# Measuring Spark Plug M14×1，25 

Type 6118B．．．

## with Integral 3 mm Cylinder Pressure Sensor and Replaceable Cable

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Measuring spark plug Type 6118B．．．allows cylinder pressu－ re measurement without the effort of providing a separate measuring bore．It incorporates the world＇s smallest piezo－ electric 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 positio－ ning the ceramic insulator slightly（ $0,6 \mathrm{~mm}$ ）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 ${ }^{\circledR}$ cable of the sensor uses a screw connec－ tion for easy user replacement．
Measuring spark plug Type 6118B．．．is also available with PiezoSmart ${ }^{\oplus}$ ．PiezoSmart ${ }^{\oplus}$ 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 re－ placement in the event of damage．If the insulator breaks，it can be replaced with repair kit Type 6998B．．．．This contains a ceramic insulator，two seals and a screw．The ordering key for the repair kit matching the measuring spark plug has the same ending as the plug．For example，Type 6998BFD16 is the repair kit matching spark plug Type 6118BFD16．

## Technical Data

| Pressure range | bar | $0 \ldots 200$ |
| :--- | :--- | ---: |
| Calibrated partial range at $200^{\circ} \mathrm{C}$ | bar | $0 \ldots 50$ |
|  |  | $0 \ldots 100$ |
|  |  | $0 \ldots 150$ |
| Overload capacity | bar | 250 |



| Sensitivity at $200{ }^{\circ} \mathrm{C}$ | pC／bar | $\approx-10$ |
| :---: | :---: | :---: |
| Natural frequency（acoustic） spark plug with integral sensor | kHz | $\approx 65$ |
| Linearity at RT | \％FSO | $\leq \pm 0,5$ |
| Acceleration sensitivity axial and radial | bar／g | ＜0，005 |
| Operating temperature range，sensor | ${ }^{\circ} \mathrm{C}$ | －20 ．．． 350 |
| Operating temperature range，cable | ${ }^{\circ} \mathrm{C}$ | －20 ．．． 200 |
| Sensitivity drift over range： $200 \pm 50^{\circ} \mathrm{C}$ | \％ | ＜$\pm 1$ |
| Thermal shock at $1500 \mathrm{~min}^{-1}, 9$ bar pmi $\Delta \mathrm{p}$（short－term drift） | bar | $< \pm 0,6$ |
| $\Delta \mathrm{p}_{\mathrm{mi}}$ | \％ | ＜$\pm 3$ |
| $\Delta p_{\text {max }}$ | \％ | $< \pm 1,5$ |
| Insulation resistance，sensor at $20^{\circ} \mathrm{C}$ | $\Omega$ | $>10^{13}$ |
| at $200{ }^{\circ} \mathrm{C}$ | $\Omega$ | $>10^{11}$ |
| Insulation resistance of plug at room temperature <br> between central electrode and plug body at 1000 V | $M \Omega$ | ＞100 |
| Final electronic test of plug spark discharge at |  | $7 \mathrm{bar} / 20 \mathrm{kV}$ |

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measure．analyze．innovate．

## Technical Data（cont．）

| Dielectric strength | kV | $<35$ |
| :--- | :--- | ---: |
| Torque wrench setting for plug | $\mathrm{N} \cdot \mathrm{m}$ | From table <br> on page 2 |
| Capacitance of sensor <br> 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 inter－ ference．A typical example is ECU engine mapping in standard or racing engines．

## Mounting

The measuring spark plug is screwed into the spark plug bore with a mounting wrench Type 1300A4．
A bore 21 mm in diameter is necessary．
The diameter of the ceramic insulator is matched up by draw－ ing 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 igniti－ on．To reduce electrical interference，the cable from the sensor to the charge amplifier should be kept as short as possible．
The insulating sheath 3．221．5．．．allows matching to the stan－ dard diameter of the ceramic insulator of $10,5 \mathrm{~mm}$ and moun－ ting with the standard spark plug connector，or with an ignition rail．
Note：Use grease Type 1067 to connect the standard spark plug connector or mount the ignition rail．This ensures good insulation and makes 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：

| NEW 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 09 | 08 |  | 07 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hot |  |  |  |  | diu |  |  |  |  | old |  |

