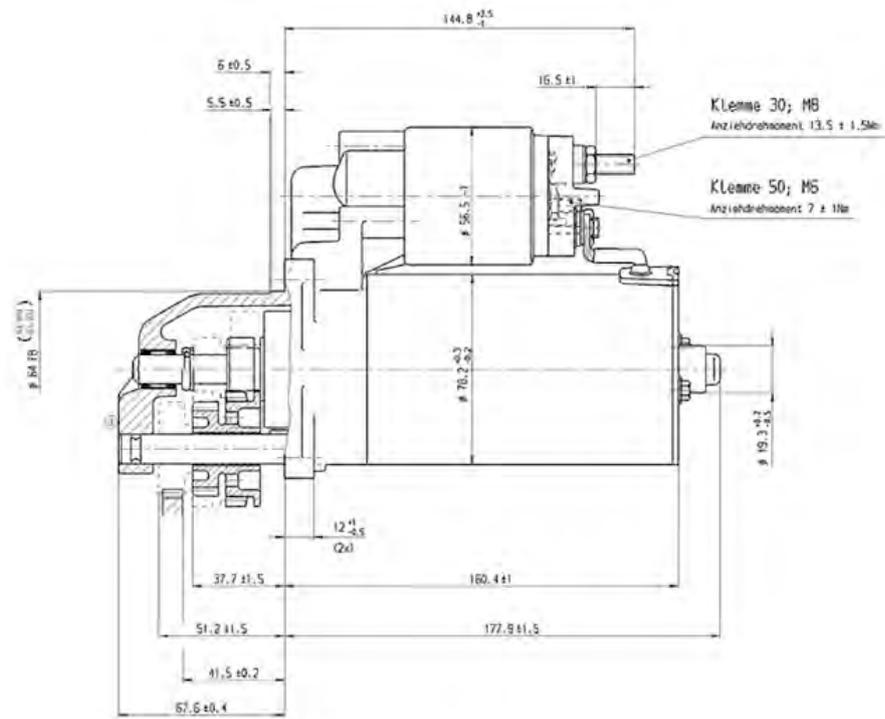
Performance	2.0 kW
-------------	--------

Ordering Information

Starter 2.0 kW

Order number **on request**

Dimensions



04 Sensors

4

Absolute Position Sensor	196
Current Sensor	198
Gear Shift Sensor	200
Knock Sensors	202
Lambda Sensors	206
Linear Potentiometers	218
Pressure Sensors Air	238
Pressure Sensors Fluid	254
Rotary Potentiometers	278
Speed Sensors	294
Temperature Sensors	323
Thermocouple Probes	344
Vehicle Dynamics Sensors	351
Wire Potentiometers	364

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 www.bosch-motorsport.com)

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	F 02U 000 207-01

Pin 1	U _s
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 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

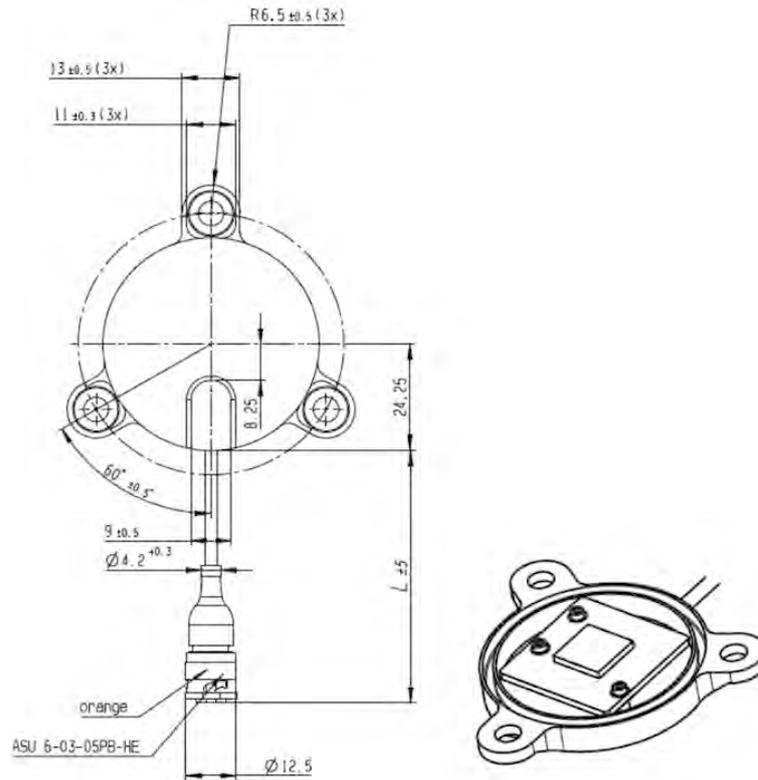
Communication link	CAN
Application tool	EM-C or RaceCon
Signal output	CAN

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



Current Sensor CS 240



4

Features

- ▶ Current measurement up to 240 A
- ▶ Single supply voltage
- ▶ Very good linearity
- ▶ No additional resistance inside the loom
- ▶ Low thermal offset and gain drift

This sensor is developed for DC and pulsed currents measurements. The advantage is the single power supply and no additional resistance.

Application

Application	Current 0 to 240 A [I_p]
Max. frequency	DC to 80 Hz at -3 db
Operating temperature range	-40 to 125°C
Storage temperature range	-40 to 125°C
Load resistance	>10 kΩ
Output type	Analog
Max. vibration	68 m/s ² at 5 to 200 Hz

Technical Specifications

Mechanical Data

Weight w/o wire	25 g
Bore diameter	19 mm / 15.5 mm
Installation length	37.5 mm
Mounting	Direct on the wire

Electrical Data

Power supply U_s	4.75 to 5.25 V
Max. power supply	8.5 V (14 V; 1 min at 25°C)

Max. continuous output current	10 mA
Typical output current	7.5 mA at 5 V

Characteristic

Sensitivity [G]	16.67 mV/A
Output drift vs. power supply	0.5 %
Power up time	25 to 110 ms
Resolution	2.5 mV at $U_s=5$ V
Output voltage	$V_{out}=U_s/5 \times (0.5 + G \times I_p)$; at U_s

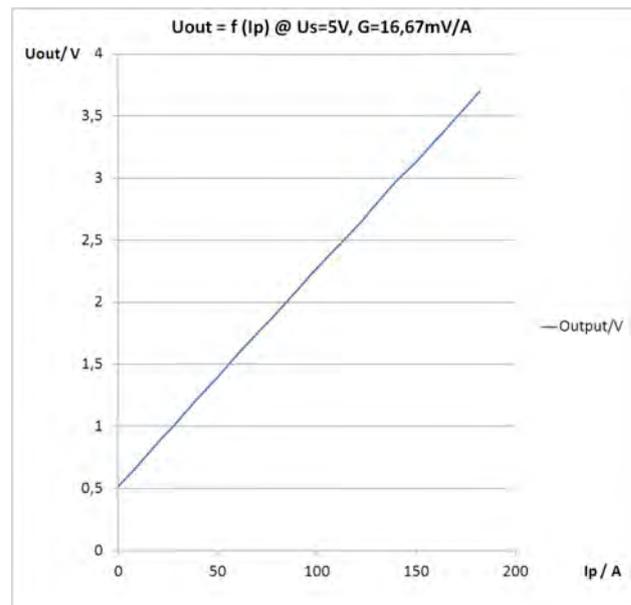
Connectors and Wires

Pin A/1 (red)	DC supply voltage
Pin B/2 (blue)	Ground
Pin C/3 (green)	Output signal
Mating connector kit Series type	F 02U B00 641-01

Various motorsport and automotive connectors available on request.

Please specify the required wire length with your order.

Output



Installation Notes

Application Notes

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

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

Current Sensor CS 240

Series type connector (no wire)
Order number **F 02U V01 311-01**

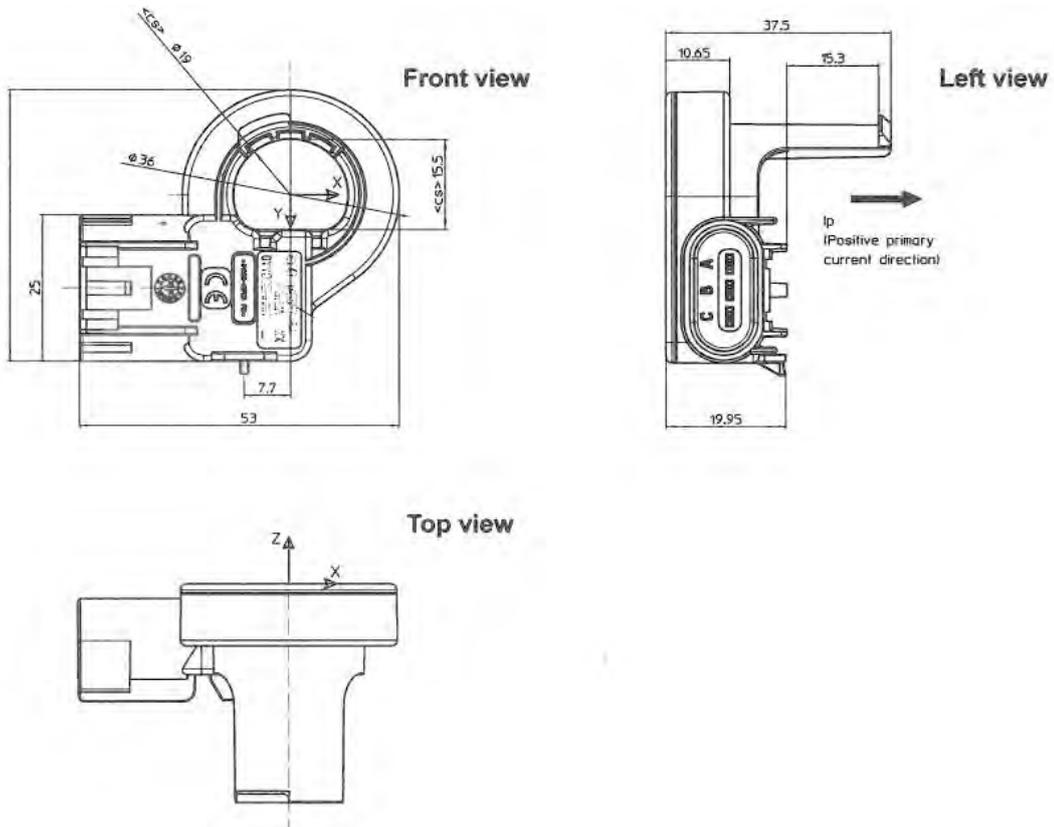
Current Sensor CS 240

With Connector ASL 6-06-05PN-HE
 Order number **F 02U V01 312-01**

Current Sensor CS 240

Open end (flying wires)
 Order number **F 02U V01 312-90**

Dimensions



Dimensions

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typ	Max	
Performance Data						
Global offset current	I_0	A		± 0.3		@ $T_A = 25^\circ\text{C}$
				± 0.5		@ $-20^\circ\text{C} < T^\circ < 65^\circ\text{C}$
				± 0.6		@ $-40^\circ\text{C} < T^\circ < 125^\circ\text{C}$
Sensitivity error	ϵ_G	%		± 0.8		@ $T_A = 25^\circ\text{C}$
				± 2		@ $-20^\circ\text{C} < T^\circ < 65^\circ\text{C}$
				± 4		@ $-40^\circ\text{C} < T^\circ < 125^\circ\text{C}$
Linearity error	ϵ_L	%		± 1		of full range, @ $T_A = 25^\circ\text{C}$

Accuracy

Gear Shift Sensor GSS-2



4

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 ² 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 _{max}	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	F 02U 000 228-01
ASL 0-06-05SC-HE	

Pin 1	U _s
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	Scr

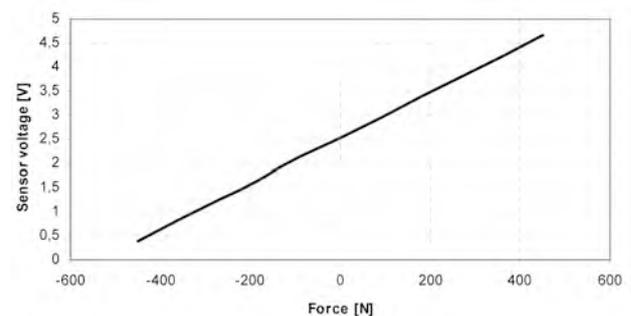
Various motorsport and automotive connectors are available on request.

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



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.

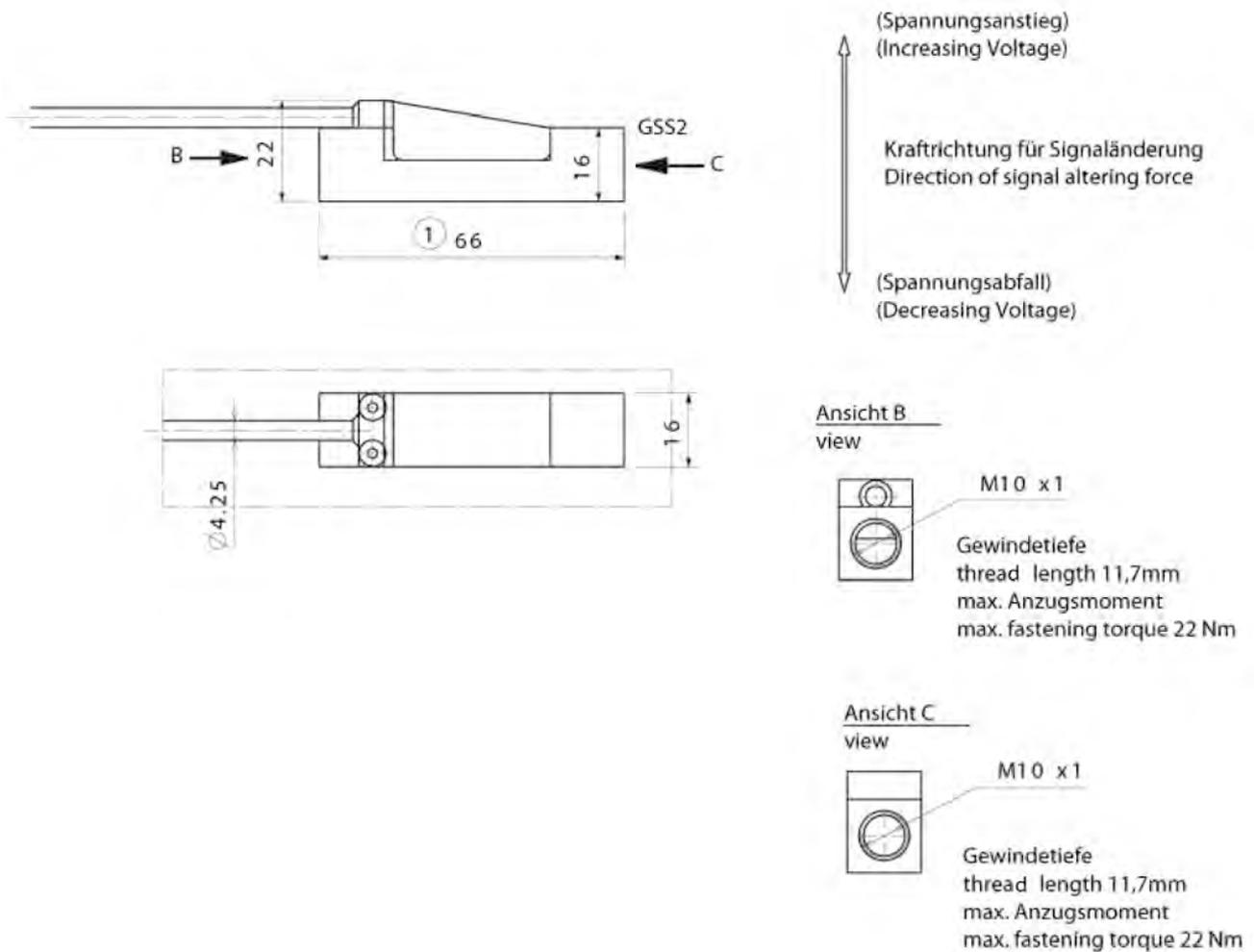
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Gear Shift Sensor GSS-2

Order number **B 261 209 227-01**

Dimensions



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 ²

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 (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	Y 280 A62 566A
Connector loom	D 261 205 337-01
Pin 1	Sig+
Pin 2	Sig-
Pin 3	Scr

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.

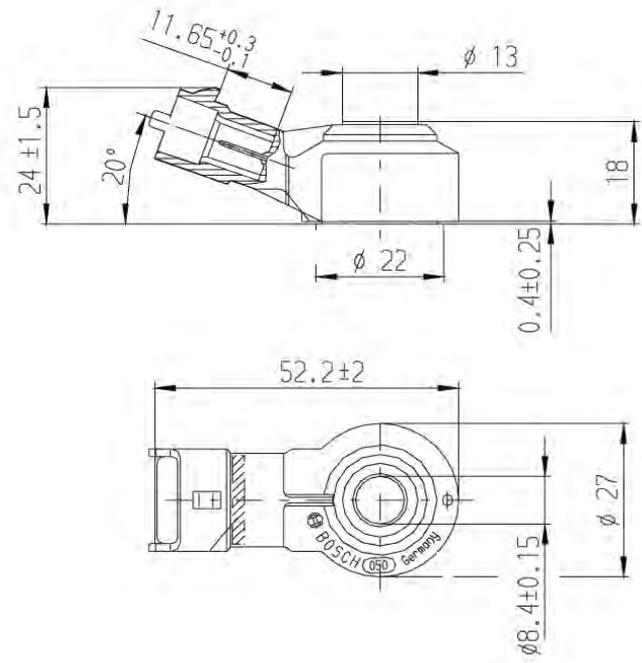
Please find further application hints in the offer drawing at our homepage.

Ordering Information

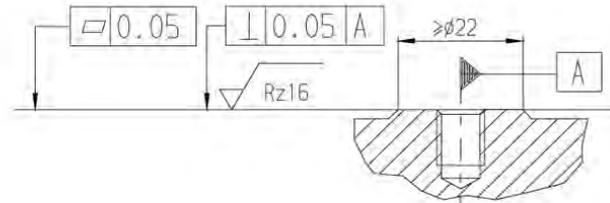
Knock Sensor KS-P

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 ²

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 3-pole Jetronic	D 261 205 289-01
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.

Installation Notes

The KS-R 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.

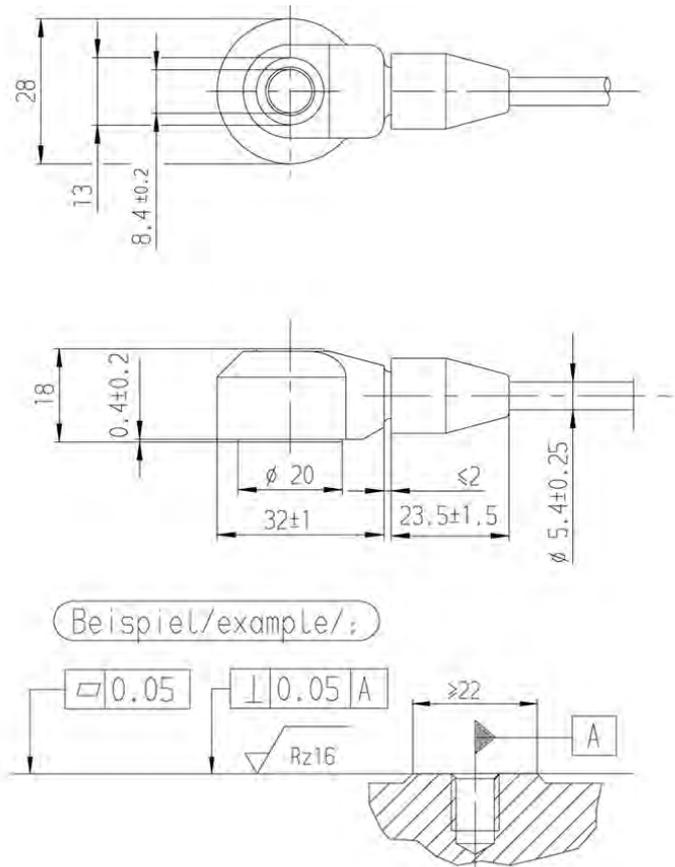
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Knock Sensor KS-R

Order number **0 261 231 047**

Dimensions



Lambda Sensor LSU 4.2



4

Features

- ▶ Application: lambda 0.65 to ∞
- ▶ Wide-band
- ▶ Exhaust gas temperature range (max.) for short time <math><1,030^{\circ}\text{C}</math>
- ▶ Max. Hexagon temperature 570°C

This sensor is designed to measure the proportion of oxygen in exhaust gases of automotive gasoline engines. 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 main benefit of the LSU is the very robust design combined with the high Bosch production quality standard.

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

Application

Application	lambda 0.65 to ∞
Fuel compatibility	Gasoline
Exhaust gas pressure	≤ 2.5 bar (higher with decrease accuracy)
Exhaust gas temperature range (operating)	930°C
Exhaust gas temperature range (max.) for short time	$< 1,030^{\circ}\text{C}$
Hexagon temperature	$< 570^{\circ}\text{C}$

Cable and protective sleeve temperature	$< 250^{\circ}\text{C}$
Connector temperature	$< 120^{\circ}\text{C}$
Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	300 m/s^2

Technical Specifications

Mechanical Data

Weight w/o wire	120 g
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 Ω
Max. current load for Nernst cell	10(DC)/250(AC) μA

Characteristic

Signal output	I_p meas
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

I_p [mA]	lambda	U_A [V], $v=17$
-1.85	0.70	-
-1.08	0.80	0.364
-0.76	0.85	0.700
-0.47	0.90	1.005
0.00	1.009	1.500
0.34	1.18	1.858
0.68	1.43	2.216
0.95	1.70	2.500
1.40	2.42	2.973
2.55	Air	4.183

Please note: U_A is not an output signal of the lambda sensor, but the output of the evaluation circuit. Only I_p correlates with the oxygen content of the exhaust gas.

Heater Strategy

$T_{\text{sensor}} [^{\circ}\text{C}]$	-40	-10	20	50
$U_{\text{H, eff, max}} (t=0) [\text{V}]$	8,5	9,5	10,5	10,5

Connectors and Wires

Connector	Y 928 K00 050
Mating connector	D 261 205 138-01
Pin 1	IP/APE
Pin 2	UN/RE
Pin 3	VM/IPN
Pin 4	Uh-/H-
Pin 5	Uh+/H
Pin 6	IA/RT
Wire length L	60.0 cm

Various motorsport and automotive connectors are available on request.

Installation Notes

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

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.

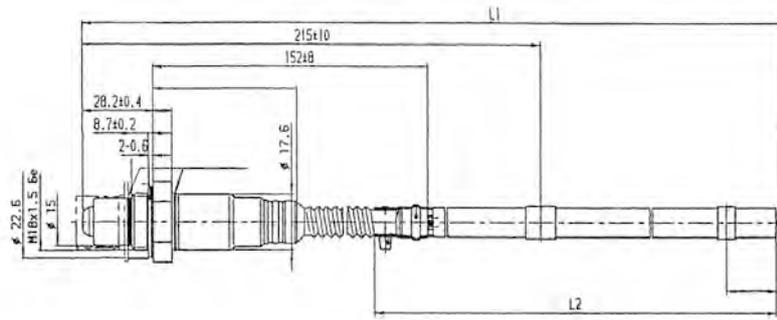
Ordering Information

Lambda Sensor LSU 4.2

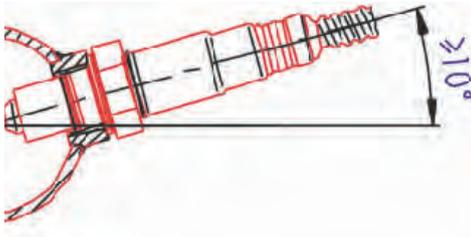
Order number **0 258 006 065**

Dimensions

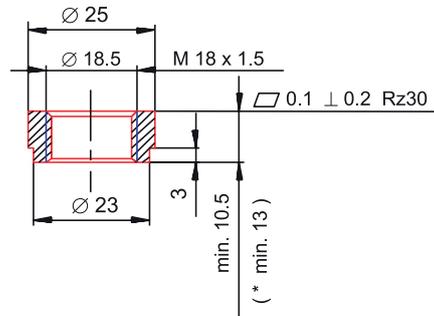
4



Mounting recommendation



Recommended materials for the mating thread in the exhaust pipe
 *: THexagon > 600°C or
 TGas > 930°C



Lambda Sensor LSU 4.9



Features

- ▶ Application: lambda 0.65 to ∞
- ▶ Wide band
- ▶ Exhaust gas temperature range (max.) for short time $\leq 1,030^{\circ}\text{C}$
- ▶ Max. Hexagon temperature 600°C

This sensor is designed to measure the proportion of oxygen in exhaust gases of automotive engines (gasoline or Diesel).

The wide band lambda sensor LSU 4.9 is a planar ZrO_2 dual cell limiting current sensor with integrated heater. Its monotonic output signal in the range of 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 main benefit of the LSU 4.9 is the robust design combined with the high Bosch production quality standard.

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

Application

Application	lambda 0.65 to ∞
Fuel compatibility	gasoline/Diesel/E85
Exhaust gas pressure	≤ 2.5 bar (higher with decrease accuracy)
Exhaust gas temperature range (operating)	$< 930^{\circ}\text{C}$
Exhaust gas temperature range (max.) for short time	$< 1,030^{\circ}\text{C}$
Hexagon temperature	$< 600^{\circ}\text{C}$

Wire and protective sleeve temperature	$< 250^{\circ}\text{C}$
Connector temperature	$< 140^{\circ}\text{C}$
Storage temperature range	-40 to 100°C
Max. vibration (stochastic peak level)	300 m/s^2

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
Wire length L	95.0 cm

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

Please specify the required wire length with your order.

Mechanical Data

Weight w/o wire	120 g
Thread	M18x1.5
Wrench size	22 mm
Tightening torque	40 to 60 Nm

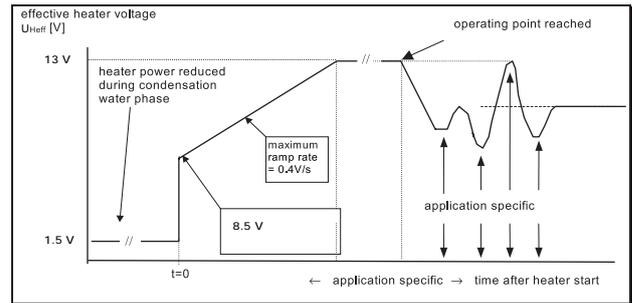
Electrical Data

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_p meas		
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		
I_p [mA]	lambda	U_A [V], v=17	U_A [V], v=8
-2.000	0.650	-	0.510
-1.602	0.700	-	0.707
-1.243	0.750	0.192	0.884
-0.927	0.800	0.525	1.041
-0.800	0.822	0.658	1.104
-0.652	0.850	0.814	1.177
-0.405	0.900	1.074	1.299
-0.183	0.950	1.307	1.409
-0.106	0.970	1.388	1.448
-0.040	0.990	1.458	1.480
0	1.003	1.500	1.500
0.015	1.010	1.515	1.507
0.097	1.050	1.602	1.548
0.193	1.100	1.703	1.596
0.250	1.132	1.763	1.624
0.329	1.179	1.846	1.663
0.671	1.429	2.206	1.832
0.938	1.701	2.487	1.964
1.150	1.990	2.710	2.069
1.385	2.434	2.958	2.186
1.700	3.413	3.289	2.342
2.000	5.391	3.605	2.490
2.150	7.506	3.762	2.565
2.250	10.119	3.868	2.614

Please note: U_A is not an output signal of the lambda sensor, but the output of the evaluation circuit. Only I_p correlates with the oxygen content of the exhaust gas. Amplification factor v=17 is typically used for lean applications (lambda>1), amplification factor v=8 is typically used for rich applications (lambda<1).

Heater Strategy**Connectors and Wires**

Connector	Please see variations
Mating connector	Please see variations
Sleeve	fiber glass / silicone coated
Wire size	AWG 24
Wire length	Please see variations
Various motorsport and automotive connectors are available on request.	

Installation Notes

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

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.

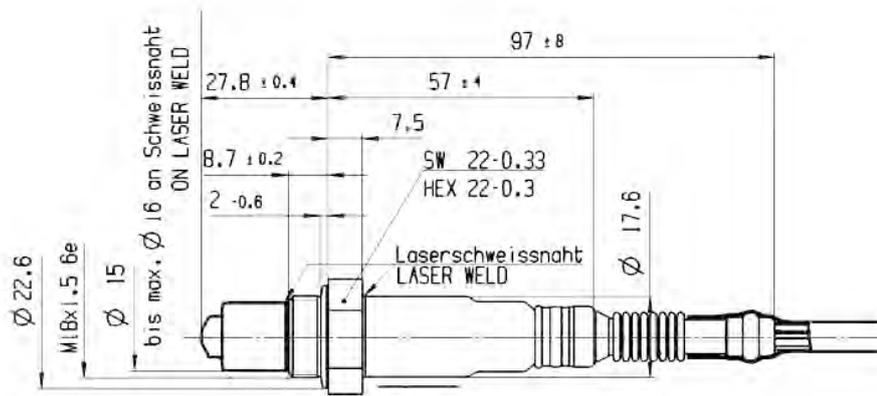
Ordering Information**Lambda Sensor LSU 4.9**

With automotive connector, wire length 95 cm
Order number **0 258 017 025**

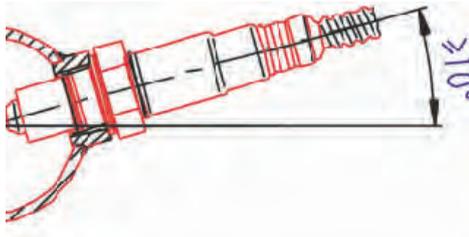
Lambda Sensor LSU 4.9

With motorsports connector. Please specify the required wire length with your order.
Order number **B 261 209 356-05**

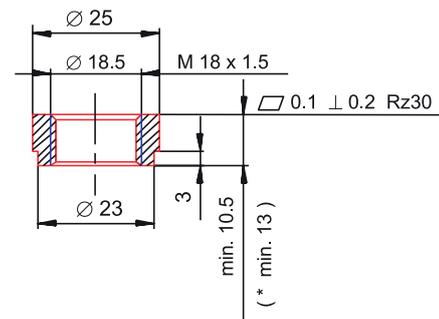
Dimensions



Mounting recommendation



Recommended materials for the mating thread in the exhaust pipe
 *: THexagon > 600°C or
 TGas > 930°C



Lambda Sensor LSU 4.9D



4

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 proportion of oxygen in exhaust gases of 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 ZrO₂ 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 main benefit of the LSU is the robust design combined with the high Bosch production quality standard. This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

Application

Application	lambda 0.65 to ∞
Fuel compatibility	Diesel
Exhaust gas pressure	≤ 2.5 bar (higher with decrease accuracy)
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 ²

Technical Specifications

Mechanical Data

Weight w/o wire	120 g
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

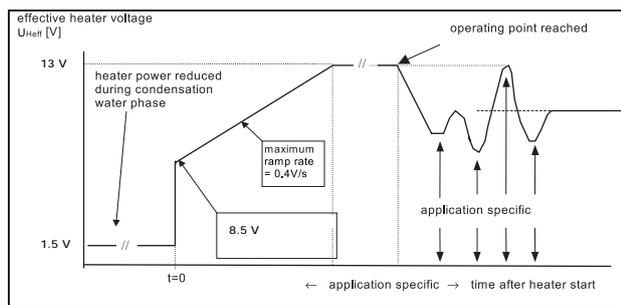
Signal output	I _p meas		
Accuracy at lambda = 0.8	0.80 ± 0.01		
Accuracy at lambda = 1	1.016 ± 0.007		
Accuracy at lambda = 1.7	1.70 ± 0.05		
I_p [mA]	lambda	U_A [V], v=17	U_A [V], v=8
-2.000	0.650	-	0.510
-1.602	0.700	-	0.707
-1.243	0.750	0.192	0.884
-0.927	0.800	0.525	1.041
-0.800	0.822	0.658	1.104
-0.652	0.850	0.814	1.177
-0.405	0.900	1.074	1.299
-0.183	0.950	1.307	1.409
-0.106	0.970	1.388	1.448
-0.040	0.990	1.458	1.480
0	1.003	1.500	1.500
0.015	1.010	1.515	1.507
0.097	1.050	1.602	1.548
0.193	1.100	1.703	1.596
0.250	1.132	1.763	1.624

0.329	1.179	1.846	1.663
0.671	1.429	2.206	1.832
0.938	1.701	2.487	1.964
1.150	1.990	2.710	2.069
1.385	2.434	2.958	2.186
1.700	3.413	3.289	2.342
2.000	5.391	3.605	2.490
2.150	7.506	3.762	2.565
2.250	10.119	3.868	2.614

Please note: U_A is not an output signal of the lambda sensor, but the output of the evaluation circuit. Only I_p correlates with the oxygen content of the exhaust gas. Amplification factor $v=17$ is typically used for lean applications ($\lambda > 1$), amplification factor $v=8$ is typically used for rich applications ($\lambda < 1$).

Heater Strategy

$T_{\text{Sensor}} [^{\circ}\text{C}]$	-40	-10	20	50
$U_{H, \text{eff. max}} (t=0) [V]$	8,5	9,5	10,5	10,5



Connectors and Wires

Connector	1 928 404 687
Mating connector	on request
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 50 cm

Various motorsport and automotive connectors are available on request.

Please specify the required wire length with your order.

Installation Notes

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

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.

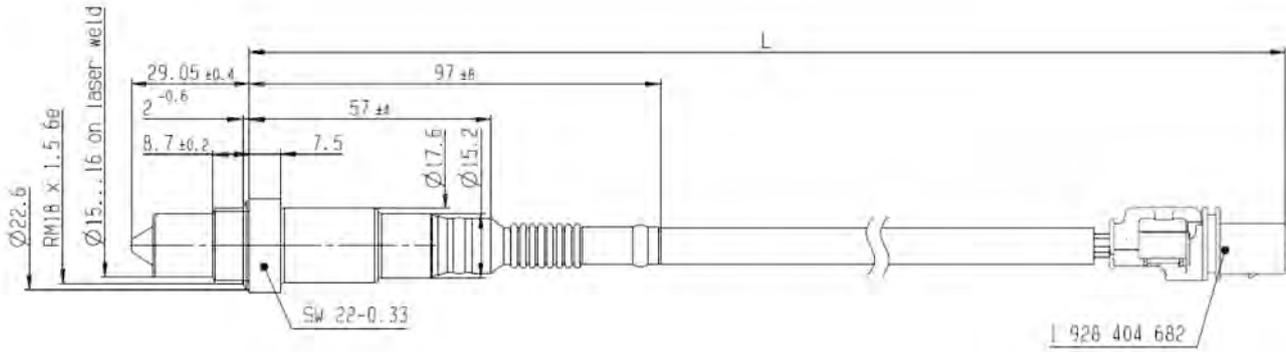
Ordering Information

Lambda Sensor LSU 4.9D

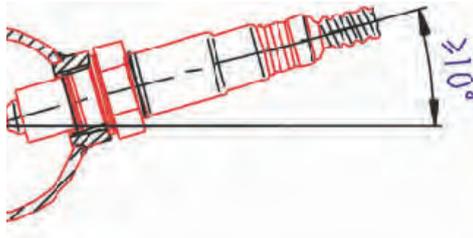
Order number **0 281 004 135**

Dimensions

4

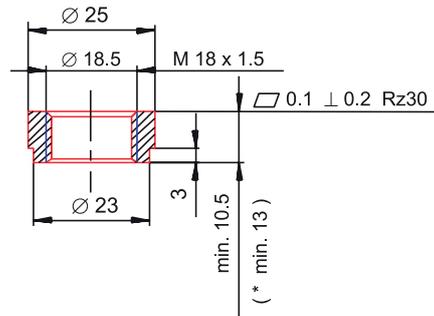


Mounting recommendation



Recommended materials for the mating thread in the exhaust pipe

*: THexagon > 600°C or
TGas > 930°C



Lambda Sensor Mini-LSU 4.9



Features

- ▶ Application: lambda 0.65 to ∞
- ▶ Wide band
- ▶ Inconel sensor housing
- ▶ Exhaust gas temperature range (max.) for short time < 1,030°C
- ▶ Max. Hexagon temperature 700°C

This sensor is designed to measure the proportion of oxygen in exhaust gases of automotive engines (gasoline or Diesel).

The wide band lambda sensor Mini-LSU 4.9 is a planar ZrO₂ 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 lean and rich ranges.

The connector housing contains a trimming resistor, which defines the characteristic of the sensor. The main benefit of the Mini-LSU 4.9 is its very compact design in combination with the high Bosch production quality standard. The Mini-LSU is produced and tested in a handmade process.

The complete light weight housing is made of Inconel which makes it resistant against high temperatures. The sensor element is more than 50 % smaller than it is in the production lambda sensor. It is connected over silver coated steel cables to make it more reliable against vibrations.

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

Application

Application	lambda 0.65 to ∞
Fuel compatibility	gasoline/Diesel/E85
Exhaust gas pressure	≤ 2.5 bar (higher with decrease accuracy)
Exhaust gas temperature range (operating)	< 930°C

Exhaust gas temperature range (max.) for short time	< 1,030°C
Hexagon temperature	≤ 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)	300 m/s ² (see Installation Notes)

Technical Specifications

Mechanical Data

Weight w/o wire	28 g
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	100 Hz
Nominal resistance of Nernst cell	300 Ω
Max. current load for Nernst cell	250 μA

Characteristic

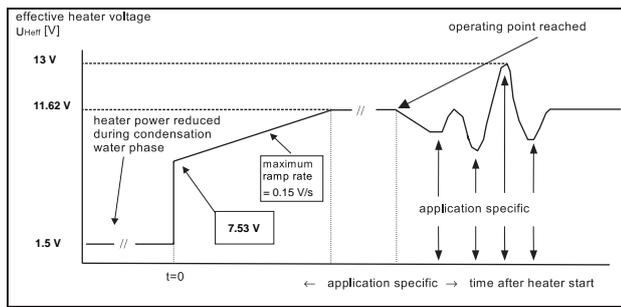
Signal output	I_p meas
Accuracy at lambda 0.8	0.80 ± 0.01
Accuracy at lambda 1	1.016 ± 0.007
Accuracy at lambda 1.7	1.70 ± 0.05

I_p [mA]	lambda	U_A [V], v=17	U_A [V], v=8
-2.000	0.650	-	0.510
-1.602	0.700	-	0.707
-1.243	0.750	0.192	0.884
-0.927	0.800	0.525	1.041
-0.800	0.822	0.658	1.104
-0.652	0.850	0.814	1.177
-0.405	0.900	1.074	1.299
-0.183	0.950	1.307	1.409
-0.106	0.970	1.388	1.448
-0.040	0.990	1.458	1.480
0	1.003	1.500	1.500
0.015	1.010	1.515	1.507
0.097	1.050	1.602	1.548

0.193	1.100	1.703	1.596
0.250	1.132	1.763	1.624
0.329	1.179	1.846	1.663
0.671	1.429	2.206	1.832
0.938	1.701	2.487	1.964
1.150	1.990	2.710	2.069
1.385	2.434	2.958	2.186
1.700	3.413	3.289	2.342
2.000	5.391	3.605	2.490
2.150	7.506	3.762	2.565
2.250	10.119	3.868	2.614

Please note: U_A is not an output signal of the lambda sensor, but the output of the evaluation circuit. Only I_p correlates with the oxygen content of the exhaust gas. Amplification factor $v=17$ is typically used for lean applications ($\lambda > 1$), amplification factor $v=8$ is typically used for rich applications ($\lambda < 1$).

Heater Strategy



Resistance/LSU Temperature

R (Ohm)	Temp (°C)
80	1030
150	888
200	840
250	806
300	780
350	761
400	744
450	729
550	703
650	686
800	665
1000	642
1200	628
2500	567

Connectors and Wires

Connector	1 928 404 682
Connector loom	on request
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

This lambda sensor operates only in combination with a special LSU-IC, used in most Bosch Motorsport ECUs and lambda control units like LT4. You'll find this unit and more on our homepage at Accessories/Expansion Modules.

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.

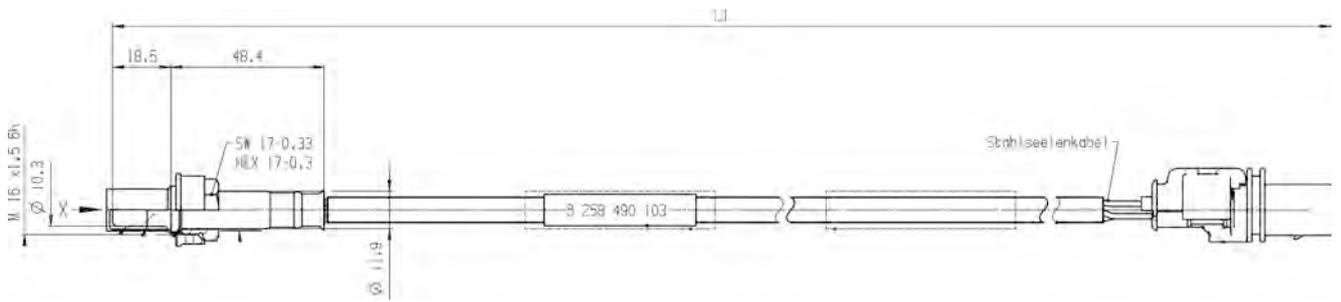
Please find further application hints in the offer drawing at our homepage.

A higher maximum vibration profile is possible and should be determined by the customer's individual application.

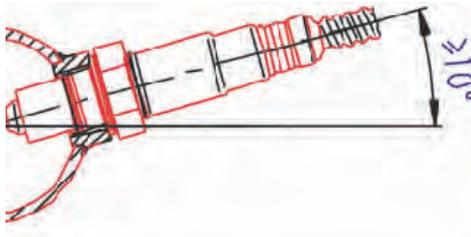
Ordering Information

Lambda Sensor Mini-LSU 4.9
Order number **B 258 490 103-26**

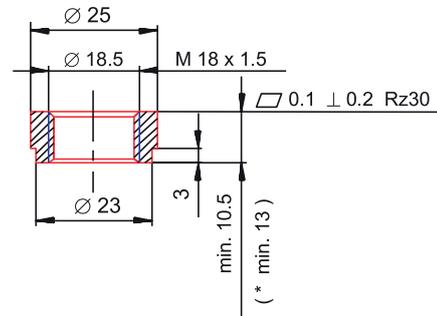
Dimensions



Mounting recommendation



Recommended materials for the mating thread in the exhaust pipe
 *: THexagon > 600°C
 TGas > 930°C



Linear Potentiometer LP 10



4

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 points, 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	F 02U 000 115-01
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.

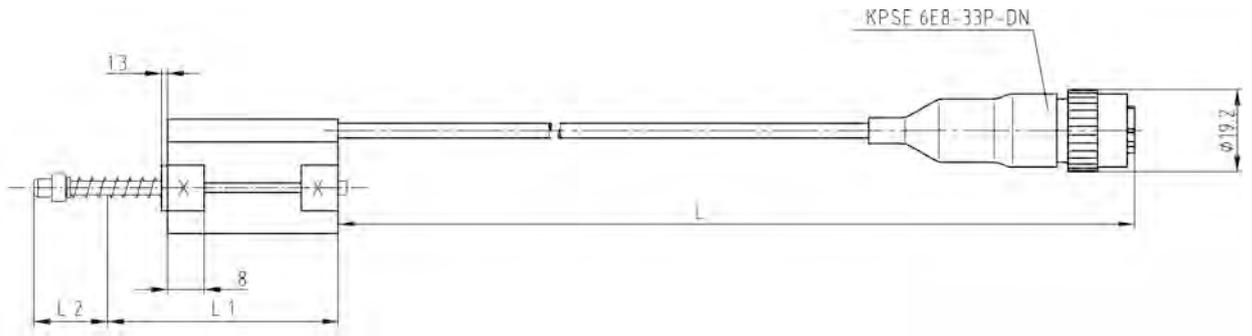
Please find further application hints in the offer drawing at our homepage.

