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High Temperature Pressure Sensor

Type 6056A...

for Cylinder Pressure Measurement in Glow Plug Adapter

Patent No. US 6,105,434

Pressure sensor Type 6056A... is designed specifically for use in glow plug adapters. A large number of different glow plug adapters can be fitted with the sensor Type 6056A.... Sensors with special lengths are not necessary. This greatly simplifies the preparation for combustion analysis measurements and storekeeping.

- Ideal for measurements with glow plug adapter Type 6542Q...
- Good temperature stability of the sensitivity
- Acceleration compensated
- Front diameter ø4,4 mm
- Low thermal shock error and long life due to front seal
- High sensitivity
- Highly miniaturized plug connection (M3 size)

Description

In Type 6056A... the PiezoStar®, a new piezoelectric crystal from Kistler is used with which a sensitivity of –20 pC/bar and high thermal stability is achieved. The sensitivity changes by not more than ±0,5 % over a temperature range of 200 ±50 °C. The front seal allows good heat dissipation permitting a maximum operating temperature of up to 400 °C for brief duration.

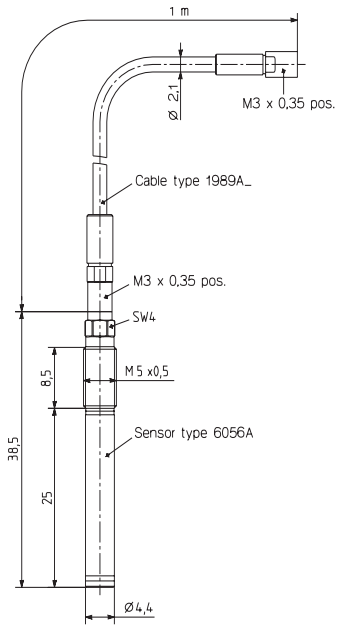
The connector enables pressure sensors of standard length to be installed in varying length glow plug adapters. This distinctly simplifies the preparation for indicating measurements and storekeeping.

Application

The miniature sensor is used typically in glow plug adapters for pressure measurement in diesel engines (Fig. 3); see also data sheet 6542Q_000-570.

However, due to its small dimensions, it can also be used in engines with complex structural geometries in indicating bores.

The rugged, turned diaphragm also allows measurements beyond the knocking limit; at the same time, thanks to its low thermal shock error, very accurate thermodynamic investigations are still assured.



Technical Data

Measuring range	bar	0 ... 250
Calibrated ranges	bar	0 ... 50, 0 ... 100, 0 ... 150, 0 ... 250
Overload	bar	300
Sensitivity	pC/bar	≈–20
Natural frequency, nominal	kHz	≈160
Linearity in all ranges (at 23 °C)	%/FSO	≤±0,3
Acceleration sensitivity	bar/g	<0,0005
Operating temperature range	°C	–20 ... 350
temperature min./max.		–50 ... 400
Sensitivity shift		
200 ±50 °C	%	≤±0,5
23 ... 350 °C	%	≤±2
Short term drift (thermal shock)		
(at 1500 1/min, p_{mi} = 9 bar)		
Δp (Short therm drift)	bar	≤±0,5
Δp_{mi}	%	≤±2
Δp_{max}	%	≤±1
Insulation resistance at 23 °C	Ω	$\geq 10^{13}$
Shock resistance	g	2 000
Tightening torque	N·m	1,5
Capacitance, without cable	pF	5
Weight with cable	g	30
Connector, ceramic insulator	–	M3x0,35

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Technical Data

Type 6056A...U20 (other specifications as for Type 6056A...)

Measuring range	bar	0 ... 300
Calibrated partial ranges	bar	0 ... 100, 0 ... 200, 0 ... 300
Overload	bar	350
Sensitivity	pC/bar	≈–19
Acceleration sensitivity		
axial	bar/*g*	<0,0005
radial	bar/*g*	<0,0005
Thermal shock error		
(at 1500 1/min, p_{mi} = 9 bar)		
Δp (short time drift)	bar	≤±0,7
Δp_{mi}	%	≤±3
Δp_{max}	%	≤±1,5

Mounting in Glow Plug Adapter

Sensor Type 6056A… is typically used in glow plug adapters (Fig. 3). For this purpose, Kistler offers the customized optimum adapters of the Type 6542Q… (see also data sheet 6542Q_000-570). These are provided with a hole bored according to requirements (Fig. 1) for the sensor mounting, and have been optimized with regard to signal quality and longevity. As a general rule, we would advise against the use of a self-manufactured glow plug adapter. On request, Kistler will provide an engine-specific adapter for your use.