Since each manufacturer uses its own numbering system， cross comparison is only possible using a commercial reference book．See Kistler＇s engine 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 $\mathrm{N} \cdot \mathrm{m}$

| Thread | Cylinder head material |  |
| :---: | :---: | :---: |
|  | Cast iron | Light alloy |
| Flat seal |  |  |
| M14×1，25 | $20 . .35$ | 15．．． 30 |
| Conical seal |  |  |
| M14×1，25 | $15 . .25$ | $12 . . .20$ |

Table 1：Mounting torque

Fig．1：Mounting measuring spark plug

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Available Versions of the M14×1，25 Measuring Spark Plug Type 6118B．．．

| Type |  | BCD25 |  | BCD27 | BCD27Q01 |  | BF107Q01 | BFD16 | BFD16Q01 | BFD18 | BFD18Q01 | BFD35 | BFD35Q03 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Thread length L | mm | 25 |  | 25 | 17，5 |  | 21，5 | 19 | 19 | 19 | 9，5 | 26，5 | 19 |
| Seal |  | conical |  | conical | conical |  | flat | flat | flat | flat | flat | flat | flat |
| Heat value |  | 5 |  | 7 | 7 |  | 07 | 6 | 6 | 8 | 8 | 5 | 5 |
| Spark position S | mm | 4，2 |  | 4，2 | 4，2 |  | 0，3 | 3，55 | 5，3 | 2，8 | 2，8 | 3，9 | 3，9 |
| Max．depth A | mm | 6，3 |  | 6，3 | 6，3 |  | 0，3 | 5，65 | 7，7 | 4，8 | 4，8 | 6 | 6 |
| Plug gap G | mm | 0，8 |  | 0，8 | 0，8 |  | 1，2 | 0，8 | 1，1 | 0，7 | 0，7 | 0，8 | 0，8 |
| Dia．of ceramic insulator D | mm | $10,5^{4)}(7,7)$ |  | 10，5 ${ }^{2)}(7,7)$ | 10，5 ${ }^{2)}(7,7)$ |  | $10,5^{1)}(7,7)$ | $10,5^{5)}(7,7)$ | $10,5^{5)}(7,7)$ | $10,5^{2)}(7,7)$ | $10,5^{2)}(7,7)$ | $10,5^{4)}(7,7)$ | $10,5^{4)}(7,7)$ |
| Wrench size SW | 17 | 17 |  | 17 | 17 |  | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| ${ }^{1)}$ With insulating sheath |  |  | h Ø10，5 | $\mathrm{L}=14 \mathrm{~mm}$ |  | 3.221 .512 |  |  |  |  |  |  |  |
| ${ }^{\text {2）}}$ With insulating sheath |  | th Ø10，5 |  | $5 \mathrm{~L}=16 \mathrm{~mm}$ |  | 3.221 .522 |  |  | 7－$-\cdots$ | $1 \text { mex }$ | $\cdots-\cdots$ | $\cdots$ | $\cdots$ |
| ${ }^{3)}$ With insulating sheath <br> ${ }^{4)}$ With insulating sheath |  |  |  | ， $\mathrm{L}=20 \mathrm{~mm}$ |  | 3.221 .518 |  | $\stackrel{N}{\otimes}$ |  |  |  |  |  |
|  |  |  | th Ø10，5 | ， $\mathrm{L}=22 \mathrm{~mm}$ |  | 3.221 .513 |  |  | 98 |  |  |  |  |
| ${ }^{5}$ ）With insulating sheath |  |  | h $\varnothing 10,5$ | $5 \mathrm{~L}=24 \mathrm{~mm}$ |  | 3.221 .509 |  |  |  | 400 600 | （Typ 1500A93） Typ 1500A93001） |  |  |



Fig．2：Available types


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

Fig．4：$\quad$ Spark plug extension cable Types 1500A93（ $\mathrm{L}=400 \mathrm{~mm}$ ）and 1500A93Q01（ $\mathrm{L}=600 \mathrm{~mm}$ ）