Ordering Information

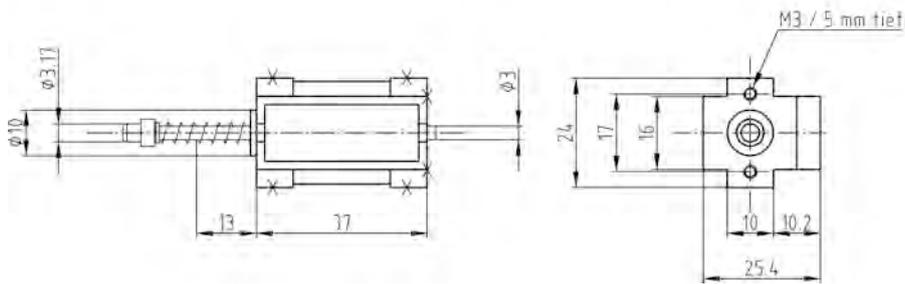
Linear Potentiometer LP 10

Order number **B 261 209 535-01**

Dimensions



4



Linear Potentiometer LP 25



4

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 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 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	F 02U 000 232-01
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 20 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.

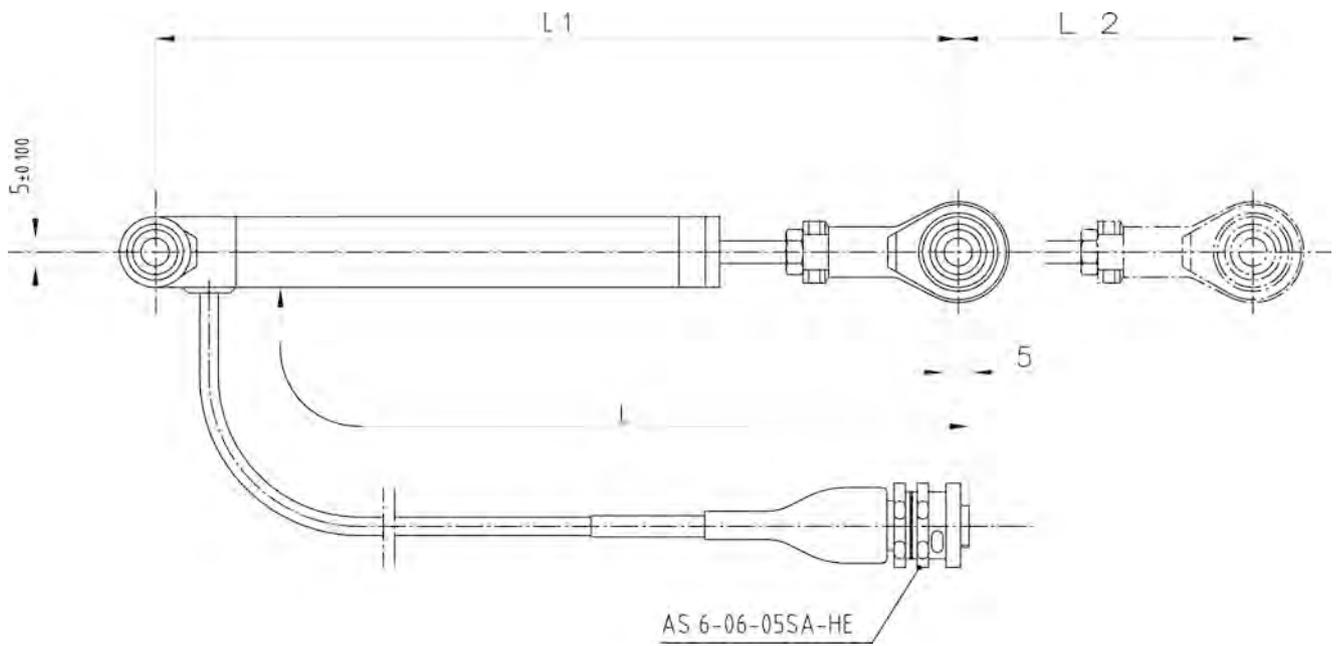
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Linear Potentiometer LP 25

Order number **B 261 209 547-01**

Dimensions



Linear Potentiometer LP 25 twin



4

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 points, 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	F 02U 000 238-01
Pin 1	U _s 1
Pin 2	Gnd 1
Pin 3	Sig 1
Pin 4	U _s 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.

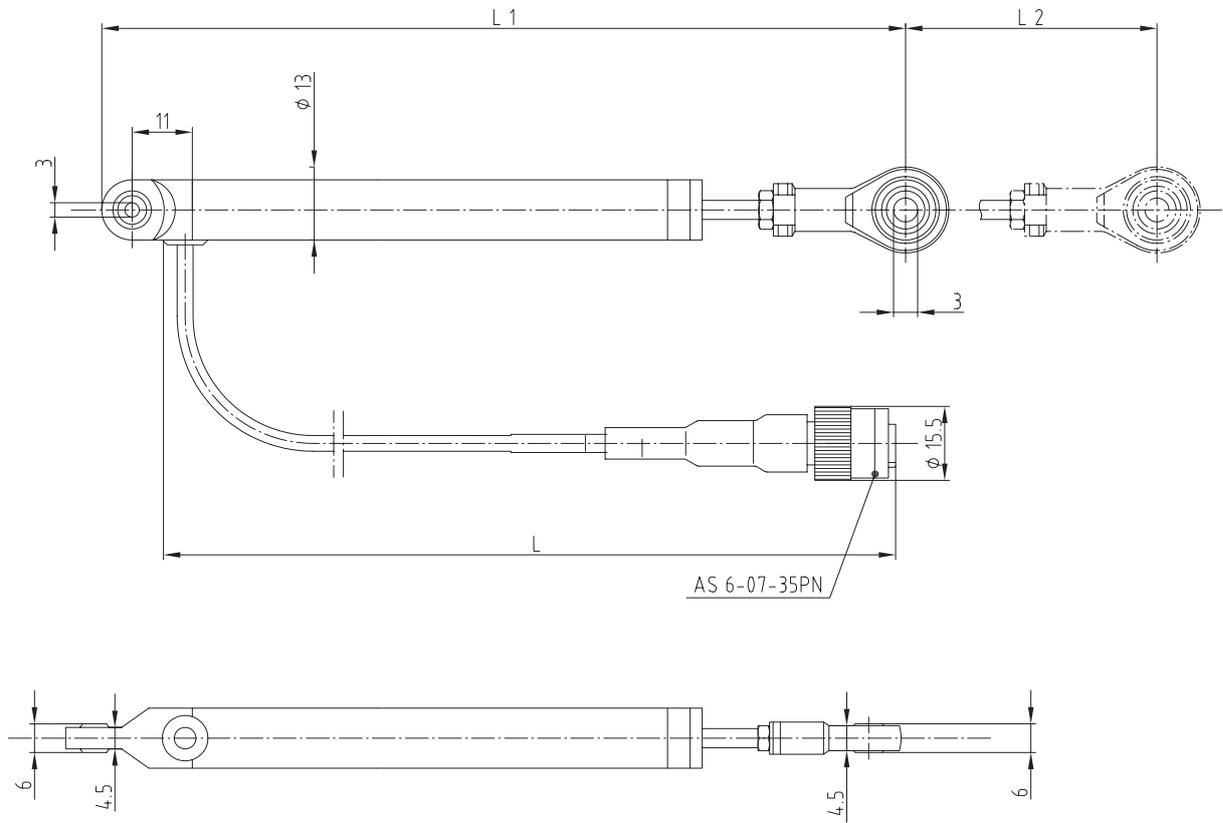
Each mounting orientation is possible.

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

Ordering Information

Linear Potentiometer LP 25 twin
Order number **B 261 209 858-01**

Dimensions



Linear Potentiometer LP 50



4

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 points, 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 ² 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	F 02U 000 115-01
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 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.

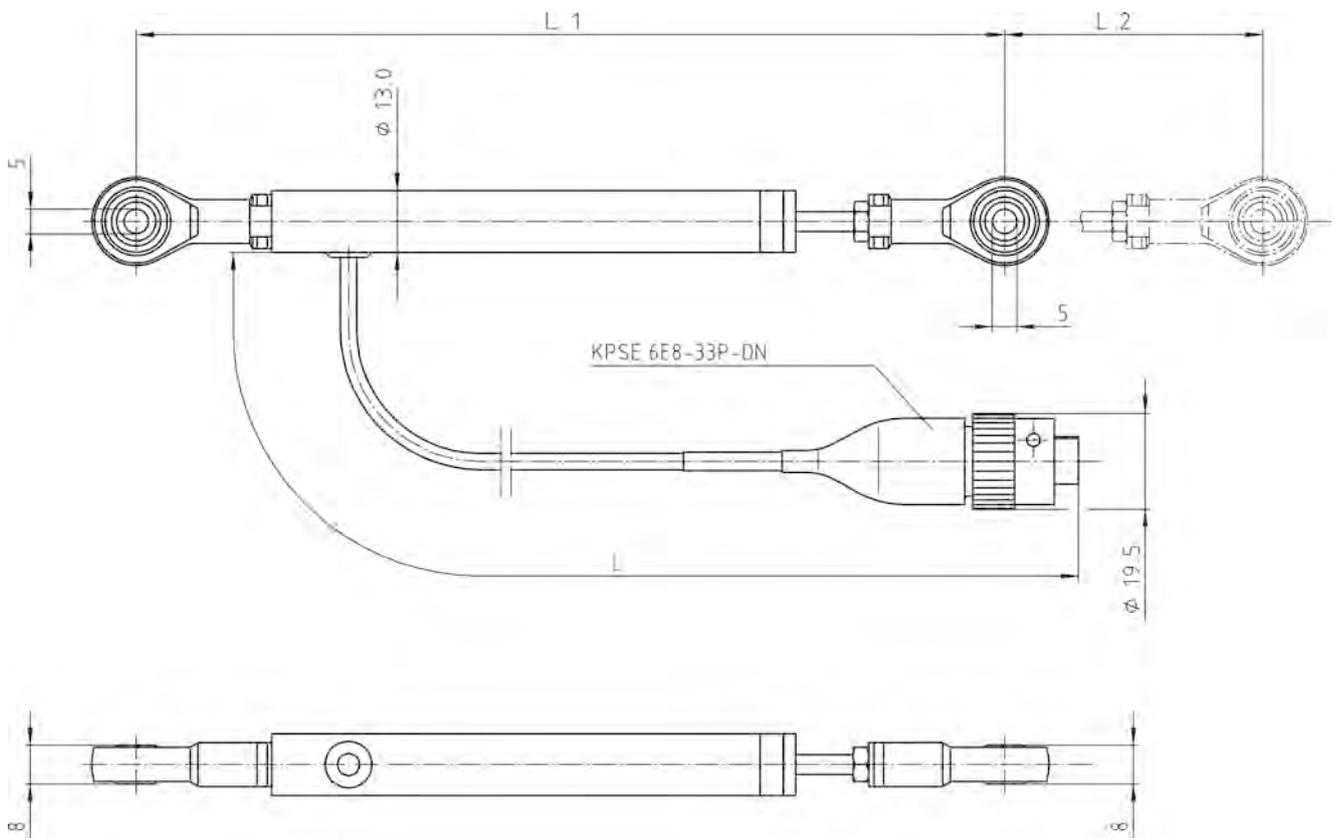
Each mounting orientation is possible.

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



4

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 points, 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	F 02U 000 238-01
Pin 1	U _s 1
Pin 2	Gnd 1
Pin 3	Sig 1
Pin 4	U _s 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.

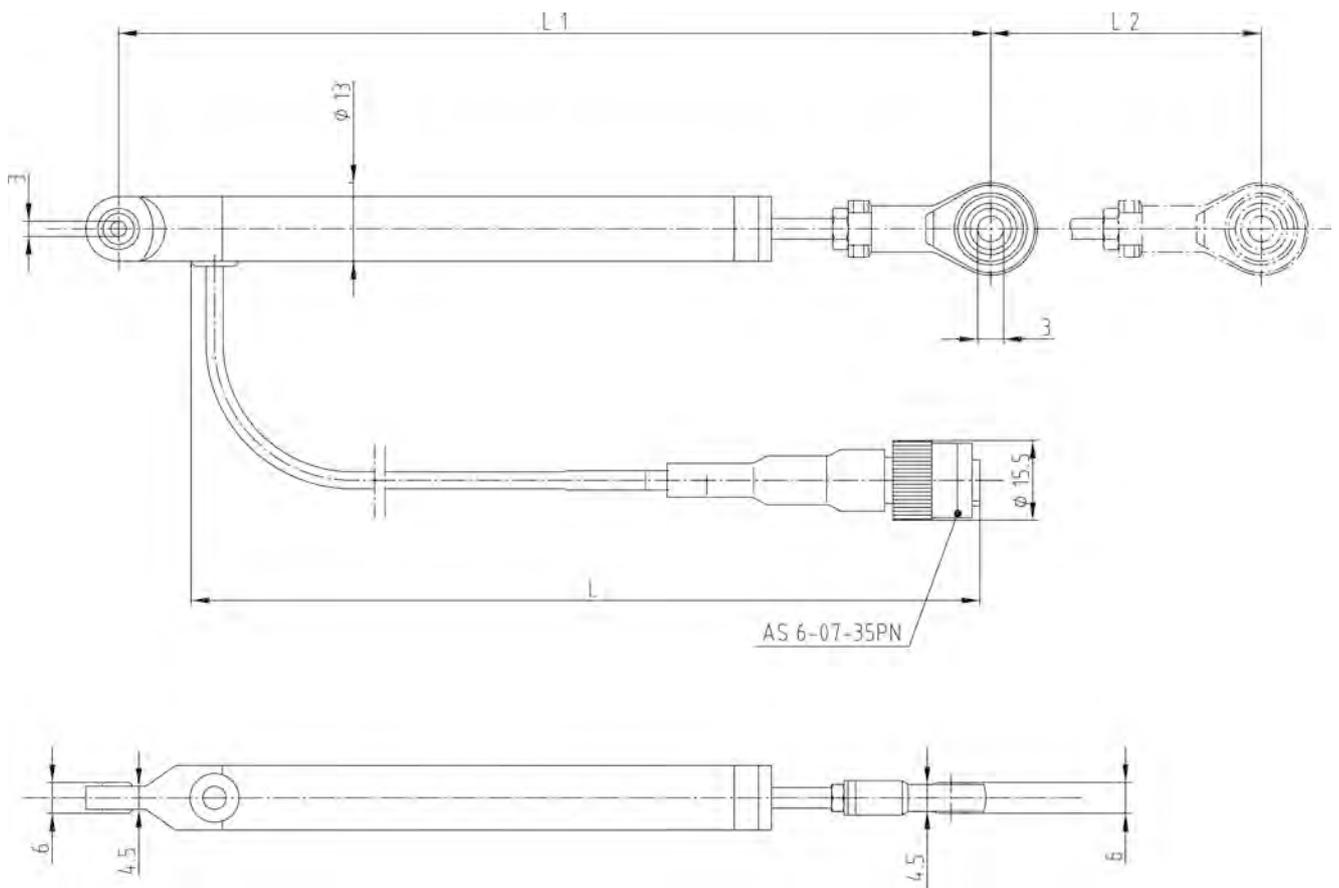
Each mounting orientation is possible.

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



Linear Potentiometer LP 75



4

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 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 hard metal housing and low power consumption.

Application

Application	0 to 75 mm
Temperature range	40 to 85°C
Max. vibration	126 m/s ² 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	F 02U 000 226-01
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 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.

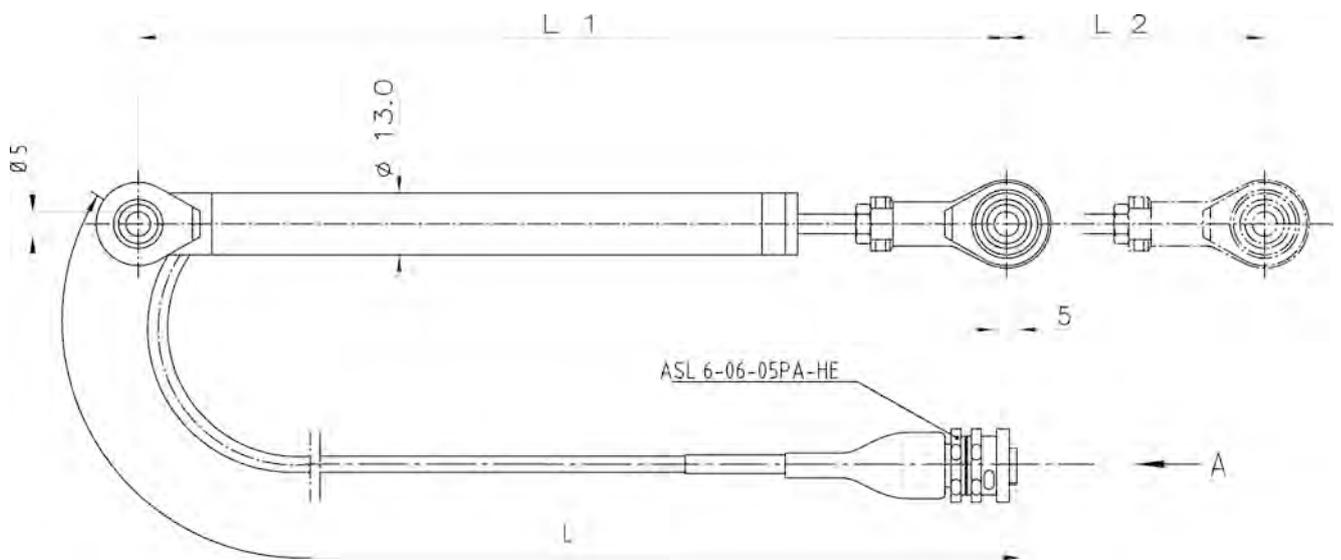
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Linear Potentiometer LP 75

Order number **B 261 209 856-01**

Dimensions



Linear Potentiometer LP 75F



4

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 points, 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 ² 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	F 02U 000 115-01
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 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.

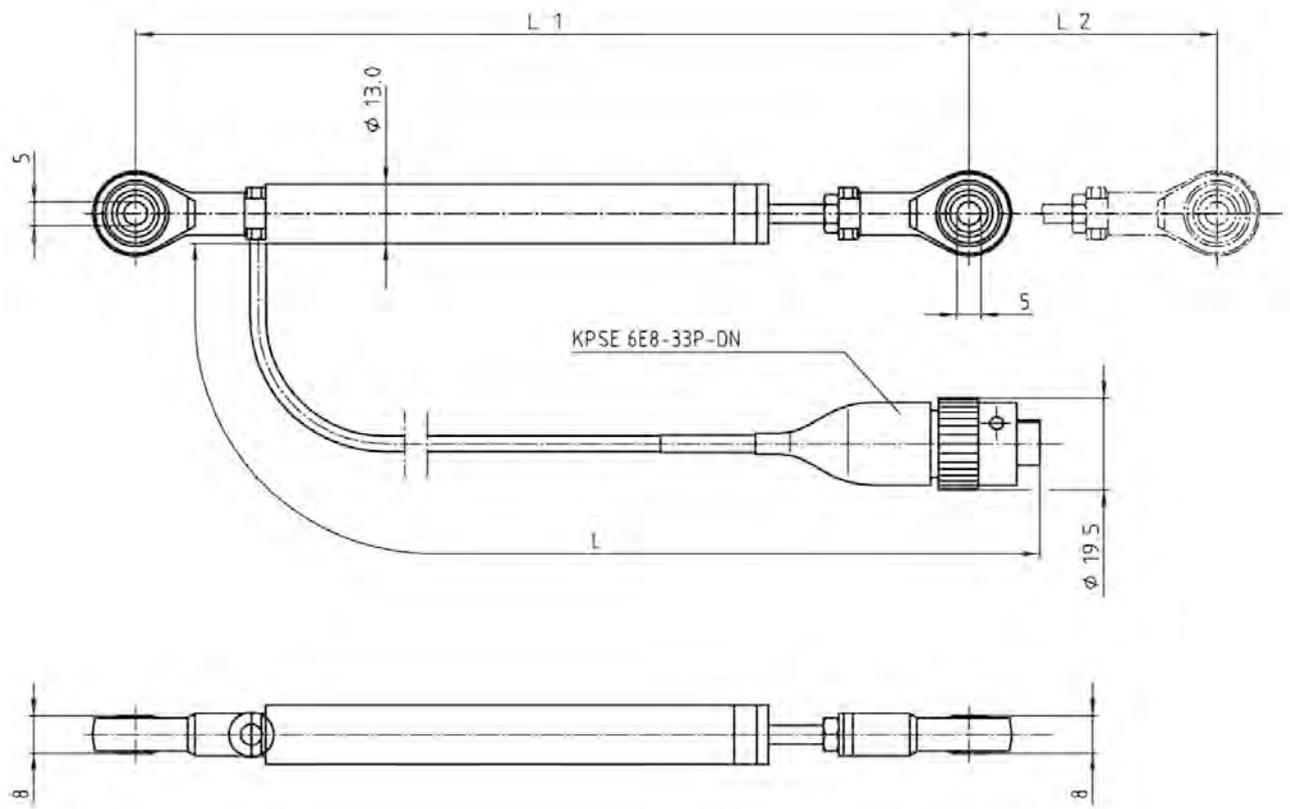
Each mounting orientation is possible.

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

Ordering Information

Linear Potentiometer LP 75F
Order number **B 261 209 852-01**

Dimensions



Linear Potentiometer LP 100



4

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	-40 to 85°C
Max. vibration	126 m/s ² at 10 to 12kHz

Technical Specifications

Mechanical Data

Weight w/o wire	98 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	F 02U 000 226-01
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 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.

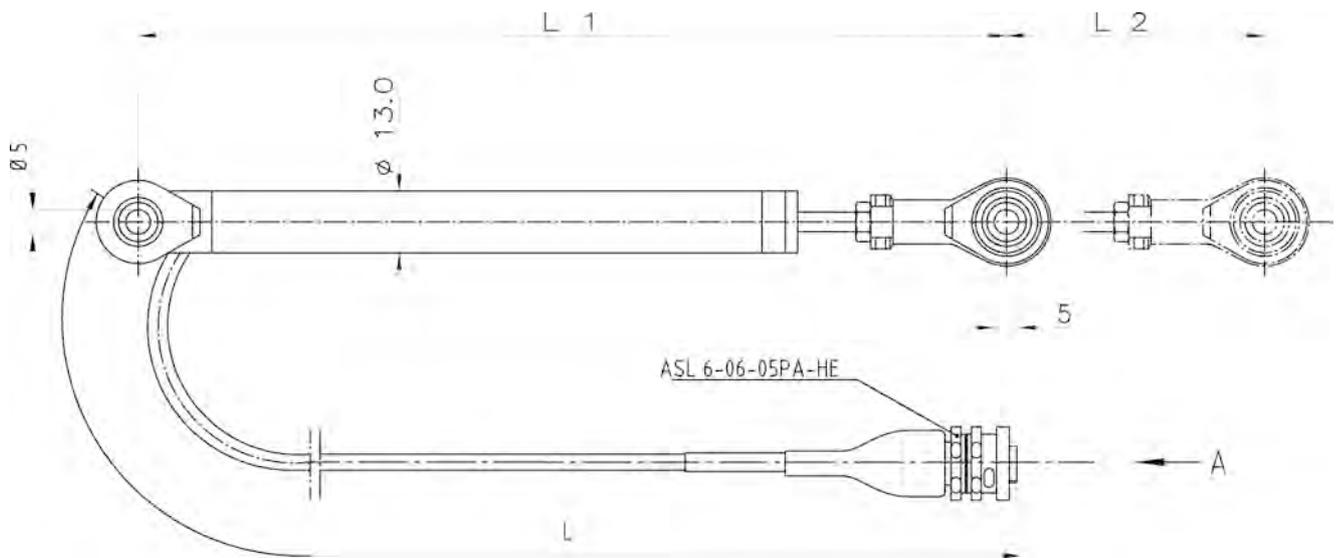
Each mounting orientation is possible.

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



4

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 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 compact and lightweight design together with its wider operating temperature range.

Application

Application	0 to 100 mm
Temperature range	-40 to 100°C
Max. vibration	126 m/s ² 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	F 02U 000 115-01
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 100F can be connected directly to most electronic control units and data logging systems.

Each mounting orientation is possible.

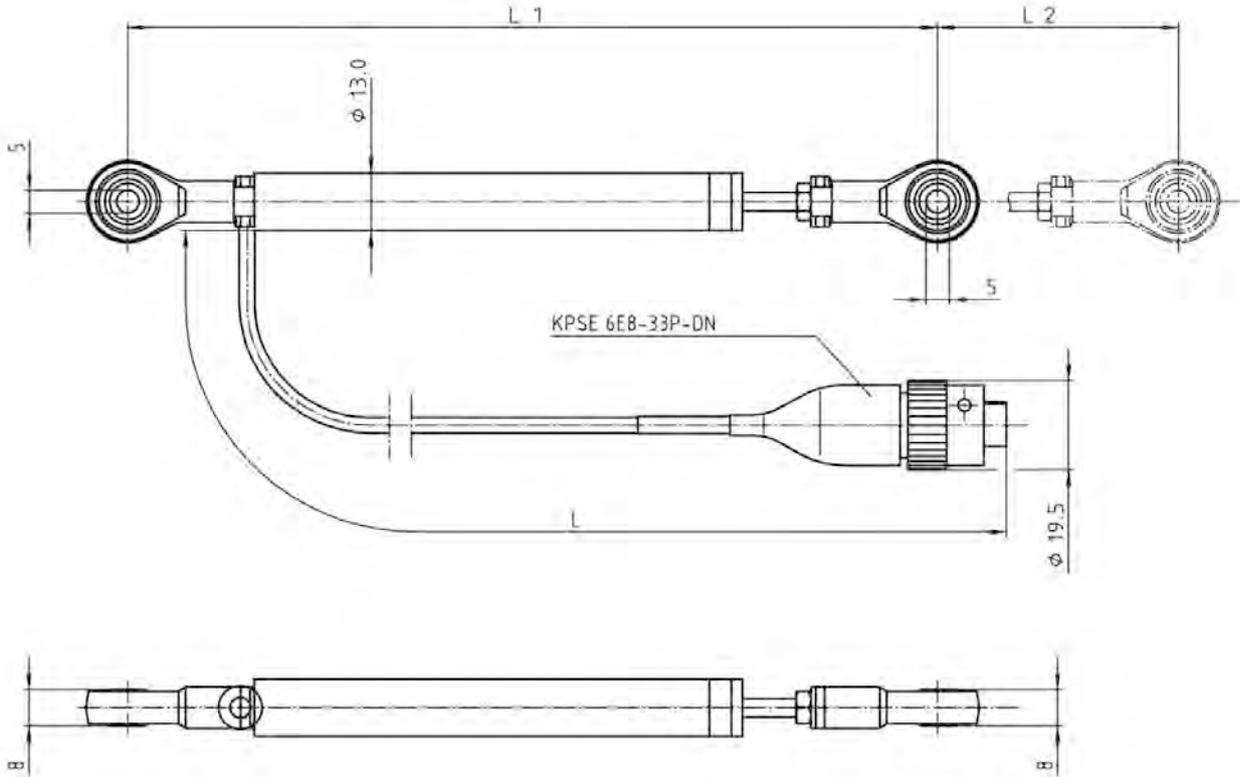
Please find further application hints in the offer drawing at our homepage.

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



Linear Potentiometer LP 150



4

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 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 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	F 02U 000 226-01
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 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.

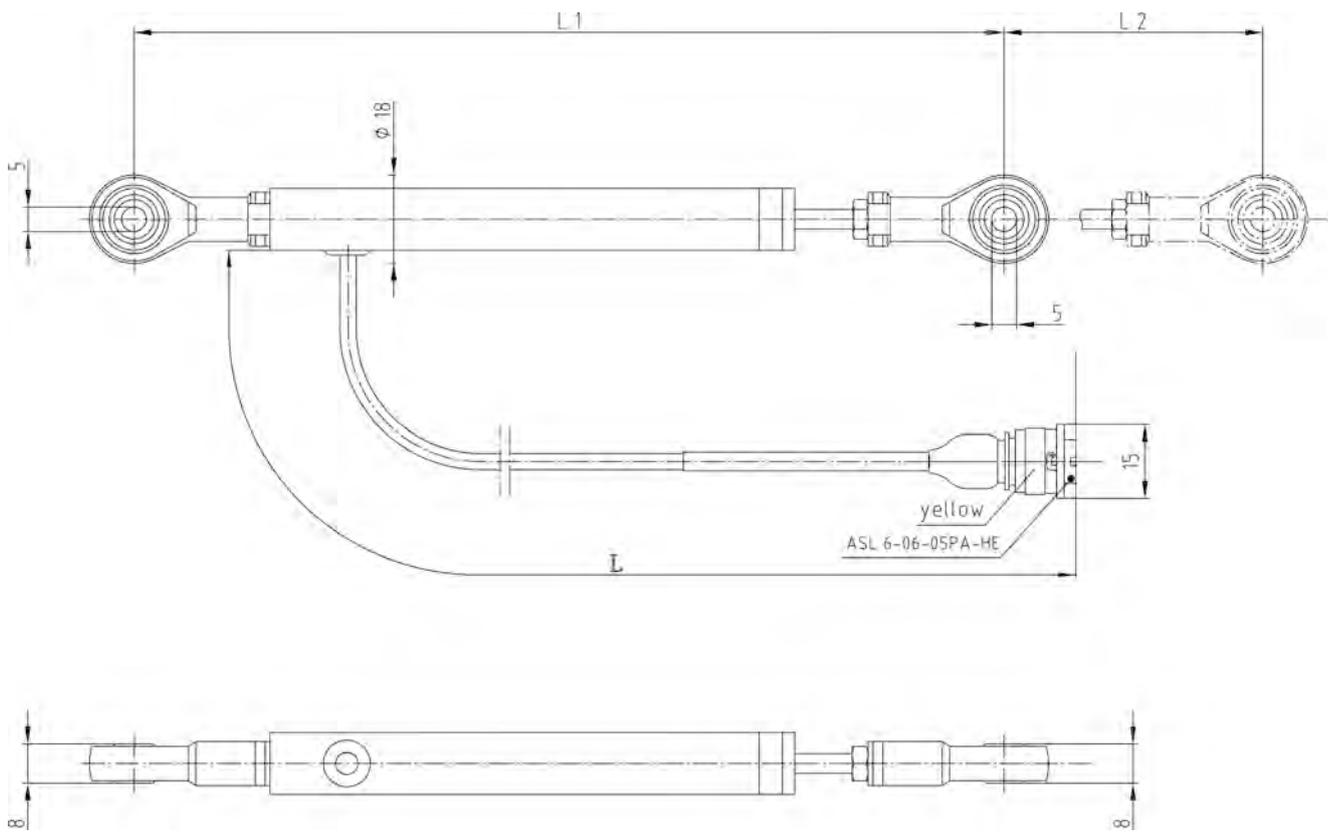
Each mounting orientation is possible.

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

Ordering Information

Linear Potentiometer LP 150
Order number **B 261 209 534-01**

Dimensions



Pressure Sensor Air PSA-B



4

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	280 m/s ² at 200 Hz, 125 m/s ² at 440 Hz, sine

Technical Specifications

Variations

	PSA-B (0.1 to 1.15 bar)	PSA-B (0.2 to 2.50 bar)
Tolerance (FS) at U _s = 5 V	± 0.016 bar	± 0.034 bar

Tolerance (FS)	± 1.4 %	± 1.36 %
Sensitivity	4,048 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

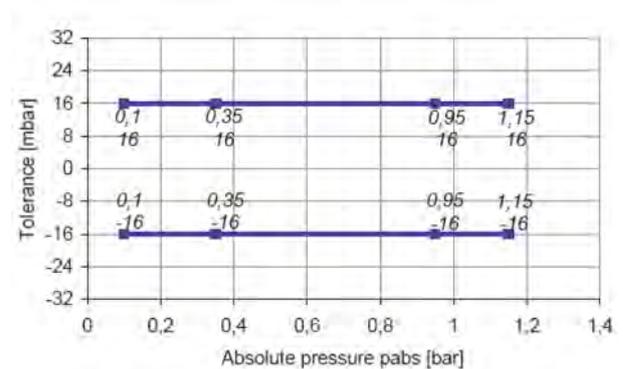
Electrical Data

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

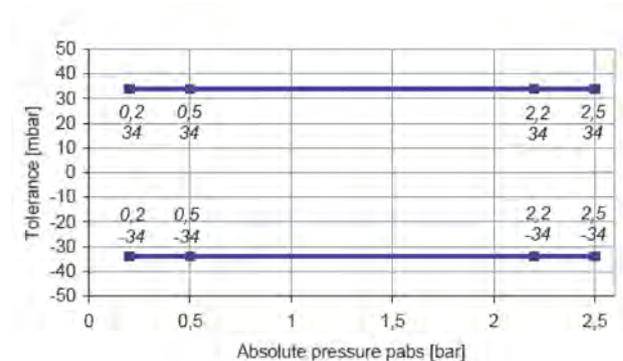
Characteristic

Response time T10/90	1 ms
Compensated range	10 to 85°C
Tolerance (FS) at U _s = 5 V	Please see variations
Tolerance (FS)	Please see variations
Sensitivity	Please see variations
Offset	Please see variations

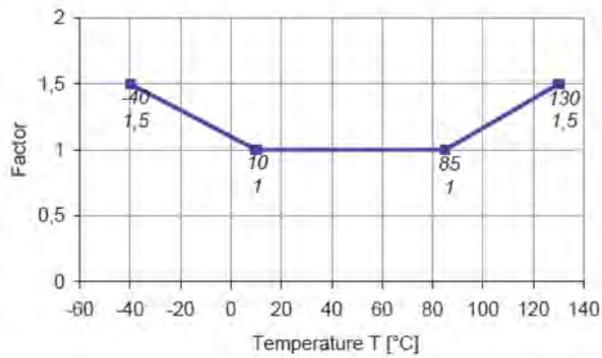
Tolerance 0.1 to 1.15 bar



Tolerance 0.2 to 2.5 bar



Expansion of Tolerance



Adapter for PSA-B

Order number **B 261 209 725-01**

Connectors and Wires

Connector ASL 6-06-05PC-HE

Mating connector F 02U 000 228-01
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).

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

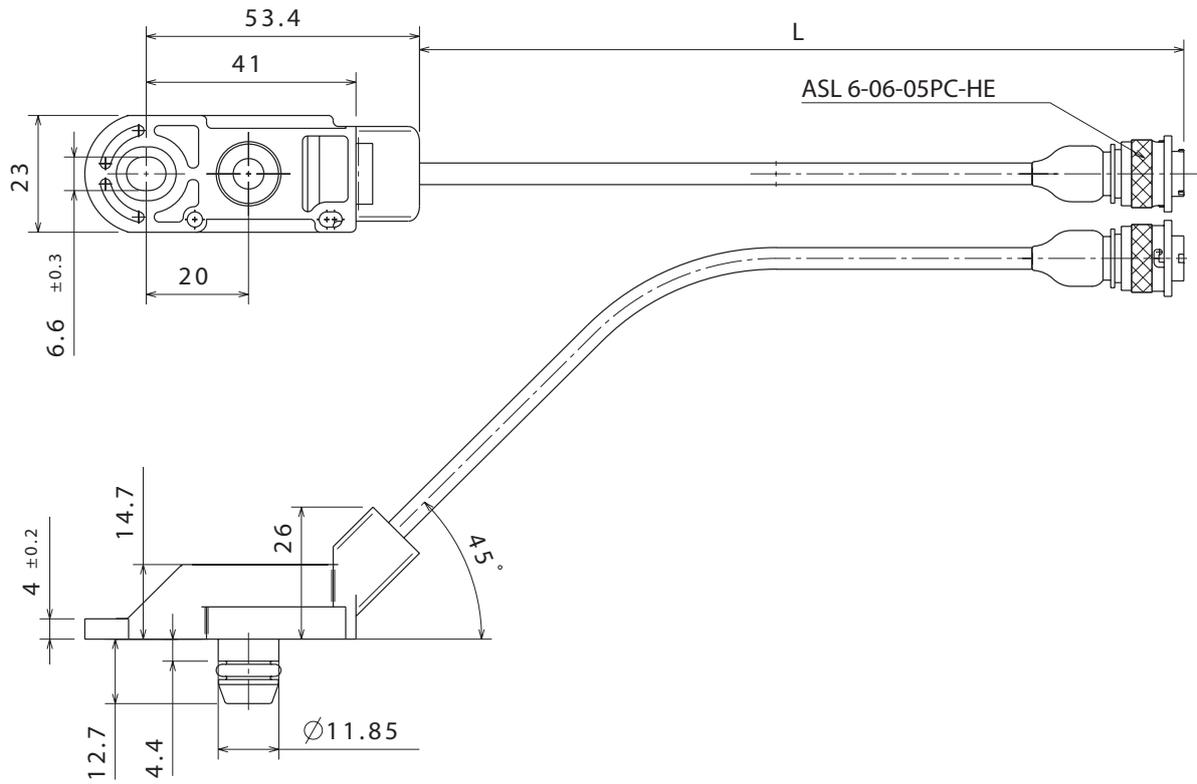
Order number **B 261 209 702-01**

PSA-B

0.2 to 2.5 bar

Order number **B 261 209 710-01**

Dimensions



Pressure Sensor Air PSA-C



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 information
Pressure reference type	absolute
Max. pressure	5 bar
Operating temp. range	-40 to 130°C
Media temp. range	-40 to 125°C
Storage temp. range	-40 to 130°C
Max. vibration	20 m/s ² 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 V	± 0.014 bar	± 0.034 bar

Tolerance (FS)	± 1.33 %	± 1.36 %
Sensitivity	5,000 mV/bar	1,848 mV/bar
Offset	-600 mV	30 mV

Mechanical Data

Mounting	M6
Fitting	6 mm
Weight w/o wire	40 g

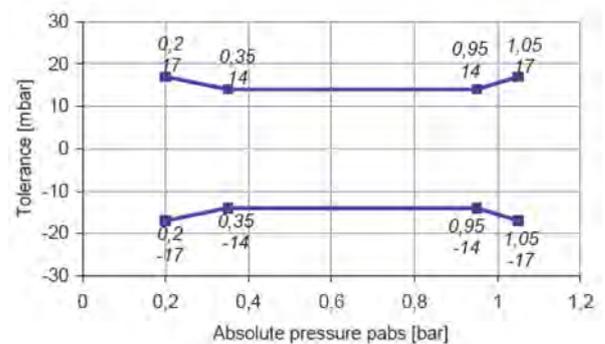
Electrical Data

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

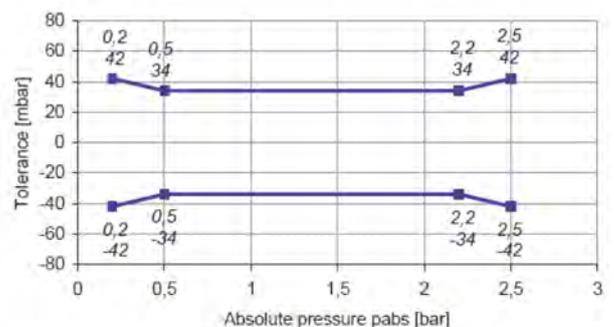
Characteristic

Response time T10/90	10 ms
Compensated range	10 to 85°C
Tolerance (FS) at U _s = 5 V	Please see variations
Tolerance (FS)	Please see variations
Sensitivity	Please see variations
Offset	Please see variations

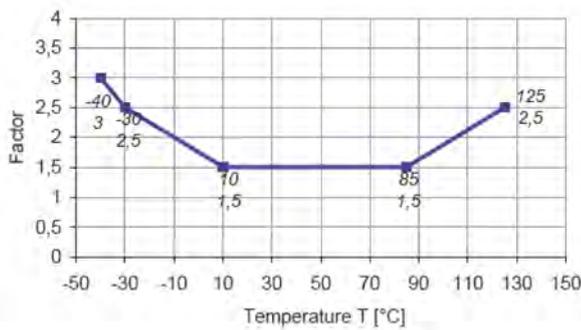
Tolerance 0.2 to 1.05 bar



Tolerance 0.2 to 2.50 bar



Expansion of Tolerance



4

Connectors and Wires

Connector	Bosch Jetronic
Mating connector 3-pole Jetronic	D 261 205 289-01
Pin 1	U _s
Pin 2	Gnd
Pin 3	Sig
Pin 4	-
Pin 5	-

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.

Ordering Information

PSA-C

0.2 to 1.05 bar

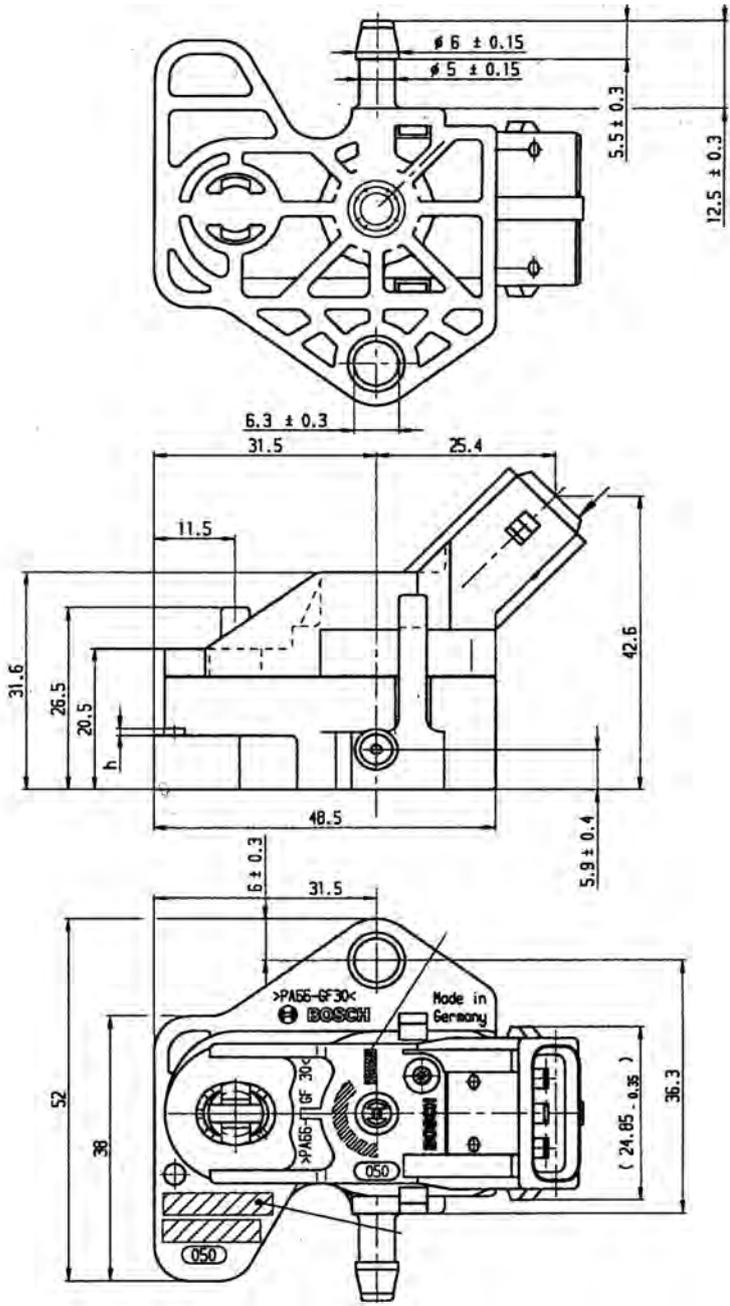
Order number **0 261 230 037**

PSA-C

0.2 to 2.50 bar

Order number **0 281 002 389**

Dimensions



Pressure Sensor Air PSB-2

4



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 ² at 200 Hz, 125 m/s ² 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

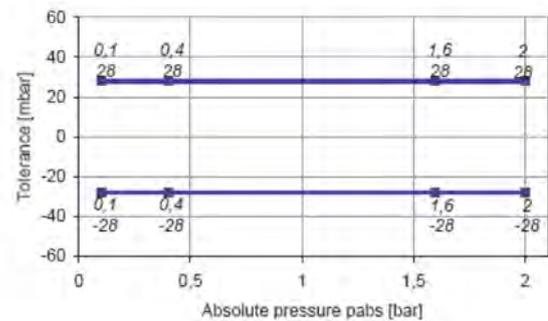
Electrical Data

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

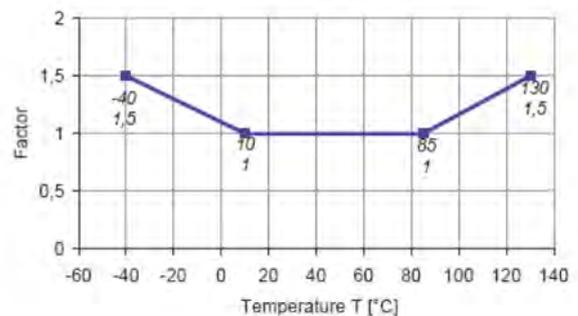
Characteristic

Response time T10/90	1 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_s = 5 V$	± 0.028 bar
Tolerance (FS)	$\pm 1.4 \%$
Sensitivity	2,236 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	F 02U 000 228-01
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
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.

