

M14x1,25 Measuring Spark Plug

with Integral 3 mm Cylinder Pressure Sensor

Type 6118A...

Measuring spark plug Type 6118A... allows cylinder pressure measurements to be performed without the effort of providing a separate measuring bore. It incorporates the world's smallest piezoelectric high-temperature cylinder pressure sensor.

The sensor is mounted flush with the wall of the combustion chamber to keep its natural frequency well above 100 kHz. As a result it is also suitable for readings at high engine speeds and for knock control.

- Measurement without indicating bore
- Highest natural frequency for high speeds
- Sensor front flush for good accuracy
- Suitable for knock control
- Replaceable ceramic insulator

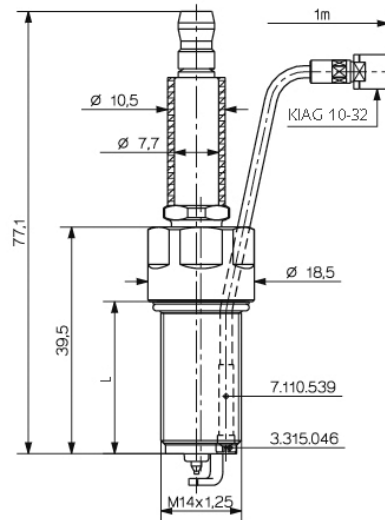
Description

The space for incorporating the sensor has been created by positioning the electrode eccentrically with a minimum gap of 0,8 mm. As a result of miniaturization, the sensor and cable form a single unit, which can only be dismantled by disconnecting the cable connector at the factory! Dismantling by the customer is not possible. The sensor is inserted from the underside of the plug and secured with a perforated screw, which also provides flame protection.

The ceramic insulator is screwed in position for ease of replacement in the event of damage. Measuring spark plug Type 6118A... is also available with PiezoSmart®. This is an active system for automatic identification of individual pressure sensors and is used for automated setting of parameters of the measuring chain (see description of PiezoSmart system, doc. no. 100-421, for more information).

Technical Data

Pressure range	bar	0 ... 200
Calibrated partial range (at 200 °C)	bar	0 ... 50
		0 ... 100
		0 ... 150
Overload	bar	250
Sensitivity at 200 °C	pC/bar	≈-9,5
Natural frequency		
	spark plug with integral sensor	kHz
Linearity at RT	%FSO	≤±0,5



Acceleration sensitivity		
axial and radial	bar/g	<0,005
Operating temperature range, sensor	°C	-20 ... 250
Operating temperature range, cable	°C	-20 ... 200
Sensitivity change 200 ±50 °C	%	<±1
Thermal shock		
at 1 500 1/min, 9 bar Δp _{mi}		
Δp (short-term drift)	bar	<±0,8
Δp _{mi}	%	<±4
Δp _{max}	%	<±2
Insulation resistance, sensor		
at 20 °C	Ω	>10 ¹³
at 200 °C	Ω	>10 ¹¹
Insulation Resistance of Plug at		
room temperature		
between central electrode and plug body at 1 000 V	Ω	>100
Final electronic test of plug		
spark discharge at		7 bar/20 kV
Dielectric strength	kV	<35
Torque wrench setting for plug	N·m	from table on page 3
Capacitance of sensor		
with 1 m cable	pF	110
Weight g		50

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Application

Cylinder pressure measurement with a spark plug is used where a separate measuring bore needs be avoided in order to minimize the cost of the sensor system.

A typical example is adjustment of the knock limit of the electronic controllers in standard and racing engines. Type 6118A... with flush-front sensor mounting avoids any pipe oscillation in the gas passage.

Mounting

The measuring spark plug is screwed into the spark plug bore (which has to be 21 mm in diameter) with a mounting wrench Type 1300A4. To avoid electrical interference, the cable should be connected to the charge amplifier as directly as possible (i.e. without an extension cable) using adapter Type 1721.

The insulating sheath art. no. 3.221.384 allows insulation diameter to be matched up with the standard 10,5 mm diameter of the ceramic insulator and connected with the standard spark plug connector or an ignition rail.

If the ceramic insulator of the plug breaks, it can be replaced with the repair kit Type 6998A... This kit contains a ceramic insulator, two seal rings and one nut (Fig. 1). The ordering key for the repair kit has the same ending as the particular plug for which it is used. Thus, for example, repair kit Type 6998AFD36 belongs to spark plug Type 6118AFD36.

Heat Value

The heat value is a measure of the thermal loading capacity of the spark plug.