Fig．5：$\quad$ Spark plug extension cable Type 1500A97（ $\mathrm{L}=400 \mathrm{~mm}$ ）


Fig．6：Insulating sheath，see spare parts for lengths


Fig．7：Mounting wrench Type 1300A4．．．（see accessories）


Fig．8：$\quad$ Wrench for connecting cable Type 1300A125

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## Included Accessories

－Coupling，10－32 neg．－BNC pos． （for non PiezoSmart ${ }^{\circledR}$ version）
－Grease for connecting high－insulation extension connector， 5 ml

## Optional Accessories

－Adapter Triax－BNC pos．
－PiezoSmart ${ }^{\circledR}$ extension cable
－Wrench for mounting plug（ 17 mm ） $\mathrm{L}=300 \mathrm{~mm}$ $\mathrm{L}=100 \mathrm{~mm}$ $\mathrm{L}=100 . . .400 \mathrm{~mm}$
－Wrench for connecting cable
－Torque wrench for plug
－Fork insert， 18 mm ，for torque wrench Type 1300A11
－Grease for connecting high－insulation extension connector， 5 ml
－Extension cable for measuring spark plug Type 6115B．．． $\mathrm{L}=400 \mathrm{~mm}$

$$
\mathrm{L}=600 \mathrm{~mm}
$$

$$
\mathrm{L}=400 \mathrm{~mm}
$$

－Adapter for pressure generator Type 6904 flat seal
－Adapter for pressure generator Type 6904 conical seal

## Spare Parts

－Viton ${ }^{\oplus}$ cable，M3
－Spare PiezoSmart ${ }^{\circledR}$＋data cable
－High－insulation extension connector
－Coupling，10－32 neg．－BNC pos．
－Repair kit ${ }^{6)}$
－Insulating sheath $\varnothing 10,5 \quad \mathrm{I}=14 \mathrm{~mm}$
－Insulating sheath $\varnothing 10,5 \quad I=16 \mathrm{~mm}$
－Insulating sheath $\varnothing 10,5 \quad I=18 \mathrm{~mm}$
－Insulating sheath $\varnothing 10,5 \quad I=20 \mathrm{~mm}$
－Insulating sheath $\varnothing 10,5 \quad I=22 \mathrm{~mm}$
－Insulating sheath $\varnothing 10,5 \quad \mathrm{I}=24 \mathrm{~mm}$

Type／Art．No． 1721

1067

Type／Art．No．
1704A4
1987B．．．
1300A4
1300A4Q01
1300Asp100－400
1300A125
1300A11

1300A15
1067

1500A93
1500A93Q01
1500A97

6587A
6588A

Type／Art．No．
1989A415U43
1985A8S411U43
1700B15
1721
6998B．．．
3.221 .512

3．221．522
3．221．515
3.221 .518
3.221 .513

3．221．509

6）The end of the ordering key for the repair kit is the same as that of the measuring spark plug it matches．

## Ordering Key



7）Detailed information about PiezoSmart ${ }^{\circledR}$ sensor identification may be found in the PiezoSmart brochure，Doc．No．100－421．

## Ordering Example

M14×1， $25 \times 19$ measuring spark plug with heat value of 6 ，see table for details of spark position

M14×1，25x19 measuring spark plug
6118BFD16S41
with heat value of 6 and PiezoSmart ${ }^{\oplus}$ sensor identification

Repair kit for measuring spark plug
6998BFD16

## Type

6118BFD16A41

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## Questions Involved in Choosing a Measuring Spark Plug

Vehicle：

Type of engine： $\qquad$
Make and model：

Type of measuring spark plug：

Type：
Manufacturer：
Thread $\mathrm{M}:$
Thread length $\mathrm{L}:$
Heat value：
Spark position $\mathrm{S}:$
Max．depth $\mathrm{A}:$
Plug gap $\mathrm{G}:$
Diameter of ceramic
insulator $\mathrm{D}:$
Insulator length $\mathrm{K}:$
Miscellaneous：

## Original Spark Plug



Fig．9：Dimensions of spark plug Type 6118B．．．

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Page 5／5

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