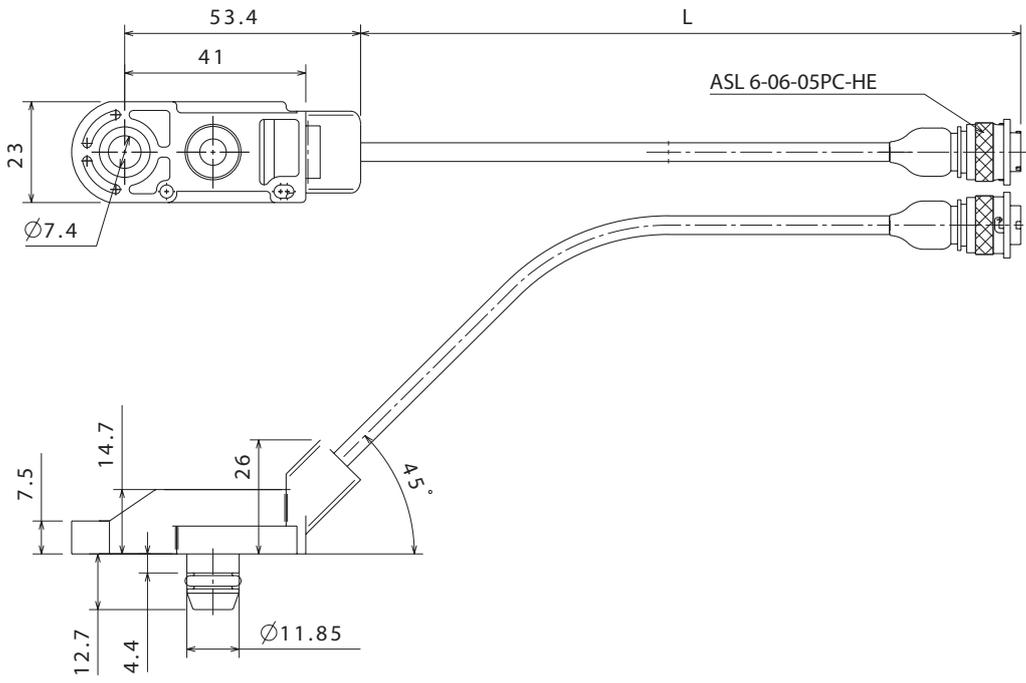
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Pressure Sensor Air PSB-2

Order number **B 261 209 337-01**

Dimensions



Pressure Sensor Air PSB-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 ² 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

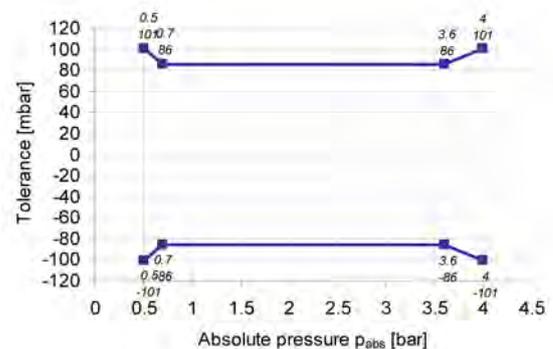
Electrical Data

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

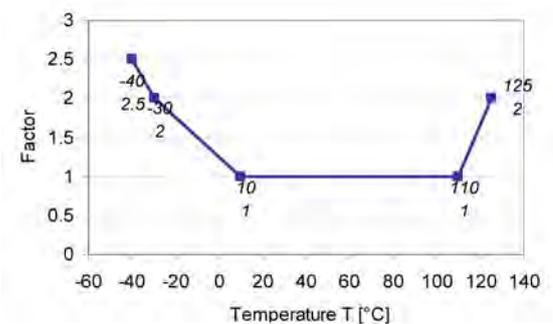
Characteristic

Response time T10/90	0.2 ms
Compensated range	0 to 80°C
Tolerance (FS) at $U_S = 5$ V	± 0.056 bar
Tolerance (FS)	± 1.4 %
Sensitivity	1,143 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	F 02U 000 228-01
ASL 0-06-05SC-HE	
Pin 1	U_S

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.

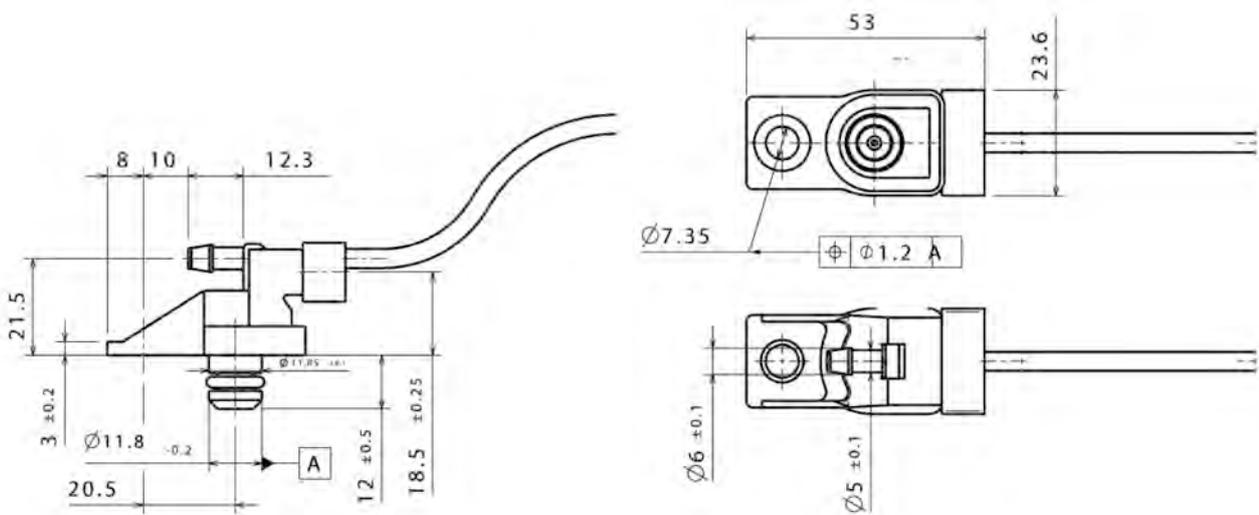
Please find further application hints in the offer drawing. www.bosch-motorsport.com

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

Ordering Information

Pressure Sensor Air PSB-4
 Order number **B 261 209 348-01**

Dimensions



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 ² 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

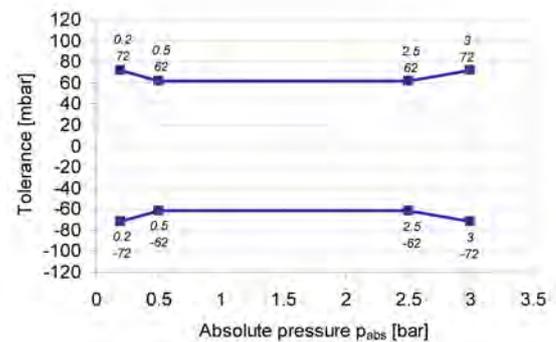
Electrical Data

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

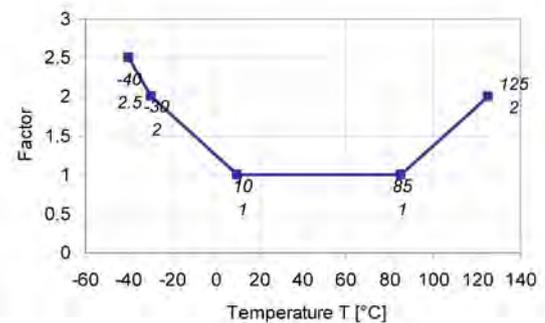
Characteristic

Response time T10/90	0.2 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_S = 5 V$	± 0.042 bar
Tolerance (FS)	± 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	F 02U 000 228-01
ASL 0-06-05SC-HE	
Pin 1	-
Pin 2	Gnd

Pin 3	Sig
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Pin 4	U_s
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Pin 5	-
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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	15 to 100 cm
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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).

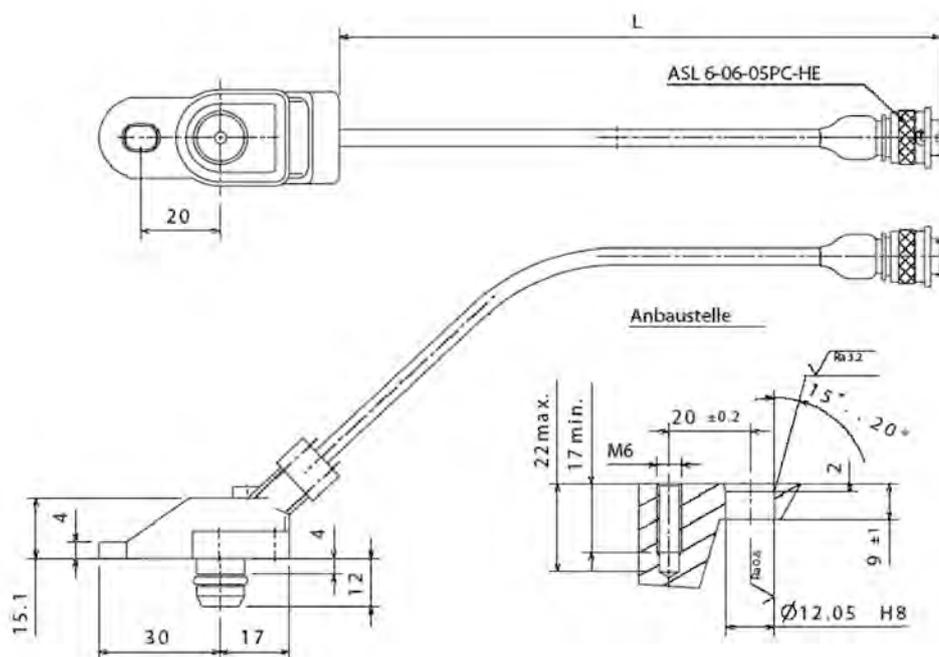
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Pressure Sensor Air PSP

Order number **B 261 209 690-01**

Dimensions



Pressure Sensor Air PST



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/s² 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

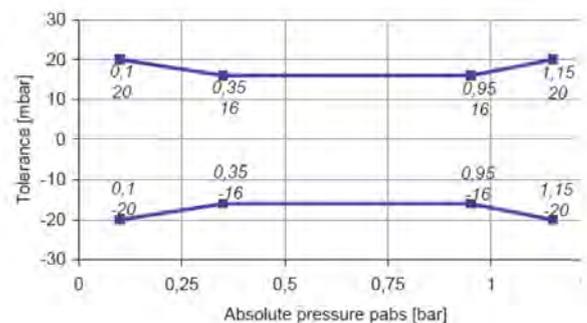
Electrical Data

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	0.3 to 4.8 V
Current I_S	9 mA

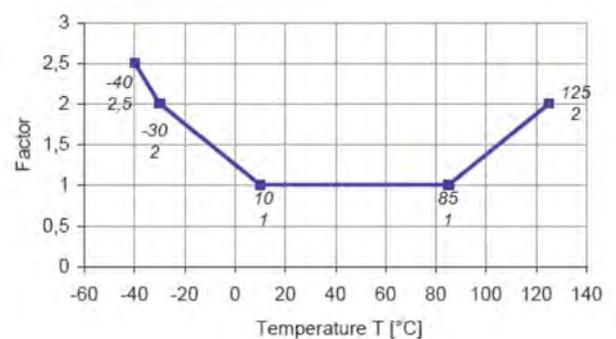
Characteristic Application 1

Response time T10/90	0.2 ms
Compensated range	10 to 85°C
Tolerance (FS) at $U_S = 5 V$	± 0.016 bar
Tolerance (FS)	± 1.39 %
Sensitivity	4,047 mV/bar
Offset	-4.76 mV

Tolerance



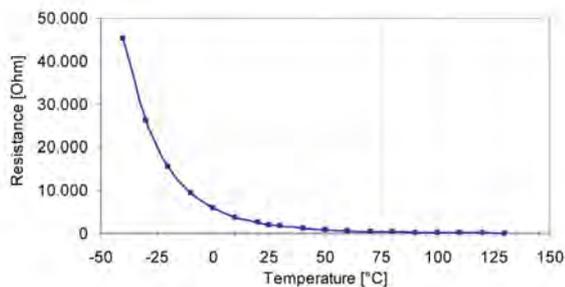
Expansion of Tolerance



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 τ_{63}	45 s at air ; $v = 6$ m/s



Connectors and Wires

Connector	Bosch Compact
Mating connector 4-pole Compact	D 261 205 336-01
Pin 1	Gnd
Pin 2	NTC
Pin 3	U_s
Pin 4	Pressure Sig
Pin 5	-

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 ($\tau = 2$ 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 $I = 0.3$ A).

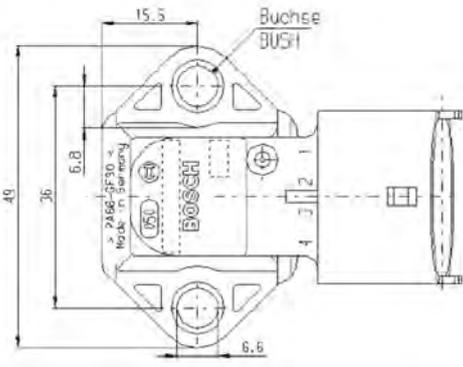
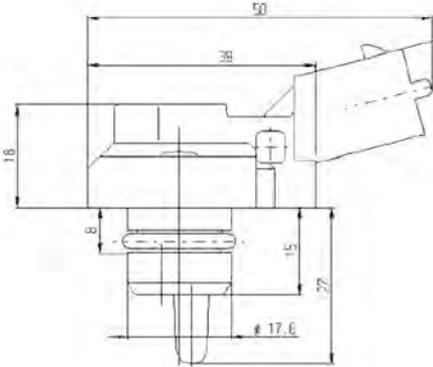
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Pressure Sensor Air PST

Order number **0 261 230 022**

Dimensions



Pressure Sensor Fluid PSC-10



4

Features

- ▶ Absolute fluid pressure measurements
- ▶ Measurement range 0 to 10 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 to 10 bar (a)
Pressure reference type	absolute
Max. pressure	20 bar
Operating temp. range	-40 to 125°C
Media temp. range	-40 to 125°C
Storage temp. range	-20 to 50°C
Bio fuel compatibility	E 85 / M 100
Max. vibration	100 m/s ² 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	9 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
Pin 1	-	U_S
Pin 2	Gnd	Gnd
Pin 3	Sig	Sig
Pin 4	U_S	-
Pin 5	-	-

Mechanical Data

Male thread	M10x1
Wrench size	17 mm
Installation torque	15 Nm
Weight w/o wire	45 g
Sealing	O-ring 8.1 x 1.6 mm

Electrical Data

Power supply U_S	Please see variations
Max power supply U_S max	$\pm 30 V$
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	F 02U 000 228-01
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

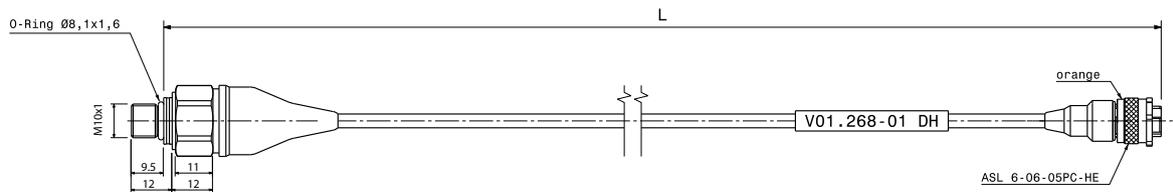
Order number **F 02U V01 268-01**

PSC-10

9 to 30 V

Order number **F 02U V01 295-01**

Dimensions



Pressure Sensor Fluid PSC-260



4

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 ² at 800 to 900 Hz 350 m/s ² 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 Ω
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	F 02U 000 228-01
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.

Sleeve	DR-25
Wire size	AWG 24
Wire length L	13 to 95 cm

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

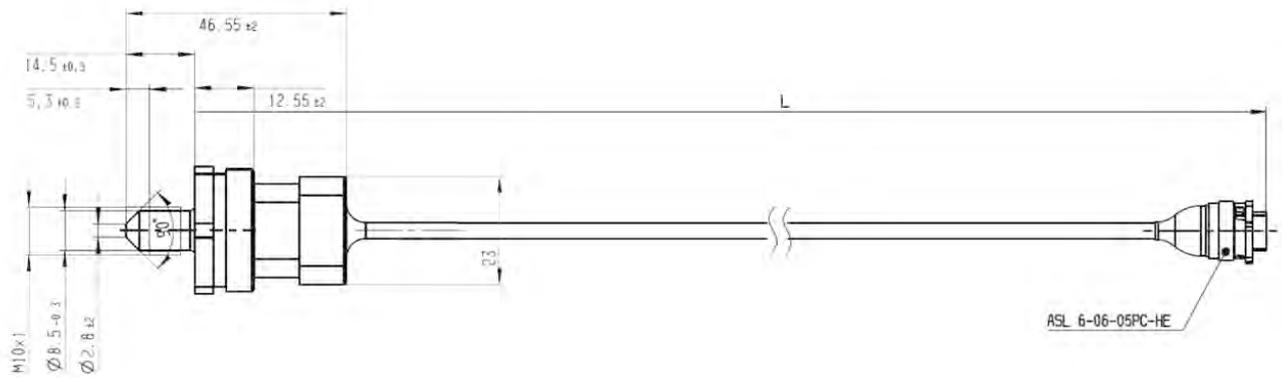
Order number **F 02U V00 990-02**

Accessories

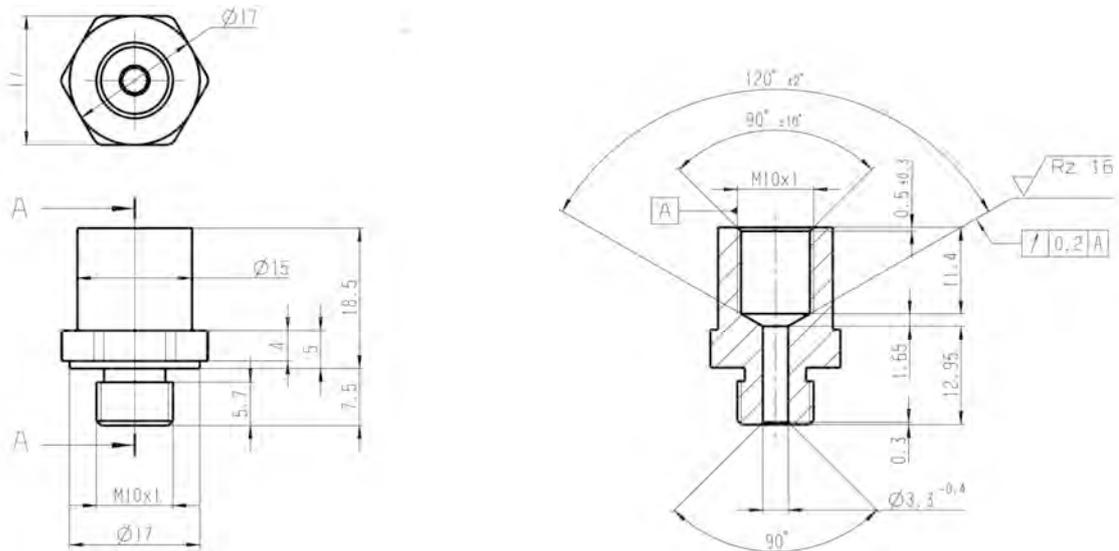
Adapter

Order number **F 02U 002 711-01**

Dimensions



Sensor



Adapter

Pressure Sensor Fluid PSM



4

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	E 85 / M 100
Max. vibration	1,000 m/s ² 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 U_A	$4.9\text{ V} \pm 1.5\%$
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	F 02U 000 228-01
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

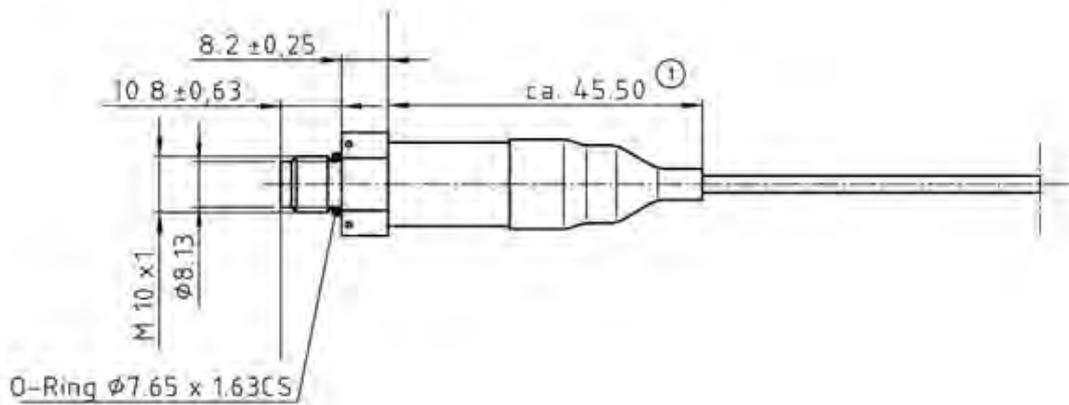
Order number **B 261 209 331-01**

PSM

0 to 250 bar

Order number **B 261 209 332-01**

Dimensions



Pressure Sensor Fluid PSM-S



4

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 piezo-resistive 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 or 0 to 70 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 ² max at 5 to 10,000 Hz (sine)

Technical Specifications

Variations

	PSM-S (12 bar)	PSM-S (70 bar)
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	F 02U 000 228-01
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, ± 0.24 bar, $\pm 2\%$

Order number **F 01T A21 315-01**

PSM-S

0 to 70 bar, 210 bar, ± 0.7 bar, $\pm 1\%$

Order number **F 01T A21 316-01**

Dimensions



Pressure Sensor Fluid PSS-10



4

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	E 85 / M 100
Max. vibration	100 m/s ² 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-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	100 mV at $U_S=5$ V	100 mV
Mating connector	3-pole Compact D 261 205 339-1	3-pole Compact D 261 205 334-01

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	-

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

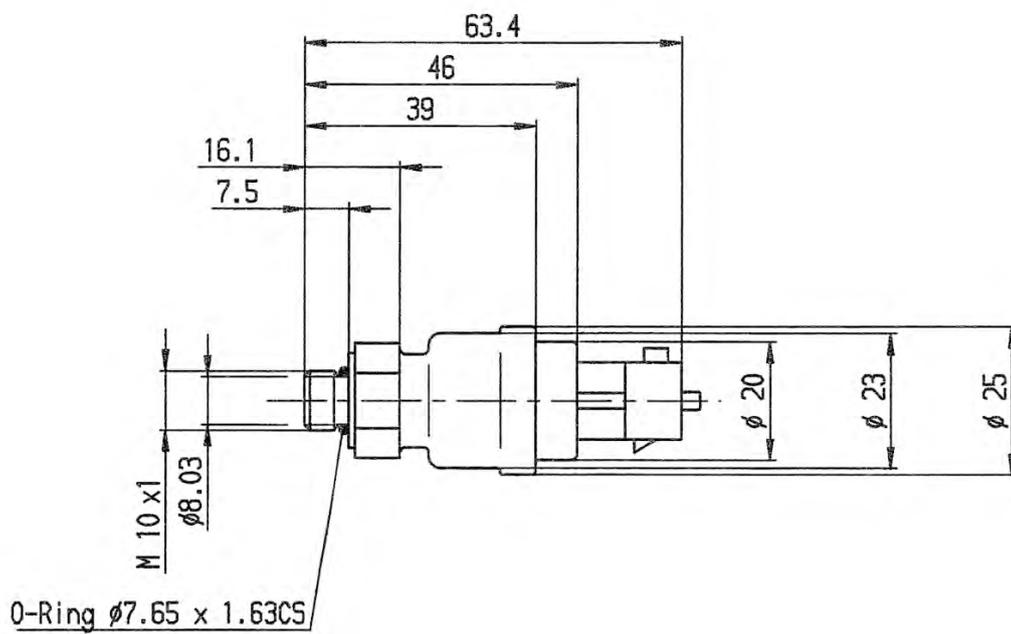
Order number **B 261 209 341-01**

PSS-10

8 to 30 V

Order number **B 261 209 064-01**

Dimensions



Pressure Sensor Fluid PSS-10R



4

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	E 85 / M 100
Max. vibration	100 m/s ² 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-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
Mating connector	3-pole Compact D 261 205 339-01	3-pole Compact D 261 205 334-01

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	-

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

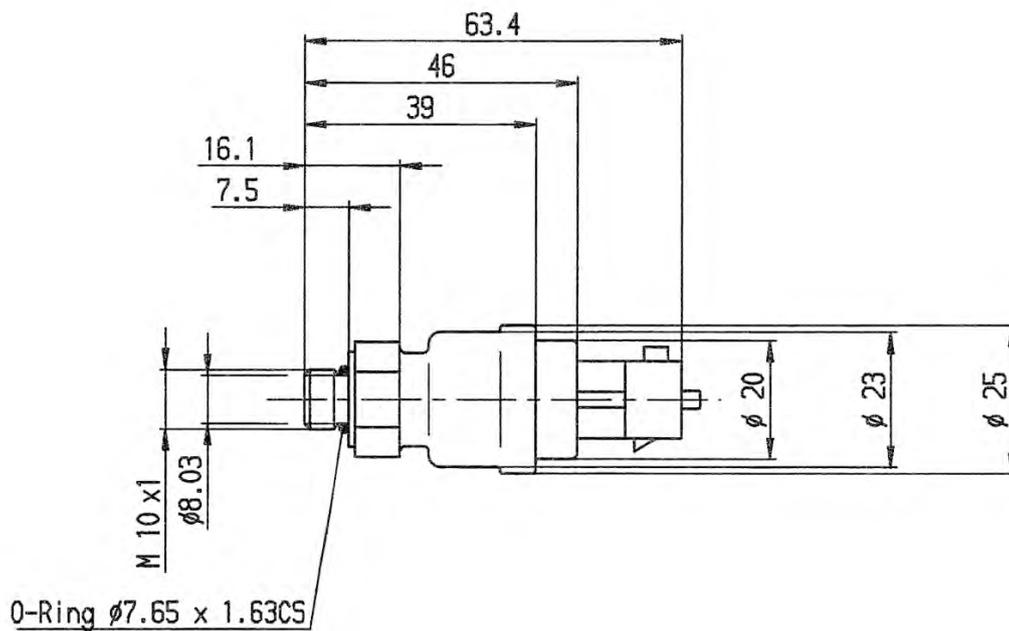
Order number **F 01T A21 312-01**

PSS-10R

8 to 30 V

Order number **F 01T A21 307-01**

Dimensions



Pressure Sensor Fluid

PSS-100R



4

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	E 85 / M 100
Max. vibration	100 m/s ² 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-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
Mating connector	3-pole Compact D 261 205 339-01	3-pole Compact D 261 205 339-01

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	8 mA

Characteristic

Response time T10/90	Please see variations
Compensated range	0 to 90°C
Tolerance (FS) at $U_s = 5$ V	± 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

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

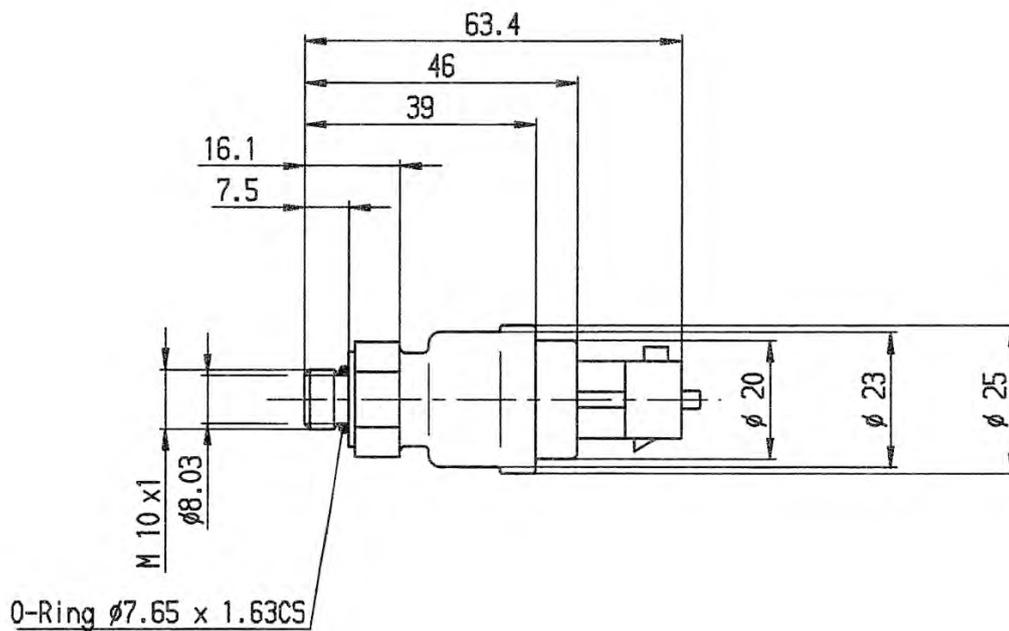
Order number **B 261 209 347-01**

PSS-100R

8 to 30 V

Order number **F 01T A21 310-01**

Dimensions



Pressure Sensor Fluid

PSS-250R



4

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	E 85 / M 100
Max. vibration	100 m/s ² 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-ratiometric
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	3-pole Compact D 261 205 339-01	3-pole Compact D 261 205 334-01

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)	± 2.5 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	-

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

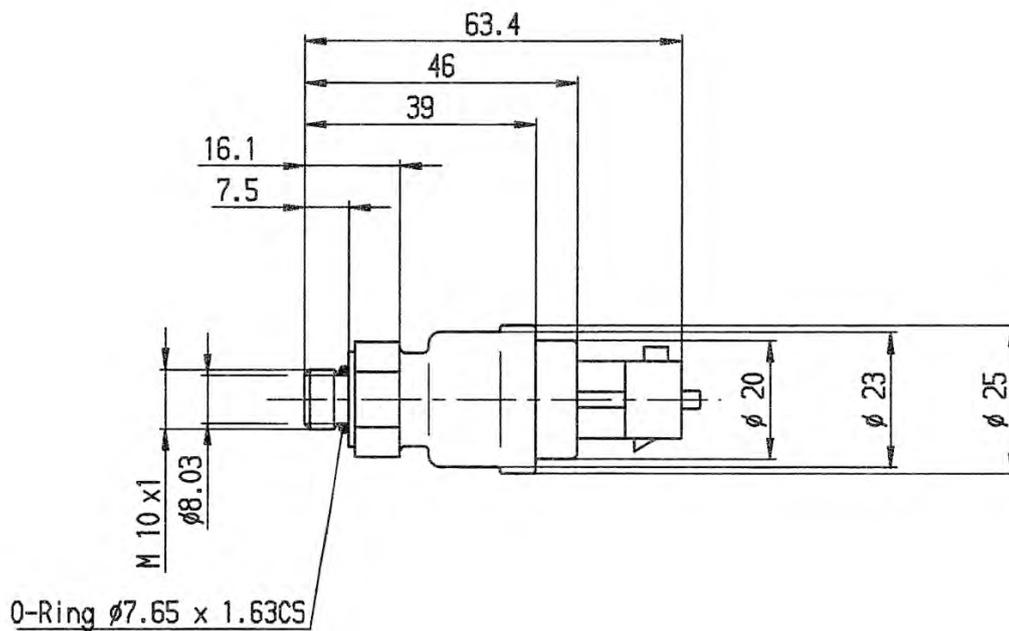
Order number **B 261 209 965-01**

PSS-250R

8 to 30 V

Order number **B 261 209 067-01**

Dimensions



Pressure Sensor Fluid PSS-260



4

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 ² 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 ratiometric
Current I_s	12 mA

Characteristic

Load capacity	10 nF
Output resistance	10 Ω
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	3-pole Compact D 261 205 366-01
Pin 1	Gnd
Pin 2	Sig
Pin 3	U_s

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**

Pressure Sensor Fluid PST-F



4

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 ² at 1 to 250 Hz 60 m/s ² at 250 to 2,600 Hz 40 m/s ² at 2,600 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

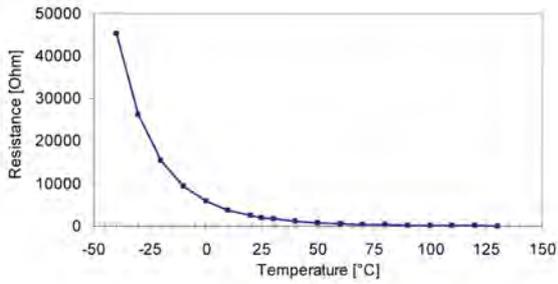
Power supply U_S	4.75 to 5.25 V
Max power supply U_S max	16 V
Full scale output U_A	0.5 to 4.5 V
Current I_S	9 mA

Characteristic 1

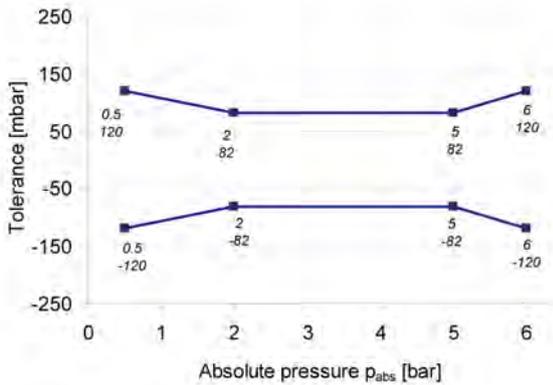
Response time T10/90	1 ms
Output load	10 kΩ
Sensitivity	727 mV/bar
Offset	136 mV

Characteristic 2

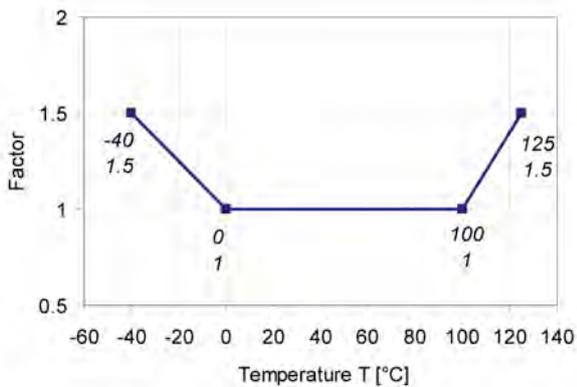
T [°C]	R [Ω]
-40	45,303
-30	26,108
-20	15,458
-10	9,395
0	5,671
10	3,791
20	2,499
30	1,706
40	1,174
50	834
60	595
70	436
80	322
90	243
100	187
110	144
120	113
125	100
Response Time tau 63	45 s in air; v = 6 m/s



Tolerance



Expansion of Tolerance



Connectors and Wires

Connector	Bosch Compact
Mating connector 4-pole Compact	D 261 205 336-01
Pin 1	Gnd
Pin 2	NTC
Pin 3	U_s
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.

To avoid noise, an ECU-input circuit with a RC-low pass filter is recommended.
(R = 21 kΩ, C = 100 nF)

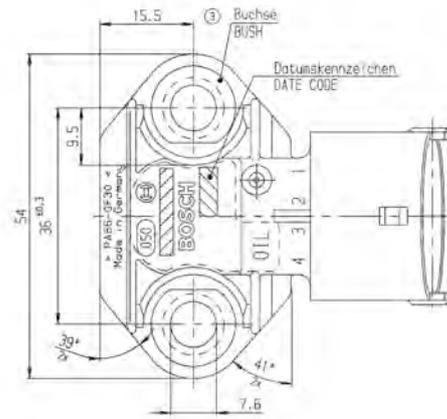
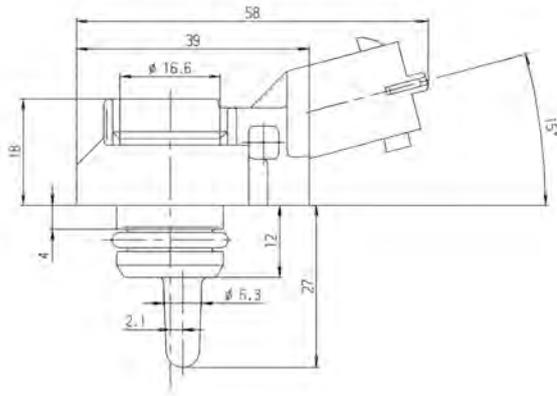
For the temperature measurement, a 1 kΩ pull-up at 5 V is recommended.

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**

Dimensions



Pressure Sensor Fluid PST-F 2



Features

- ▶ Absolute fluid pressure and temperature measurements
- ▶ Pressure measurement range 0 to 280 bar
- ▶ Temperature measurement range -40 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 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 an NTC thermistor. The main feature of this sensor is its compact design and the integration of two functions (temperature and pressure measurements) in a common housing.

Application

Application 1	0 to 280 bar (a)
Application 2	-40 to 140°C
Reference	Absolute
Max. pressure	340 bar
Operating temp. range	-40 to 130°C (140°C)
Media temp. range	-40 to 130°C (140°C)
Storage temp. range	-40 to 60°C
Biofuel compatibility	E26, E85
Max. vibration	210 m/s ² at 147 to 1,350 Hz 175 m/s ² at 1,350 to 2,000 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

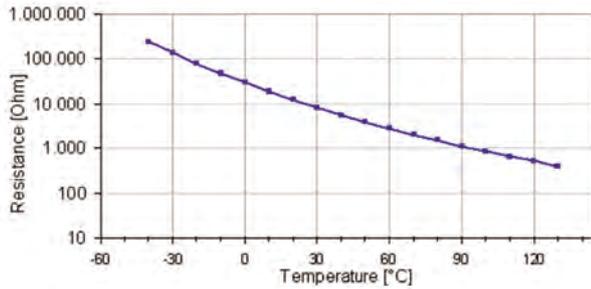
Power supply U_S	4.75 to 5.25 V
Max power supply U_S max	16 V
Full scale output U_A	0.5 to 4.5 V U_S ratiometric
Current I_S	12 mA

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 at $U_S = 5$ 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



4

Connectors and Wires

Connector	Bosch Compact
Mating connector	F 02U B00 596-01
Pin 1	Gnd
Pin 2	Sig
Pin 3	NTC
Pin 4	U_s

Installation Notes

The sensor can be connected directly to most control units.

For temperature measurement please use a pull-up resistor with an optimal value of 4.6 kOhm.

Please note that using the adapter F 02U 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 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 2

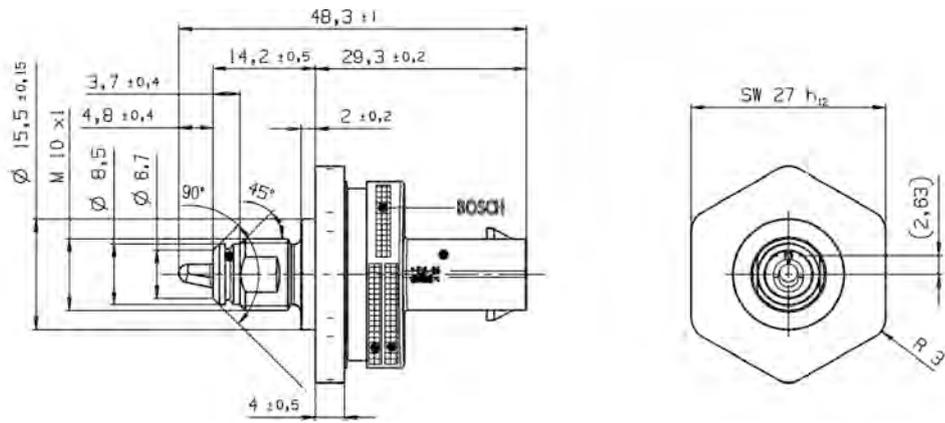
Order number **0 261 B21 023-00**

Accessories

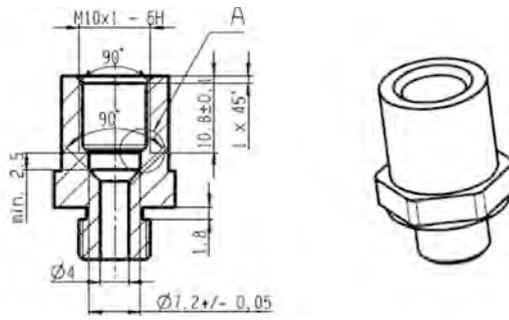
Pressure Sensor Fluid PST-F 2 Adapter

Order number **F02U 002 956-01**

Dimensions



Sensor



Adapter

Rotary Potentiometer Mini-RP 100-M



4

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	-55 to 125°C
Storage temperature range	0 to 100°C
Max. vibration	200 m/s ² 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 ⁶ rotations
Housing	Aluminum alloy

Electrical Data

Power supply U_s	5 V
Max. power supply	<15 V
Total resistance	1.5 k Ω \pm 20%
Current I_s	1 μ A
Max. allowable contact current	1 mA

Characteristic

Max. rotation speed	120 min ⁻¹
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.

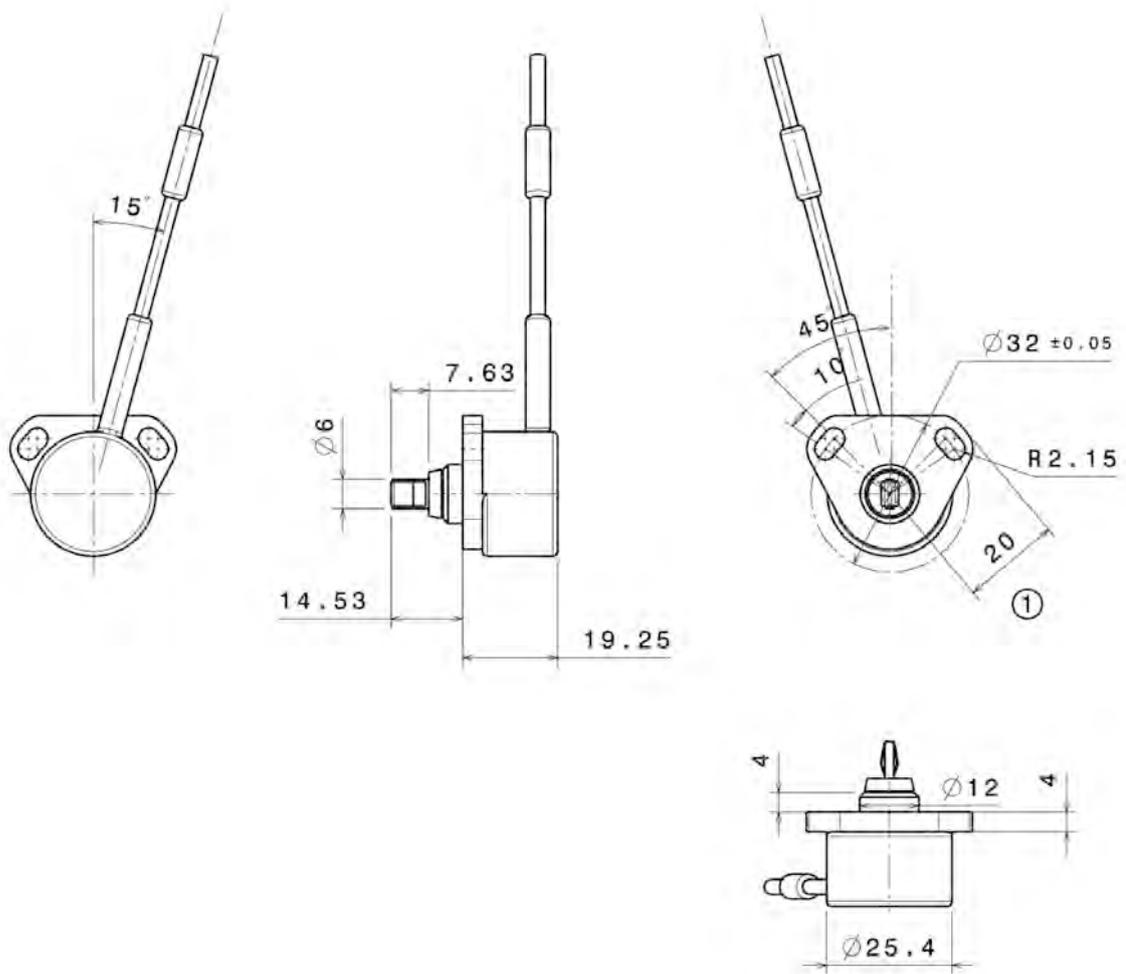
Both rotation directions and other rotation angles available on request.