General Mounting

When mounting the adapter, it is essential to comply with the tightening torque of approx. 1,5 N·m. The sensor should therefore be mounted with cable connected and socket wrench Type1300A14 and the torque wrench Type 1300A17.

A slotted mounting key must be used for sensors with PiezoSmart. The mounting bore must either be exactly ø5,7 mm (with step drill) or larger than ø7,5 mm. The mounting key Type 1300B14 is for ø5,7 mm. The mounting key Type 1300B14Q01 is for ø≥7,5 mm.

Direct Mounting

Sensor Type 6056A… can be mounted directly in the cylinder head (Fig. 2). When drilling the hole, bore specifications (Fig. 1) must be hold exactly.
The following Kistler tools:

Step drill	Type 1300A16
Tap	Type 1357A
Reaming tool	Type 1300A99

enable you to maintain the tolerances required. The hole must be drilled in one work holding fixture. Before mounting the sensors, in particular the sealing surface in the hole must be checked; use of the reaming tool Type 1300A99 is mandatory. You will find additional information on drilling the hole and mounting in the instruction manual. Your Kistler distributor will provide you with further information such as, for example, concerning the preferred location of the indicating bore in the combustion chamber.

Sleeve Mounting

Where space allows or if the sensor must be mounted through the water jacket of the cylinder head, we recommend the use of a mounting sleeve. Mounting sleeves are manufactured to customer specifications. An additional advantage of mounting sleeves is that the actual sensor bore in the sleeve can be very precisely machined. On request, Kistler will provide mounting sleeves Type 6561AQ... for your particular mounting situation.

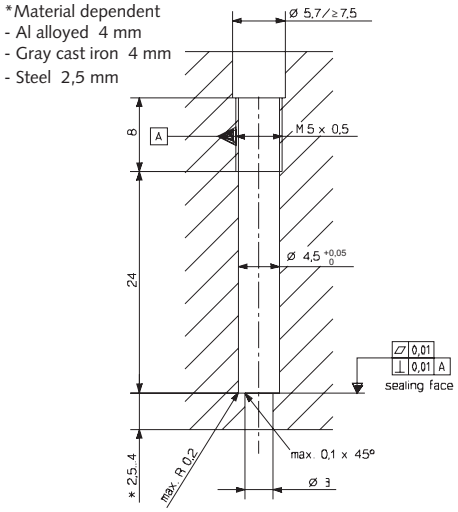

Fig. 1: Dimensions of the mounting bore

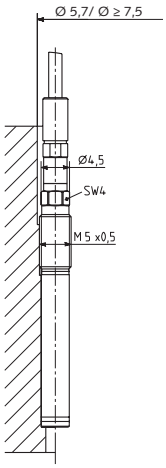

Fig. 2: Direct mounting

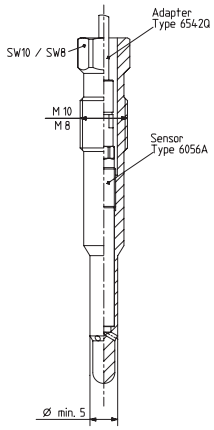

Fig. 3: Mounting in glow plug adapter

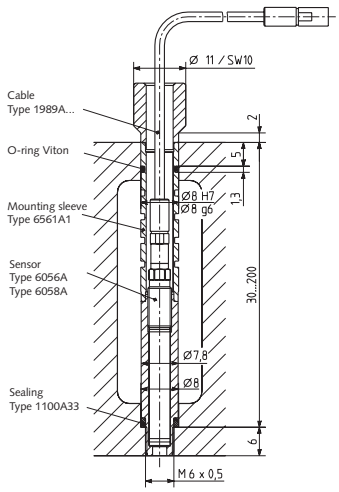

Fig. 4: Mounting in mounting sleeve

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Included Accessories	Type/Art. No.
• Cable according ordering key	
• Coupling M3x0,35 neg. – BNC pos.	1706

