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High-Temperature Pressure Sensor

for Engine Measuring Technology

Type 6052C...

Patent No. US 6,105,434

High-temperature pressure sensor with very small dimensions are ideal for use in internal combustion engines with complex structural geometry of the cylinder head. The sensor is installed with front sealing in an M5x0,5 bore.

- Good temperature stability of the sensitivity
- High sensitivity
- Low thermal shock error
- Long service life due to front seal

Description

Type 6052C… uses a piezoelectric crystal which achieves high sensitivity in conjunction with an extremely small sensor structure. This sensitivity varies by not more than ±0,5 % in the temperature range from 150 ... 250 °C. The passive acceleration compensation patented by Kistler keeps the influence of engine vibrations to a minimum.

The front seal provides very good heat transfer and keeps the sensor at a save operating temperature. The diaphragm, optimized by finite element calculation, produces good measuring results and ensures a long service life.

Application

The sensor Type 6052C... is an excellent all-rounder. Its rugged construction makes it suitable for measurements at the knock limit as well as for thermodynamic investigations. This sensor is used mainly for complex cylinder head geometry. As well as for motor cycles and other small engines and for combustion analysis in vehicles.

For applications mainly in the knocking range or at very high peak pressures, use of Type 6052C...U20 with reinforced diaphragm (heavy duty version) is recommended.

Type 6052C...U40 is provided with additional damping and is suitable for applications on engines with extremely high vibrations, e.g. racing engines.

These sensors are always provided with an integrated cable. For standard applications, a rugged cable with steel braiding Type 1929A1 is used. If the sensor connector is exposed directly to engine oil, e.g. when installed through the valve cover, the oil proof cable (IP67) Type 1983AA1 is recommended.
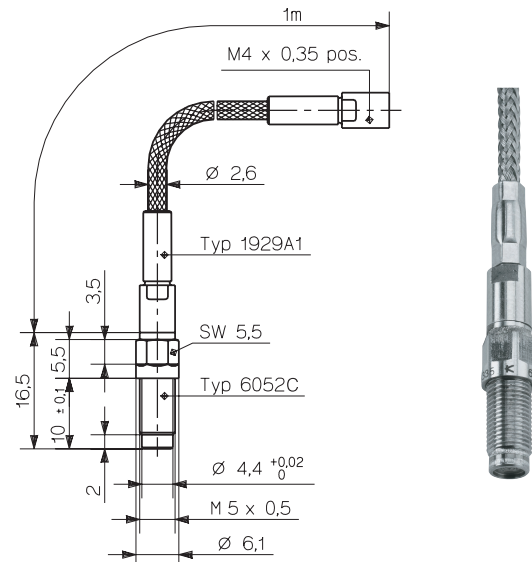
Technical Data

Type 6052C...

Type 6052C...		
Measuring range	bar	0 ... 250
Calibrated partial ranges	bar	0 ... 50, 0 ... 100,
		0 ... 150, 0 .. 250
Overload	bar	300
Sensitivity	pC/bar	≈−20
Natural frequency (measuring element)	kHz	≈160
Linearity, all ranges (at 23 °C)	%/FSO	≤±0,3
Acceleration sensitivity		
axial	bar/g	<0,0002
radial	bar/g	<0,0005
Operating temperature range	°C	−20 ... 350
Temperature min./max.		−50 ... 400
Sensitivity change		
200 °C ±50 °C	%	≤±0,5
23 ... 350 °C	%	≤±2
Thermal shock error		
(at 1500 1/min, p_{mi} = 9 bar)		
Δp (short time drift)	bar	≤±0,5
Δp_{mi}	%	≤±2
Δp_{max}	%	≤±1,0
Insulation resistance at 23 °C	Ω	≥10^{13}
Shock resistance	g	2 000
Tightening torque	N·m	1,5
Capacitance, without cable	pF	5
Weight with cable	gram	30
Connector, ceramic insulator	–	M4 x0,35

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Technical Data

Type 6052C...U20 (other specifications as for Type 6052C...)

Measuring range	bar	0 ... 300
Calibrated partial ranges	bar	0 ... 100, 0 ... 200, 0 ... 300
Overload	bar	350
Sensitivity	pC/bar	≈–19
Linearity, all ranges (at 23 °)	%/FSO	≤±0,5
Acceleration sensitivity		
axial	bar/g	<0,0005
radial	bar/g	<0,0005
Sensitivity change		
23 ... 350 °C	%	≤±3
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

Type 6052C...U40 (other specifications as for Type 6052C...)