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



Rotary Potentiometer RP 50-M/130-M/350-M



4

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 motorsport 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 F 02U 000 226-01	KPTA 1E6-4S-C-DN F 02U 000 108-01	ASL 0-06-05SA-HE F 02U 000 226-01

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 μA
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**

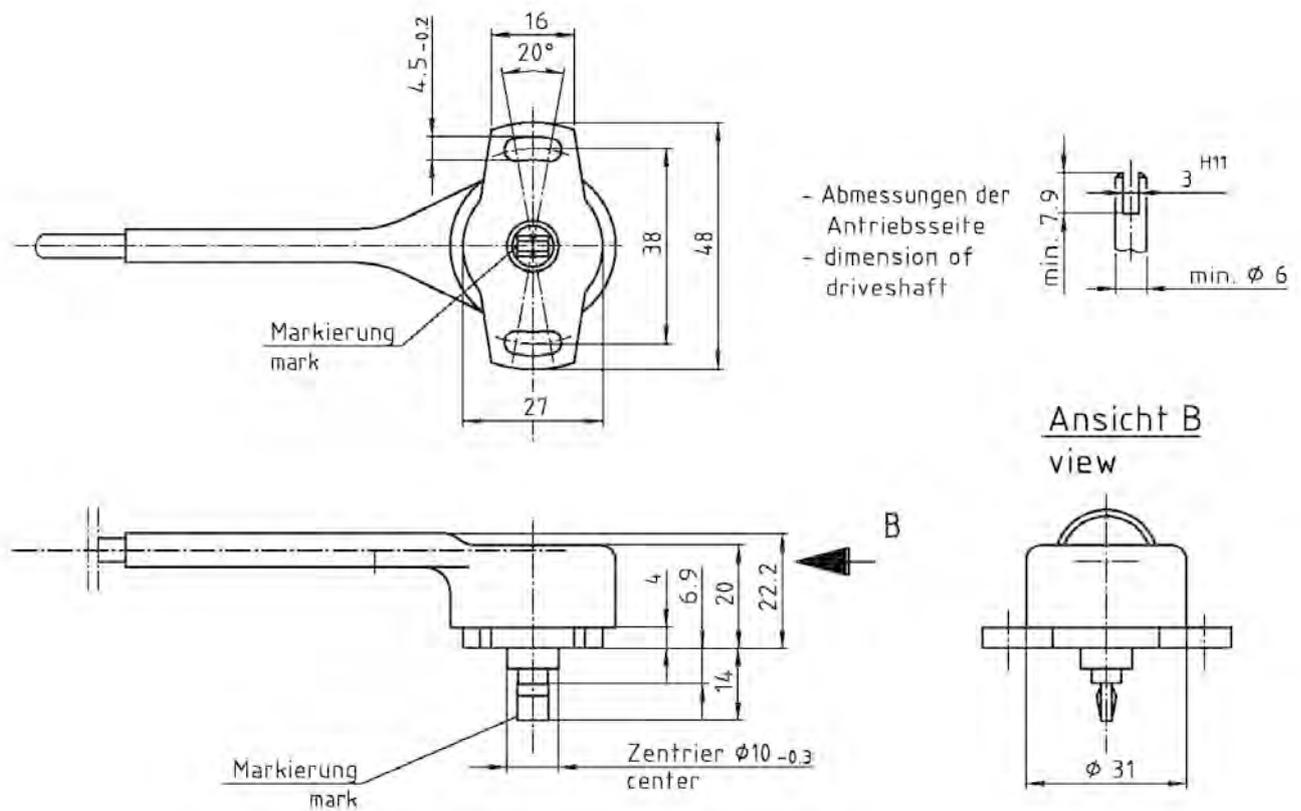
Rotary Potentiometer RP 130-M

Order number **B 261 209 576-01**

Rotary Potentiometer RP 350-M

Order number **B 261 209 573-01**

Dimensions



Rotary Potentiometer RP 55



4

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 ² at 30 to 500 Hz

Technical Specifications

Mechanical Data

Weight w/o wire	59 g
Protection class	IP63
Mounting	di 6 mm
Lifetime	5 x 10 ⁶ rotations
Housing	Aluminum alloy

Electrical Data

Power supply U _s	5 V
Total resistance	5 kΩ
Current I _s	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	F 02U 000 226-01
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.

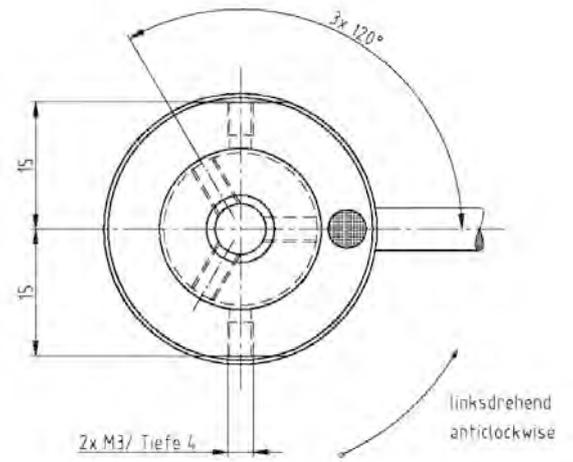
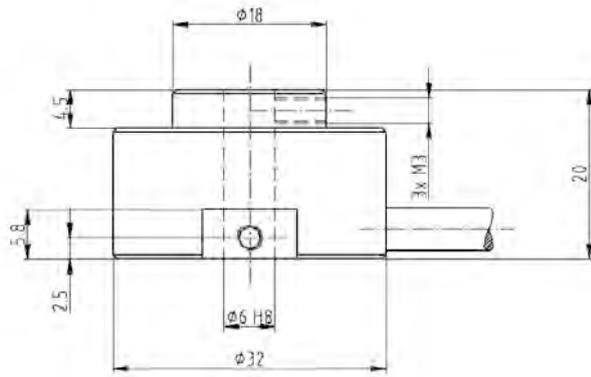
Both rotation directions and other rotation angles available on request.

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 55
Order number **B 261 209 578-01**

Dimensions



Rotary Potentiometer RP 86



4

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 ²

Technical Specifications

Mechanical Data

Weight w/o wire	26 g
Mounting	2 x M4
Lifetime	2 x 10 ⁶ rotations
Housing	Synthetic material

Electrical Data

Power supply U _s	5 V
Max. power supply	42 V
Total resistance	2 kΩ ±20 %
Current I _s	18 μA

Characteristic

Max. rotation speed	120 min ⁻¹
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	
Redundancy	No

Connectors and Wires

Connector	Bosch Compact
Mating connector 3-pole Compact	D 261 205 334-01
Pin 1 (A)	U _s
Pin 2 (B)	Gnd
Pin 3 (C)	Sig
Pin 4 (D)	-
Pin 5 (E)	-

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**

Rotary Potentiometer RP 100/130/308



4

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 ² 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 ⁶ rotations
Housing	Synthetic material

Electrical Data

Power supply U _s	5 V
Max. power supply	42 V
Total resistance	Please see variations
Current I _s	1 μA
Max. allowable contact current	10 mA

Characteristic

Max. rotation speed	120 min ⁻¹
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	F 02U 000 226-01
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.

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

Ordering Information

RP 100

Order number **B 261 209 127-01**

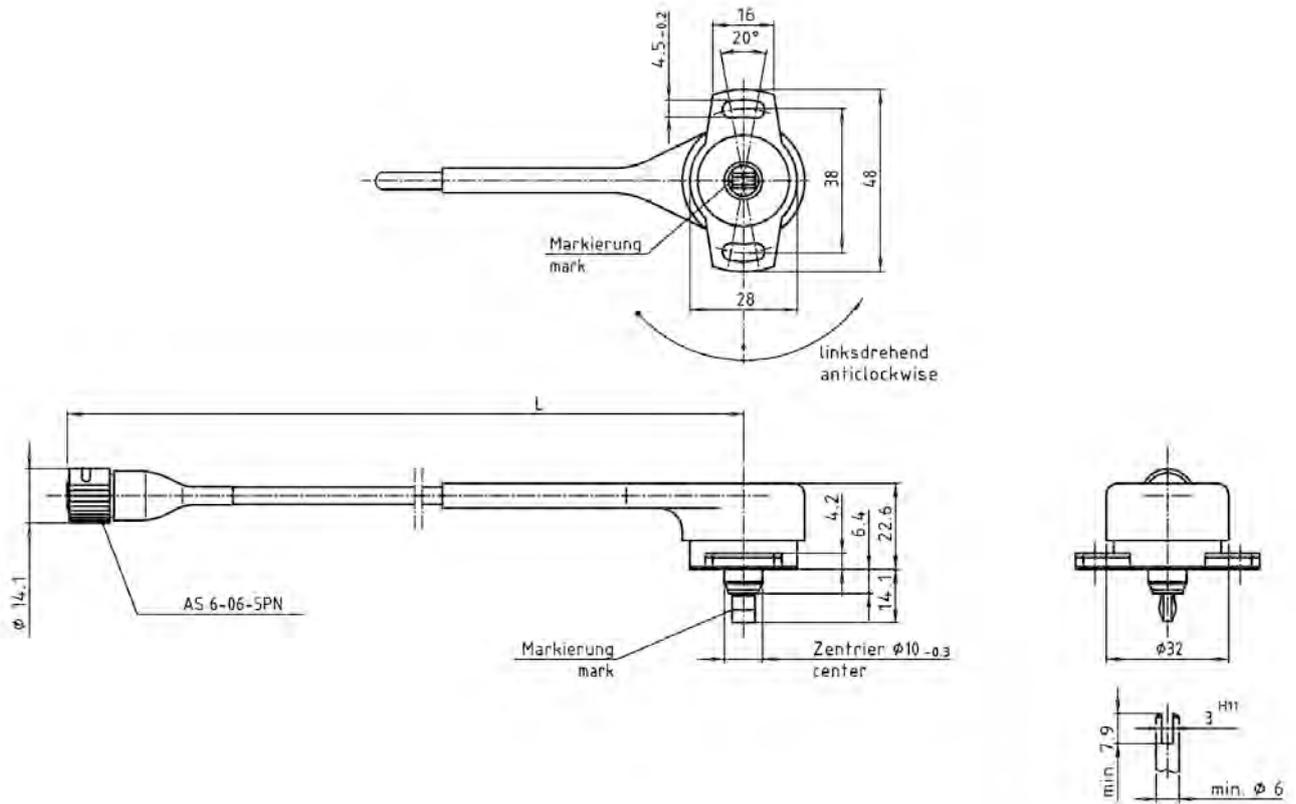
RP 130

Order number **B 261 209 128-02**

RP 308

Order number **B 261 209 570-01**

Dimensions



Rotary Potentiometer RP 100 twin



4

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 ² at 5 to 2,000 Hz

Technical Specifications

Mechanical Data

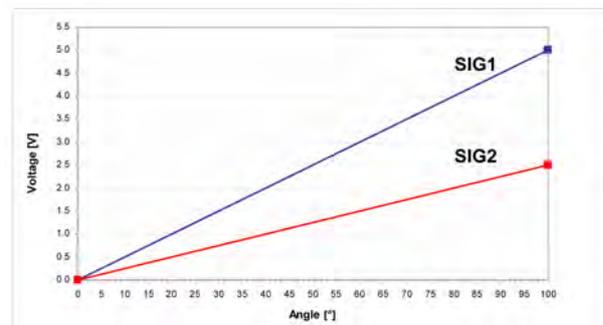
Weight w/o wire	32 g
Protection class	IP65
Mounting	2 x M4
Lifetime	50 x 10 ⁶ rotations
Housing	Synthetic material

Electrical Data

Power supply U_s	5 V
Max. power supply	42 V
Total resistance	3 k Ω \pm 20 %
Current I_S	1 μ A
Max. allowable contact current	10 mA

Characteristic

Max. rotation speed	120 min ⁻¹
Temp. coefficient	5 ppm/°K
Direction of rotation	Clockwise
Both rotation directions are available on request	
Redundancy	



Connectors and Wires

Connector	AS 6-07-35PN
Mating connector AS 0-07-35SN	F 02U 000 238-01
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).

Both rotation directions and other rotation angles available on request.

Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

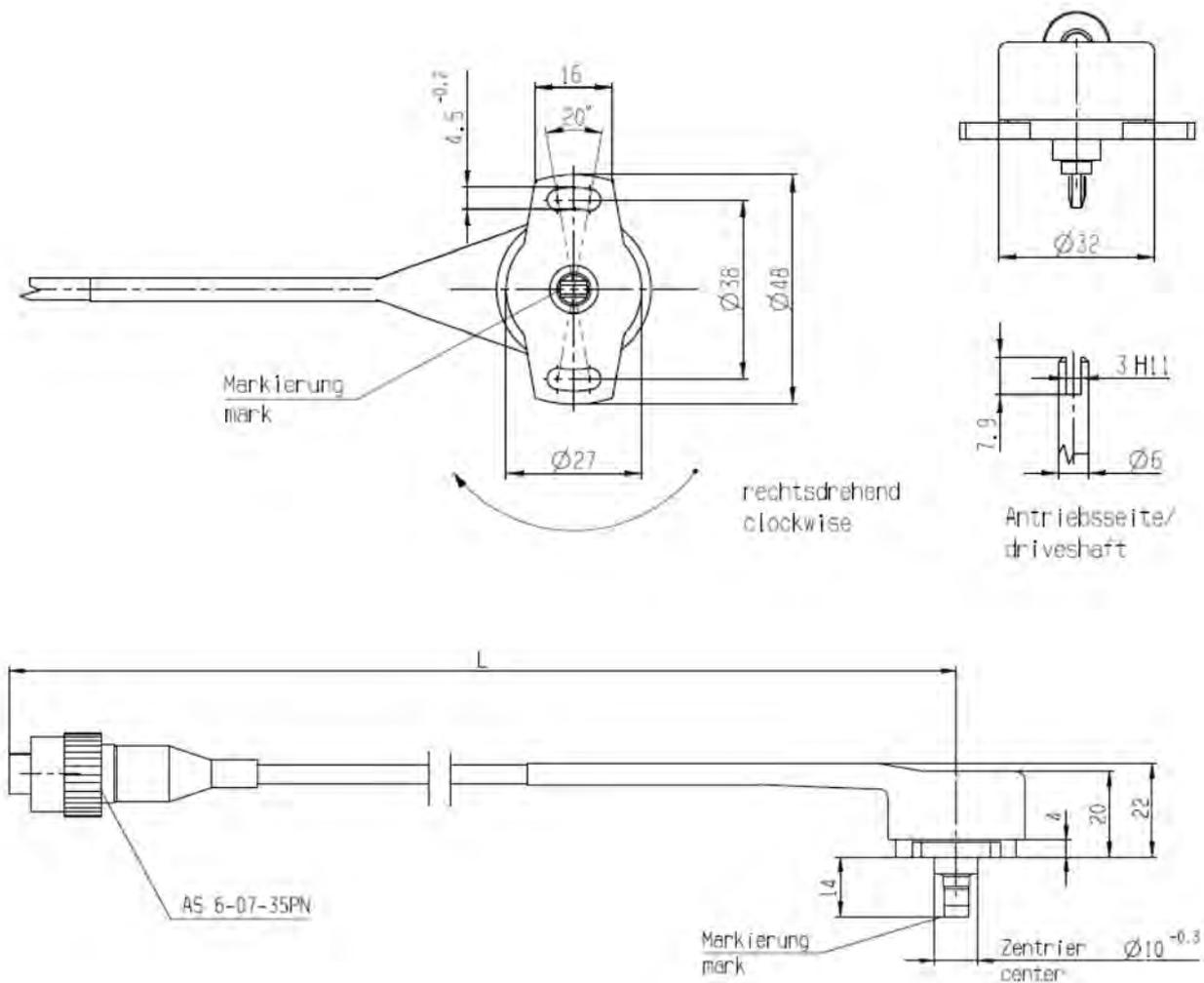
Ordering Information

Rotary Potentiometer RP 100 twin

Order number **B 261 209 591-02**

4

Dimensions



Rotary Potentiometer RP 345-M



4

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 ² 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 ⁶ rotations
Housing	Aluminum alloy

Electrical Data

Power supply U_s	5 V
Maximal power supply	42 V
Total resistance	5 k Ω \pm 20 %
Current I_s	1 μ A
Max. allowable contact current	10 mA

Characteristic

Max. rotation speed	120 min ⁻¹
Temp. coefficient	5 ppm/°K
Direction of rotation	Anti-clockwise
Both rotation directions are available on request.	
Redundancy	No

Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector ASL 0-06-05SA-HE	F 02U 000 226-01
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.

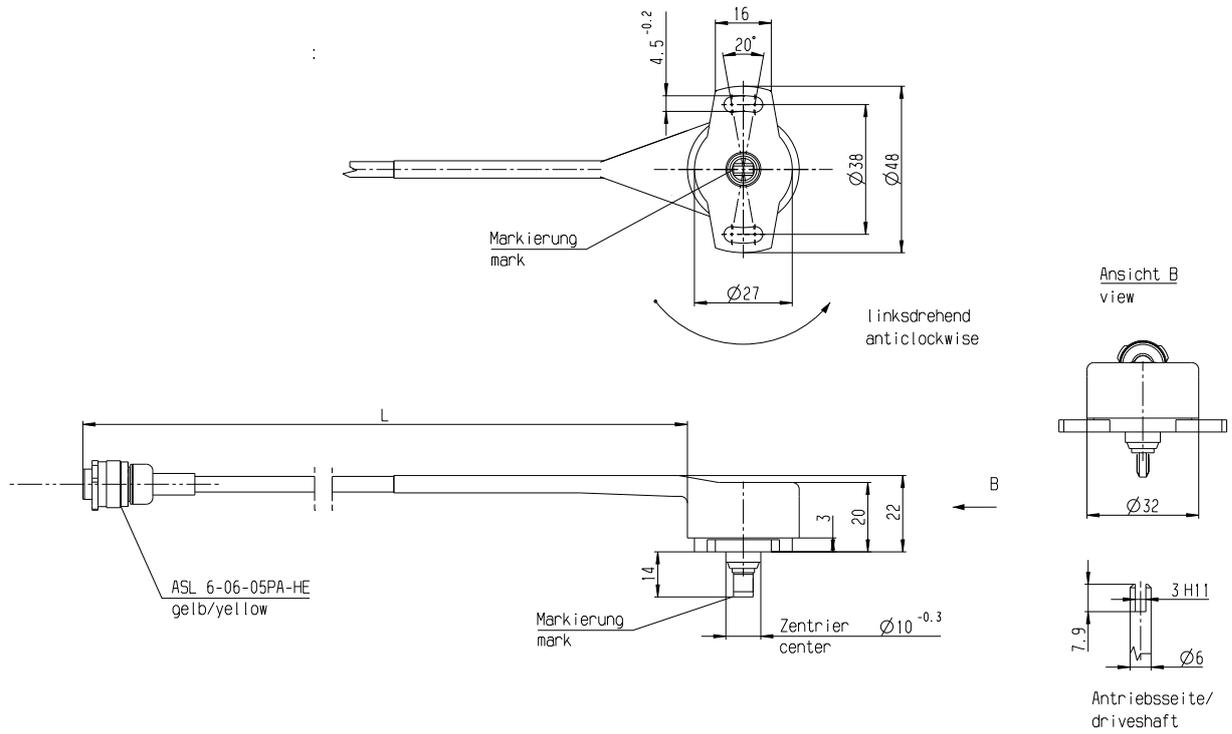
Both rotation directions and other rotation angles available on request.

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 345-M
Order number **F 01T A21 400-01**

Dimensions



Rotary Potentiometer RP 360-H



4

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 ² at 5 to 2,000 Hz

Technical Specifications

Mechanical Data

Weight w/o wire	< 35 g
Protection class	IP68
Mounting	2 x M4

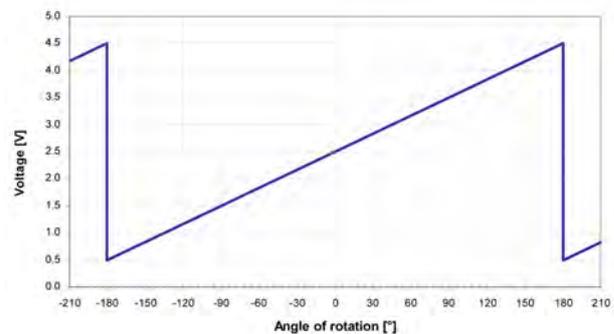
Lifetime	20 x 10 ⁶ operations of ±75°
Housing	Synthetic material

Electrical Data

Power supply U _s	5 V regulated
	9 V to 30 V unregulated
Max. power supply	30 V
Total resistance	10 kΩ
Current I _s	< 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 ⁻¹
Temp. coefficient	< 30 ppm/°K in 5 V supply mode
< 90 ppm/°K in 9 V to 30 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	F 02U 000 226-01
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 22
Wire length L	16 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 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.

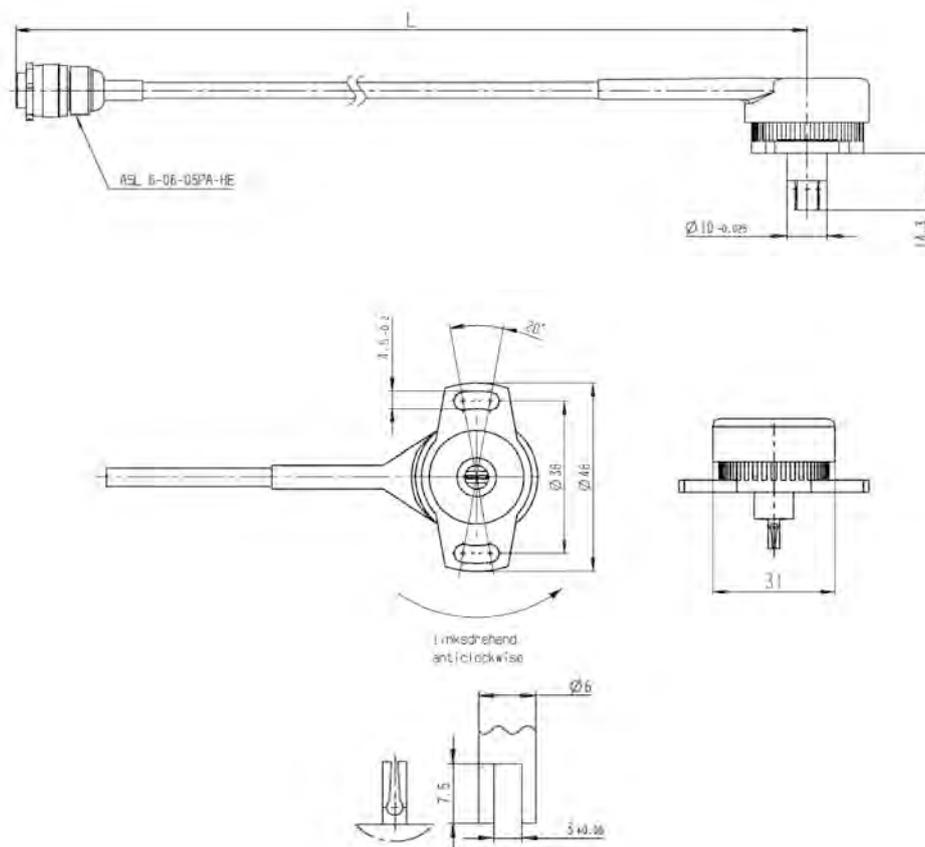
Please find further application hints in the offer drawing at our homepage.

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
- ▶ Also available with 0°, 180° and 270° mounting position
- ▶ 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 90, 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 ² 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 _s

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	F 02U 000 228-01
Pin 1	U _s
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.

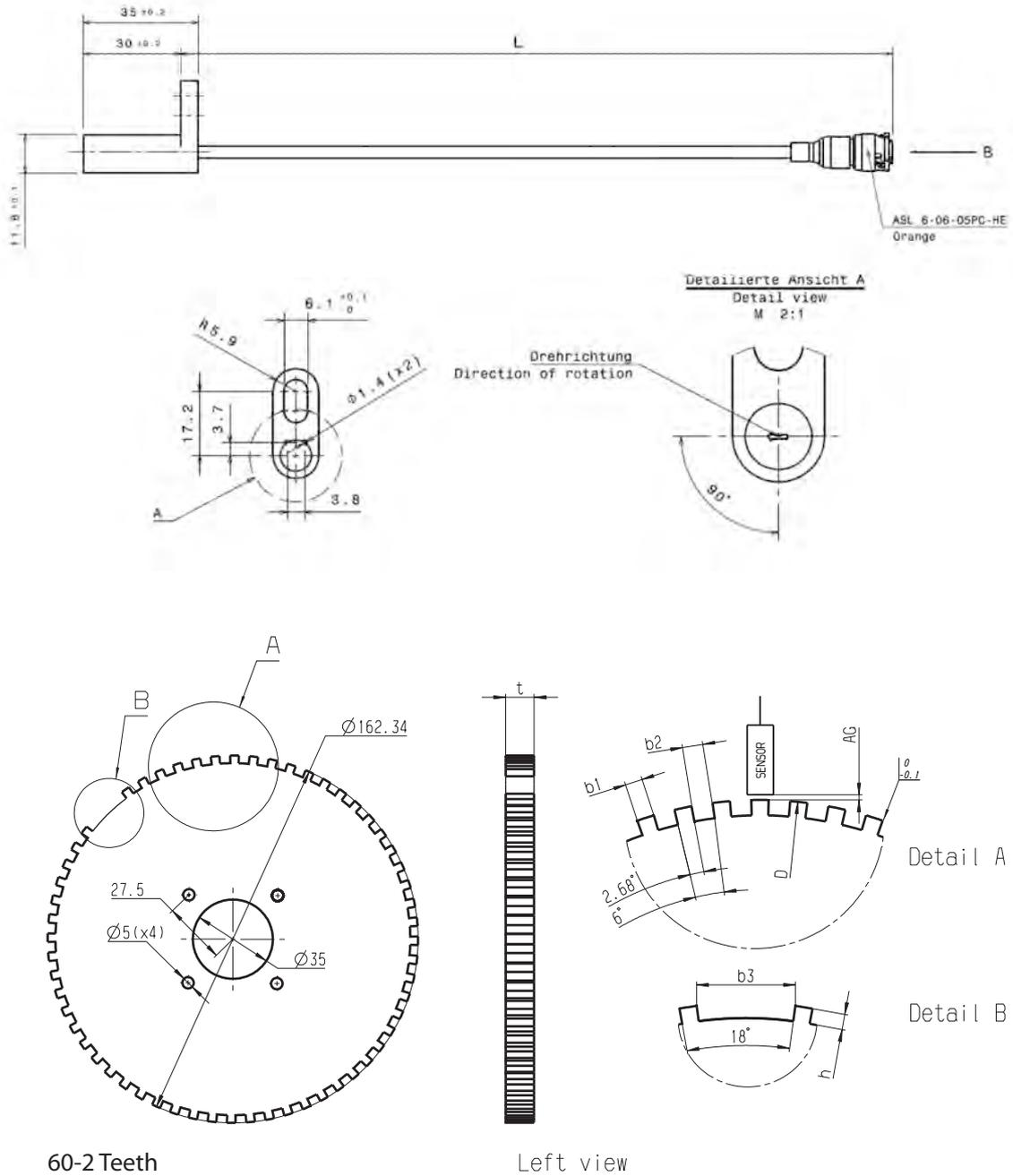
Please find further application hints in the offer drawing at our home-page.

Ordering Information

Hall-Effect Speed Sensor HA-D 90

Order number **F 02U V00 334-01**

Dimensions



60-2 Teeth

Left view

Hall-Effect Speed Sensor HA-Di



4

Features

- ▶ Wheel / crankshaft speed
- ▶ Available with 0°, 90°, 180° and 270° mounting position
- ▶ Detecting the rotational direction
- ▶ Self-learning
- ▶ Measuring of differences with 3 Hall sensors

This sensor is designed for incremental measurement of rotational wheel or crankshaft speed.

Due to the rotation of a ferromagnetic target wheel in front of the HA-Di, the magnetic field of the built-in magnet is modulated at the place of the sensors diff.

The main feature and benefit of this sensor is the detection of the rotational direction.

Application

Application	Speed
Max. frequency	≤ 10 kHz forward ≤ 6 kHz backward
Target wheel air gap AG	0.4 to 1.2 mm
Temperature range	-40 to 150°C
Output circuit	Open collector for 1 kΩ
External magnetic fields	≤ 100 mT
Max. vibration	1,200 m/s ² at 10 Hz to 2 kHz

Technical Specifications

Mechanical Data

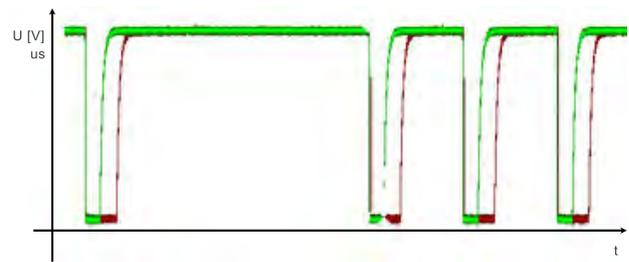
Weight w/o wire	12 g
Mounting	Screw 1 x M6
Bore diameter	12-0.2 mm
Installation depth L2	30 mm
Tightening torque	6 Nm

Electrical Data

Power supply	5 to 16 V (24 V for max. 5 min.)
Current IS	<20 mA
Power-on time	1 ms

Characteristic

Signal output width forward	37 to 53 μs (45)
Signal output width backward	75 to 105 μs (90)
Accuracy (tolerance)	±1.5° (for forward direction)
Signal output	0.52 V to < U _s



Signal output width (forward: green, backward: red)

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

Alternative Target Wheel

Target wheel diameter	118 to 370 mm
Width of teeth b1	2.2 to 3.8 mm
Width of gap b2	≥4 mm
Depth of teeth h	≥4 mm
Target wheel width	≥5 mm
Relative magnetic permeability	μ (r) ≥1000

Connectors and Wires

Connector	ASL 6-06-05PC-HE
Mating connector	F 02U 000 228-01
ASL 0-06-05SC-HE	
Pin 1	U _s
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-Di is no true-power-on sensor. It needs the falling edge of trigger wheel 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.

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

HA-Di 0

Order number **F 02U V01 802-01**

HA-Di 90

Order number **F 02U V01 803-01**

HA-Di 180

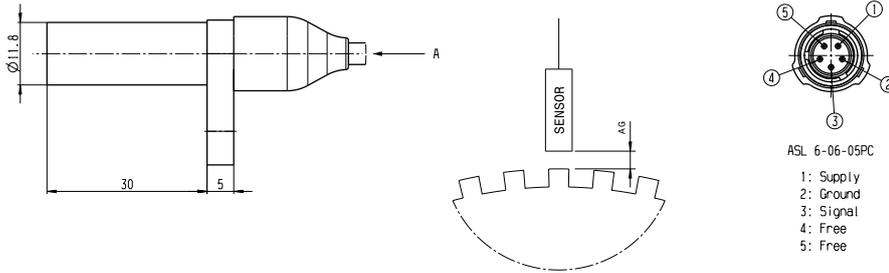
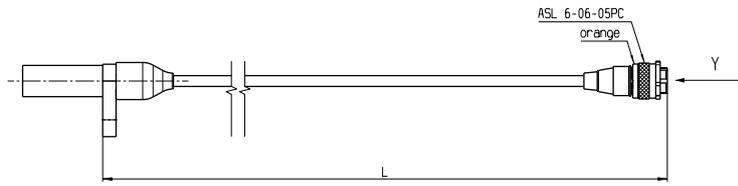
Order number **F 02U V01 804-01**

HA-Di 270

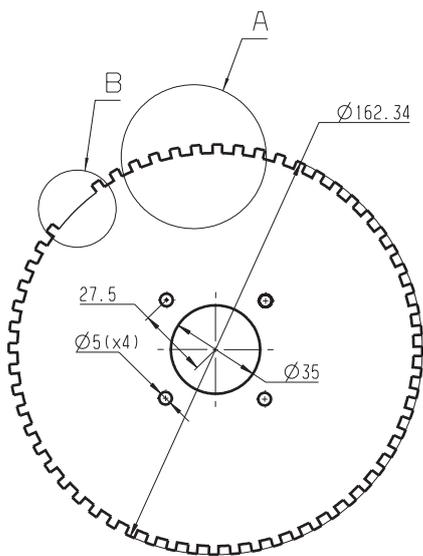
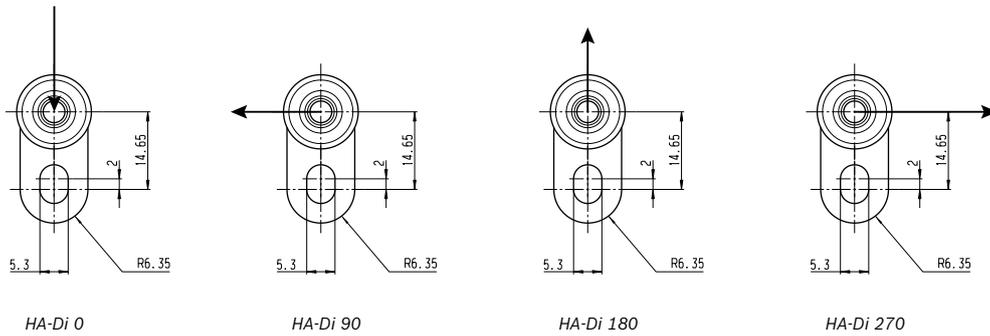
Order number **F 02U V01 805-01**

Dimensions

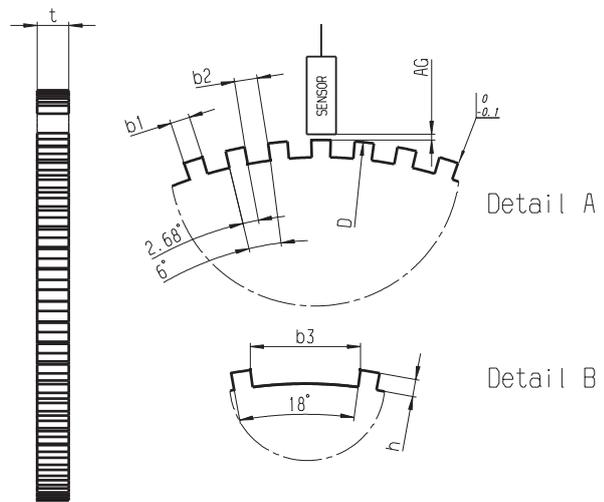
4



Direction of rotation of the target wheel
View A



60-2 Teeth



Left view

Hall-Effect Speed Sensor HA-M



Features

- ▶ Camshaft/crankshaft/wheel speed
- ▶ Max. frequency 10 kHz
- ▶ Self-learning
- ▶ Active high/low programmable

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 ² 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	F 02U 000 199-01
Pin 1	U _s
Pin 2	Gnd
Pin 3	Sig

Active high, without connector

Red	U _s
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 _s	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 _s

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 home-page.

Ordering Information

HA-M

Active low

Order number **B 261 209 283-01**

HA-M

Active high

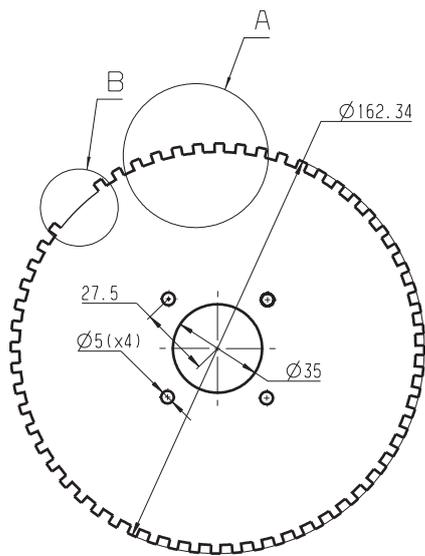
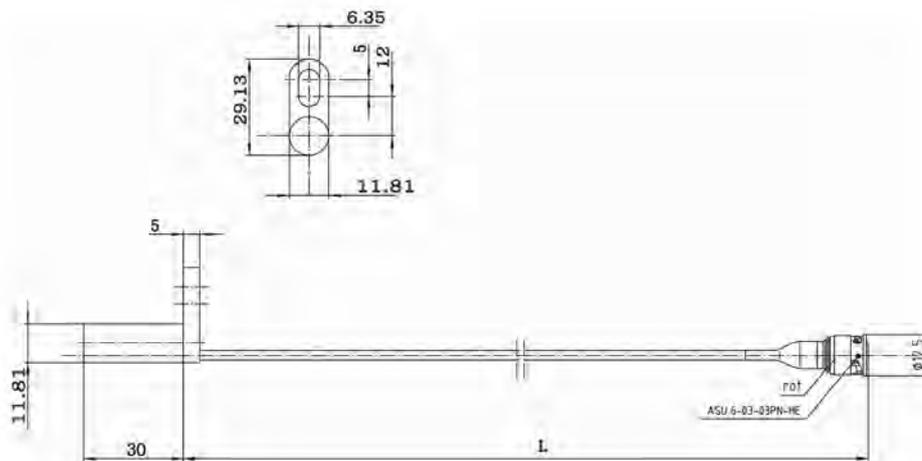
Order number **B 261 209 295-01**

HA-M

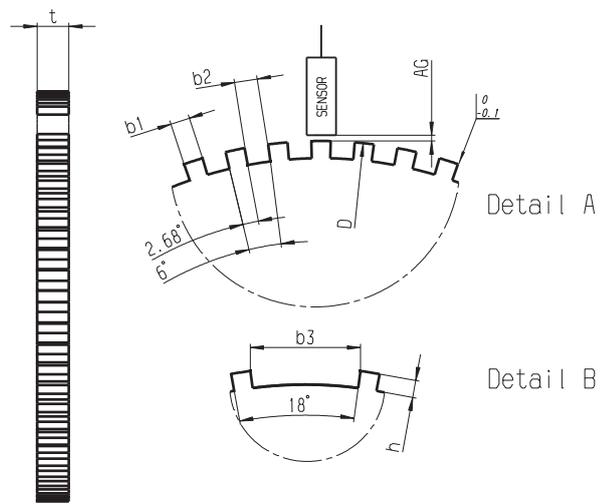
Active high, without connector

Order number **F 02U V00 627-01**

Dimensions



60-2 Teeth



Left view

Hall-Effect Speed Sensor HA-P



Features

- ▶ Camshaft or Wheel speed
- ▶ 24.0 mm depth
- ▶ Robust design
- ▶ Active low

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft 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 ² 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 I _S	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 3-pole Compact	D 261 205 335-01
Pin 1	Gnd
Pin 2	Sig
Pin 3	U _s

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.

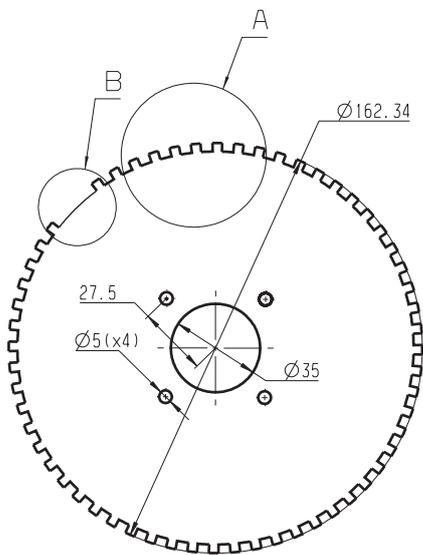
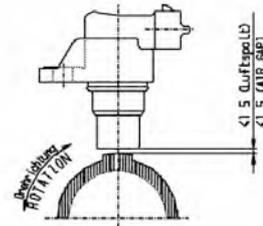
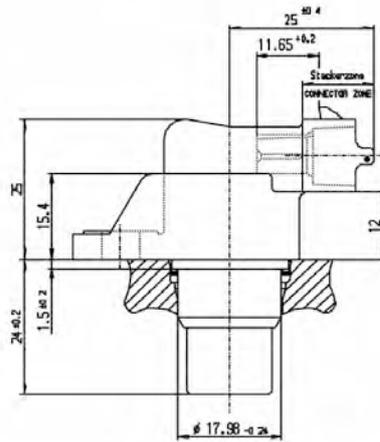
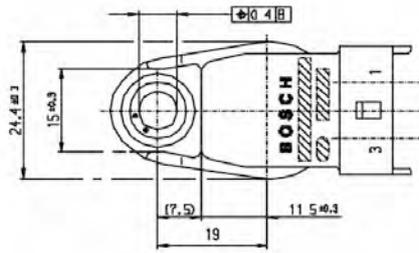
Ordering Information

Hall-Effect Speed Sensor HA-P

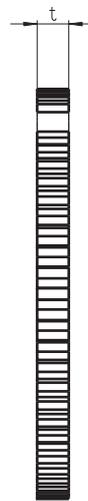
Order number **0 232 103 037**

Dimensions

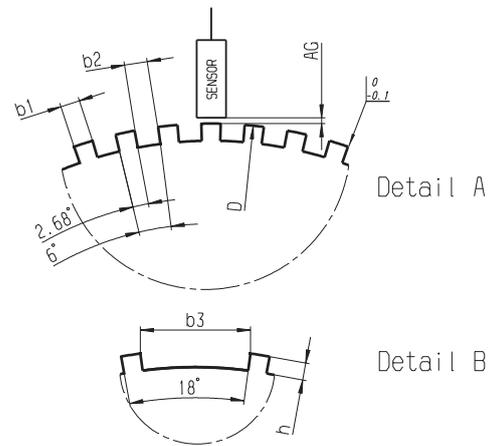
4



60-2Teeth



Left view



Detail A

Detail B

Hall-Effect Speed Sensor HA-P2



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 ² 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 Is	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 _s

Connectors and Wires

Connector	Hirschmann 872-658-501 Cod.A
Mating connector	F 02U B00 520-01
Pin 1	U _s
Pin 2	Sig
Pin 3	Gnd

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.

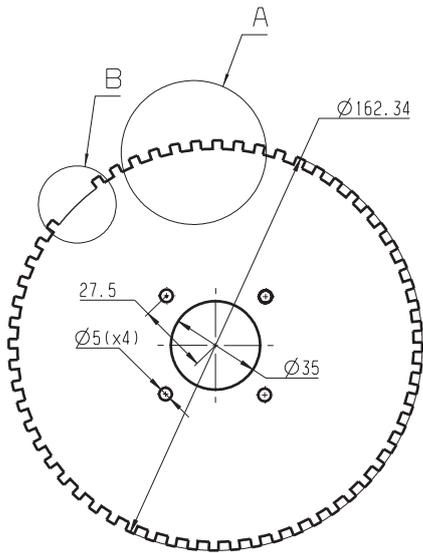
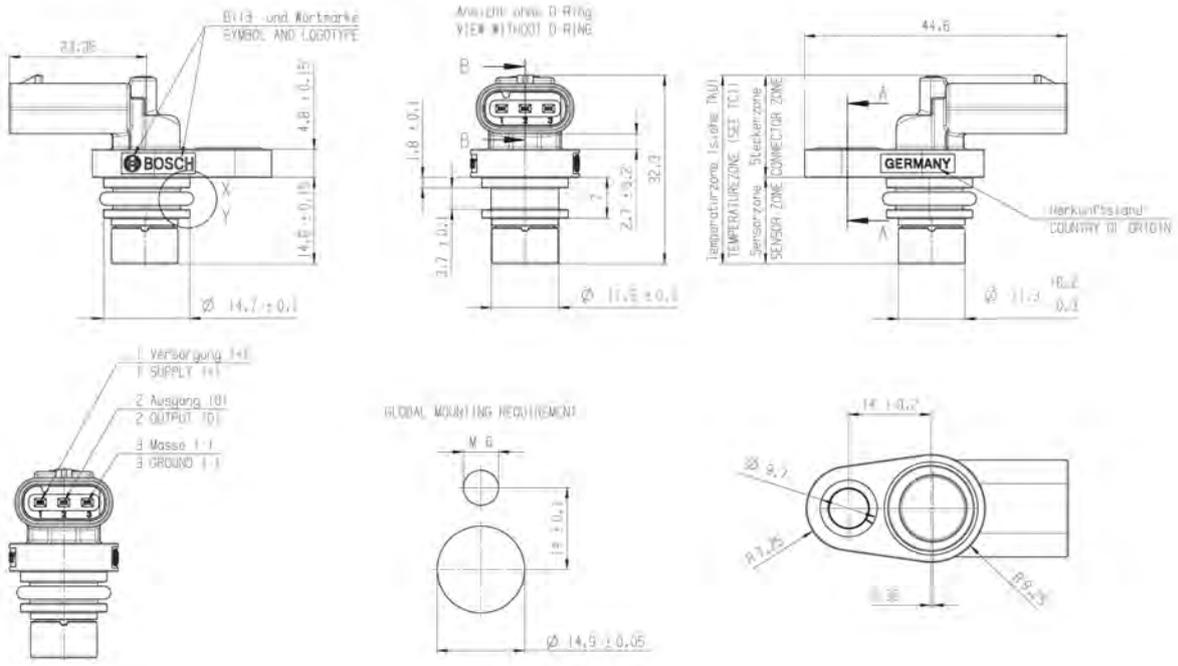
Please find further application hints in the offer drawing at our homepage.