Optional Accessories	Type/Art. No.
• Coupling M3x0,35 neg. – BNC pos.	1706
• Cable 1 m	1989A...
• Mounting key	
ø5,6 mm, not slotted	1300A14
ø5,6 mm, slotted	1300B14
ø7,3 mm, slotted	1300B14Q01
• Torque wrench 1 ... 6 N·m	1300A17
• Special drilling tool	1300A16
• Special screw tap M5x0,5	1357A
• Mounting sleeve incl. O-ring	6561AQ...
• O-ring for mounting sleeve	5.110.055
• Adapter for pressure generator Type 6904	6591
• Finishing tool for bore	1300A99
• Temperature probe	6056AT
• Dummy	6405
• Extraction tool for dummy	1349

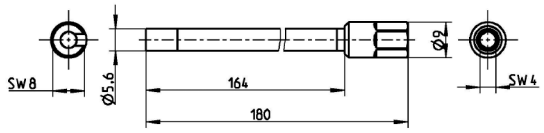

Fig. 5: Mounting key Type 1300A14

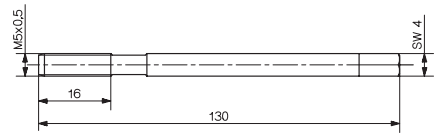

Fig. 6: Special tap Type 1357A

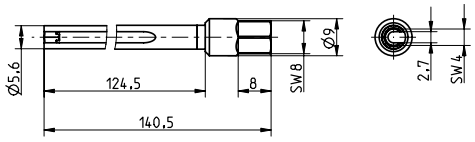

Fig. 7: Mounting key ø5,6 mm, slotted, Type 1300B14

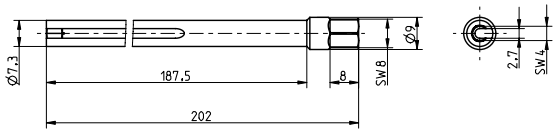

Fig. 8: Mounting key ø7,3 mm, slotted, Type 1300B14Q01

Ordering Key

Type 6056A ☐☐☐☐

Without PiezoSmart®	–
With PiezoSmart®	**S**

Cable Type

Without cable	–
Fluoropolymer	**4**

Cable Length

Without cable	–
1 m	**1**
2 m	**2**
Cable with special length, L stated in m (L_{min} = 0,15 m/L_{max} = 3,5 m)	**9**

Version

Standard	–
Reinforced diaphragm	**U20**

For PiezoSmart® specifications please refer to the PiezoSmart brochure doc. no. 100-421

Ordering Examples	Type
• Version without cable	6056A
• Version with 1 m fluoropolymer cable	6056A41
• Version with PiezoSmart and 2 m fluoropolymer cable	6056AS42

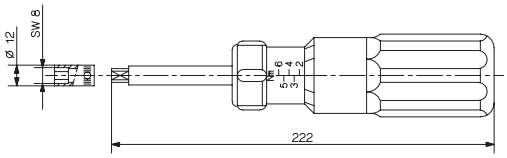

Fig. 9: Torque wrench Type 1300A17

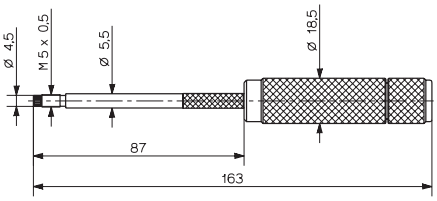

Fig. 10: Reaming tool Type 1300A99

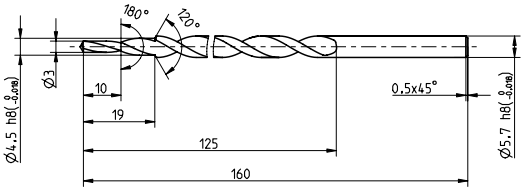

Fig. 11: Step drill Type 1300A16

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