Operating temperature range	°C	–20 ... 200
Temperature min./max.	°C	–50 ... 250
Sensitivity shift		
23 ... 200 °C	%	≤±2
Calibrated partial ranges	bar	0 ... 100, 0 ... 200, 0 ... 250

Mounting

Direct mounting:

Sensor Type 6052C... can be mounted directly in the cylinder head, see Fig. 2. Machining of the bore must correspond exactly to the bore specifications shown in Fig. 1.

The Kistler tools:

Step drill	Type 1300A51
Special tap	Type 1357A and the
Finishing tool for bore	Type 1300A79

must be used in order to comply with the tolerances required. The bore must be machined in one clamping. Before mounting the sensor, the sealing surface in particular must be checked; use of the finishing tool (reamer) Type 1300A79 is mandatory. When mounting the sensor, it is essential to comply with the tightening torque of 1,5 N·m. The sensor should therefore be mounted with the cable connected using the socket wrench Type 1300A9 and the torque wrench Type 1300A17. You will find additional information for machining the bore and mounting in the instruction manual. Your Kistler distributor will provide you with information, for example concerning the preferred position of the indicating bore in the combustion chamber.

Mounting sleeve:

When space allows or if the water jacket of the cylinder head will be breached, a mounting sleeve is recommended. Mounting sleeves are manufactured to customer requirements; Fig. 3 shows a version with M7x0,75 thread. 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 custom made adapters for your particular mounting situation.

Spark plug adapter:

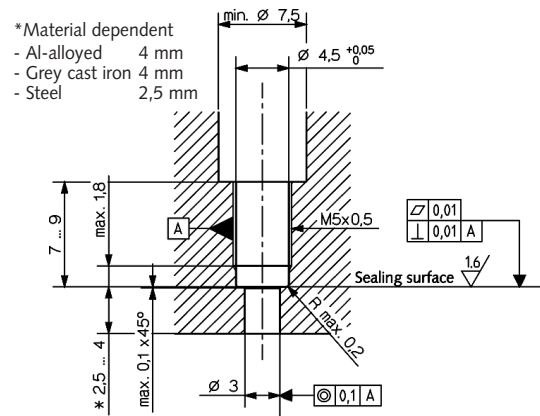Sensor 6052C... can also be used in the spark plug adapter 6517B..., see data sheet 6517B_000-491.
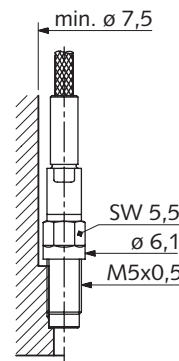

Fig. 1: Mounting bore

Fig. 2: Direct mounting

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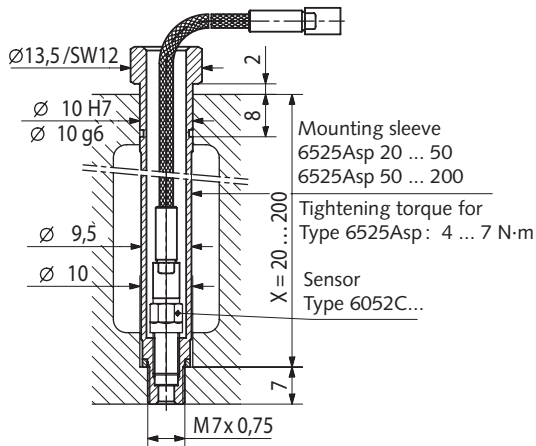*measure. analyze. innovate.*

Fig. 3: Using the mounting sleeve

Accessories Included	Type
• Cable according to ordering key	
• Coupling M4 neg. – BNC pos.	1705