Ordering Information

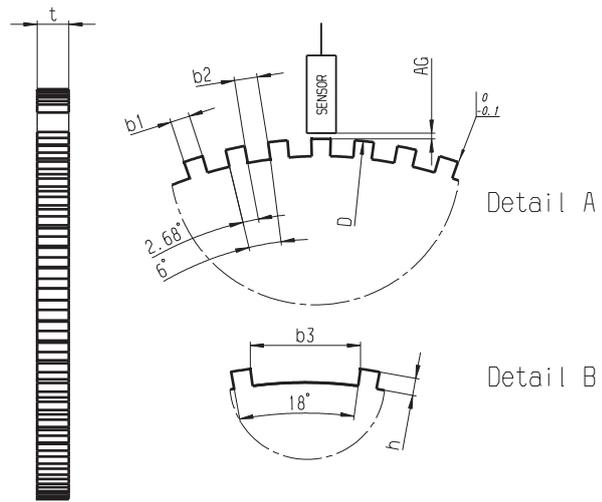
Hall-Effect Speed Sensor HA-P2
 Order number 0 232 103 111

Dimensions

4



60-2 Teeth



Left view

Hall-Effect Speed Sensor Mini-HA-P



Features

- ▶ Camshaft or Wheel speed
- ▶ Max. frequency ≤ 10 kHz
- ▶ High vibration resistance
- ▶ Low weight
- ▶ Small housing

This sensor is designed for incremental measurement of rotational speed (e.g. camshaft 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	≤ 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 Ω
Output type	Active low
External magnetic fields	≤ 0.3 mT
Max. vibration	1,200 m/s ² 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 _s	U _s
Pin 2	Gnd	Sig
Pin 3	Sig	Gnd
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 _S	10 mA

Characteristic

Accuracy repeatability of the falling edge of tooth	< 3 % (≤ 6 kHz) < 5 % (≤ 10 kHz)
Signal output	0.4 V to < U _s

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 home-page.

Ordering Information

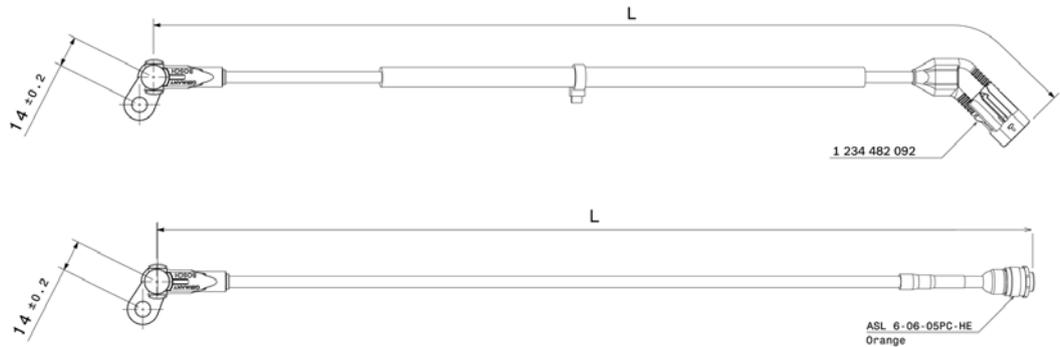
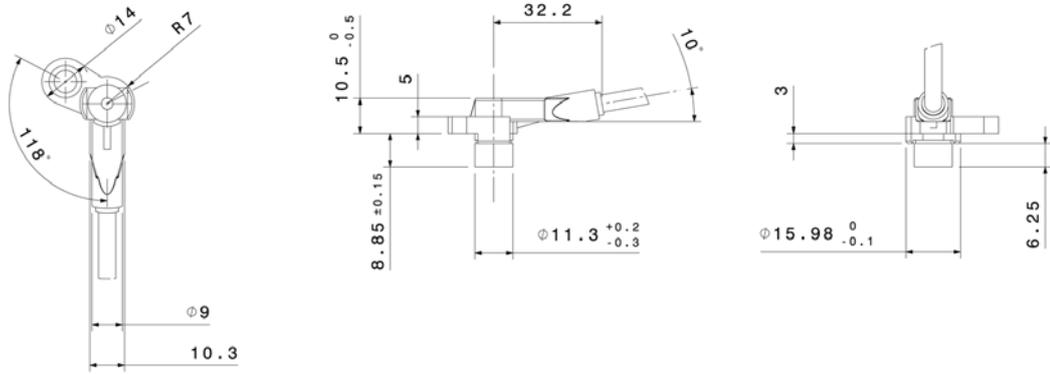
Mini-HA-P

ASL 6-06-05PC-HE
Order number **F 02U V00 564-02**

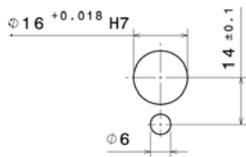
Mini-HA-P

1 234 482 092
Order number **F 02U V00 566-02**

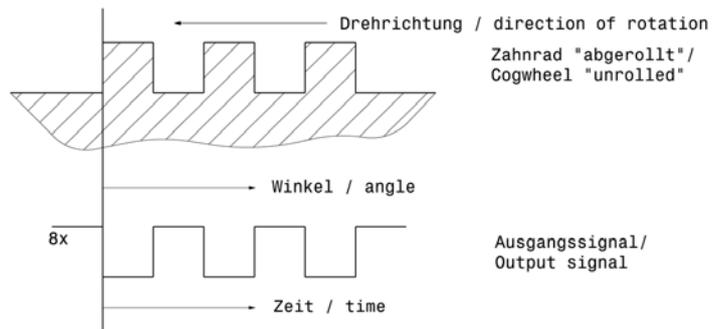
Dimensions

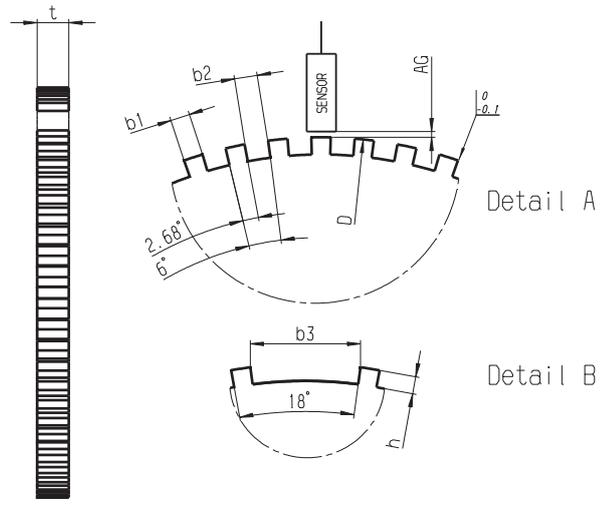
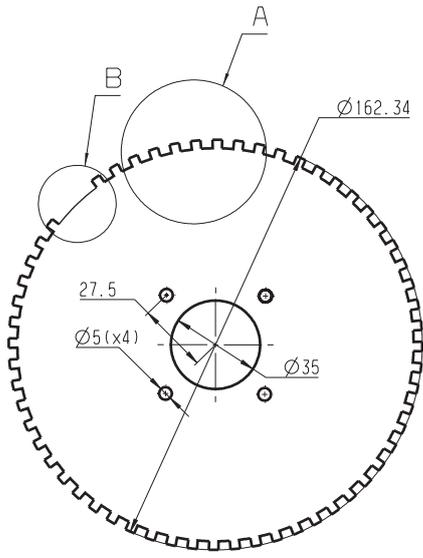


Einbauvorschrift
Mounting requirement



Signal-Definition
Signal definition





60-2 Teeth

Left view

Hall-Effect Speed Sensor Mini-HA-P sealed



Features

- ▶ Wheel/camshaft/crankshaft speed
- ▶ Max. frequency ≤ 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	≤ 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 Ω
Output type	Active low
External magnetic fields	≤ 0.3 mT
Max. vibration	1,200 m/s ² at 10 Hz to 2 kHz

Technical Specifications

Variations

Connector	ASL 6-06-05PC-HE	Without connector
Mating connector	ASL 0-06-05SC-HE F 02U 000 228-01	-
Pin 1	U _s	U _s (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 IS	10 mA

Characteristic

Accuracy repeatability of the fall-ing edge of tooth	< 3 % (≤ 6 kHz) < 5 % (≤ 10 kHz)
Signal output	0.4 V to < U _s

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 home-page.

Ordering Information

Mini-HA-P sealed

ASL 6-06-05PC-HE

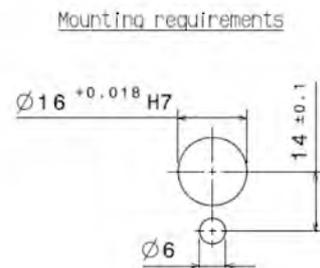
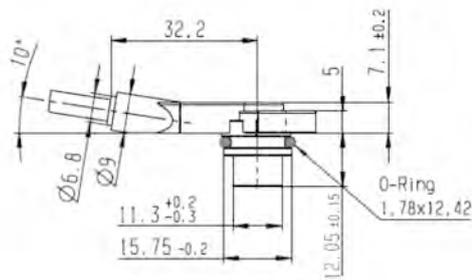
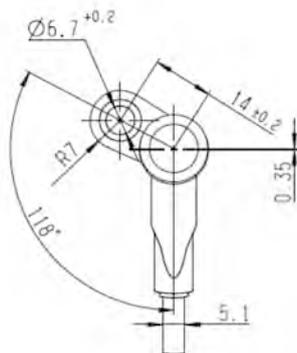
Order number **F 02U V00 500-01**

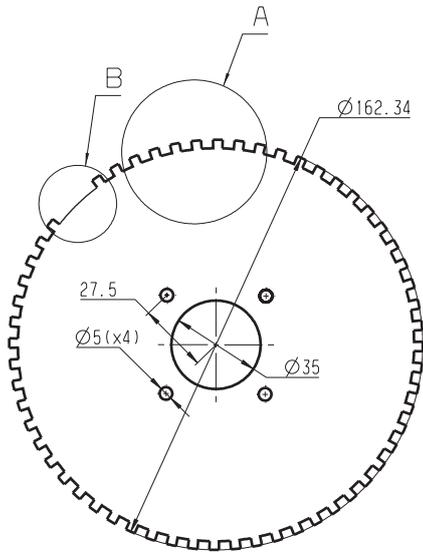
Mini-HA-P sealed

without connector

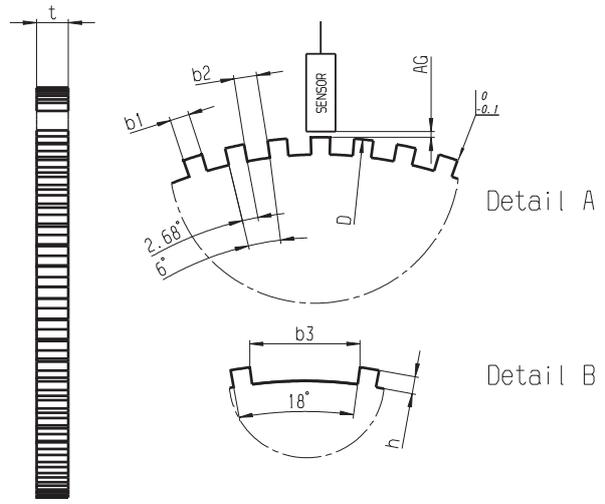
Order number **F 02U V00 570-01**

Dimensions





60-2Teeth



Left view

Inductive Speed Sensor IA



4

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 ² max. 80 h

Technical Specifications

Mechanical Data

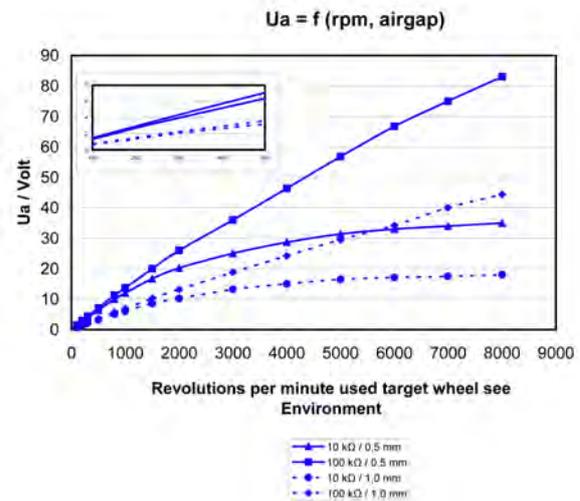
Magnetic pole	Round
Bore diameter	12.5 mm
Weight w/o wire	30 g
Installation depth L2	32.2 mm

Electrical Data

Coil resistance	1,200 Ω
Inductance max.	400 mH
Output voltage max.	190 V _{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	F 02U 000 237-01
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.

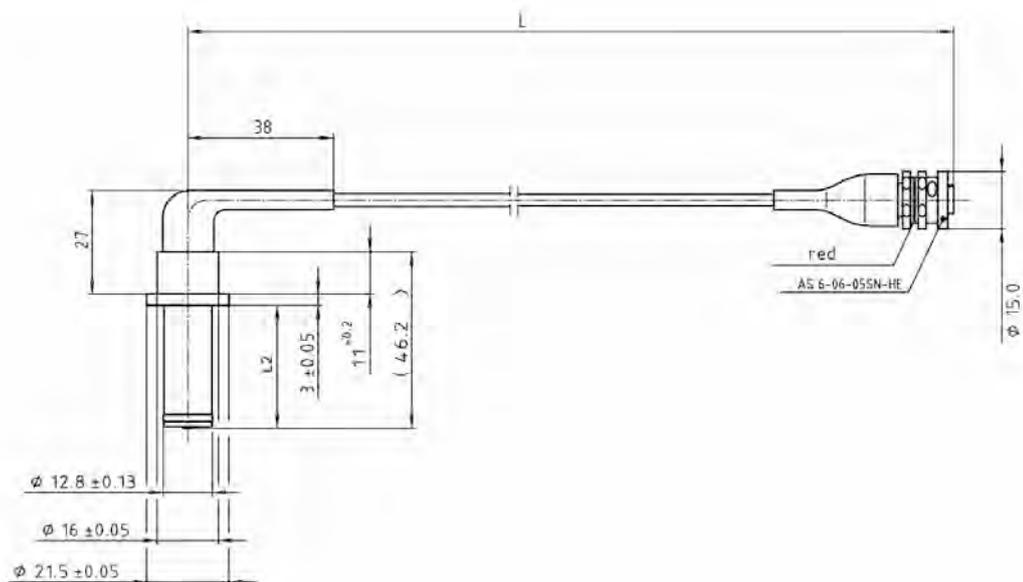
Please find further application hints in the offer drawing at our homepage.

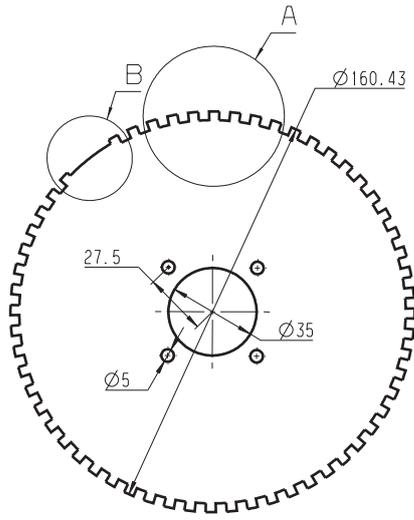
Ordering Information

Inductive Speed Sensor IA

Order number **B 261 209 519-01**

Dimensions

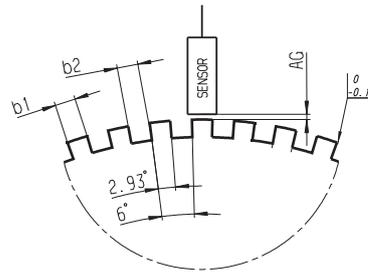




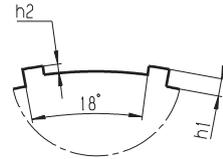
60-2 Teeth



Left view



Detail A



Detail B

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 ² 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

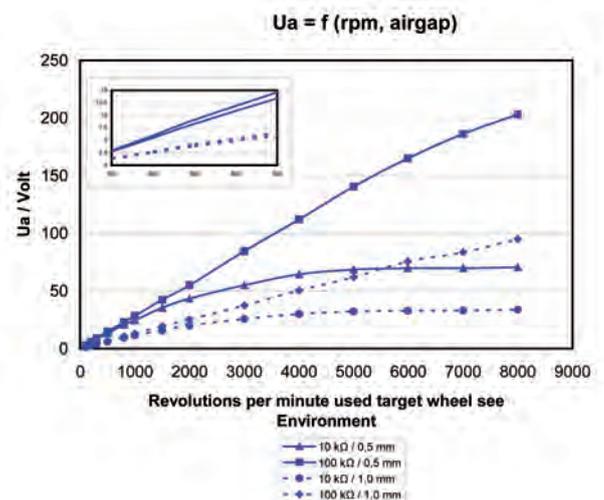
Target wheel diameter D	160.43 mm
Thickness t	> 5 mm
Width of teeth b1	4.1 mm
Width of gap b2	4.3 mm
Depth of teeth h1	3.5 mm
Depth of teeth h2	1.75 mm
Number of teeth	60-2

Connectors and Wires

Connector	1 928 404 227
Mating connector	D 261 205 335-01
3-pole Compact	
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 home-page.

The inductive speed sensor IA-C is developed for wheels made of ferromagnetic material.

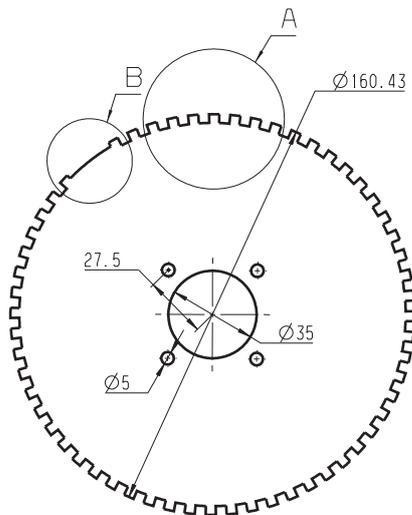
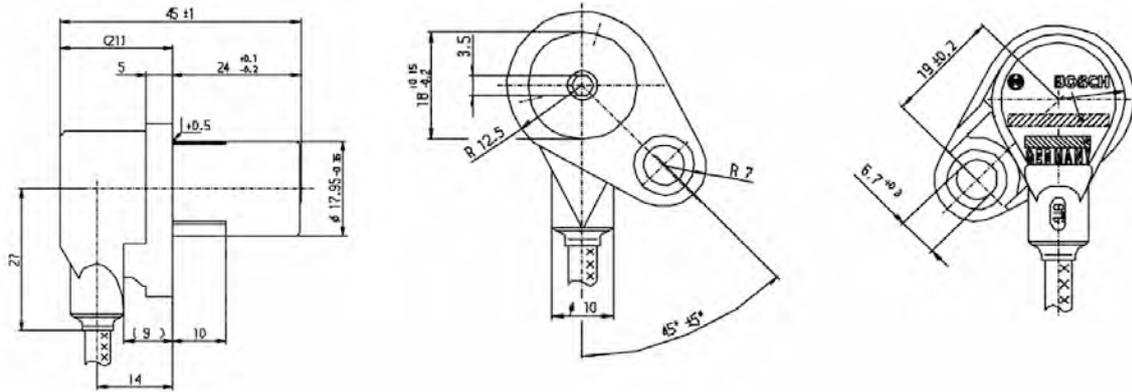
Ordering Information

Inductive Speed Sensor IA-C

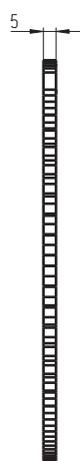
Order number **0 261 210 136**

Dimensions

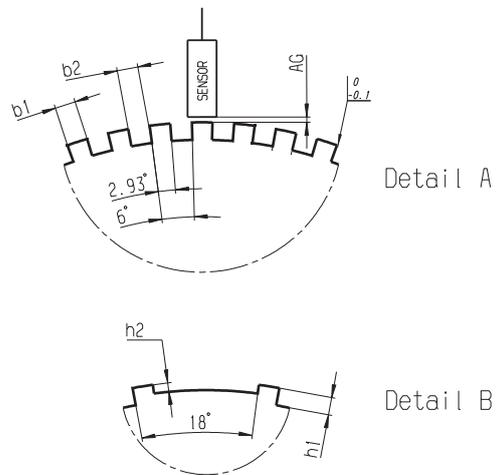
4



60-2 Teeth



Left view



Detail A

Detail B

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 ² 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

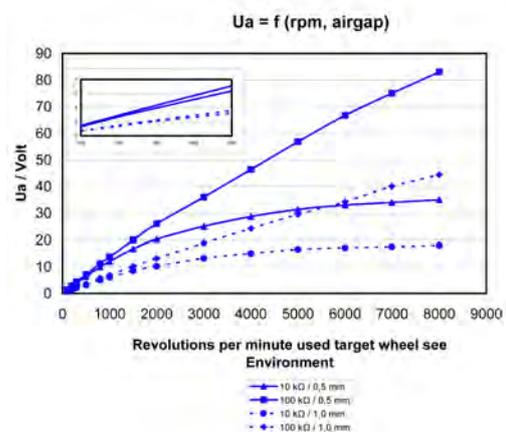
Connector	ASL 6-06-05SN-HE
Mating connector	F 02U 000 237-01
ASL 0-06-05PN-HE	

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.

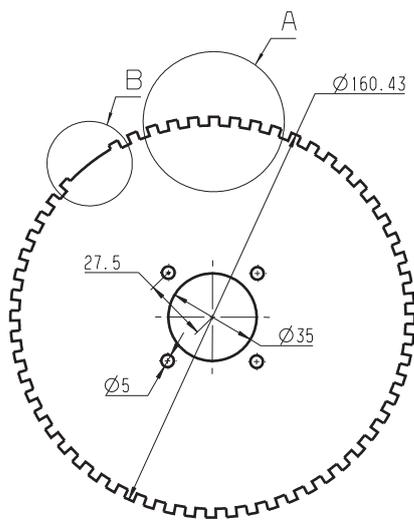
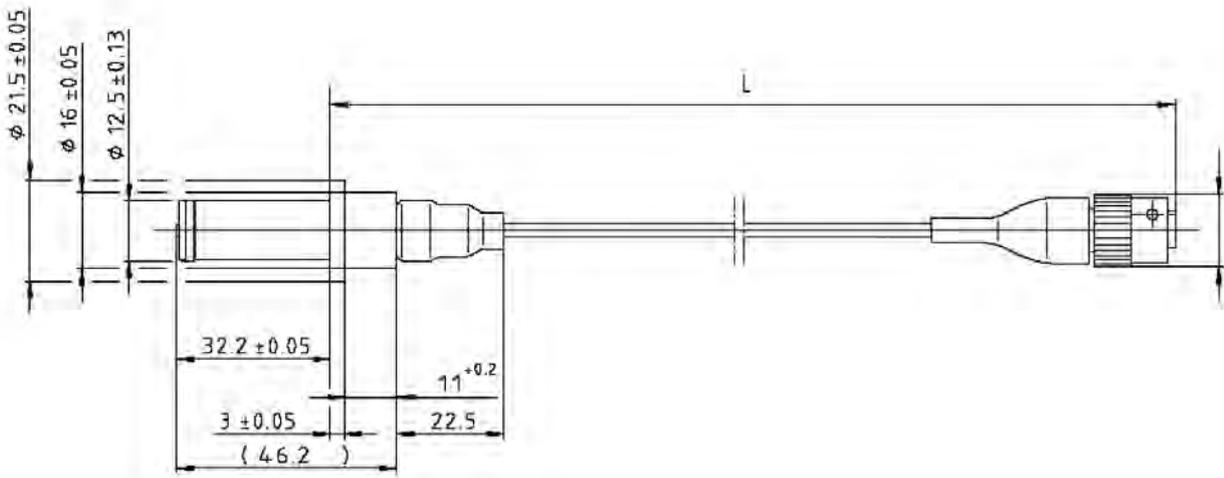
Please find further application hints in the offer drawing at our homepage.

Ordering Information

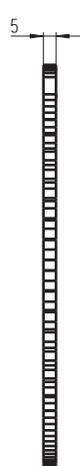
Inductive Speed Sensor IS

Order number **B 261 209 517-01**

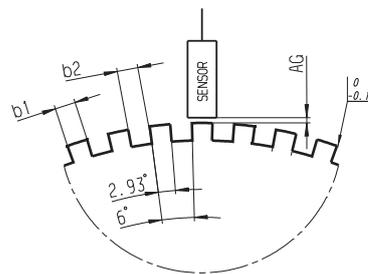
Dimensions



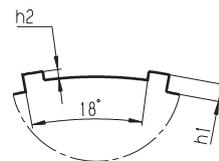
60-2 Teeth



Left view



Detail A



Detail B

Inductive Speed Sensor IS-C



Features

- ▶ Crankshaft or 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 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 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 ² 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

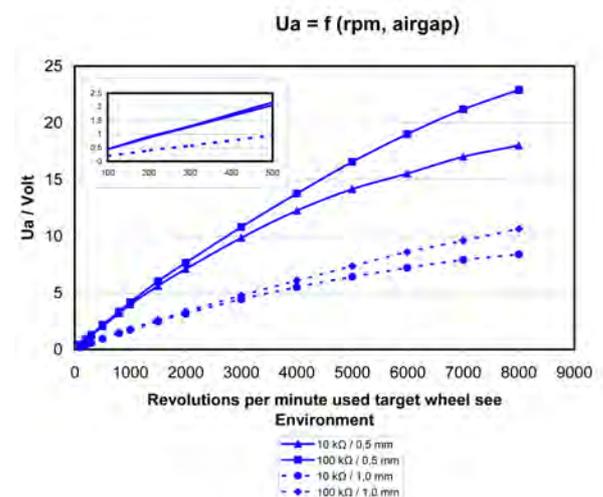
Connector	ASL 6-06-05SN-HE
Mating connector	F 02U 000 237-01
ASL 0-06-05PN-HE	

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.

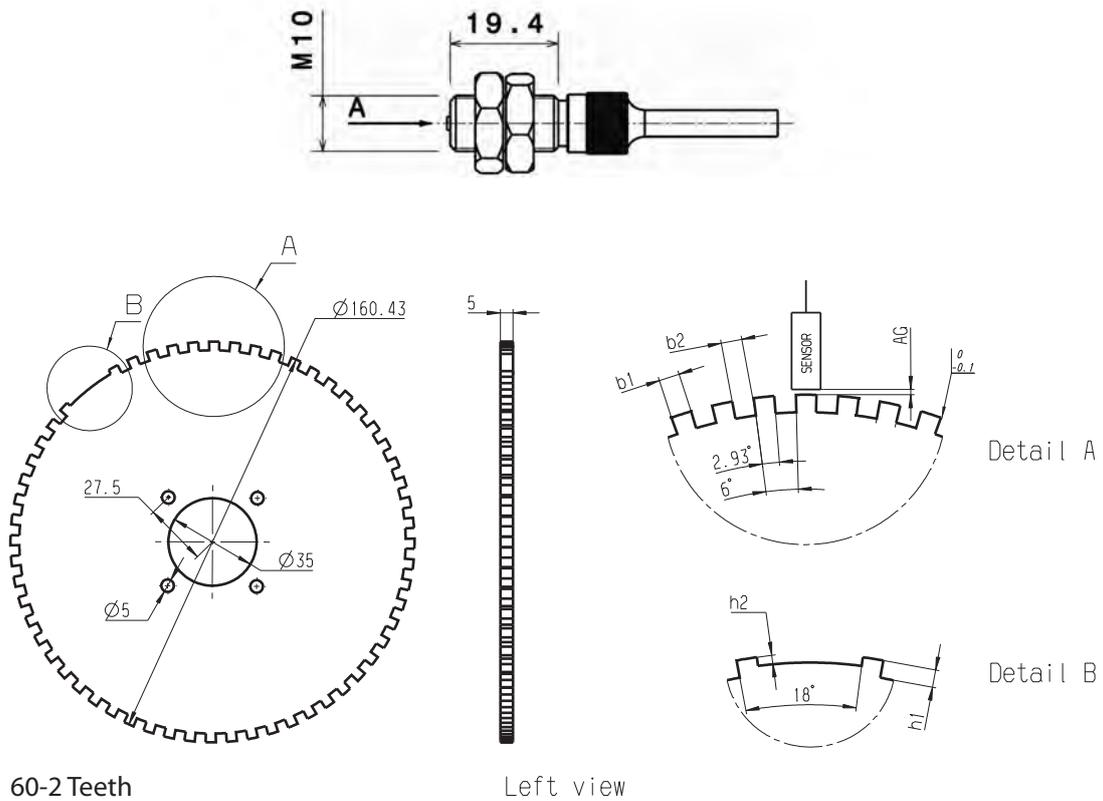
4

Ordering Information

Inductive Speed Sensor IS-C

Order number **B 261 209 609-01**

Dimensions



Inductive Speed Sensor IS-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 ± 0.1 mm
Operating temp. range (sensing head)	-40 to 230°C
Storage temperature range	0 to 100°C
Max. vibration	800 m/s ² 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

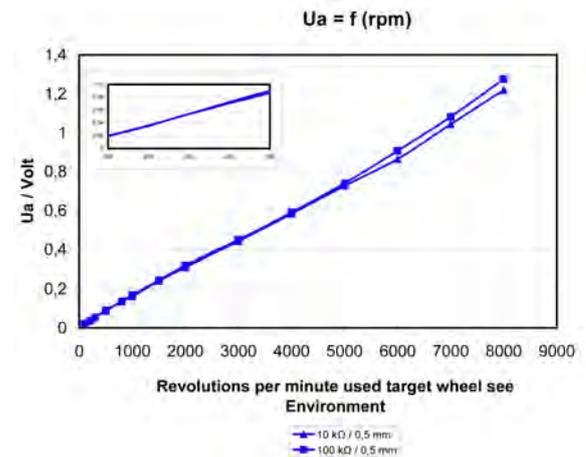
Connectors and Wires

Connector	ASL 6-06-05SN-HE
Mating connector ASL 0-06-05PN-HE	F 02U 000 237-01
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.

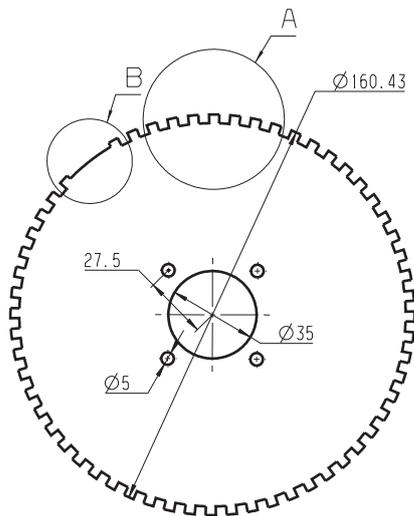
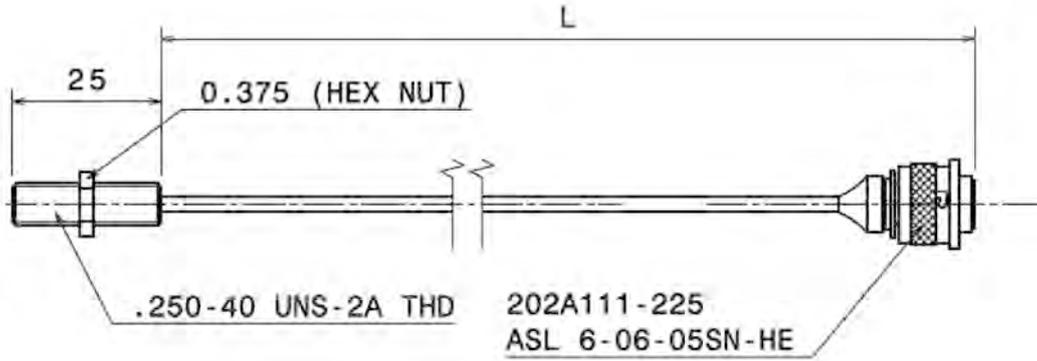
Please find further application hints in the offer drawing at our homepage.

Ordering Information

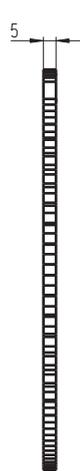
Inductive Speed Sensor IS-T
 Order number B 261 209 662-01

Dimensions

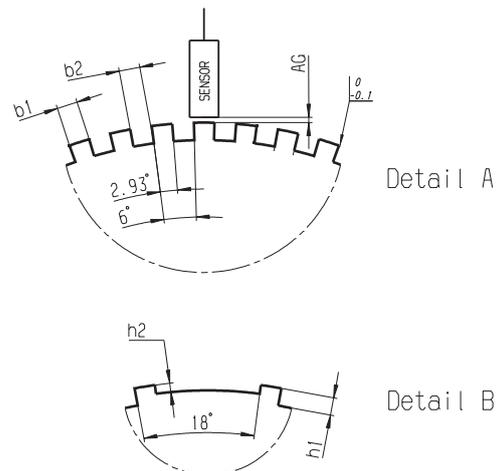
4



60-2 Teeth



Left view



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

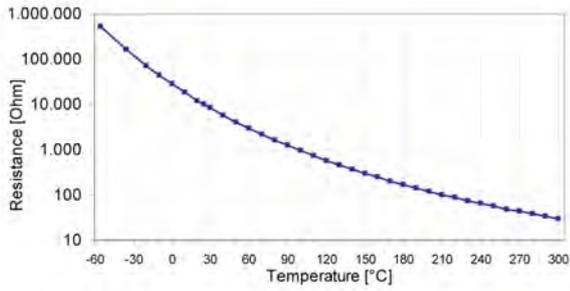
Characteristic	NTC
Nominal resistance	10 kΩ

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
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
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	F 02U 000 231-01
ASL 0-06-05SN-HE	

Pin 1	-
-------	---

Pin 2	Sig-
-------	------

Pin 3	Sig+
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Pin 4	-
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Pin 5	-
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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 kΩ).

Any mounting orientation is possible.

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

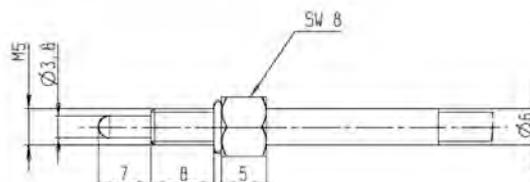
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Temperature Sensor NTC M5-HS

Order number **F 02U V00 510-01**

Dimensions



Temperature Sensor NTC M6-H



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 ² 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

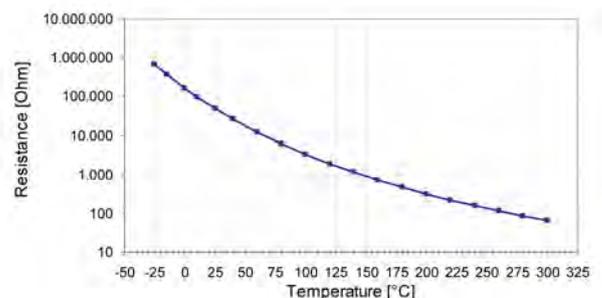
Characteristic	NTC
Max. power at 25°C	200 mW
Nominal resistance at 25°C	49.12 kΩ

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	F 02U 000 231-01
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 Ω).

Any mounting orientation is possible.

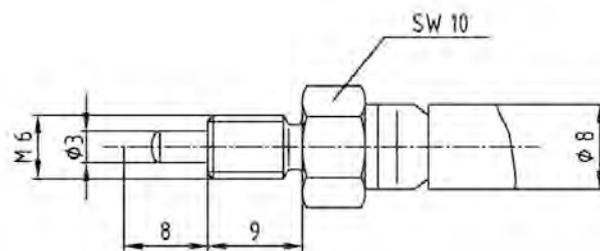
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

Ordering Information

Temperature Sensor NTC M6-H

Order number **B 261 209 989-01**

Dimensions



Temperature Sensor NTC M6- HS



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

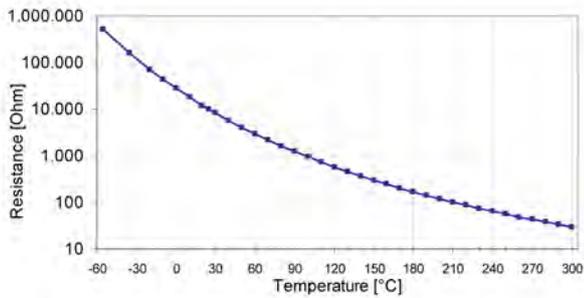
Characteristic

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	F 02U 000 231-01
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 M6-HS can be connected directly to most control units using a pull-up resistor (typically 1 or 3 k Ω).

Any mounting orientation is possible.

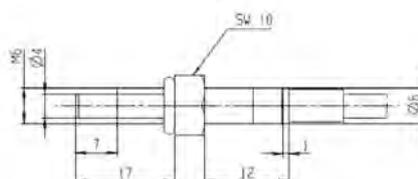
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging at our homepage.

Ordering Information

Temperature Sensor NTC M6-HS

Order number **F 02U V00 486-01**

Dimensions



Temperature Sensor NTC M8-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

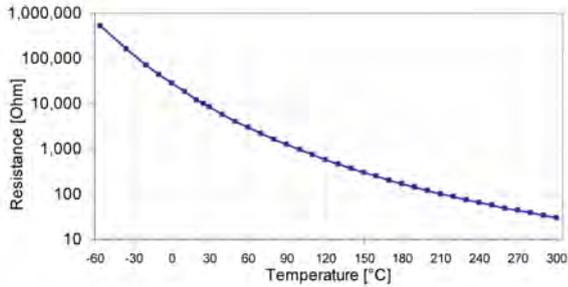
Characteristic

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 63	< 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	F 02U 000 231-01
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 k Ω).

Any mounting orientation is possible.

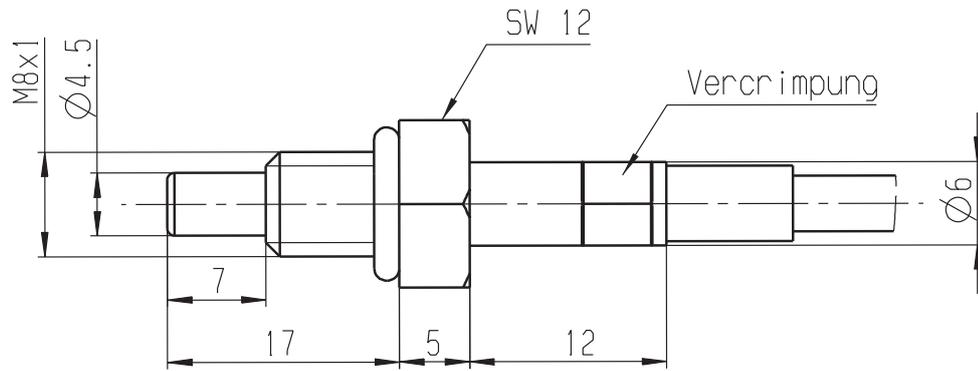
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

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 ²

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

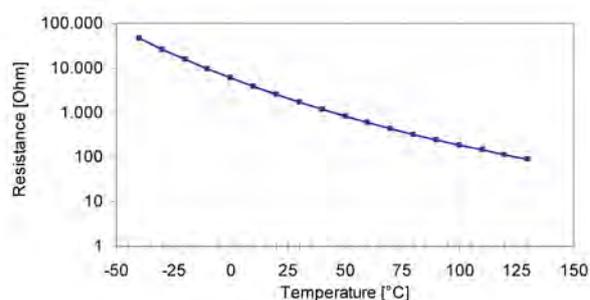
Characteristic	NTC
Nominal resistance at 20°C	2.5 kΩ ± 5 %

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 2-pole Jetronic	D 261 205 288-01
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 Ω).

Any mounting orientation is possible.

Please find further application hints in the offer drawing. www.bosch-motorsport.com

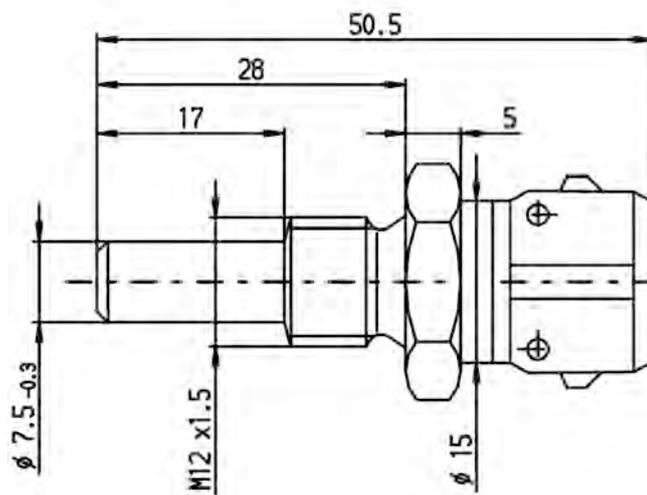
Free download of the sensor configuration file (*.sdf) for the Bosch Data Logging at our homepage.

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 ²

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

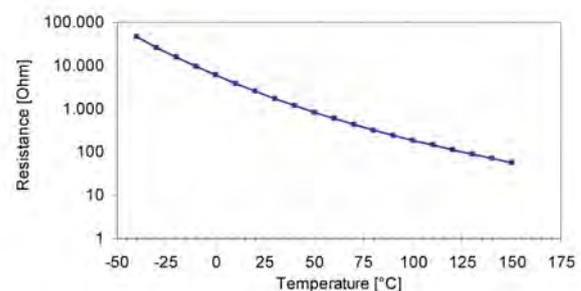
Characteristic	NTC
Nominal resistance at 20°C	2.5 kΩ ± 20°C

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 2-pole Compact	D 261 205 337-01
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 Ω).

Any mounting orientation is possible.

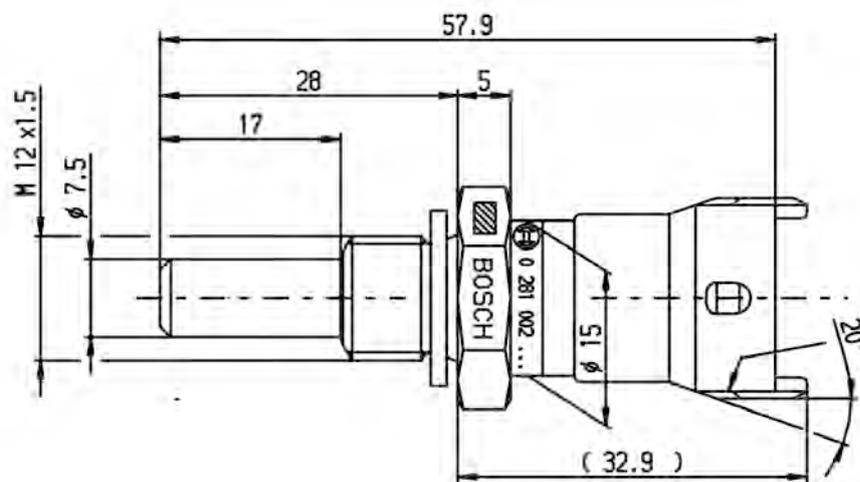
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

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 ² 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

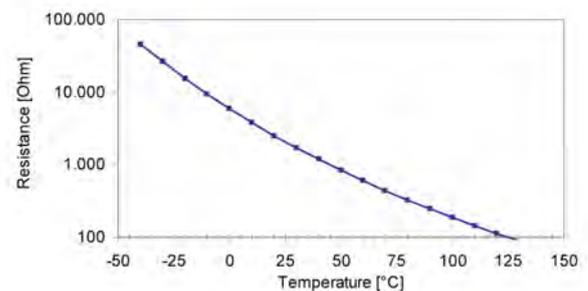
Characteristic	NTC
Nominal resistance ± 5%	2.5 kΩ at 20°C

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 2-pole Jetronic	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 Ω).

