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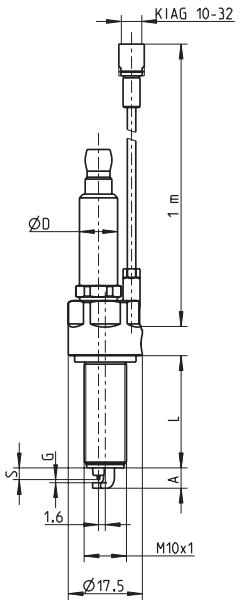
Measuring Spark Plug M10x1

Type 6113B...

with Integral 3 mm Cylinder Pressure Sensor and Replaceable Cable

Measuring spark plug Type 6113B... allows cylinder pressure measurement without the effort of providing a separate measuring bore. It incorporates the world's smallest piezoelectric high-temperature cylinder pressure sensor.
This sensor is mounted flush with the wall of the combustion chamber to keep its natural frequency at about 65 kHz. It is therefore also suitable for readings at high engine speeds and for knock control.

- Replaceable sensor cable and ceramic insulator
- Measurement without combustion analysis bore
- Highest natural frequency for high speeds
- Front of sensor flush with wall of combustion chamber for good accuracy
- Suitable for knock control
- Different heat values and spark positions possible



Description

Space to incorporate the sensor has been created by positioning the ceramic insulator slightly (1,6 mm) eccentrically. The sensor can be replaced if repair is necessary.
It is inserted from the underside of the plug and secured with a perforated screw, which also provides flame protection.
The 1 m long Viton® cable of the sensor uses a screw connection for easy user replacement.
Measuring spark plug Type 6113B... is also available with PiezoSmart. PiezoSmart® is an active system for automatic identification of individual pressure sensors. It allows automated configuration of measuring chains ("plug and measure") (see PiezoSmart brochure, Doc. No. 100-421 for more information).
The ceramic insulator is mounted in position for ease of replacement in the event of damage. If the insulator breaks, it can be replaced.

Technical Data

Pressure range	bar	0 ... 200
Calibrated partial range at 200 °C	bar	0 ... 50 0 ... 100 0 ... 150
Overload capacity	bar	250
Sensitivity at 200 °C	pC/bar	–10
Natural frequency (acoustic) spark plug with integral sensor	kHz	≈65
Linearity at RT	% FSO	≤±0,5
Acceleration sensitivity axial and radial	bar/g	<0,005
Operating temperature range, sensor	°C	–20 ... 350
Operating temperature range, cable	°C	–20 ... 200
Sensitivity drift over range: 200±50 °C	%	<±1
Thermal shock at 1 500 min $^{-1}$, 9 bar p_{mi}		
Δp (short-term drift)	bar	<±0,6
Δp_{mi}	%	<±3
Δp_{max}	%	<±1,5
Insulation resistance, sensor at 20 °C	Ω	>10^{13}
at 200 °C	Ω	>10^{11}

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Technical Data (cont.)

Insulation resistance of plug at room temperature between central electrode and plug body at 1 000 V	MΩ	>100
Final electronic test of plug spark discharge at		7 bar/20 kV
Dielectric strength	kV	<30
Torque wrench setting for plug	N·m	see table
Capacitance of sensor with 1 m cable	pF	110
Weight	g	50

Application

Cylinder pressure measurement with a spark plug is used where a separate measuring bore needs be avoided to minimize the cost of the sensor system. Flush mounting of the front of the sensor gives a high-quality signal free from pipe oscillation interference. A typical example is ECU engine mapping in standard or racing engines.

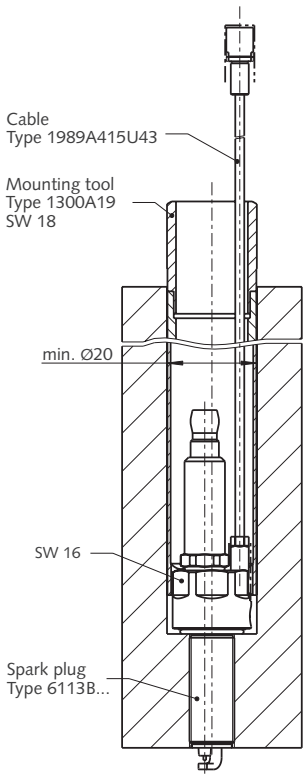

Fig. 1: Mounting measuring spark plug

Mounting

The measuring spark plug is screwed into the spark plug bore with a mounting wrench Type 1300A19.
A bore 20 mm in diameter is necessary.
The diameter of the ceramic insulator can be matched up by drawing an insulating sheath onto it. The reduction of the air gap between ceramic insulator and spark plug connector allows the voltage to be supplied without interference for perfect ignition. To reduce electrical interference, the cable from the sensor to the charge amplifier should be kept as short as possible.
Note: Use grease Type 1067 to make it easier to draw the insulating sheath on and connect the plug connector. This ensures good insulation and makes subsequent removal more straightforward.