Kistler measuring spark plugs are classified according to 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, it is only possible to cross-compare using a commercial reference book. You will find a summary in Kistler's Combustion Pressure Measurements for Research and Development, doc. no. 100-460.

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 around.

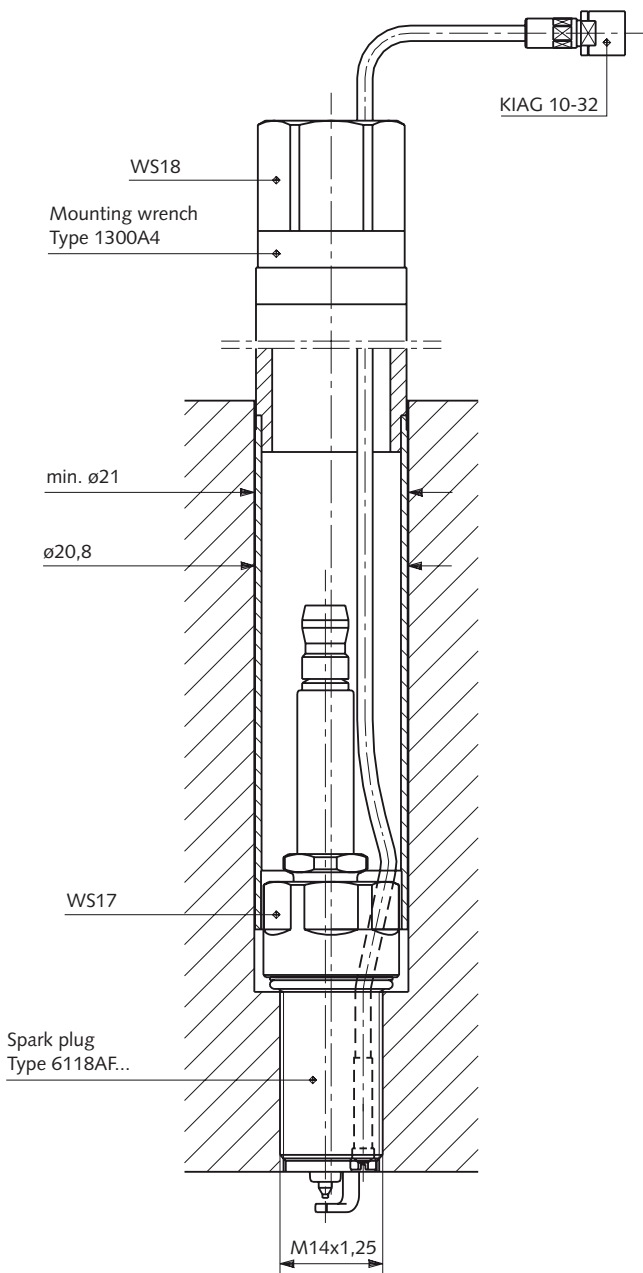


Fig. 1: Mounting measuring spark plug

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Torque in N·m (Do Not Use any Lubricants)

Thread	Cylinder Head Material	
	Cast iron	Light alloy

Flat seal		
M12x1,25	15 ... 25	12 ... 20
M14x1,25	20 ... 35	15 ... 30

Conical seal		
M14x1,25	15 ... 25	12 ... 20

Mounting without torque wrench:

- Spark plug with flat seal (new): do not tighten more than 90°
- Spark plug with conical seal: tighten about 15°

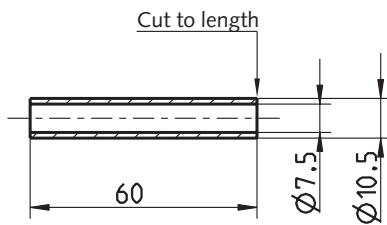


Fig. 2: Insulating sheath art. no 3.221.384



Fig. 3: Torque wrench open ring insert Types 1300A15

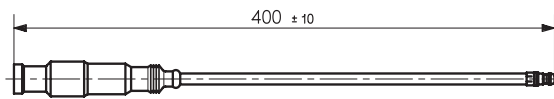


Fig. 4: Spark plug extension cable Types 1500A93 and 1500A93Q01

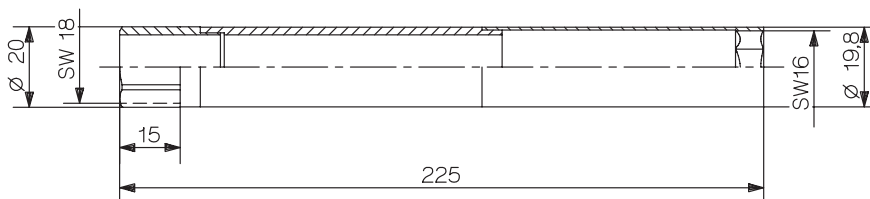


Fig. 5: Mounting key Type 1300A4

Type	ACD35	
Thread length L	mm	25
Seal	conical	
Heat value	5	
Spark position A	mm	6
Plug gap G	mm	0,8