Any mounting orientation is possible.

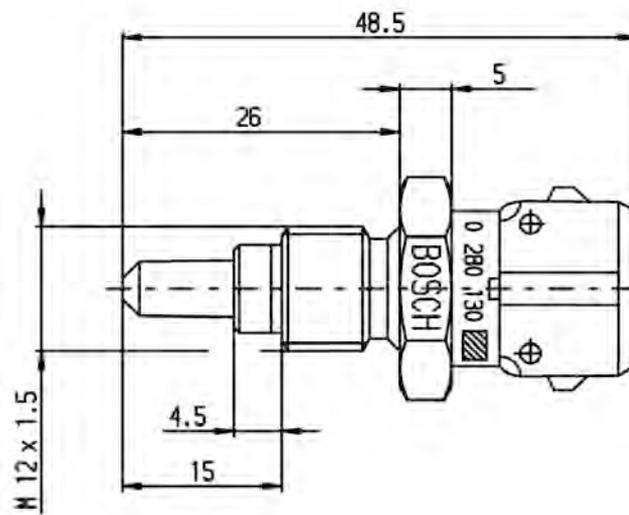
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for the Bosch Data Logging System at our homepage.

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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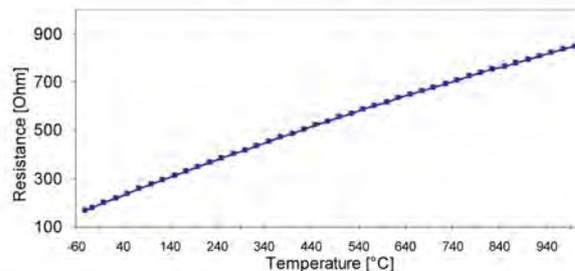
Characteristic

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	F 02U 000 226-01
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 Ω).

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

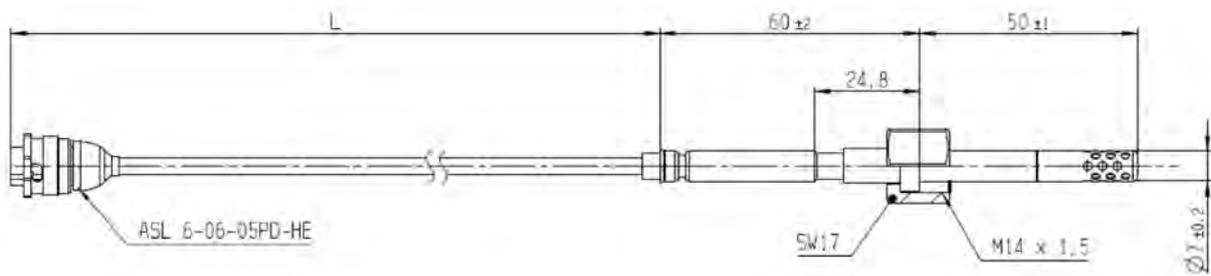
Order number **F 02U V00 811-01**

Accessories

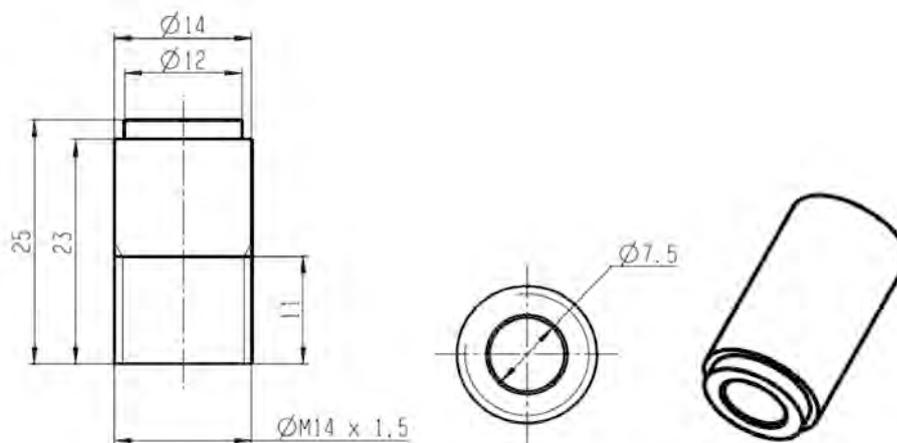
Temperature Sensor PT 200E Adapter

Order number **F 02U 000 847-01**

Dimensions



Sensor



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 ² at 11 to 200 Hz 500 m/s ² , 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	70 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 μ 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	F 02U 000 231-01
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

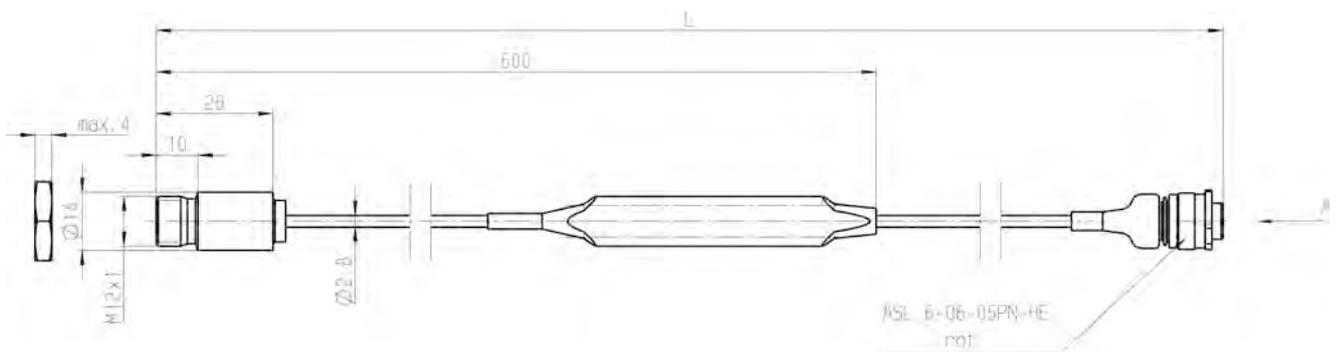
TI-16-r

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 ² at 11 to 200 Hz 500 m/s ² , 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	70 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 μ 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	F 02U 000 231-01
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-100 can be connected directly to most control units and data logging systems.

The temperature measurement range can be changed anywhere in the range of -20°C to 1,000°C per request.

The emissivity can be changed by request.

The predefined emissivity can differ from the real emissivity.

To determine the emissivity, please contact Bosch Motorsport for assistance.

The sensor is protected against reverse polarity and short-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

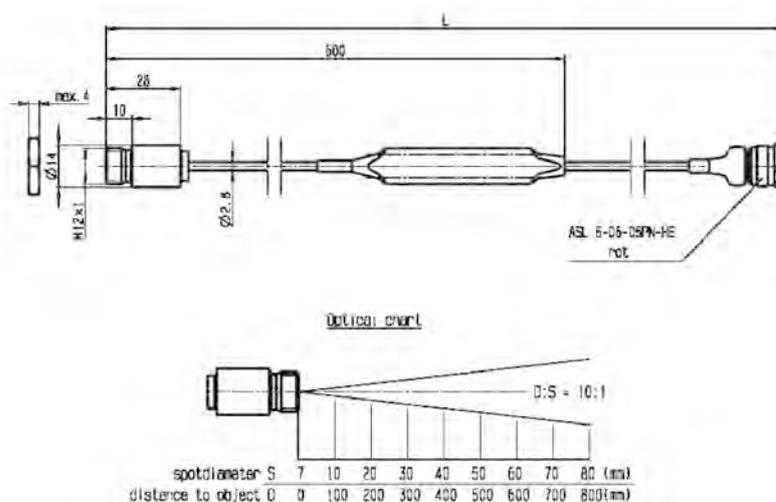
TI-100-s

Order number **F 01T A21 210-02**

TI-100-c

Order number **F 01T A21 211-01**

Dimensions



Thermocouple Probe TCP K



4

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 ² 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

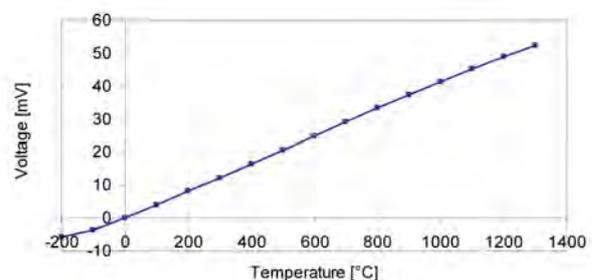
Electrical Data

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	F 02U 000 229-01
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

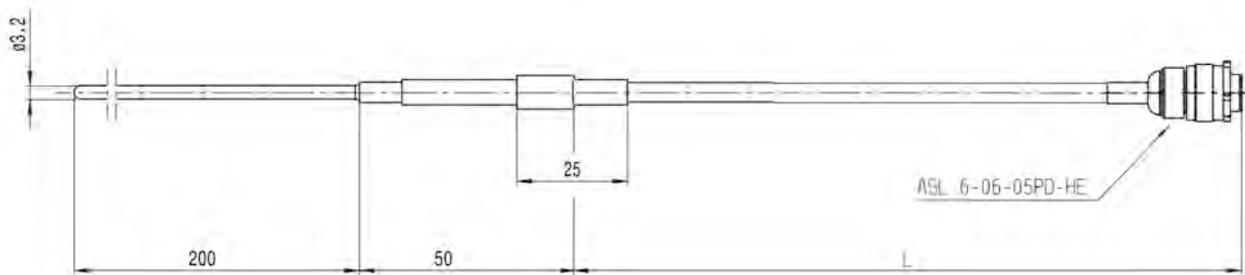
Order number **B 261 209 385-01**

Accessories

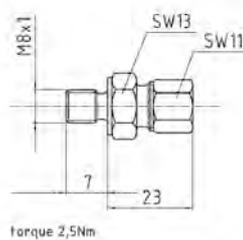
Thermocouple Probe TCP K Adapter

Order number **B 261 209 159-01**

Dimensions



Sensor



Adapter

Thermocouple Probe TCP KA



4

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 thermo-electric 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

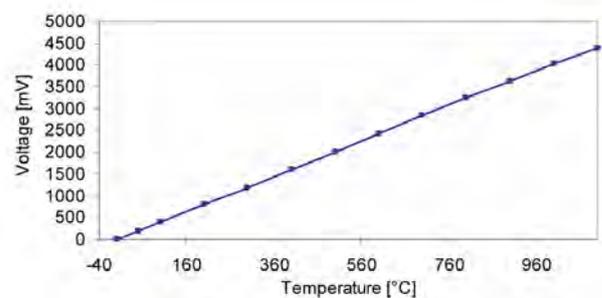
Voltage supply	12 V
Full scale output	0 to 5 V

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 261 205 357-01
Pin 1	Sig
Pin 2	Gnd
Pin 3	U _s
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.

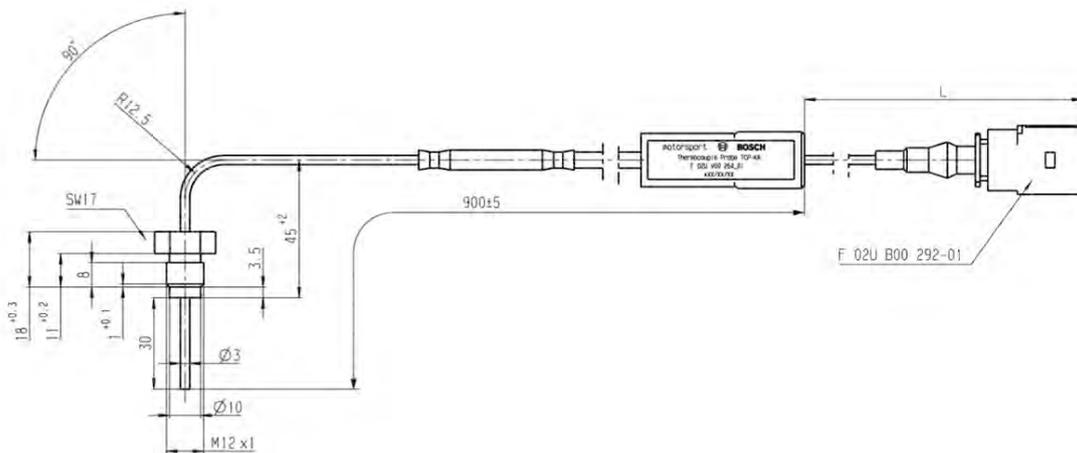
Ordering Information

Thermocouple Probe TCP KA
Order number **F 02U V01 664-01**

Accessories

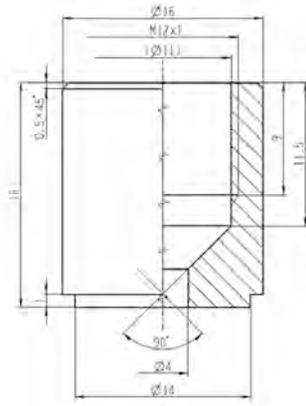
Thermocouple Probe TCP KA Adapter
Order number **F 02U V01 185-01**

Dimensions



Sensor

4



Adapter

Thermocouple Probe TCP KN 2



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 without any additional external energy source. The mantle thermocouple has a metal mantle which includes two isolated wires made of thermomaterial NiCr-Ni Type K. The voltage is amplified by an electronic circuit, which is powered by 12 V and supplies an output signal from 0 to 5 V. The sensing element is protected with a double housing made of Nimonic 75 to make possible its application before turbo chargers. Please note that the operating temperature of the external electronics is from 0 to 125°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 125°C

Technical Specifications

Mechanical Data

Male thread	M14x1.5
Wrench size	17 mm
Installation torque	15 Nm
Weight with wire	85 g
Length	81 mm

Electrical Data

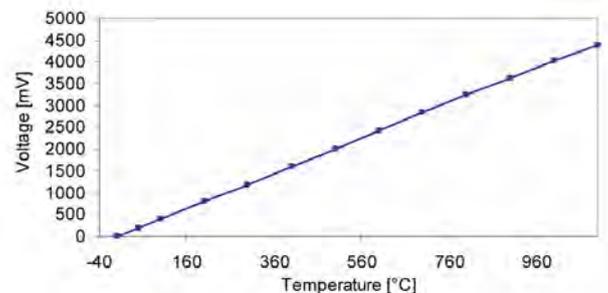
Voltage supply	5 to 16 V
Full scale output	0 to 5 V

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	ASU 6-03-03PB-HE
Mating connector	ASU 3-03-03SB-HE
Pin 1	Power Supply
Pin 2	GND
Pin 3	Signal
Sleeve	DR-25
Wire size	AWG 24
Wire length L	15 to 75 cm

Installation Notes

The TCP KN2 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 125°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.

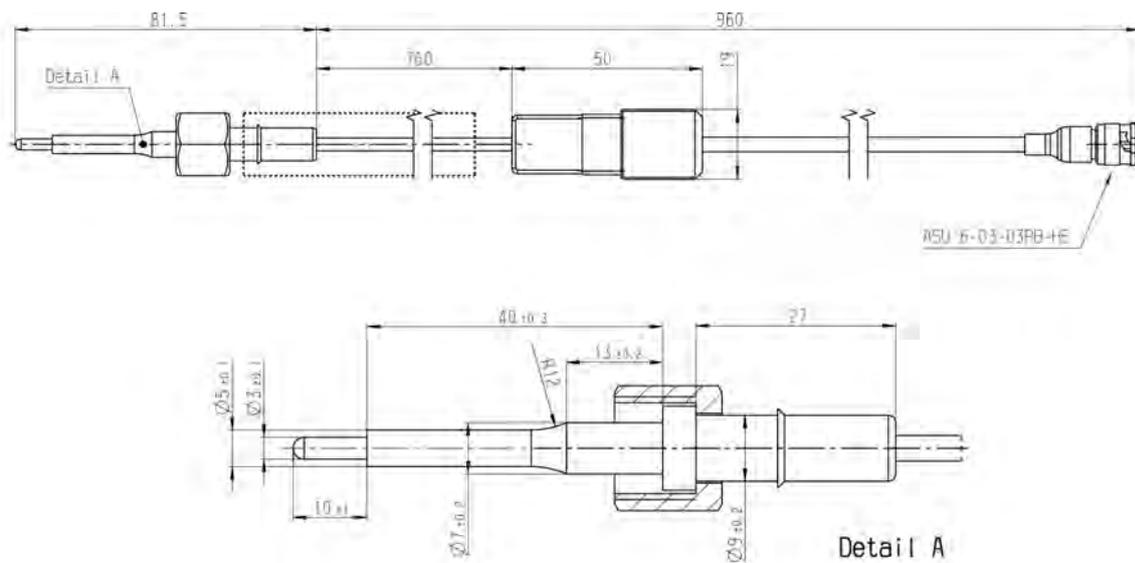
Please find further application hints in the offer drawing and free download of the sensor configuration file (*.sdf) for Bosch Data Logging System at our homepage.

Ordering Information

Thermocouple Probe TCP KN 2

Order number **F 02U V01 863-01**

Dimensions



Acceleration Sensor AM 600-2



Features

- ▶ 2 -axis
- ▶ Measurement range: ± 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 ± 4.5 g
Max. vibration	5,000 m/s ² 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	± 3 %
Non-linearity of sensitivity	± 2 %

Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	F 02U 000 226-01

Pin 1	U _s
Pin 2	Gnd
Pin 3	Sig _x
Pin 4	Sig _y
Pin 5	Scr

Sleeve	DR-25
--------	-------

Wire size	AWG 24
-----------	--------

Wire length	15 to 100 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 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.

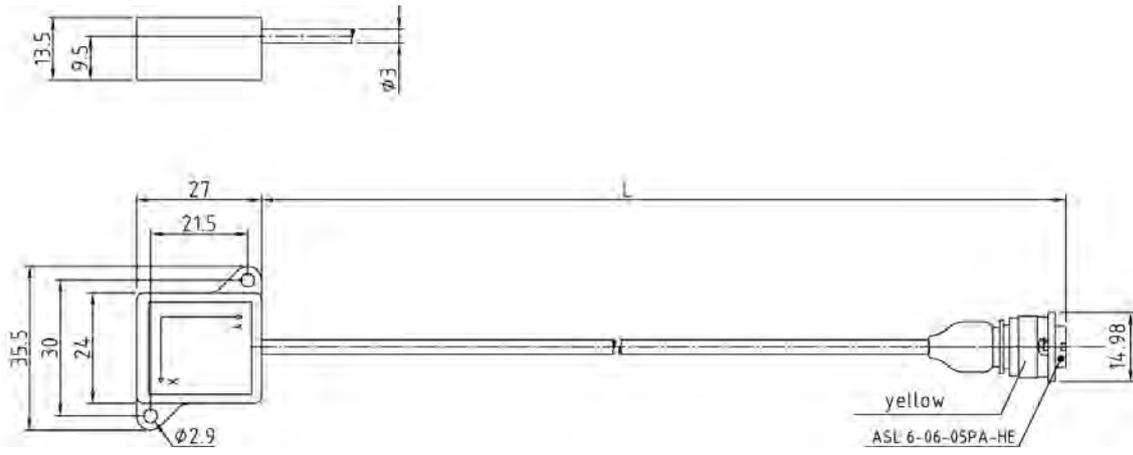
Please ensure that the environmental conditions do not exceed the sensor specifications.

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



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 ± 4.5 g
Max. vibration	5,000 m/s ² 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	± 3 %
Non-linearity of sensitivity	± 2 %

Connectors and Wires

Connector	ASL 6-06-05PA-HE
Mating connector	F 02U 000 226-01

Pin 1	U _s
Pin 2	Gnd
Pin 3	Sig _y
Pin 4	Sig _x
Pin 5	Sig _z

Sleeve	DR-25
--------	-------

Wire size	AWG 24
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Wire length	15 to 100 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 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.

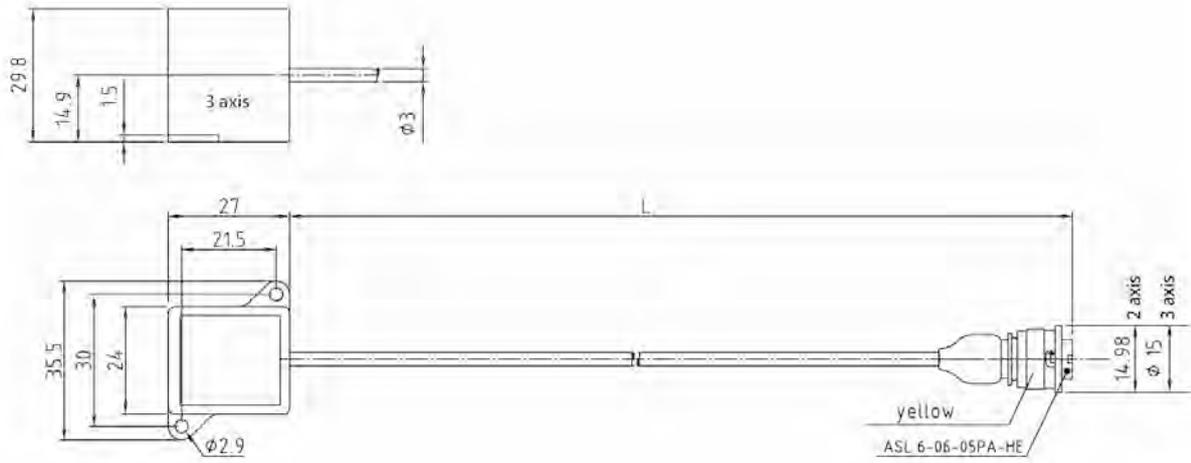
Please ensure that the environmental conditions do not exceed the sensor specifications.

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



Acceleration Sensor MM5.10



Features

- ▶ 2-axis rotation rate (yaw-rate, roll-rate)
- ▶ 3-axis accelerometer (X, Y, Z)
- ▶ 1 Mbaud or 500 kbaud CAN-output
- ▶ 15 Hz low-pass filtered
- ▶ Measurement ranges: ± 4.2 g; $\pm 163^\circ/\text{s}$

The MM5.10 was designed to measure the physical effects of rotational and lineal acceleration. In order to achieve this, the sensor includes MEMS measuring elements connected to an appropriate integrated circuit. A rotational acceleration around the integrated sensing elements generates a Coriolis force which changes the internal capacity of the micromachined sensing parts. Furthermore, a pure surface micromachined element is used to measure the vehicle lineal acceleration in all 3 axis. This combination of rotational and lineal acceleration sensors enables a precise measurement of the vehicle dynamics.

The main feature and benefit of this sensor is the combination of 3 lineal and 2 rotational accelerometers and its high speed 1 Mbaud/s CAN-signal output.

Application

Application I	$\pm 163^\circ/\text{s}$ (roll rate/yaw rate)
Application II	± 4.2 g (X, Y and Z acceleration)
Operating temperature range	-20 to 85°C

Technical Specifications

Mechanical Data

Weight w/o wire	35 g
Size	80 x 56 x 21 mm

Electrical Data

Power supply	7 to 18 V
Max input current	90 mA
CAN speed	1 Mbaud/s or 500 kbaud/s

CAN Message

CAN ID 01 0x174

Byte	Value
0	Yaw rate
1	
2	Reserved
3	
4	Acc Y-axis
5	
6	Reserved
7	Unused

CAN ID 02 0x178

Byte	Value
0	Roll rate
1	
2	Reserved
3	
4	Acc X-axis
5	
6	Reserved
7	Unused

CAN ID 02 0x17C

Byte	Value
0	Reserved
1	
2	Reserved
3	
4	Acc Z-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°/s

Cut-off frequency (-3 dB)	15 Hz; 30 Hz; 60 Hz
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Characteristic Application II

Measuring range	±4.2 g
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Over range limit	±10 g
------------------	-------

Absolute resolution	0.01 g
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Cut-off frequency (-3 dB)	15 Hz; 30 Hz; 60 Hz
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Connectors and Wires

Connector (1)	AMP 114-18063-076
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Mating connector (1)	F 02U B00 435-01
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Pin 1	Gnd
-------	-----

Pin 2	CANL
-------	------

Pin 3	CANH
-------	------

Pin 4	UBat
-------	------

Connector (3)	ASL-6-06-05PC-HE
---------------	------------------

Mating connector (3)	ASL-0-06-05SC-HE
----------------------	------------------

Pin 1	UBat
-------	------

Pin 2	Gnd
-------	-----

Pin 3	CANH
-------	------

Pin 4	CANL
-------	------

Pin 5	Not connected
-------	---------------

Sleeve	DR-25
--------	-------

Wire size	AWG 24
-----------	--------

Wire length L	15 to 100 cm
---------------	--------------

CAN Parameters

Byte order	LSB (Intel)
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CAN speed	1 Mbaud/s or 500 kbaud/s
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Bit mask	unsigned
----------	----------

Offset (all signals)	0x8000 hex
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Quantization Yaw Rate	0.005 [°/s/digit]
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Quantization Roll Rate	0.005 [°/s/digit]
------------------------	-------------------

Quantization Acc X-axis	0.0001274 [g/digit]
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Quantization Acc Y-axis	0.0001274 [g/digit]
-------------------------	---------------------

Quantization Acc Z-axis	0.0001274 [g/digit]
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Installation Notes

The MM5.10 can be connected directly to most control units and data logging systems.

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 and calibration sheet.

Please deliver the calibration sheet with your order placement.

Ordering Information**Acceleration Sensor MM5.10 (1)**

Without wire

Order number **F 02U V01 511-02**

Acceleration Sensor MM5.10 (2)

Wire with open end

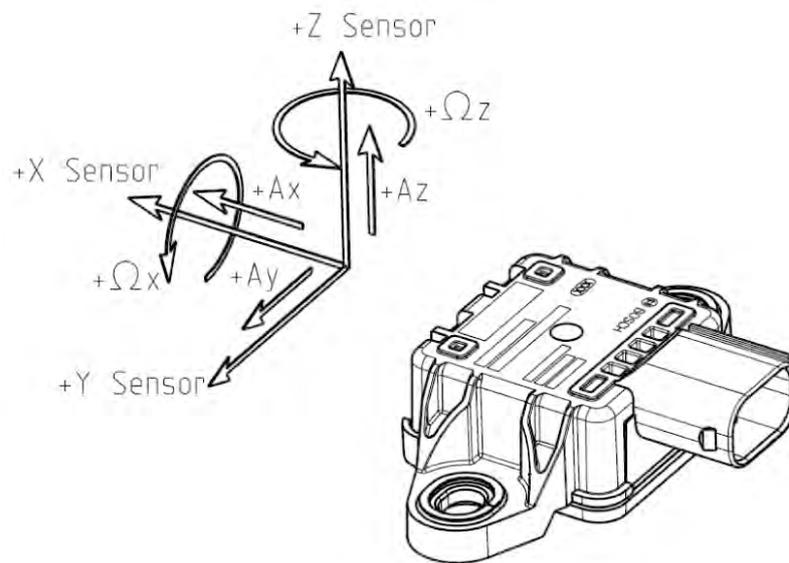
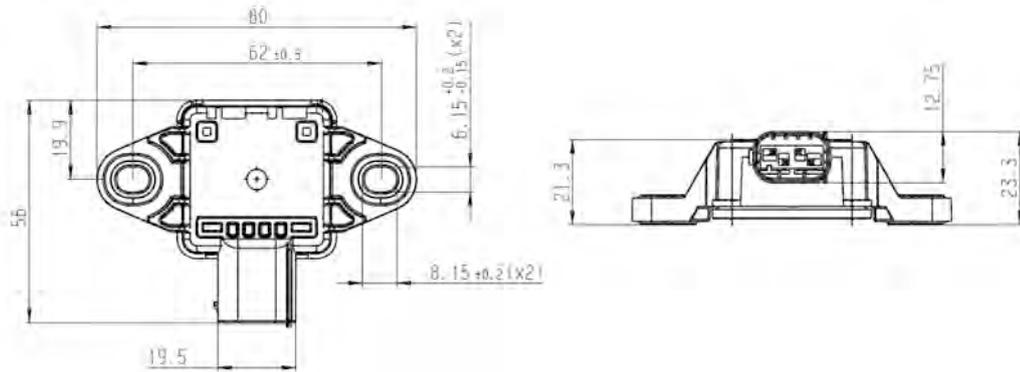
Order number **F 02U V01 511-91**

Acceleration Sensor MM5.10 (3)

Wire with motorsports connector

Order number **F 02U V01 512-02**

Dimensions



Axis Scheme

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: ± 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 Ω_z , roll rate Ω_x , lateral acceleration a_y and longitudinal acceleration a_z).

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	± 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	AccX 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	± 4.1 g
Over range limit	± 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.

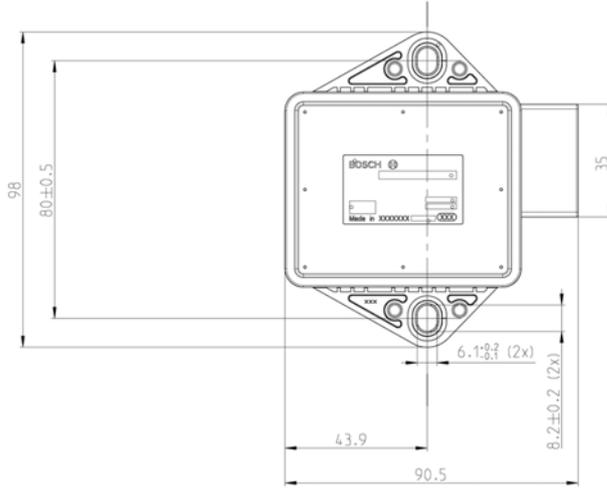
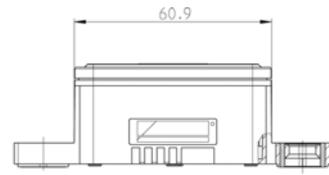
Please find further application hints in the offer drawing at our homepage.

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: ± 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	± 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	± 4.1 g
Over range limit	± 10 g
Absolute resolution	0.01 g
Cut-off frequency (-3 dB)	15 Hz

Connectors and Wires

Connector	AMP 114-18063-076
Mating connector 4-pole DRS	F 02U B00 435-01 (connector kit) F 02U 002 460-01 (connector housing)
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 ² /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.

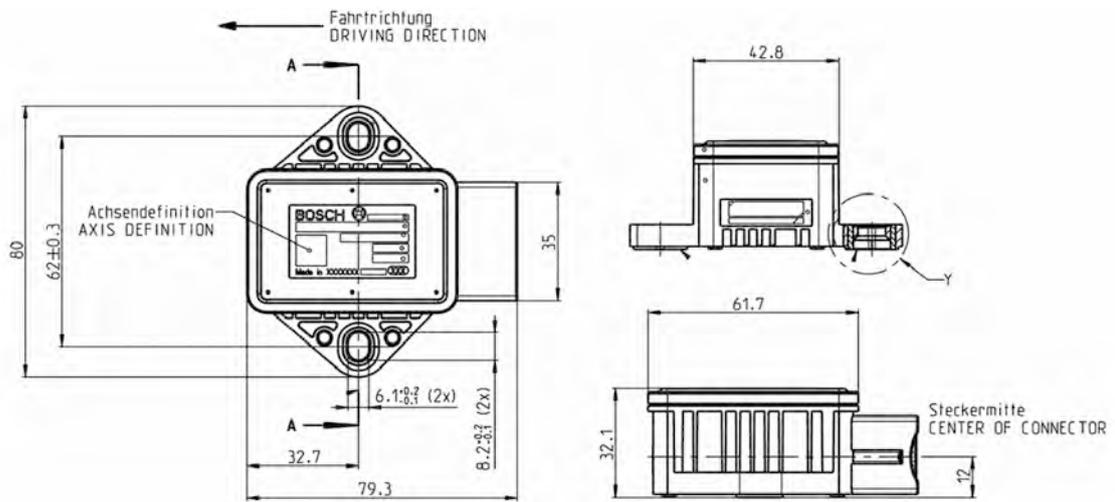
Please find further application hints in the offer drawing at our home-page.

Ordering Information

Yaw Rate Sensor YRS 3

Order number **0 265 005 838**

Dimensions



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 ²
Max. wire tension	1.7 N
Shock	1,000 m/s ² for 6 ms
Vibration	150 m/s ² 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 ⁶ 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	F 02U 000 226-01
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 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 ± 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 35

Order number **B 261 209 541-01**

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 ²
Max. wire tension	3.3 N
Shock	1,000 m/s ² for 6 ms
Vibration	150 m/s ² 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 ⁶ 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	F 02U 000 226-01
ASL 0-06-05SA-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 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 ± 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.

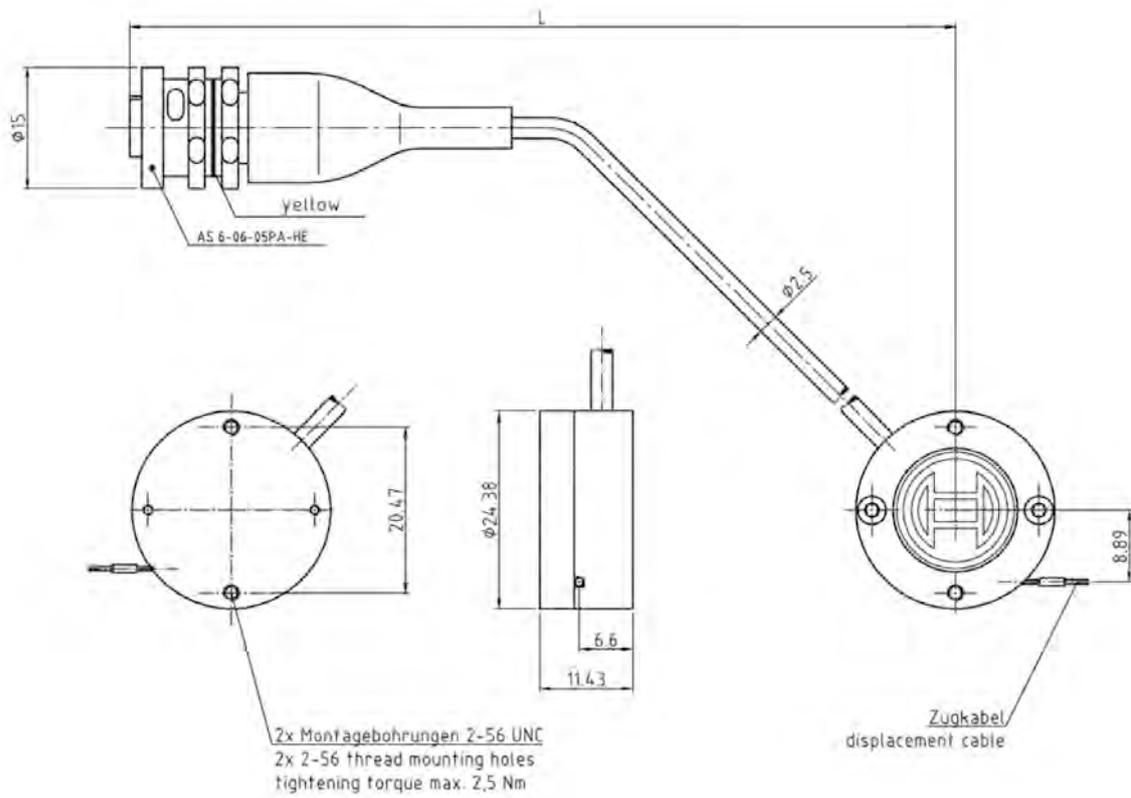
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Wire Potentiometer WP 50

Order number **B 261 209 542-01**

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 ²
Max. wire tension	2.8 N
Shock	1,000 m/s ² for 6 ms
Vibration	150 m/s ² 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 ⁶ 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	F 02U 000 226-01
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 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.

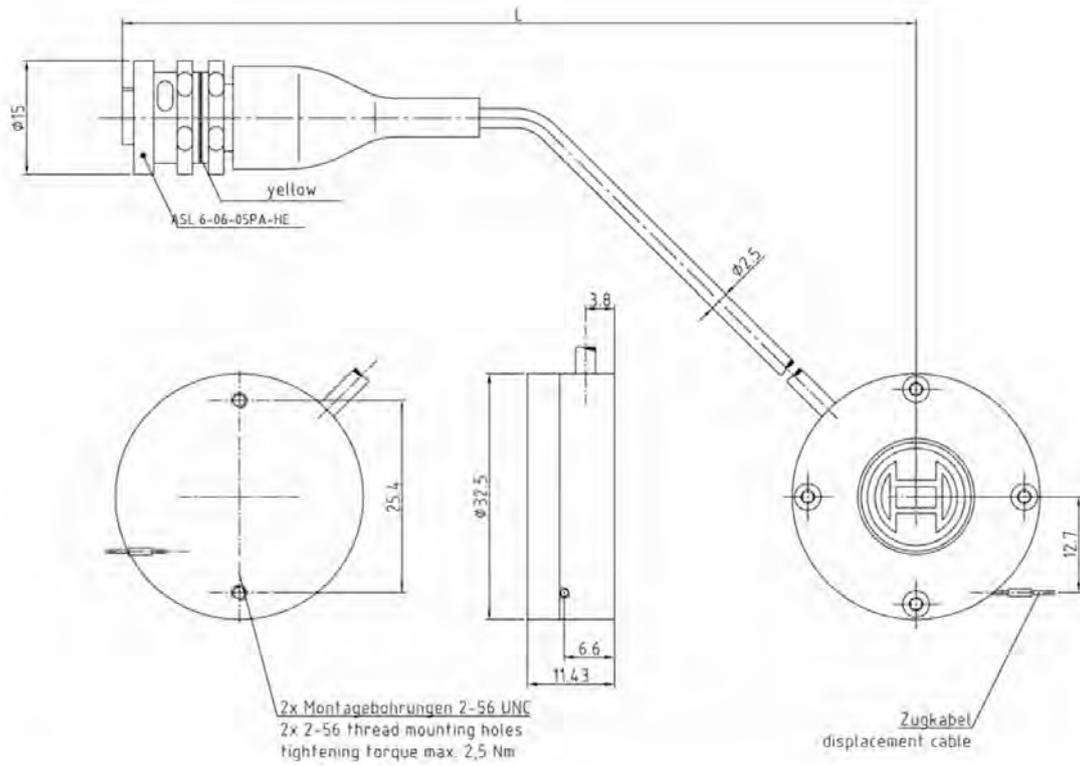
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Wire Potentiometer WP 75

Order number **B 261 209 543-01**

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 ²
Max. wire tension	3.3 N
Shock	1,000 m/s ² for 6 ms
Vibration	150 m/s ² 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 ⁶ 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	F 02U 000 226-01
ASL 0-06-05SA-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 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 ± 5 to 10° from normal direction to avoid damaging the housing.

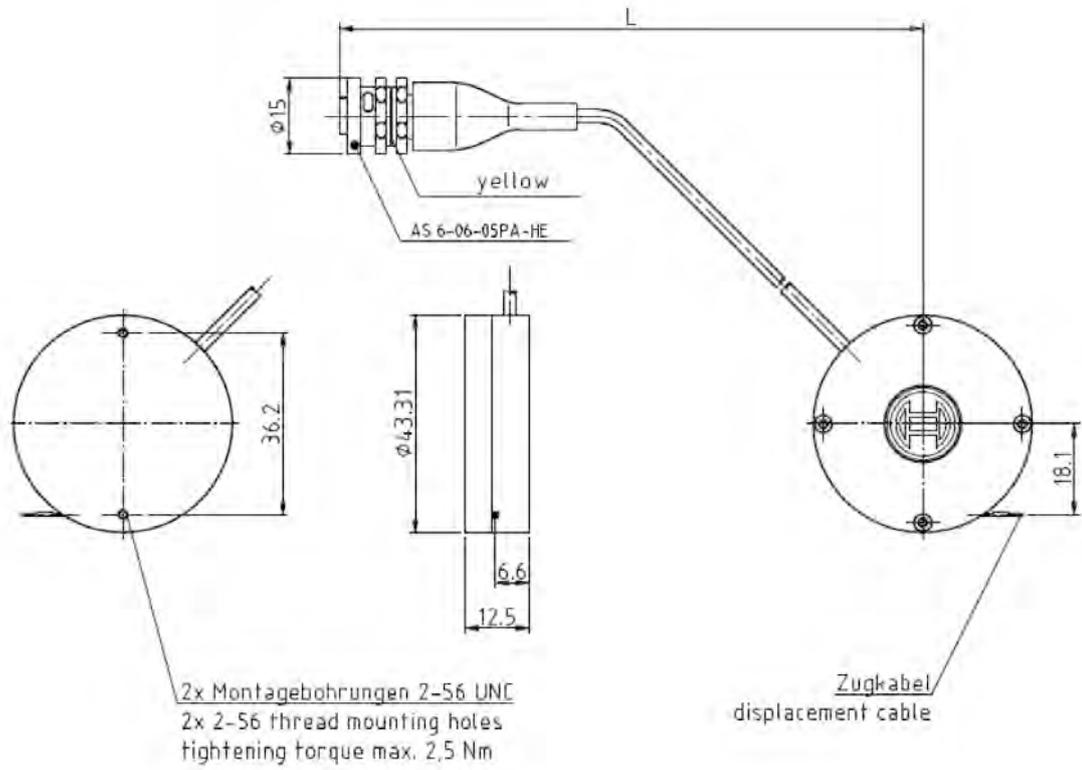
Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

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

Ordering Information

Wire Potentiometer WP 100
Order number **B 261 209 544-01**

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 ⁶ 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	F 02U 000 226-01
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 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 ± 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.

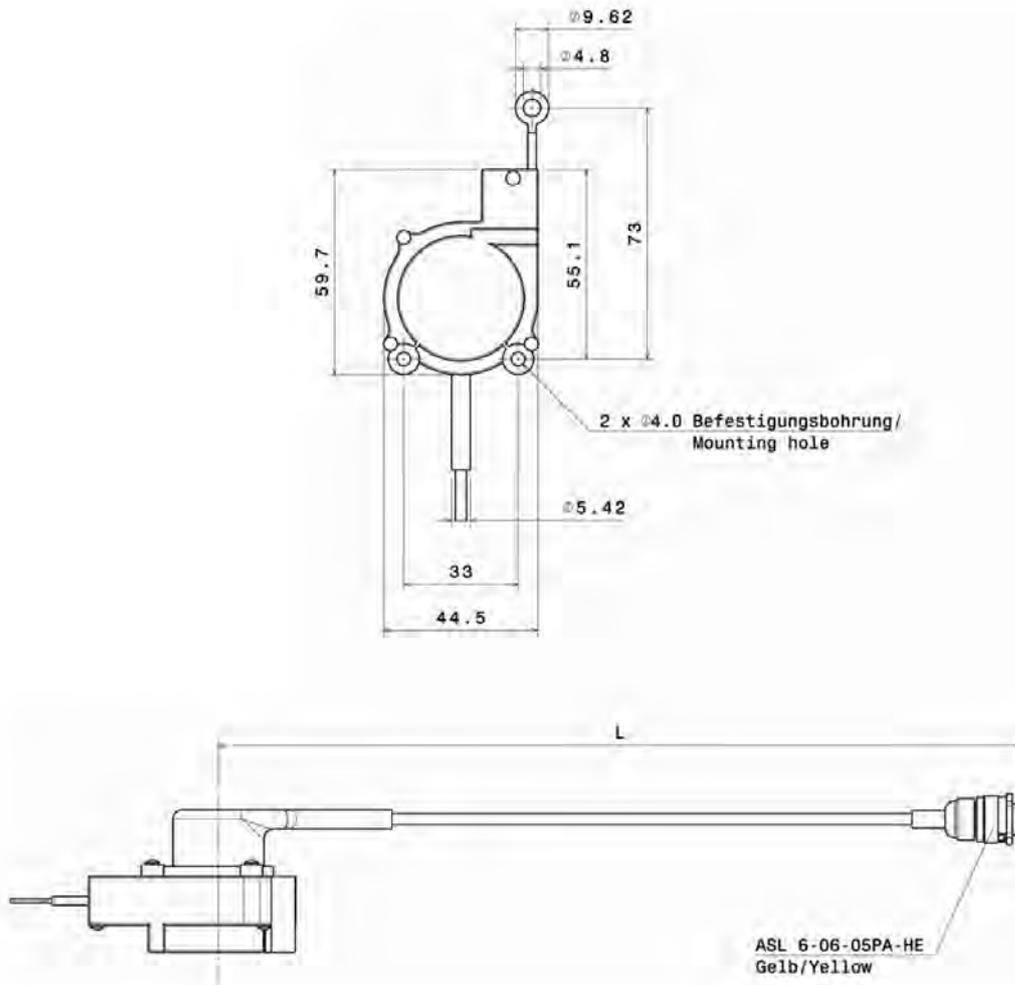
Please find further application hints in the offer drawing at our homepage.