Heat value

The heat value is a measure of the thermal loading capacity of the spark plug.
Kistler measuring spark plugs are classified on the BERU/ BOSCH scale:

10	9	8	7	6	5	4	3	09	08	07
Hot					**Medium**					**Cold**

Since each manufacturer uses its own numbering system, cross comparison is only possible using a commercial reference book. See Kistler's combustion analysis brochure Doc. No. 100-460 for an overview.

Wherever possible, the original heat value should be used. A plug can always be replaced with a colder, but never with a hotter plug. For example, a plug with a heat value of 6 can be replaced with one with a heat value of 5, but not the other way round.

Torque in N·m

Thread	**Cylinder head**	
	Cast iron	Light alloy
Flat seal		
M10x1	**10 ... 15**	**10 ... 12**

Table 1: Mounting torque

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Available Versions of the M10x1 Measuring Spark Plug Type 6113B...

Type		BFD12Q01	BFD12Q02	BFD33Q01	BFD33Q02	BFD35Q02	BFD35Q03	BFD35Q04
Thread length L	mm	19	19	26,5	26,5	26,5	26	19
Sealing		flat	flat	flat	flat	flat	flat	flat
Heat value		2	2	3	3	5	5	5
Spark position S	mm	0,5	0,5	2,8	1	2,8	4,8	2,8
Max. depth A	mm	2,5	2,5	4,8	3	4,8	6,8	4,8
Plug gap G	mm	0,7	0,7	0,7	0,7	0,7	0,7	0,7
Dia. of ceramic insulator D	mm	10[1] (7,7)	9	9	9	9	9	10,5[2] (7,7)
Wrench size		16	16	16	16	16	16	16

Type		BFD43Q01
Thread length L	mm	22
Sealing		flat
Heat value		4
Spark position S	mm	3,5
Max. depth A	mm	3,5
Plug gap G	mm	0,7
Dia. of ceramic insulator D	mm	10,5[3] (7,7)
Wrench size		16

Table 2: Available versions

[1] Insulating sheath Ø10,5 l = 14 mm 3.221.523
[2] Insulating sheath Ø10,5 L = 20 mm 3.221.518
[3] Insulating sheath Ø10,5 L = 22 mm 3.221.513

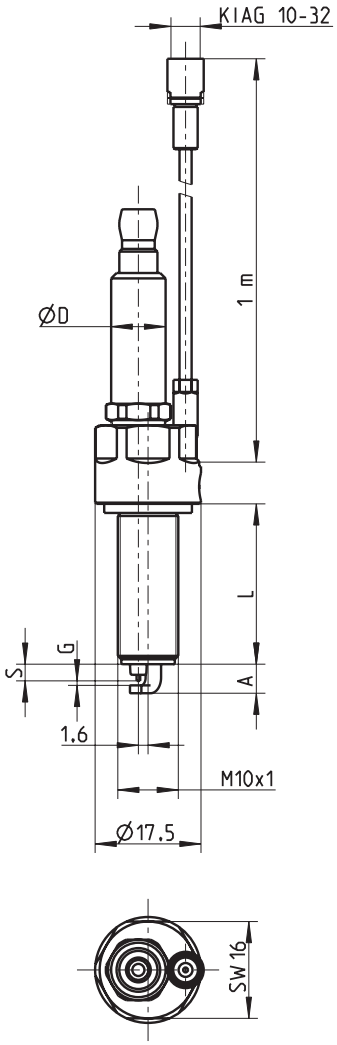

Fig. 2: Available types

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Fig. 3: Torque wrench Type 1300A11 with fork insert Type 1300A15

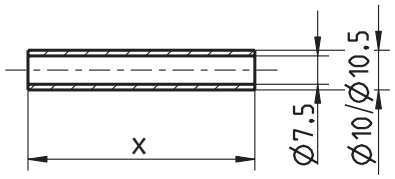

Fig. 4: Insulating sheath, see spare parts for lengths

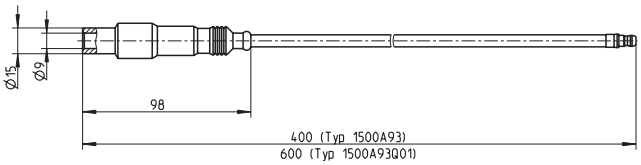

Fig. 5: Spark plug extension cable Types 1500A93 (L = 400 mm) and 1500A93Q01 (L = 600 mm)