Optional Accessories	Type
• Spare cable with metal braiding, L = 1 m	1929A1
• Spare cable oil proof of Viton®, L = 1 m	1983AA1
• PiezoSmart® extension cable for Type 6052CS..., L= 1 m	1987B1
• Coupling M4 neg. – 10-32 UNF neg.	1700A13
• Mounting sleeve incl. O-ring	6525Asp...
• Mounting key SW 5,5	1300A9
• Torque wrench 1 ... 6 N·m	1300A17
• Special tap M5x0,5	1357A
• Step drill	1300A51
• Dummy sensor (for Type 6052C...)	6445
• Extraction tool for dummy sensor	1319
• Adapter for pressure generator Type 6904	6585A
• O-ring for Mounting sleeve Type 6525	5.110.078
• Finishing tool for bore, bore depth ≤60 mm	1300A79
• Finishing tool for bore, bore depth ≤170 mm	1300A79Q01
• Adapter M8x0,75	6595
• Adapter M10x1/SW12	6595A1
• Adapter M10x1/SW10	6595A1Q01
• Adapter M14x1,25	6585AQ01

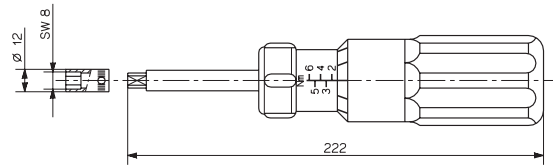Fig. 4: Mounting key SW 5,5 Type 1300A9

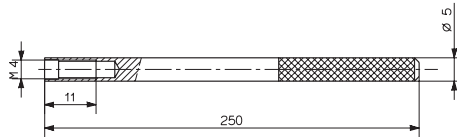Fig. 5: Torque wrench 1 ... 6 N·m Type 1300A17

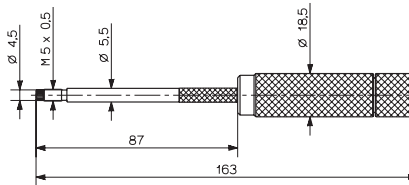Fig. 6: Extraction tool for dummy sensor Type 1319

Fig. 7: Finishing tool for bore Type 1300A79
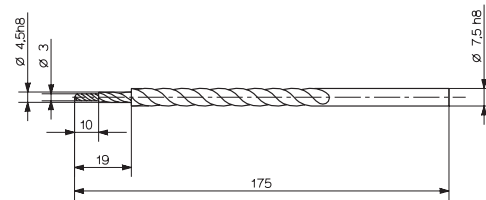

Fig. 8: Step drill Type 1300A51

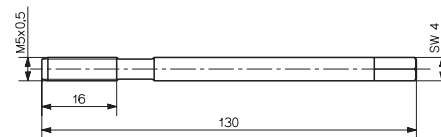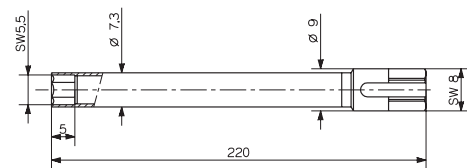Fig. 9: Special tap M5x0,5 Type 1357A
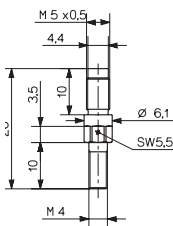
Fig. 10: Dummy sensor (for Type 6052C...)

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Ordering Key

Type 6052C ☐☐☐☐

Without PiezoSmart®	–
With PiezoSmart®	S

Cable Version

With metal braiding, Type 1929A...	3
Viton®	4
Viton®, oil proof	7

Cable length

1 m	1
2 m	2
Cables with special length, specify cable length L in m (L$_{min}$ = 0,15 m/L$_{max}$ = 3,5 m)	9

Version

Standard	–
Reinforced diaphragm	U20
Additional damping	U40
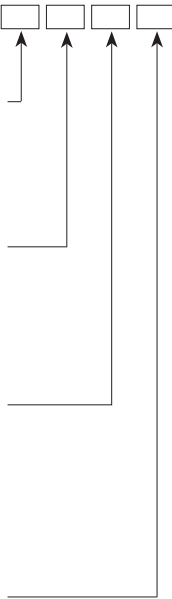
For PiezoSmart® specifications please refer to the PiezoSmart brochure doc. no. 100-421.

Ordering Examples: Type 6052C...

Version with 1 m braided cable	Type 6052C31
Version with PiezoSmart® and 1 m Viton® cable	Type 6052CS71
Version with PiezoSmart® and 1 m Viton® cable, and reinforced diaphragm	Type 6052CS71U20
Version with PiezoSmart®, braided cable L = 3 m and additional damping	Type 6052CS39U40 L = 3 m

Viton® is a registered Trademark of DuPont Performance Elastomers.

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