Ordering Information

Wire Potentiometer WP 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 ²
Max. wire tension	2.8 N
Shock	1,000 m/s ² for 6 ms
Vibration	150 m/s ² 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 ⁶ 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	F 02U 000 226-01
Pin 1	U _s
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 ± 5 to 10° from normal direction to avoid damaging the housing.

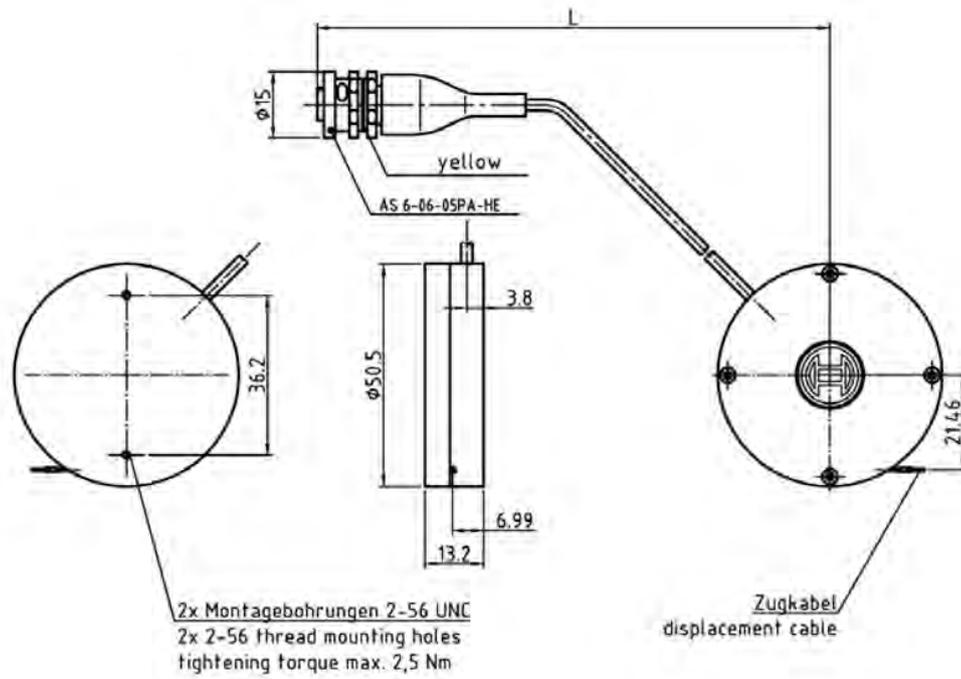
Do not allow the wire to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the wire at all times.

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

Ordering Information

Wire Potentiometer WP 125
Order number **B 261 209 545-01**

Dimensions



05 Brake Control

5

ABS

378

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 ³ /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"> • 9 switch positions pre-configured • 2 switch positions programmable • 1 switch position for ABS function OFF

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"> • Single, without connectors 	F 02U V00 225-01
<ul style="list-style-type: none"> • Single, motorsport connectors 	F 02U V00 209-01
<ul style="list-style-type: none"> • Quad, 2 motorsport connectors 	F 02U V00 203-03
<ul style="list-style-type: none"> • Quad, 1 motorsport connector 	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

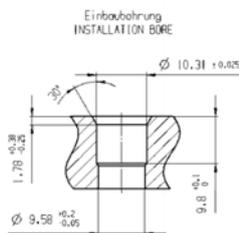
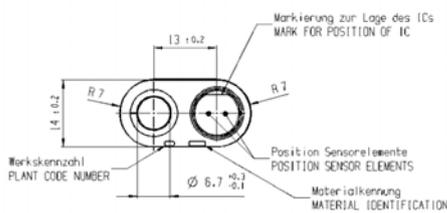
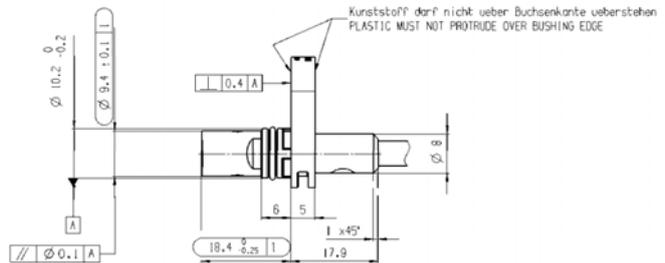
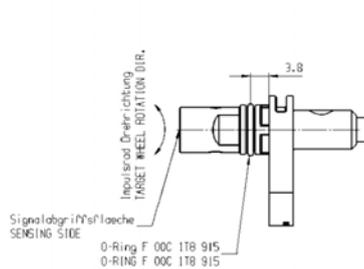
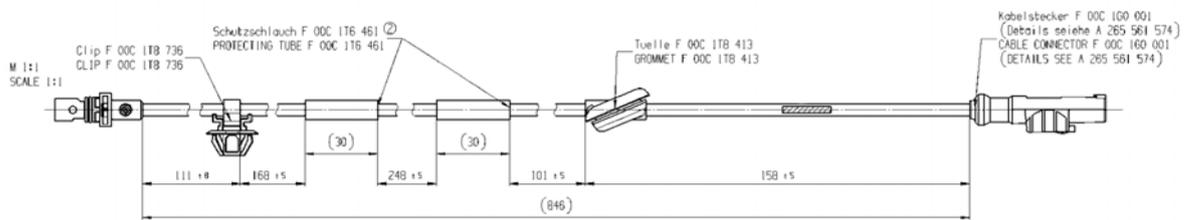
Ordering Information

ABS M4 Kit 1
Order number **F 02U V00 289-01**

ABS M4 Kit 2
Order number **F 02U V00 290-01**

Dimensions

5



Material/MATERIAL

Gehäuse: Polyamid wärme-
stabilisiert
HOUSING: POLYAMIDE HEAT
STABILIZED

Leitung: Mantelleitung zweidrig
Aussen Ø : 5,0±0,3
Mantelisolierung: Polyurethan-
Elastomer 95: 5 Shore A.
CABLE: MOLDED CABLE COVER
TWO CORES, Ø : 5,0±0,3
COVER INSULATION: POLY-
URETHANE ELASTOMER 95: 5
SHORE A.

Buchse: Stahl
BUSHING: STEEL

Wheel Speed Sensor

06 Displays

6

Displays

382

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"> • 5,7" graphic colour display • 12 user configurable display pages • 10 multicolor freely configurable (RGB) LEDs
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	
Sampling rate	Max. 1,000 Hz for all channels
Online data compression	
Logging rate	Max. 100 kB/s
Recording channels	Up to 720 per connected device

Logged data download speed	Max. 1,000 kB/s
Internal storage capacity	2 GB
FM 40 long range telemetry support, GSM telemetry support	
RS232 GPS input	

CCP-Master, data acquisition from ECU that support CAN calibration protocol (optional)

Technical Specifications

Mechanical Data

Size	148 x 126 x 32 mm
Weight	440 g
Protection Classification	IP54 to DIN 40050, Section 9, Issue 2008
Operating temperature internal	-20 to 85°C
Operating temperature Display	-20 to 70°C
Max. vibration	Vibration profile 1 (see Appendix or www.bosch-motorsport.com)

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

Outputs

Sensor supply 5 V ± 1 % (350 mA)	1
Sensor supply 10 V ± 1 % (350 mA)	1

Environment

External switch for page selection, 12 steps	B 261 209 658-01
External switch for brightness adjustment or page selection, 6 steps	B 261 209 659-01
USB flash drive and connector are available on request	

Software Upgrade 1

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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Software Upgrade 2

CCP-Master (ASAP2 file from ECU manufacturer required)	F 02U V01 134-01
Adapter cable to USB-Port included	F 02U V01 343-01
Adapter for wiring harness included	F 02U 002 996-01

Connectors and Wires

Motorsport connector AS 2-14-35PN at DDU7	37 pins
Mating connector AS 6-14-35SN	F 02U 000 453-01

Installation Notes

The required software (.pst file) for this device is available in the download area of our homepage www.bosch-motorsport.com.

Communication

CAN interfaces	2
Ethernet 100BaseT	1
Laptrigger input	1
RS232	Telemetry, GPS
Configuration via RaceCon	Over Ethernet or MSA-Box II

Ordering Information

Display DDU 7

Order number **F 02U V01 130-04**

Software Options

SW Upgrade 1

Order number **F 02U V01 133-02**

SW Upgrade 2

Order number **F 02U V01 134-01**

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 colour 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 analogue 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"> • 5" graphic colour display • Multiple user configurable display pages • 10 multi colour (RGB) gearshift lights
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	
Sampling rate	Max. 1,000 Hz for all channels
Online data compression	
Logging rate	Max. 300 kB/s

Recording channels	Up to 720 per connected device
Logged data download speed	Max. 1,000 kB/s
3-port network switch	
CCP-Master, data acquisition from ECU that support CAN calibration protocol (optional)	

Technical Specifications

Mechanical Data

Size	161 x 111 x 31 (49) mm
Weight	675 g
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Operating temperature internal	-20 to 60°C
Max. vibration	Vibration profile 1 (see Appendix or www.bosch-motor-sport.com)

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 ± 1 % (350 mA)	1

Software

Configuration via RaceCon over Ethernet or MSA-Box II

Environment

External switch for page selection, 12 steps	B 261 209 658-01
External switch for brightness adjustment or page selection, 6 steps	B 261 209 659-01

USB flash drive and connector are available on request.

Adapter cable to USB-Port included

Adapter for wiring harness included

Software Upgrade 1 F 02U V00 701-01

Activation of internal data logger	2 GB
Telemetry support	BT 60
Long range telemetry support	FM 40
Interface for telemetry (on yellow connector)	RS232
Software Upgrade 2	F 02U V00 702-01
Yellow connector unlocked	
GPS input	
Additional analog channels	20
Additional rotational channels (Input Hall/inductive)	4
Additional sensor supplies 5 V ± 1 % (350 mA each)	3
Additional sensor supply 10 V ± 1 % (350 mA)	1
Additional sensor supply 12 V (1 A) non regulated	1
Interface for GPS	RS232
Software Upgrade 3	F 02U V00 796-01
CCP-Master (ASAP2 file from ECU manufacturer required)	
Software Upgrade 4	F 02U V00 871-02
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)	

Connectors and Wires

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

Installation Notes

Software

The required software (.pst file) for this device is available in the download area of our homepage www.bosch-motorsport.com.

Download data and save configurations before sending device as it will be reset during service.

Accumulator Service

Internal accumulator for data preservation and clock included

Recommended service interval: 24 months (inclusive accumulator change)

Send device to Bosch dealer for service.

Charge accumulator for > 6 h after installation (supply with power).

Charge accumulator twice per year for > 6 h (supply with power).

Communication

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**

Software Options

SW Upgrade 1

Order number **F 02U V00 701-01**

SW Upgrade 2

Order number **F 02U V00 702-01**

SW Upgrade 3

Order number **F 02U V00 796-01**

SW Upgrade 4

Order number **F 02U V00 871-02**

07 Data Logging Systems

7

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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	
Sampling rate	Max. 1,000 Hz for all channels
Online data compression	
Logging rate	Max. 100 kB/s
Recording channels	Up to 720 per connected device
Logged data download speed	Max. 1,000 kB/s
Internal storage capacity	2 GB
FM 40 long range telemetry support, GSM telemetry support	
RS232 GPS input	
CCP-Master, data acquisition from ECU that support CAN calibration protocol (optional)	

Technical Specifications

Mechanical Data

Size	148 x 126 x 16 mm
Weight	300 g
Protection Classification	IP54 to DIN 40050, Section 9, Issue 2008
Operating temperature (internal)	-20 to 60°C
Max. vibration	Vibration profile 1 (see Appendix or www.bosch-motorsport.com)

Electrical Data

Supply voltage	8 to 18 V
Max. power consumption (w/o loads)	14 W at 14 V

Inputs

Analog channels	8
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

Outputs

Sensor supply 5 V ± 1 % (350 mA)	1
Sensor supply 10 V ± 1 % (350 mA)	1

Environment

USB flash drive and connector are available on request

Software Upgrade 1

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

Software Upgrade 2

CCP-Master (ASAP2 file from ECU manufacturer required)

F 02U V01 134-01

Adapter cable to USB-Port included

F 02U V01 343-01

Adapter for wiring harness included

F 02U 002 996-01

Connectors and Wires

Motorsport connector AS 2-14-35PN at C 50	37 pins
Mating connector AS 6-14-35SN	F02U 000 453-01

Installation Notes

The required software (.pst file) for this device is available in the download area of our homepage www.bosch-motorsport.com.

Communication

CAN interfaces	2
Ethernet 100BaseT	1
Lap trigger input	1
RS232	Telemetry, GPS
Configuration via RaceCon	Over Ethernet or MSA-Box II

Ordering Information

Data Logger C 50

Order number **F 02U V01 164-04**

Software Options

SW Upgrade 1

Order number **F 02U V01 133-02**

SW Upgrade 2

Order number **F 02U V01 134-01**

Data Logger C 60



Features

7

- ▶ 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	
Sampling rate	Max. 1,000 Hz for all channels
Online data compression	
Logging rate	Max. 300 kB/s
Recording channels	Up to 720 per connected device
Logged data download speed	Max. 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 (optional)

Technical Specifications

Mechanical Data

Size	105 x 34.5 x 137.5 mm
Weight	495 g
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
Operating temperature (internal)	-20 to 65°C
Max. vibration	Vibration profile 1 (see Appendix or www.bosch-motorsport.com)

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 ± 1 % (250 mA)	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 (250 mA each)	3
Sensor supply 10 V (250 mA)	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
---	------------------

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

Adapter cable to USB-Port included

F 02U V01 343-01

Adapter for wiring harness included

F 02U 002 996-01

Connectors and Wires

Motorsports 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

Installation Notes**Software**

The required software (.pst file) for this device is available in the download area of our homepage www.bosch-motorsport.com.

Download data and save configurations before sending device as it will be reset during service.

Accumulator Service

Internal accumulator for data preservation and clock included

Recommended service interval: 24 months (inclusive accumulator change)

Send device to Bosch dealer for service.

Charge accumulator for > 6 h after installation (supply with power).

Charge accumulator twice per year for > 6 h (supply with power).

Communication

Configuration via RaceCon over Ethernet or MSA-Box II

CAN interfaces

2

Ethernet 100BaseT

3

RS232

Telemetry

Lap trigger input

1

Ordering Information**Data Logger C 60**

Order number **F 02U V00 875-03**

Software Options**SW Upgrade 1**

Order number **F 02U V00 703-01**

SW Upgrade 2

Order number **F 02U V00 797-01**

SW Upgrade 3

Order number **F 02U V00 872-02**

Upgrade USB



Connectors and Wires

Pin layout for connection to vehicle loom (see also Dimensions)

Pin 1	Data -
Pin 2	+ 5 V
Pin 3	GND
Pin 4	Data +

Features

7

- ▶ Capacity 2 GB
- ▶ Robust brass housing
- ▶ High performance push-pull connector

The Bosch Motorsport rugged USB flash drive is securely mounted within a rugged brass housing designed to provide full protection against extreme environmental conditions. The USB flash drive is IP68 protected and is resistant to extreme operating temperatures (-30 to 85°C). The USB flash drive is equipped with a rugged protection cap.

The upgrade USB also contains an adapter cable to USB-port and a connection socket to your wiring harness.

Application

Operating temperature range	-30 to 85°C
Protection class	IP68
Tightening torque of Backnut for connection socket	1.5 to 2.0 Nm
Max. vibration	Vibration Profile 3 (see Appendix or www.bosch-motorsport.com)

Technical Specifications

Mechanical Data

Housing material	Brass
Weight	42 g
Length	72 mm
Bore diameter	15.5 mm

Electrical Data

Capacity	2 GB
Specification	USB 1.1/2.0
Data rate	USB 2.0 up to 480 MBit/s

Installation Notes

The USB flash drive should be fixed on a soft surface to reduce the stress on the USB flash drive.

Required Software upgrades:

SW upgrade 1 for DDU 7 F 02U V01 133-02

SW upgrade 4 for DDU 8 F 02U V00 871-02

SW upgrade 2 for C 50 F 02U V01 134-01

SW upgrade 3 for C 60 F 02U V00 872-02

Ordering Information

Rugged USB flash drive

Order number **F 02U V01 342-01**

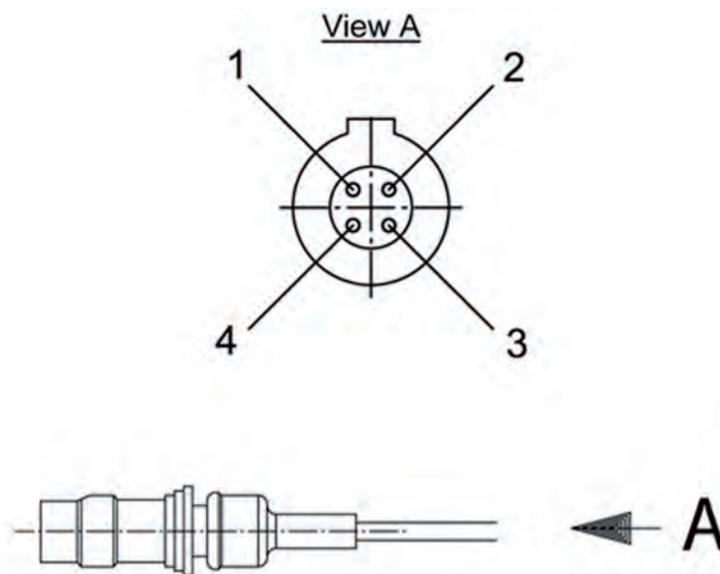
Adapter cable to USB port

Order number **F 02U V01 343-01**

Connection socket to wiring harness

Order number **F 02U 002 996-01**

Dimensions



Lap Trigger HF 58 Receiver



7

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 sig-

nal 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	127 g
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
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

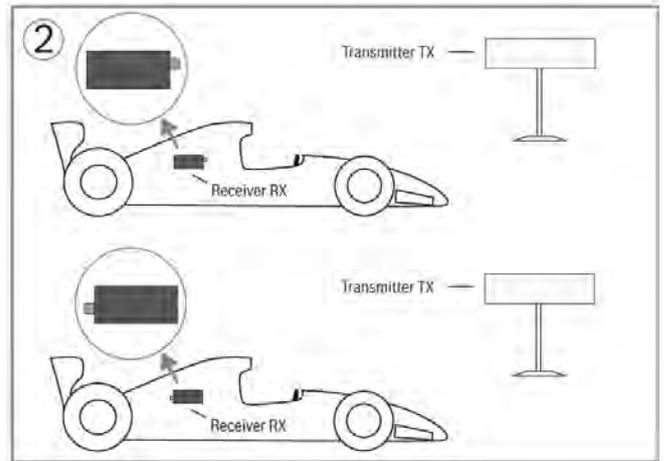
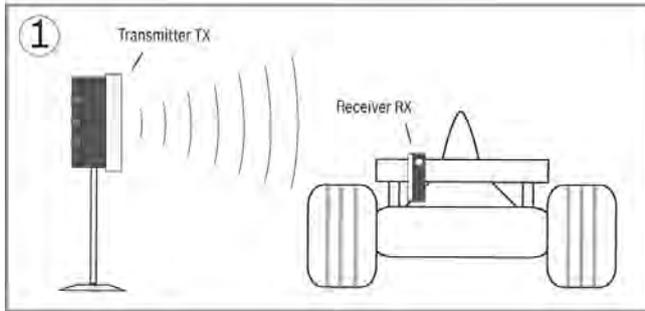
Lap Trigger HF 58 Receiver

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
Protection Classification	IP54 to DIN 40050, Section 9, Issue 2008
Ambient temperature	-20 to 60°C

Option: internal accumulator

Additional weight	350 g
Charging time	< 4 h
Running time	Approx. 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.

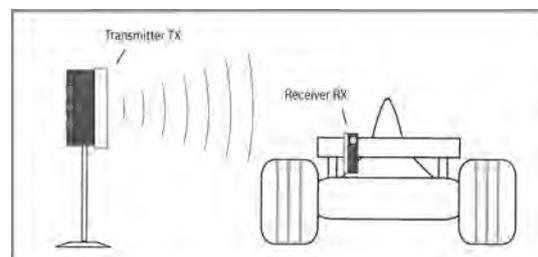
Charge control shows:	<ul style="list-style-type: none"> • blue when charging • green when battery full • red on power or battery failure
-----------------------	--

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



Lap Trigger IR-02 Receiver



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

Connectors and Wires

Pin 1/A	V+ (Battery voltage)
Pin 2/B	GND
Pin 3/C	Trigger signal

Installation Notes

Same height between receiver and transmitter

Visibility connection between receiver and transmitter

Avoid direct exposure to sunlight

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 261-206 887-03**

IR-02 Receiver KPTA 6E6-4P-C-DN

Order number **B 261 206 888-01**

Lap Trigger IR-02 Transmitter



Ordering Information

Lap Trigger IR-02 Transmitter
Order number **B 261 206 890-01**

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

CAN Module



Features

- ▶ 8 high speed analogue channels 12 bit, voltage range 0 to 5 V
- ▶ CAN identifiers configurable
- ▶ Sampling rate of 1100 Hz
- ▶ 120 Ohm CAN bus terminating resistor selectable on-board

The CAN Modules are designed to expand the number of the channels available on a logger. The linearization of the channels can be made directly from the acquisition system so no additional software is necessary. You can install up to 32 of these modules on the vehicle using different CAN IDs.

Technical Specifications

Mechanical Data

Size	52 x 56 x 21 mm
Weight	70 g

CAN parameters

Continuous transmission of CAN identifiers with rates configurable 1 Hz to 1 KHz at 1 Mb/s or at 500 Kb/s.

BUS data:

- 0xADD1 AN0÷AN3
- 0xADD2 AN4÷AN7
- 0xADD4 Temperature, Vext /2, DIAG

Diagnostics

Diag1 = Vref (1/2 of the Vout value, used to supply external devices)
 Diag2 = board temperature
 Temperature value $T = ((Temp * 5000 / 4096) - 500) / 10$ [°C]
 Software Filtering: Analogue inputs have IIR LP 1° order filter selectable in 1 to 100 Hz range.

Transmission parameters (address and transmission frequency) on CAN bus are software switchable.

A PC software program is available to set configuration parameters and directly set-up Smart Capture Devices on field.

Data structure

All acquired data are available on CAN with the following IDs (ADD1, ADD2, ADD3, ADD4 with DLC=8)

ID	DLC	AN1 H	AN1 L	AN2 H	AN2 L	AN3 H	AN3 L	AN4 H	AN4 L
ADD1	8	AA							

Output message

ID	DLC	AN5 H	AN5 L	AN6 H	AN6 L	AN7 H	AN7 L	AN8 H	AN8 L
ADD2	8	AA							

Output message

ID	DLC	DIAG2 H	DIAG2 L	DIAG1 H	DIAG1 L
ADD4	8	AA	AA	AA	AA

Output message

Data bus details

Analog inputs

Analog inputs are in counts on 12 bit (0 -> 0 mV, 0x1FFF -> 5000 mV)
 1 bit is 1.22 mV
 All analog inputs have a low pass hardware filter at 100 Hz and an IIR pole software configurable in range 1 to 100 Hz.

PC Software

Modules are pre-configured by Bosch Motorsport.

Pin configuration

Connector on Module	AS12-35PN
Pin	Function
1	Power Supply 12 V
2	CAN H
3	CAN L
4	Power Supply Ground
5	Close CAN (Bridge with Pin2)
6	12 V out Sensors (protected)
7	Reference Voltage 5 V/50 mA
8	Reference Voltage 5 V/50 mA
9	Analogue channel 1
10	Analogue channel 2
11	Analogue channel 3
12	Analogue channel 4
13	Analogue channel 5
14	Analogue channel 6
15	Analogue channel 7
16	Analogue channel 8
17	Analogue ground
18	Analogue ground
19	Not used

20	Not used
21	Not used
22	Not used

Ordering Information

CAN Module

Order number **F 02U V01 514-01**

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 www.bosch-motorsport.com)
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

Connector 1 (red)	ASU 0-03-05PN-HE
Mating connector ASU 6-03-05SN-HE	F 02U 000 407-01
Pin 1	U _s

Pin 2	GND
Pin 3	-
Pin 4	-
Pin 5	Config
Connector 2 (green)	ASU 0-03-05SD-HE
Mating connector ASU 6-03-05PD-HE	F 02U 000 399-01
Pin 1	U _s
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

7

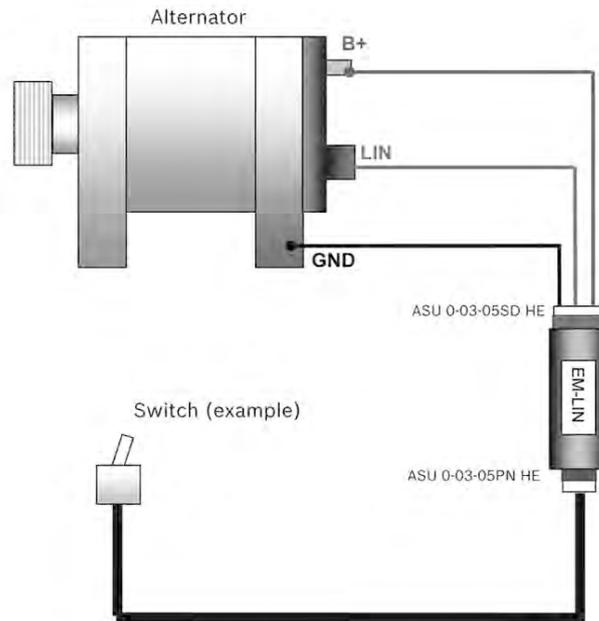


Illustration 1: Possible application to switch between two alternator voltage values

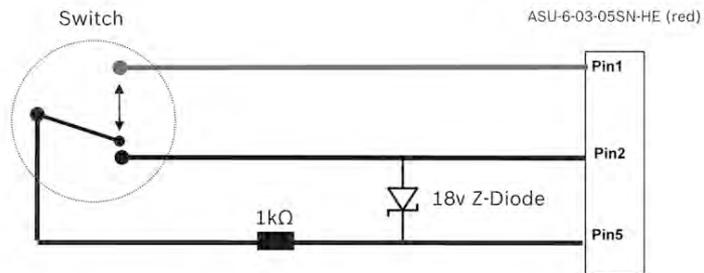
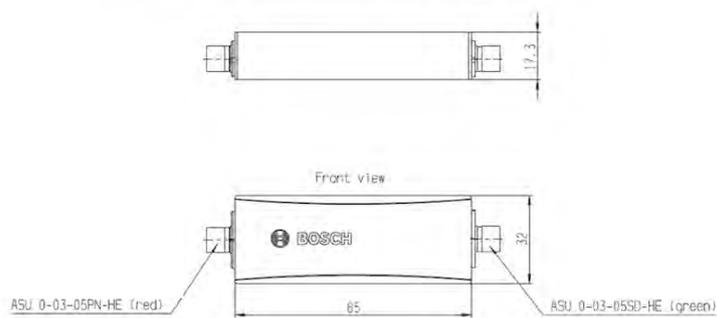


Illustration 2: Recommended switch design (example)



Lambdatronic LT4



Features

- ▶ Supply of up to 4 Bosch lambda sensors, type LSU 4.2, LSU 4.9 or Mini-LSU 4.9
- ▶ Integrated voltage compensation for sensor heater

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 www.bosch-motorsport.com)

Electrical Data

Power supply U_s	(6.5) 10 to 14 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 Sport	Included
--------------------------------	----------

Characteristic

Signal output 1	CAN
Signal output 2	4 x 0 to 5 V "analog"
CAN- baud rate	500 kbaud or 1 Mbaud
Signal resolution	2,5 * 10 ⁻⁴ 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	F 02U 000 355-01
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	Pump 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 LT4 is featured with voltage compensation for the heating profile

The unit can be connected to any CAN system (500 kbaud or 1 Mbaud) and analog measuring device.

To avoid signal errors, a cable length of maximum 1.5 m between sensor and box is recommended.

The unit is secure from miss-pinning.

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

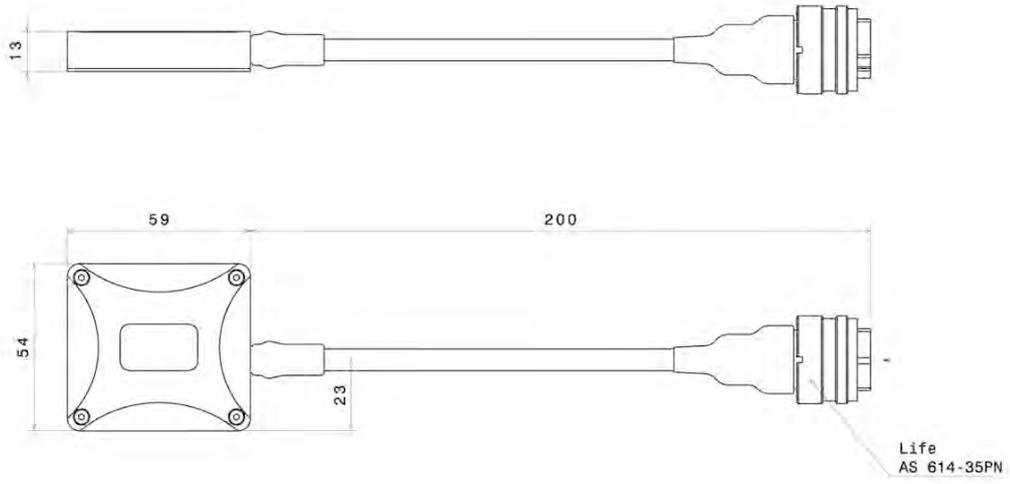
Communication link	K-Line / CAN
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Ordering Information

Lambdatronic LT4

Order number **F 01T A20 070-07**

Dimensions



Modular Sensor Interface M 60



Features

7

- ▶ 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 logger 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, 8 x oversampling and highly linear digital filtering. The cut-off 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

RS232 GPS input

CCP-Master, data acquisition from ECU that support CAN calibration protocol (optional)

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 www.bosch-motorsport.com)

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

Environment

Software Upgrade 1

CCP-Master (ASAP 2 file from ECU manufacturer required)	F 02U V01 012-01
---	------------------

Connectors and Wires

Motorsports 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

Installation Notes

Internal accumulator for data preservation and clock included

Required service interval: 24 months (internal accumulator is replaced)

Charge accumulator for > 6 h after installation.

Charge accumulator twice per year for > 6 h.

Send device to Bosch dealer for accumulator change.

The required software (.pst file) for this device is available in the download area of our homepage www.bosch-motorsport.com.

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 882-02**

Software Options**SW Upgrade 1**

Order number **F 02U V01 012-01**

Wheel Speed Signal Splitter



Features

- ▶ ABS Wheel Speed Sensor Interface
- ▶ Lightweight Aluminum Housing

Bosch Motorsport has developed a wheel speed module that converts the Bosch DF11 (differential dual hall sensors) signals to a signal that can be processed by peripheral engine controlling devices and data recording systems. The adapter can be plugged into any Bosch ABS M4 loom.

The operation principle is that it forwards the sensor information to the ABS. In addition it converts the speed info into a digital signal. The type of output is open collector. The connected device needs to contain an internal pull up resistor of 2.15 kΩ to 12 V like the MS 4-ECUs.

The interface is available in two different housings supporting one connector or two connectors (see photo). The single connector type is used if the signal is fed back into an especially pre-defined ABS loom which connects e.g. to the original chassis loom. The double connector type is used if the speed signal is broadcast to the peripheral device via a separate loom.

Application

Application	ABS wheel speed sensor interface
Compatible sensor type	Bosch DF 11
Operating temperature range	-20 to 85°C
Storage temperature range	-20 to 85°C

Technical Specifications

Mechanical Data

Weight	53 g
Size (Single connector type)	101.8 x 63.5 x 30.3 mm
Size (Double connector type)	112.1 x 63.5 x 30.3 mm
Max. vibration	Vibration profile 1 (see Appendix or www.bosch-motorsport.com)

Electrical Data

Power supply	12 V
Max. power supply (1 min)	25 V

Connector for Single Connector Type

Connector 1 (wide)	AS-012-35-PN
Mating connector AS-6-12-35-SN	F 02U 000 443-01

Connectors for Double Connector Type

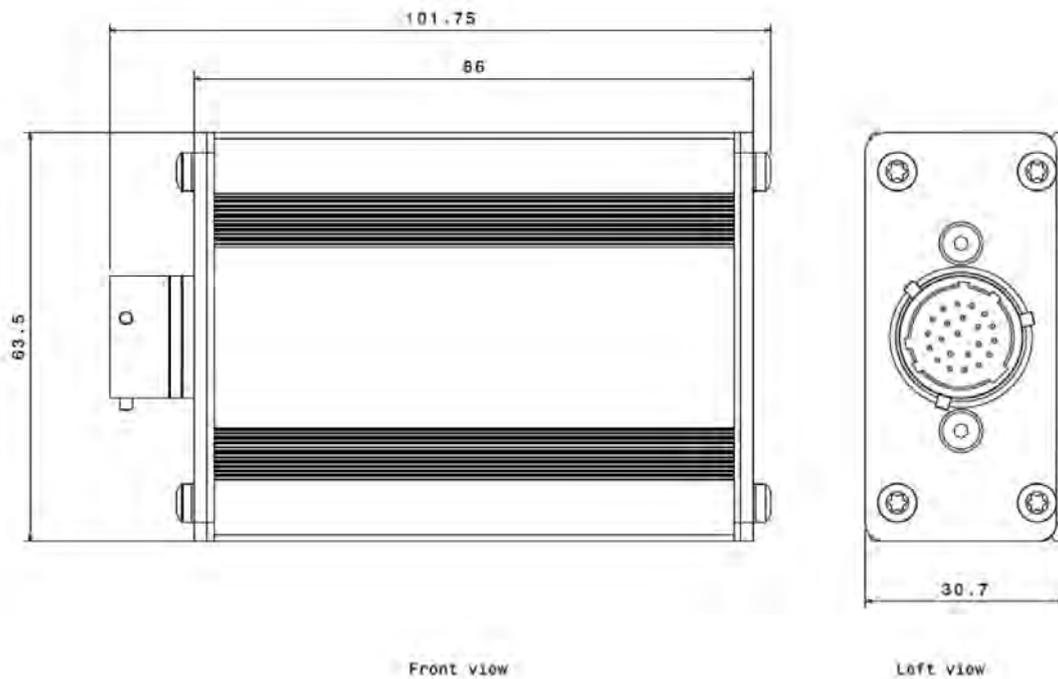
Connector 1 (wide)	AS-2-12-35-PN
Mating connector AS-6-12-35-SN	F 02U 000 443-01
Connector 2 (small)	AS-2-08-35-PN
Mating connector AS-6-08-35-SN	F 02U 000 430-01

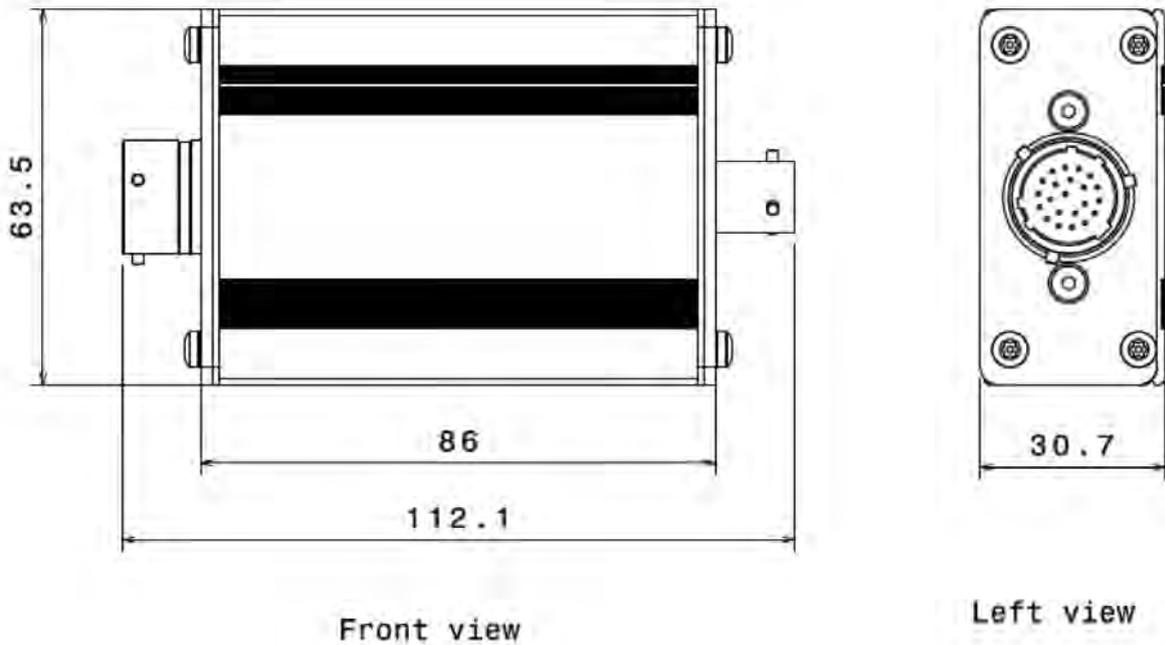
Pinout Connector 1 (wide)

Pin	Description for one connector	Description for two connectors
1	Supply to DF11 (RR)	Supply to DF11 (RR)
2	Signal from DF11 (RR)	Signal from DF11 (RR)
3	Supply to DF11 (RL)	Supply to DF11 (RL)
4	Signal from DF11 (RL)	Signal from DF11 (RL)
5	Supply to DF11 (FR)	Supply to DF11 (FR)
6	Signal from DF11 (FR)	Signal from DF11 (FR)
7	Supply to DF11 (FL)	Supply to DF11 (FL)
8	Signal from DF11 (FL)	Signal from DF11 (FL)
9	Signal to ABS (FL)	Signal to ABS (FL)
10	DF11 supply from ABS (FL)	DF11 supply from ABS (FL)
11	Signal to ABS (FR)	Signal to ABS (FR)
12	DF11 supply from ABS (FR)	DF11 supply from ABS (FR)
13	Signal to ABS (RL)	Signal to ABS (RL)
14	DF11 supply from ABS (RL)	DF11 supply from ABS (RL)
15	Signal to ABS (RR)	Signal to ABS (RR)
16	DF11 supply from ABS (RR)	DF11 supply from ABS (RR)
17	Open collector Signal to ECU (FL)	Not used
18	Open collector Signal to ECU (FR)	Not used
19	UBat 12V	UBat 12V
20	Open collector Signal to ECU (RL)	Not used
21	Open collector Signal to ECU (RR)	Not used
22	ECU Ground	Not used

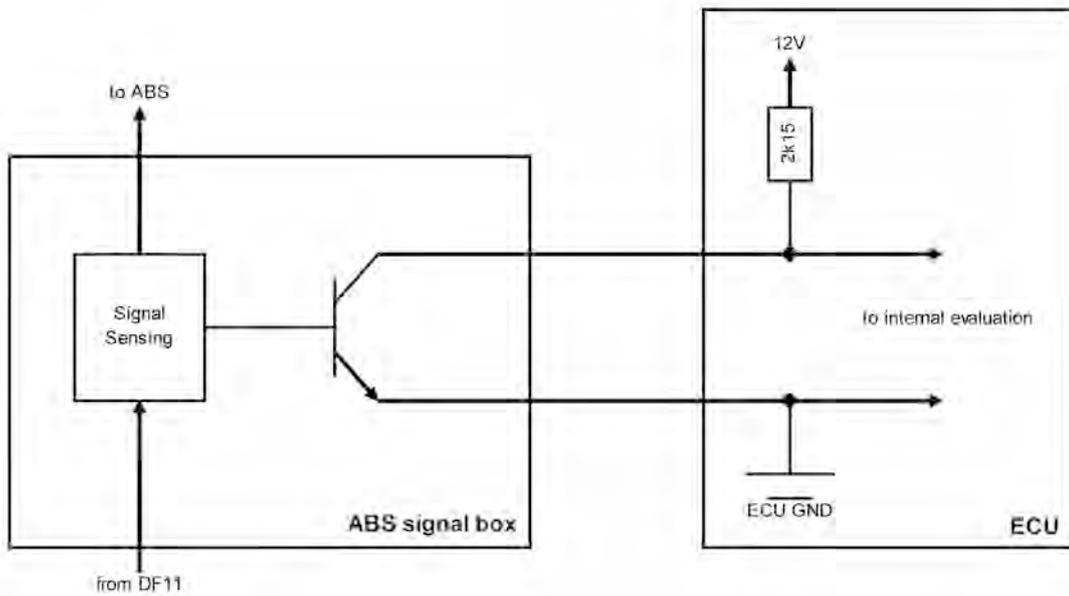
Pinout Connector 2 (small)

Pin	Description for one connector	Description for two connectors
1	n.a.	Open collector Signal to ECU (FL)
2	n.a.	Open collector Signal to ECU (FR)
3	n.a.	Open collector Signal to ECU (RL)
4	n.a.	Open collector Signal to ECU (RR)
5	n.a.	Not used
6	n.a.	ECU Ground

Ordering Information**Single Connector Type**Order number **F 02U V00 335-03****Double Connector Type**Order number **F 02U V00 203-03****Dimensions***Single Connector Type Housing*



Double Connector Type Housing



Connection Scheme

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 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, e.g. 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

Environment

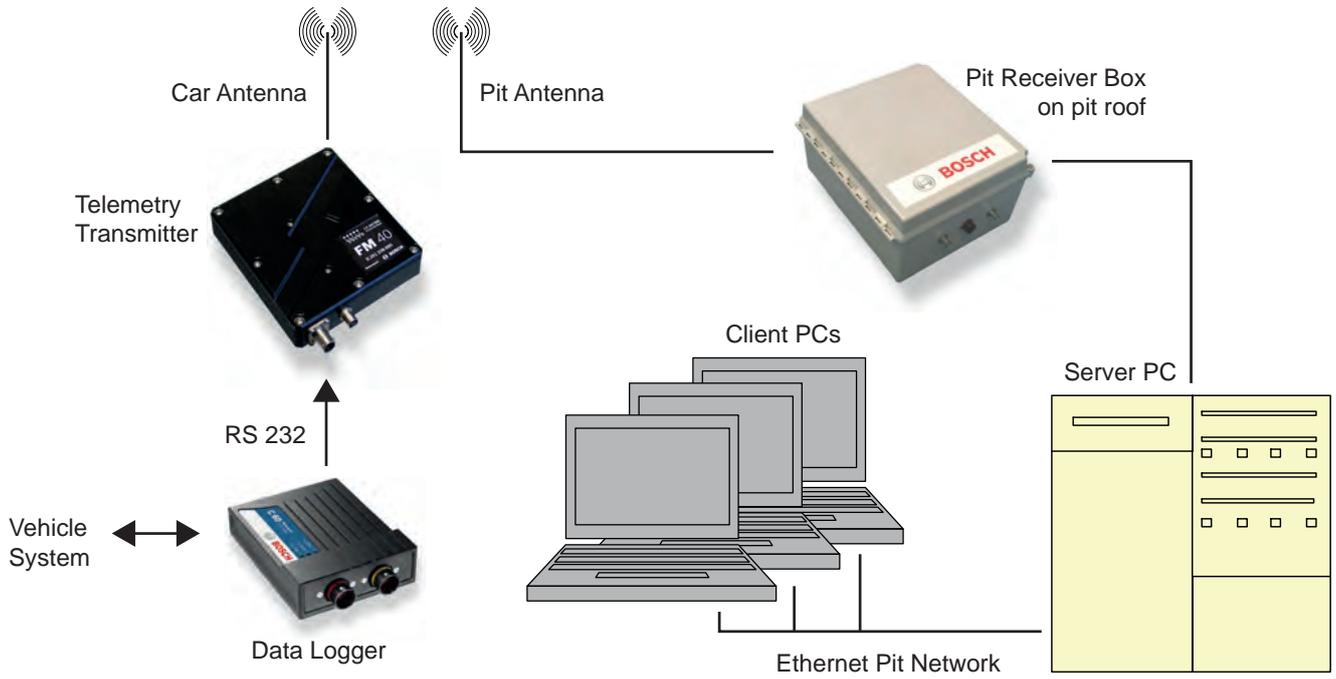
Car antenna

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 ± 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
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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 ² 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



7

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.