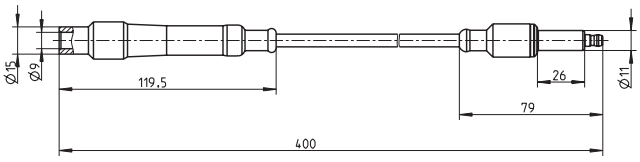

Fig. 6: Spark plug extension cable Type 1500A97 (L = 400 mm)

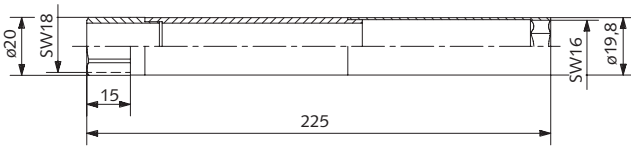

Fig. 7: Wrench for mounting plug Type 1300A19

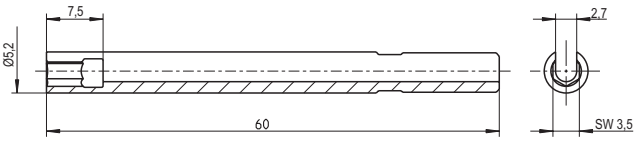

Fig. 8: Wrench for connecting cable Type 1300A125

Included Accessories	**Type/Art. No.**
• Coupling, 10-32 neg. – BNC pos (for non PiezoSmart® version)	1721
• Grease for connecting high-insulation extension connector, 5 ml	1067

Optional Accessories		**Type/Art. No.**
• Adapter, Triax – BNC pos		1704A4
• PiezoSmart® extension cable		1987B...
• Wrench for mounting plug (16 mm)		1300A19
• Wrench for connecting cable		1300A125
• Torque wrench for plug		1300A11
• Fork insert, 18 mm, for torque wrench Type 1300A11		1300A15
• Grease for connecting high-insulation extension connector, 5 ml		1067
• High-insulation extension connector		1700B15
• Extension cable for measuring spark plug Type 6113B...	L = 400 mm	1500A93
	L = 600 mm	1500A93Q01
	L = 400 mm	1500A97
• Adapter for pressure generator Typ 6904 Flat seal		6583AF

Spare Parts			**Type/Art. No.**
• Viton® cable M3 – 10-32 pos.			1989A415U43
• Spare PiezoSmart® cable with data			1985A8S411U43
• Coupling, 10-32 neg. – BNC pos.			1721
• Copper seal M10x1			1100A23
• Insulating sheath	Ø10	l = 14 mm	3.221.523
	Ø10,5	l = 20 mm	3.221.518
	Ø10,5	l = 22 mm	3.221.513

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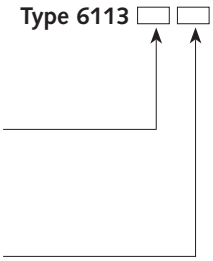
Ordering Key



Type from picture 2, available versions, page 3	

Without PiezoSmart	**A41**
With PiezoSmart [2)]	**S41**

2) Detailed information about PiezoSmart® sensor identification may be found in the PiezoSmart brochure, Doc. No. 100-421.

Ordering Example

M10x1x26,5 measuring spark plug with heat value of 3, see table for details of spark position	6113BFD33Q0141
M10x1x26,5 measuring spark plug with heat value of 3 and PiezoSmart® sensor identification, see table for details of spark position	6113BFD33Q01S41

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Questions Involved in Choosing a Measuring Spark Plug

Vehicle: _____ Make and model: _____

Type of engine: _____ Type of measuring spark plug: _____

Original spark plug

Manufacturer: _____ Type: _____

Thread M: M ____ x ____ , ____ mm

Thread length L: ____ , ____ mm

Sealing: ☐ flat ☐ conical

Heat value: _____ Original ____BOSCH/BERU

Spark position S: ____ , ____ mm

Max. depth A: ____ , ____ mm

Plug gap G: ____ , ____ mm

Diameter of ceramic insulator D: ____ , ____ mm

Insulator length K: ____ , ____ mm

Miscellaneous: _____

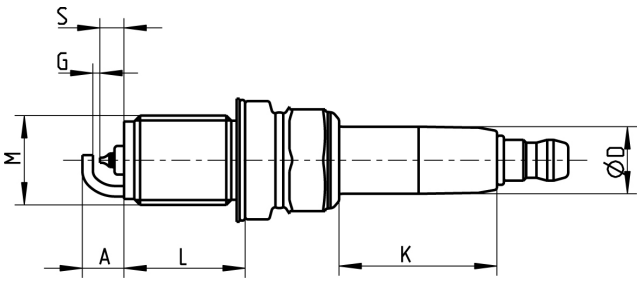

Fig. 9: Dimensions of spark plug Type 6113B...

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