Type	AF109	AF109Q01
Thread length L	mm	19
Seal	flat	flat
Heat value	09	09
Spark position A	mm	0,3
Plug gap G	mm	1,5

Type	AFD13	AFD14Q01	AFD16Q01
Thread length L	mm	19	19
Seal	flat	flat	flat
Heat value	3	5	6
Spark position A	mm	4,3	5,4
Plug gap G	mm	0,8	1,1

Type	AFD34	AFD34Q01	AFD35
Thread length L	mm	26,5	19
Seal	flat	flat	flat
Heat value	4	4	5
Spark position A	mm	5,5	5,5
Plug gap G	mm	0,8	0,8

Type	AFD44	
Thread length L	mm	22
Seal	flat	
Heat value	4	
Spark position A	mm	5,5
Plug gap G	mm	0,8

Type	AFG34	AFG34Q01
Thread length L	mm	26,5
Seal	flat	
Heat value	4	
Spark position A	mm	4,5
Plug gap G	mm	1,6

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Included Accessories

- Insulating sheath l = 60 mm
- Grease for fitting high-insulation extension connector 5 ml

Art. No./Type
3.221.384

1067

Optional Accessories

- Mounting key for plug (17 A/F)
- Torque wrench for plug
- Open ring insert (18 A/F) for torque wrench Type 1300A11
- Extension cable for measuring spark plug Type 6118A... , length = 400 mm
- Adapter for pressure generator Type 6904
- Repair kit* for measuring spark plug Type 6118A...

Type
1300A4
1300A11
1300A15
1500A93
6593
6998A...

* The end of the ordering key for the repair kit is the same as that of the particular measuring spark plug for which it is intended

Spare Parts

- Insulating sheath l = 60 mm
- Coupling 10-32 neg. – BNC pos.

Art. No./Type
3.221.384
1721

Detailed information about PiezoSmart® sensor identification may be found in the PiezoSmart brochure, doc. no. 100-421.

Ordering Key

Type 6118A

Seal

Flat	F
Conical	C

Electrode

Front	D
Surface gap	G

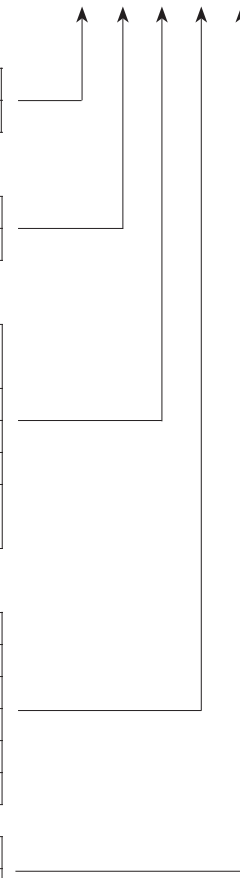
Thread Length

Flat seal	
L = 19 mm	1
L = 12,7 mm	2
L = 26,5 mm	3
L = 22 mm	4
Conical seal	
L = 26 mm	5

Heat Value

Cold	09
...	3
Medium	4
...	5
...	6
Hot	7

Without PiezoSmart	-
With PiezoSmart	S



Ordering Example

M14x1,25x19 measuring spark plug with heat value of 3, see table for details of spark position
 M14x1,25x26,5 measuring spark plug with heat value of 4 and PiezoSmart sensor identification, see table for details of spark position

Type
6118AFD13
6118AFD34S

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Questions Involved in Choosing a Measuring Spark Plug

Vehicle: _____ Make and mode: _____

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

Original Spark Plug

Manufacturer: _____ Type: _____

Thread: M ____ x ____, ____ mm

Thread length L: ____, ____ mm

Heat value: _____ Original _____ BOSCH/BERU

Spark position A: ____, ____ mm

Plug gap G: ____, ____ mm

Miscellaneous: _____

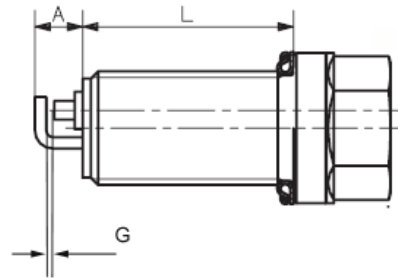


Fig. 6: Spark plug dimensions Type 6118A...

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