The Pit Receiver Box contains 1 to 4 UHF receivers fed by a single RX antenna and low noise filter amplifier (LNA). This enables parallel telemetry data reception from up to 4 cars, provided transmitters need to operate in the same 2 MHz frequency band.

The Box is equipped with dual Ethernet port for redundant Ethernet wire to the pit or for connection to a directional link (relay station).

Technical Specifications

Mechanical Data

Weight	4.2 kg
Size	330 x 280 x 180 mm
Max. distance receiver box to PC (with F 020 V01 440-01)	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	20 to 50 V

Communication	2 x 10 / 100 Mbit ethernet
Power consumption	10 W

Connectors and Wires

Data and power connector	Motorsports type
Antenna connector	BNC (Jack) 50 Ω

Package Parts

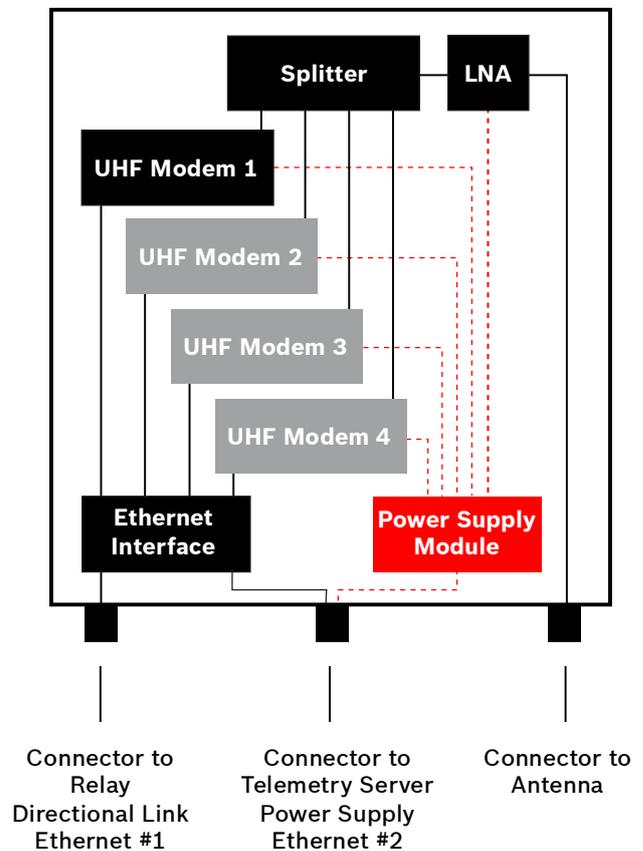
Box
48 V power supply

Ordering Information

Pit Receiver Box

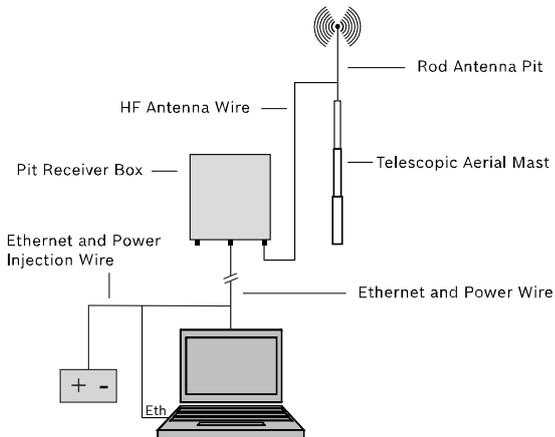
Order number **F 02U V01 460-01**

Dimensions



Scheme Pit Receiver Box

Pit Receiver Package



The Pit Receiver Package contains everything that is required to start operation.

Technical Specifications

Package Parts

Pit Receiver Box (2 channels)	F 02U V01 460-01
HF antenna wire (8 m)	B 261 209 493-01
Rod antenna pit 7 dbi (2 m)	B 261 208 867-01
Ethernet and power wire (50 m)	F 020 V01 440-01
Ethernet and power injection wire (1.5 m)	B 261 209 744-01
Telescopic aerial mast (7.7 m)	B 261 208 873-01

Ordering Information

Pit Receiver Package

Order number **on request**

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 to 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.

Application

6 MB measurement per lap

Bidirectional transmission scheme

Privacy ensured by 128-bit WEP encryption

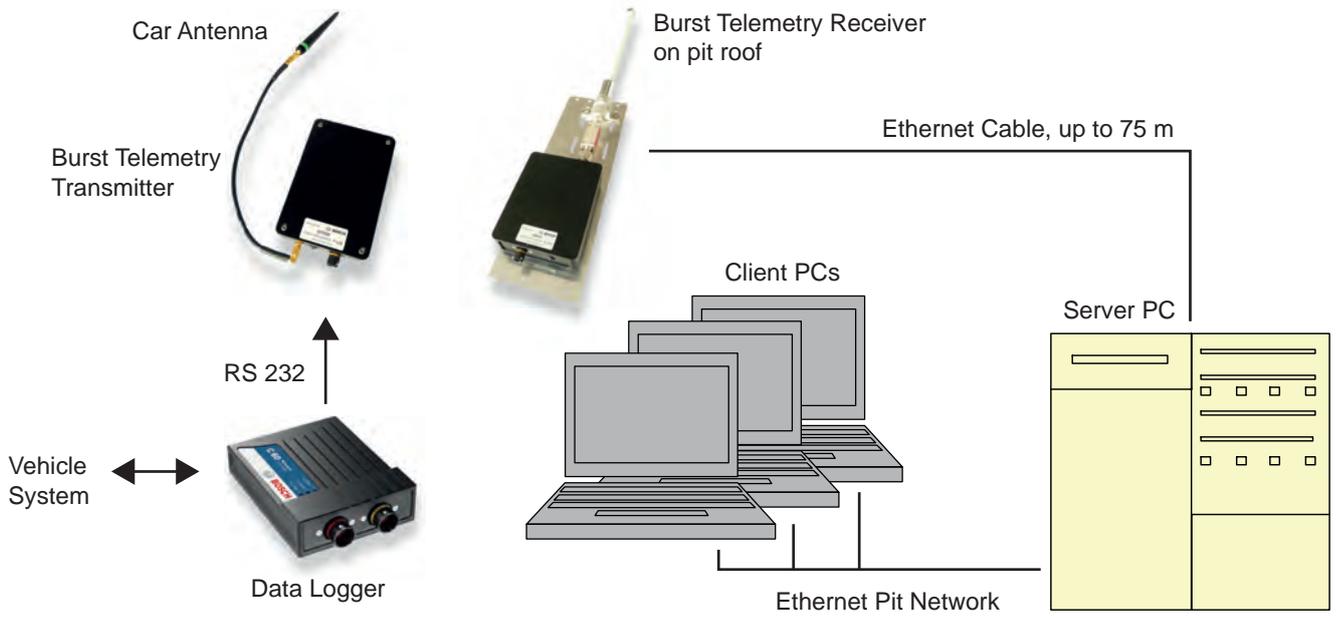
Technical Specifications

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
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	AS008-35PA (Deutsch)
Mating connector	AS608-35SA (Deutsch)

Legal Notes

This product contains open source software. For detailed information see product documentation.

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
Protection Classification	IP67 to DIN 40050, Section 9, Issue 2008
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	AS008-35PA (Deutsch)
Mating connector	AS608-35SA (Deutsch)

Legal Notes

This product contains open source software. For detailed information see product documentation.

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.

7

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	$\frac{1}{4} \lambda$
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**

Antenna Cable Kit



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
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Ordering Information

Antenna Cable Kit

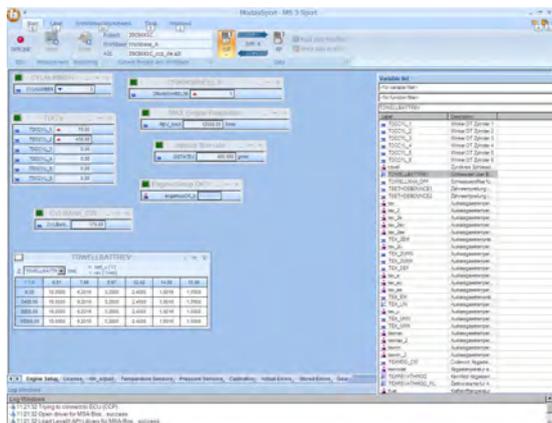
Order number **B 261 209 490-01**

08 Software

8

Calibration	426
Simulation	428
Analysis	430
Software Upgrades	432

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 32/64 Bit, Windows 7 32/64 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 our homepage**

RaceCon



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

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 32/64 Bit, Windows 7 32/64 Bit

Optional Accessories

MSA-Box II

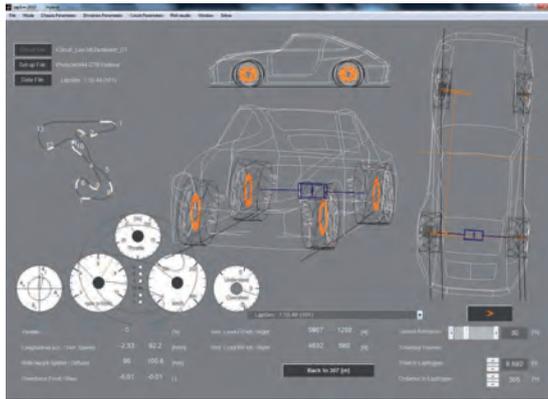
F 02U V00 327-02

Ordering Information

RaceCon

Order number **Free download at our homepage**

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 our homepage**

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 058-01**

Upgrade LapSim Chassis License

Order number **F 01T A20 059-01**

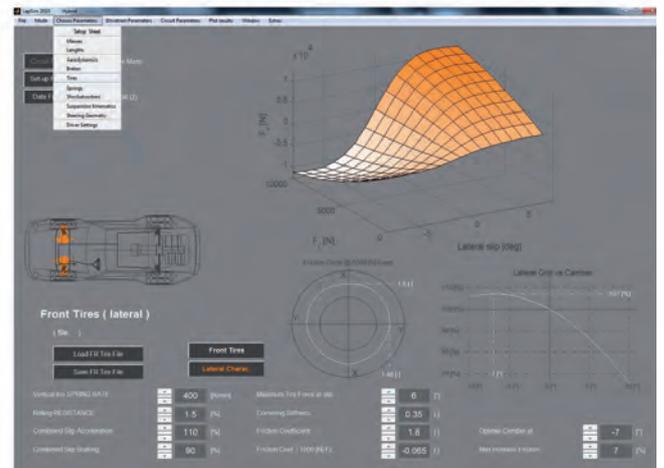
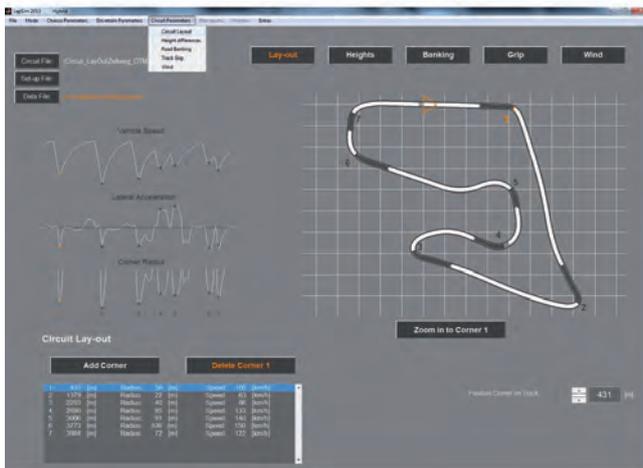
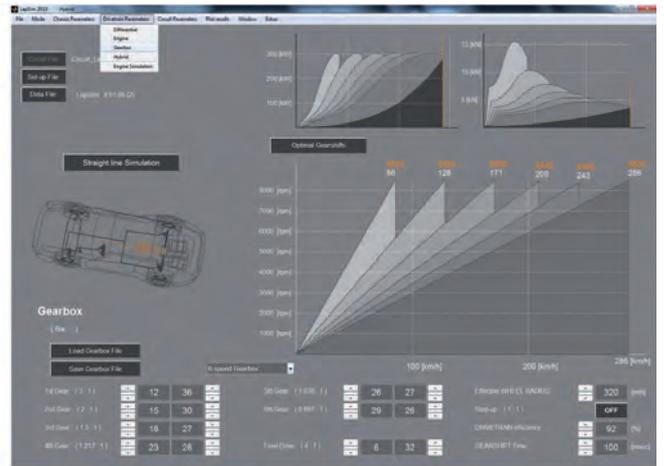
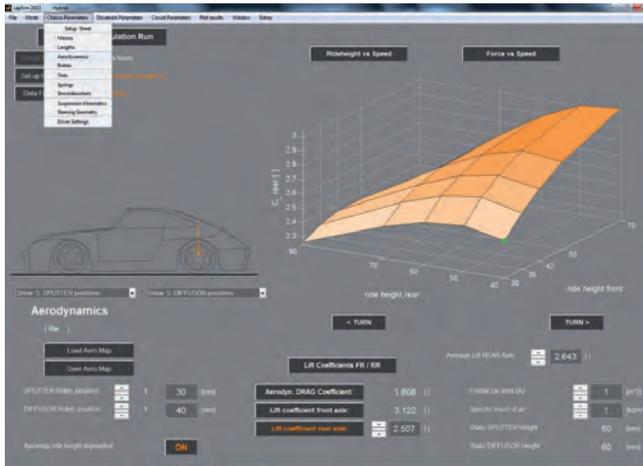
Update LapSim Chassis or Engine

Order number **F 02U V00 287-01**

Update LapSim Chassis and Engine

Order number **F 02U V00 288-01**

Dimensions



A few Screenshots

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 and is 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. Choose between the *Free* and the *Expert* version depending on your purpose. 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 32 Bit, Vista 32/64 Bit, Windows 7 32/64 Bit

Technical Specifications

Variations

	Free	Expert
Max. open files	4	unlimited
Max. measuring data windows	2	unlimited
Max. areas in measuring data windows	4	unlimited
Histogram	+	+
x/y-plot	+	+
Distribution	+	+
min/max-tables	+	+
Fourier-transformation	+	+

Outing report	+	+
Lap analysis	-	+
Flowcharts	-	+
Instrument panel	+	+
User defined physical units	+	+
Racetrack generation via speed/lateral G or GPS	+	+
ASCII export	+	+
Available operators for math channels.	+, -, *, /, ^, \sqrt{x} , $\sqrt[3]{x}$	All
Extras settings/comments	-	+
Desktop load/save	+	+
Telemetry	+	+
Programming interface (API)	-	Opt.

Ordering Information

WinDarab Free

Order number **Free download at our homepage**

WinDarab Expert

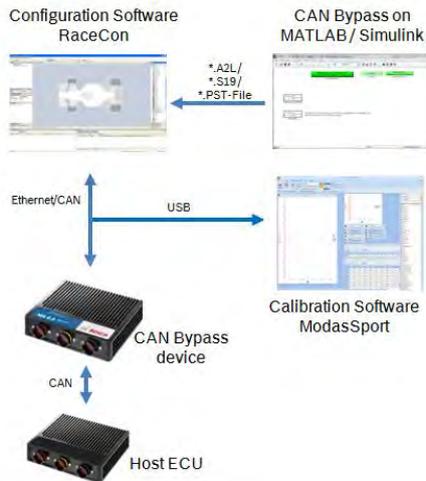
Order number **F 02U V01 308-01**

Software Options

Software licence API for WinDarab Expert

Order number **F 02U V01 682-01**

CAN Bypass



Features

- ▶ Calculation in external Bosch CAN bypass ECU
- ▶ Connection to Non-Bosch ECU possible
- ▶ Interface binding via CAN (max. 1 Mbaud/s)
- ▶ Interface bandwidth depending on CAN

Develop your own software on a Bosch Motorsport ECU for bypassing or support a host ECU via CAN or as standalone ECU. CAN Bypass is a software development environment based on Matlab/Simulink. It allows a significantly speed algorithm development with option for all MS 5.x ECUs, data loggers C 50 and C 60 and the MS 5.5 internal data logger. We deliver it with a full environment for Matlab/Simulink, an empty model with Bosch Motorsport real time operating system library and a package of Matlab/Simulink interfaces to all ECU I/Os. Using a bypass ECU with software breakouts on host ECU to calculate parts of host ECU functions on bypass ECU or as standalone ECU e.g. for hybrid or transmission control.

Technical Specifications

General Functions

Support for generating executables that include algorithm, device-driver and real-time operating system

Multitasking scheduling using time synchronous (and asynchronous) tasks, task pre-emption, and temporary task overruns

Environment for Matlab/Simulink

Full I/O access with Bosch-Motorsport device drivers

Support for CAN bypass of MS 5.x ECUs. Break out signals with CAN standard DBC file.

Bypass interaction between host ECU and bypass ECU via CAN (500 kBaud/s or 1 MBaud/s)

Calibration and measurement interface CCP via CAN or XCP via Ethernet

Interface to Bosch data logging systems

SW-Download via Bosch Motorsport calibration tool RaceCon

Software option for all MS 5.1 ECU, dataloggers C 50 and C 60 and MS 5.5 internal data logger available. For other MS 5.x ECUs on request.

Required and not included Software

MathWorks Requirements

MATLAB R2010b

Simulink

Real-Time Workshop

Real-Time Workshop Embedded Coder

Fixed-Point Toolbox

Simulink Fixed-Point

Stateflow

Stateflow Coder

Compiler

Freescale CodeWarrior Professional – MobileGT

Operating Systems

Windows XP SP3, Windows 7 (64 Bit)

Development Hints

Depending on your experiences with SW-Development of Bosch Motorsport ECUs we recommend SW-Development support from Bosch Motorsport.

Ordering Information

CAN Bypass for ECU MS 5.0

Order number **F 02U V00 991-01**

CAN Bypass for Datalogger C 50

Order number **F 02U V00 670-01**

CAN Bypass for Datalogger C 60

Order number **F 02U V00 671-01**

CAN Bypass for ECU MS 5.5 internal Datalogger

Order number **F 02U V00 002-01**

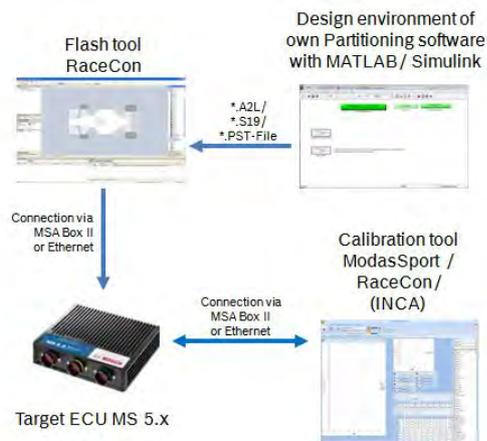
Services

Service Contract

The service contract extension is necessary at the beginning of the second year of use. It has a runtime of one year.

Order number **F 02U V01 672-01**

MSD Partitioning



Features

- ▶ Calculation directly in Bosch main ECU
- ▶ Communication binding via Software free cuts
- ▶ Fast connection to Bosch Software, solution for time-critical calculations
- ▶ Unlimited bandwidth interfaces
- ▶ One Box Design (compact solution, no extra weight)

Develop your own Software on a Bosch Motorsport MS 5.x ECU. MSD Partitioning Single TGT is a software option for all MS 5.x ECUs such as the MS 5.0, MS 5.1, MS 5.2, MS 5.5. We deliver it with a full environment for Matlab/Simulink, a compiled Bosch Motorsport model as library, an empty model and real-time operating system library and a package of Matlab/Simulink interfaces to all ECU I/Os.

Technical Specifications

General Functions

- Support for generating executables that include algorithm, device-driver and real-time operating system
- Multitasking scheduling using time synchronous (and asynchronous) tasks, task pre-emption and temporary task overruns
- Environment for Matlab/Simulink
- Full I/O access with Bosch-Motorsport device drivers
- Full read access to all Bosch signals
- Development environment with reduced Bosch "unit_blockset"
- Real time calibration
- Calibration and measurement interface CCP via CAN or XCP via Ethernet
- SW-Download via Bosch Motorsport calibration tool RaceCon
- Software option for all MS 5.x ECUs

Required and not included Software

MathWorks Requirements

MATLAB R2010b

Simulink

Real-Time Workshop

Real-Time Workshop Embedded Coder

Fixed-Point Toolbox

Simulink Fixed-Point

Stateflow

Stateflow Coder

Compiler

Freescale CodeWarrior Professional – MobileGT

Operating Systems

Windows 7, 64 Bit SP1

Development Hints

Depending on your experiences with SW-Development of Bosch Motorsport ECUs we recommend SW-Development support from Bosch Motorsport.

Ordering Information

MSD Partitioning

Order number **F 02U V01 350-01**

Services

Service Contract

Order number **F 02U V01 755-01**

09 Accessories

9

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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**

Connector Opening Tool for AS series



Features

- ▶ Quick and easy opening of ECU connectors

Technical Specifications

Mechanical Data

Material	Stainless steel
----------	-----------------

Ordering Information

Opening tool for shellsize 16
Order number **F 02U V01 393-01**

Opening tool for shellsize 18
Order number **F 02U V01 394-01**

PowerBox PBX 180



Features

- ▶ Advanced user interface
- ▶ CAN communication
- ▶ Reverse polarity protection
- ▶ Lightweight aluminum casing
- ▶ Current measurement on all channels

We designed the PowerBox for intelligent control and distribution of the electric grid in a modern racing car. It is capable to replace all conventional relays, fuses and circuit breakers, simplifies wiring harnesses and provides diagnostic capabilities.

Technical Specifications

Mechanical Data

Size	191 x 176 x 36 mm
Weight	1,250 g
Temp. range (at internal sensors)	-10 to 85°C

Electrical Data

Supply voltage range	6 to 20 V
Power supply current	180 A

Inputs

16 analogue inputs (12 bit resolution)
14 digital inputs

Outputs

2 very high power channels (up to 180 A inrush current, 20 A continuous)
12 high power channels (up to 80 A inrush current, 20 A continuous)
2 high power PWM channels (20 A continuous)

26 low power channels (8 A continuous)
4 low power PWM channels (8 A continuous)
2 wiper channels (8 A continuous)
4 tri-state digital channels
3 sensor supplies 5 V with individual ground pins
Warning light

Software

Real time clock

Connectors

Connector 1: Battery power supply	Deutsch ASHD0 14-1 PN
Connector 2: High power outputs	Deutsch AS2 20-16 SN
Connector 3: Low power outputs	Deutsch AS2 20-39 SA
Connector 4: Signal and Inputs	Deutsch AS2 16-35 SN

Pin configuration

Connector 1 – Battery Power Supply

Mating connector	Deutsch ASHD6 14-1 SN C35
Order number connector housing	F 02U 002 905-01

Notice: Depending on the cable used for power supply, one of the following pins is needed according to the diameter of the cable.

Order number pin for cable 16 mm ²	F 02U 002 906-01
Order number pin for cable 25 mm ²	F 02U 002 907-01
Order number pin for cable 35 mm ²	F 02U 002 908-01

Connector 2 – High Power Outputs

Mating connector	Deutsch AS6 20-16 PN
Order number connector	F 02U 000 480-01

Pin	Used for	Max Rating / Peak (A) *
A	Channel 10 High Power	20 / 80
B	Channel 2 Very High Power	20 / 180
C	Channel 1 Very High Power	20 / 180
D	Channel 9 High Power	20 / 80
E	Channel 1 High Power	20 / 80
F	Channel 5 High Power	20 / 80
G	Channel 1 High Power PWM	20 / 80 (0 to 100% DC)
H	Channel 2 High Power PWM	20 / 80 (0 to 100% DC)
J	Channel 12 High Power	20 / 80
K	Channel 4 High Power	20 / 80
L	Channel 11 High Power	20 / 80
M	Channel 3 High Power	20 / 80

N	Channel 6 High Power	20 / 80
P	Channel 2 High Power	20 / 80
R	Channel 7 High Power	20 / 80
S	Channel 8 High Power	20 / 80

*) Please note that the current draw per channel is limited by the connector, not by the driver stages.

Connector 3 – Low Power Outputs

Mating connector	Deutsch AS6 20-39 PA
Order number connector	F 02U 002 859-01

Pin	Used for	Max Rating / Peak (A) *)
A	Channel Wiper 2	8 / 40
B	Tri-State Output 2	Trigger 0 / 2.5 / 5 V
C	Tri-State Output 4	Trigger 0 / 2.5 / 5 V
D	Channel 25	8 / 40
E	Channel 26	8 / 40
F	Channel 23	8 / 40
G	Channel 21	8 / 40
H	Channel 22	8 / 40
J	Channel 20	8 / 40
K	Channel 14	8 / 40
L	Channel 16	8 / 40
M	Channel 18	8 / 40
N	Channel 2	8 / 40
P	Channel 4	8 / 40
R	Channel 6	8 / 40
S	Channel 8	8 / 40
T	Channel 10	8 / 40
U	Channel 12	8 / 40
V	Channel 2 PWM	20 / 60 (0 to 100% DC)
W	Channel 4 PWM	20 / 60 (0 to 100% DC)
X	Channel Wiper 1	8 / 40
Y	Tri-State Output 1	Trigger 0 / 2.5 / 5 V
Z	Tri-State Output 3	Trigger 0 / 2.5 / 5 V
a	Reserved	-
b	Channel 24	8 / 40
c	Channel 19	8 / 40
d	Channel 13	8 / 40
e	Channel 1	8 / 40
f	Channel 3	8 / 40
g	Channel 7	8 / 40
h	Channel 9	8 / 40

i	Channel 11	8 / 40
j	Channel 3 PWM	20 / 60 (0 to 100% DC)
k	Channel 1 PWM	20 / 60 (0 to 100% DC)
m	Power Ground	
n	Channel 15	8 / 40
p	Channel 17	8 / 40
q	Channel 5	8 / 40
r	Power Ground	

*) Please note that the current draw per channel is limited by the connector – not by the driver stages.

Connector 4 – Signal and Inputs

Mating connector	Deutsch AS6 16-35 PN
Order number connector	F 02U 000 466-01

Pin	Used for	Comments
1	Digital Input 7	Trig high / low
2	Digital Input 5	Trig high / low
3	Digital Input 3	Trig high / low
4	Digital Input 11	Trig high / low
5	Digital Input 9	Trig high / low
6	Digital Input 6	Trig high / low
7	Digital Input 2	Trig high / low
8	Digital Input 1	Trig high / low
9	Reserved	
10	Digital Input 13	Trig high / low
11	Digital Input 12	Trig high / low
12	Digital Input 8	Trig high / low
13	Digital Input 4	Trig high / low
14	Reserved	
15	CAN 2L	
16	CAN 2H	
17	Reserved	
18	Reserved	
19	Digital Input 14	Trig high / low
20	Digital Input 10	Trig high / low
21	Reserved	
22	Reserved	
23	CAN 1L	
24	CAN 1H	
25	Reserved	
26	Reserved	
27	Reserved -	

28	Reserved	
29	Reserved	
30	Reserved	
31	Analogue Input 16; 12 bit	Pull-up 0 / 3.16 k / 47 k
32	Sensor Supply VREF2	5.0 V
33	Analogue ground	
34	Analogue ground	
35	Analogue ground	
36	Analogue ground	
37	Analogue Input 12; 12 bit	Pull-up 0 / 3.16 k / 47 k
38	Analogue Input 14; 12 bit	Pull-up 0 / 3.16 k / 47 k
39	Analogue Input 15; 12 bit	Pull-up 0 / 3.16 k / 47 k
40	Sensor Supply VREF2	5.0 V
41	Analogue ground	
42	Warning Light at 5V, max. 0.5 A	5.0 V
43	Analogue Input 4; 12 bit	Pull-up 0 / 3.16 k / 47 k
44	Analogue Input 8; 12 bit	Pull-up 0 / 3.16 k / 47 k
45	Analogue Input 10; 12 bit	Pull-up 0 / 3.16 k / 47 k
46	Analogue Input 13; 12 bit	Pull-up 0 / 3.16 k / 47 k
47	Sensor Supply VREF3	5.0 V
48	Analogue Input 1; 12 bit	Pull-up 0 / 3.16 k / 47 k
49	Analogue Input 2; 12 bit	Pull-up 0 / 3.16 k / 47 k
50	Analogue Input 6; 12 bit	Pull-up 0 / 3.16 k / 47 k
51	Analogue Input 9; 12 bit	Pull-up 0 / 3.16 k / 47 k
52	Analogue Input 11; 12 bit	Pull-up 0 / 3.16 k / 47 k
53	Analogue Input 3; 12 bit	Pull-up 0 / 3.16 k / 47 k
54	Analogue Input 5; 12 bit	Pull-up 0 / 3.16 k / 47 k
55	Analogue Input 7; 12 bit	Pull-up 0 / 3.16 k / 47 k

Communication

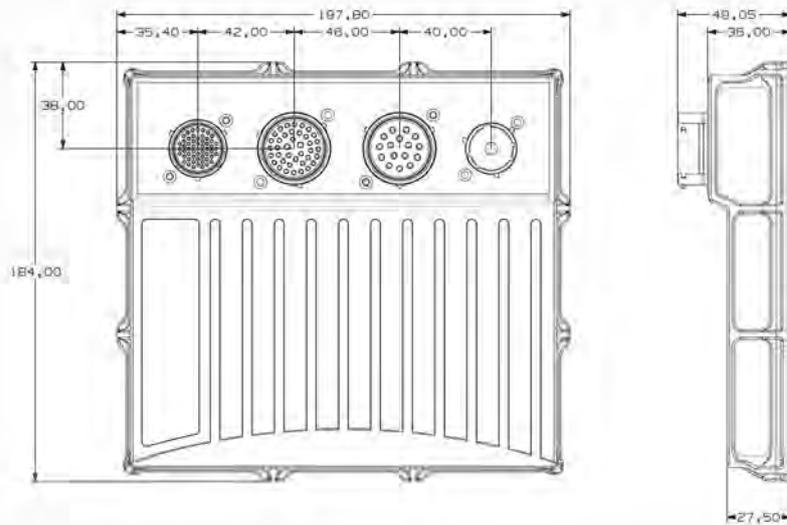
2 CAN lines (64 input channels)

Ordering Information

PowerBox PBX 180

Order number **F 02U V01 555-01**

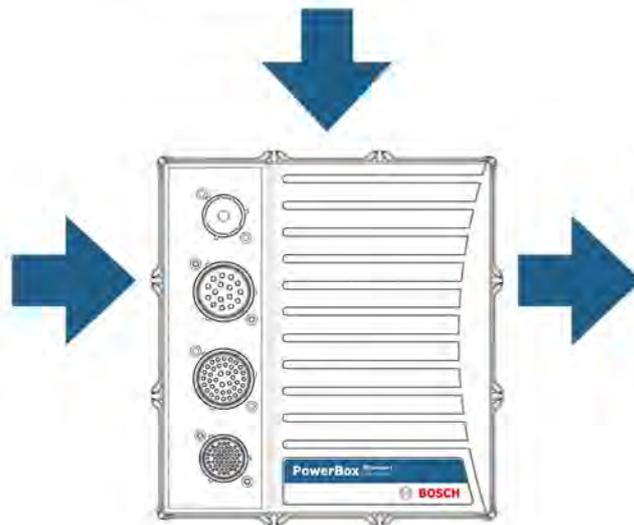
Dimensions

**Software**

- Programmable inputs
- Programmable outputs
- Manual output activation
- Diagnostic logs

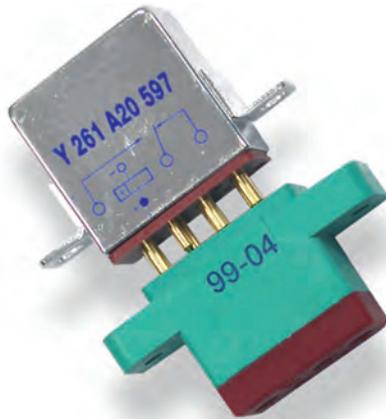
Inputs

- 14 Digital
- 16 Analog
- 64 CAN IDs
- 512 Multi input logic functions (analog, CAN and other virtual inputs)

**Outputs**

- 16 High Power
- 32 Low Power
- 4 Tri-State Digital
- 1 Warning Light
- 6 PWMs
- 3 Sensor VREFs
- 4 Sensor Grounds
- CAN Export of all channel current consumption

Relay 25 A



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

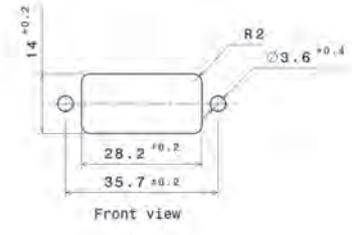
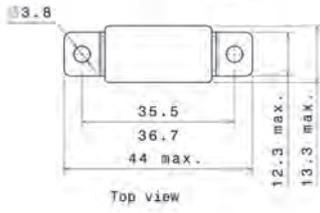
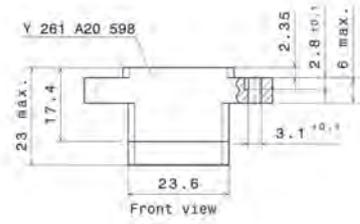
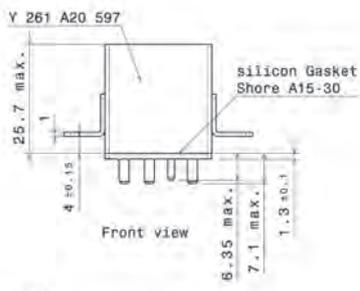
Power Supply	12 to 14.5 V
Min. switches	50,000
Coil resistance at 25°C	80 Ω
Max. current	25 A

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
250	0.2
350	0.1

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

Connectors and Wires

Please specify the required cable length with your order.

Ordering Information

For MAP function

Straight, ASL 6-06-05PN-HE

Order number **B 261 209 644-01**

6 steps for display switch-over

Straight, ASL 6-06-05PN-HE

Order number **B 261 209 659-01**

12 steps angled 90°

Angled 90°, KPTA 6E6-4P-C-DN

Order number **B 261 209 658-01**

12 steps straight

Straight, ASL 6-06-05PN-HE

Order number **B 261 209 643-01**

Wiper Direct Actuator WDA



Features

► Analog and LIN 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 simply by switching its analog inputs to ground [Version Analog] or via LIN [Version LIN]. 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 Analog

Operating modes:

Stop
Interval
Speed 1
Speed 2

WDA LIN

Operating modes:

Stop
Interval
Speed 1
Speed 2
Single stroke
Service position

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. wipe cycles/min	Depending on wipe angle
Max. wipe 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

LIN Protocol

LIN Version	2.0					
LIN Speed	19,2 kBaud/s					
Message ID	0x31					
Interframe-Space	20 to 40 ms					
BYTE 0 Value	0	0	1	1	Counter	
Bit	7	6	5	4	3	2 1 0

BYTE 1 Value	SPD1	SPD2	INT	0	1	1	0	1
Bit	7	6	5	4	3	2	1	0

BYTE 2 Value	0	0	0	0	0	0	0	0
Bit	7	6	5	4	3	2	1	0

BYTE 3 Value	0	0	0	0	0	0	0	0
Bit	7	6	5	4	3	2	1	0

BYTE 4 Value	0	0	0	0	0	0	0	0
Bit	7	6	5	4	3	2	1	0

BYTE 5 Value	0	0	0	0	0	0	0	0
Bit	7	6	5	4	3	2	1	0

Counter The counter has to be increased with each LIN-message (0 ... 15 dez).

INT Operating Mode Interval. ON=1, OFF=0

SPD1 Operating Mode Speed 1. ON=1, OFF=0

SPD2 Operating Mode Speed 2. ON=1, OFF=0

Connectors and Wires

Connector	CEP2M-AMP-4
Mating connector	F 02U B00 542-01
Various motorsport and automotive connectors available on request	

Pinout Analog

Pin 1	AN2
Pin 2	AN1
Pin 3	Gnd
Pin 4	U _s

Pinout LIN

Pin 1	LIN
Pin 2	Special functions, e.g. Master/Slave
Pin 3	Gnd
Pin 4	U _s

Installation Notes

The WDA Analog can be operated by switching the analog inputs between ground and voltage supply.

The WDA LIN can be operated by all ECUs with LIN 2.X Master function. Further information about the LIN-Frame available upon request.

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 Analog**

Order number **F 02U V00 938-03**

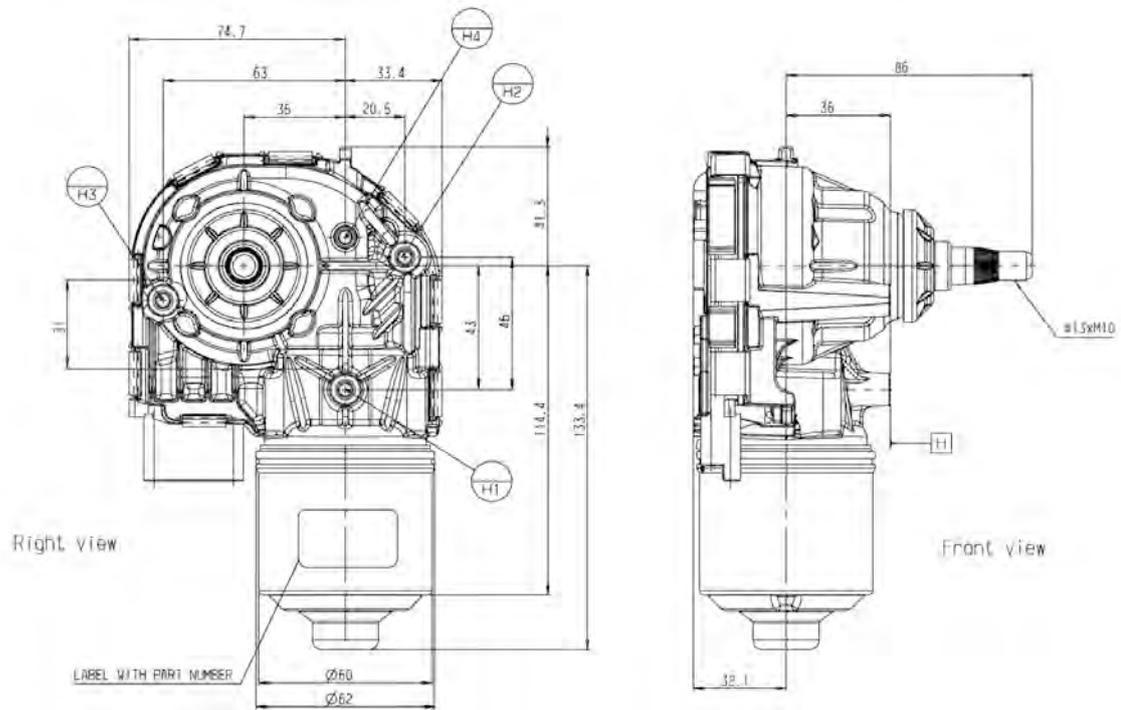
WDA LIN

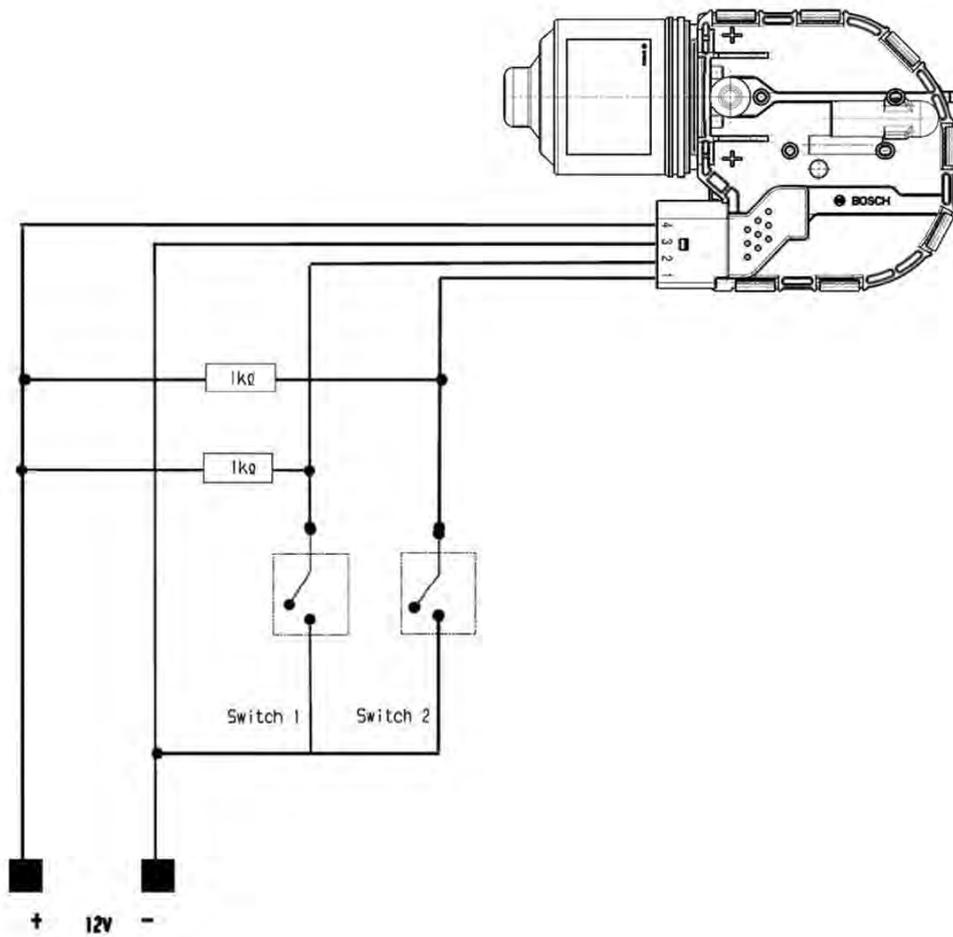
Order number **F 02U V00 838-03**

Accessories**Silentblock**

Order number **F 02U 003 027-01**

Dimensions





Operating modes referring analog inputs configuration

Operating Mode	AN1 (Pin 2)	AN2 (Pin 1)
Stop	Power Supply	Power Supply
Interval	Power Supply	GND
Speed 1	GND	GND
Speed 2	GND	Power Supply

Operating modes referring switch configuration

Operating Mode	Switch 1	Switch 2
Stop	opened	opened
Interval	opened	closed
Speed 1	closed	closed
Speed 2	closed	opened

Operating Modes

Wiring Harnesses



We offer special wiring harnesses for motorsport applications. Our portfolio contains 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**

10 Appendix

10

General Information 452

Vibration Profiles 453

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).

Service

To ensure full functionality every time, Bosch Motorsport recommends annual functional testing of all equipment.

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 compatibility.

Vibration Profile 1

Broadband noise: 8h/direction

Frequency (Hz)	Acceleration density (m/s ²) ² /Hz
20	50.4
55	26.0
180	1.0
300	1.0
360	0.56
1,000	0.6
2,000	0.6
Effective value a_{Eff}	55.4 m/s ²

Sinus: 8h/direction

Frequency (Hz)	Acceleration peak (m/s ²)
100	50
180	200
250	200
350	60
2,000	60

Vibration Profile 2

Broadband noise: 8h/direction

Frequency (Hz)	Acceleration density (m/s ²) ² /Hz
10	10
50	10
66.7	1
100	1
1,000	0.1
Effective value a_{Eff}	26.9 m/s ²

Vibration Profile 3

Broadband noise

Frequency (Hz)	Acceleration density (m/s ²) ² /Hz
10	14.0
50	7.0
60	3.5
300	0.51
500	45.6
1,500	15.26
Effective value a_{Eff}	168 m/s ²

Sinus

Alteration rate of frequency: 1 oct./min

Frequency (Hz)	Amplitude of acceleration (m/s ²)	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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 Rotary Potentiometer RP 86284

S

Single Fire Coil C90i-E10146
 Single Fire Coil C90i-E8143
 Single Fire Coil C90i-pro140
 Single Fire Coil P3587
 Single Fire Coil P35-E1096
 Single Fire Coil P35-E893
 Single Fire Coil P35-T90
 Single Fire Coil P35-TE10101
 Single Fire Coil P35-TE898
 Single Fire Coil P50/P50-M104
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 Single Fire Coil P65-E10116
 Single Fire Coil P65-E8113
 Single Fire Coil P65-T110
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Y

Yaw Rate Sensor YRS 3361



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