KISTLER
measure. analyze. innovate.

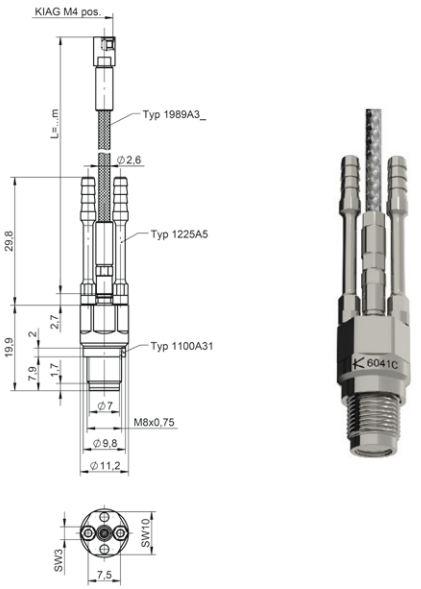
# Watercooled PiezoStar pressure sensor

## for combustion engine measurements

**Type 6041C...**

The smallest water-cooled pressure sensor of the latest generation in M8 size. It is perfectly suited for a wide range of engines and applications, including detailed thermodynamic investigations at the test bench
Sensor Type 6041C is optimised for thermodynamic behavior and combines the excellent measurement properties of the predecessor products with greater robustness and stability. Water cooling and the use of latest Kistler technology complete this new development. Type 6041C can be used in applications with classic fuels as well as with alternative fuels including hydrogen.

- Minimal change in temperature sensitivity: stable over the entire operating range
- Very low linearity deviation: accurate measurement data at all loads
- Low thermal shock error: assured MEP accuracy under all conditions
- High durability: without compromising the thermodynamic behavior
- Long-term stability: due to optimized cooling flow around the measuring element.
- Suitable for use in hydrogen combustion engines




### Description

The sensor Type 6041C further highlights the advantages of water-cooled sensors. The high thermal stability over the entire power range, the long-term stability thanks to the cooled diaphragm or the option of flush mounting in high-temperature installations are just a selection of the advantages of water-cooled sensors. Type 6041C uses the latest PiezoStar crystal, resulting in a high sensitivity and natural frequency as well as in a low thermal shock error and an excellent zero-point stability.

The excellent linearity over the entire range enables measurements with the highest levels of accuracy and makes this M8 sensor ideal for gas exchange analysis.

The sensor Type 6041C is mounting compatible to the Types 6041A/B as well as to the uncooled versions Type 6045A/B and 6044A and is always delivered with a mounted cable.

### Technical data

| | | |
|---|---|---|
| Measuring range | bar | 0 ... 250 |
| Calibrated ranges | bar | 0 ... 50 |
| (@ RT, 50°C, 350°C (only 250 bar)) | | 0 ... 100 |
| | | 0 ... 150 |
| | | 0 ... 250 |
| Overload | bar | 300 |
| Sensitivity (@ RT) | pC/bar | –33 ±3 |
| Natural frequency nominal | kHz | >85 |
| Linearity in all ranges (room temperature and 50 °C) | %FSO | ±0.3 |
| Acceleration sensitivity | | |
| cooled | bar/g | <0.013 |
| non-cooled | bar/g | <0.0015 |
| Cooling water flow (50°C, $p_{max}$ 3 bar) | L/min | 0.3 ... 0.5 |
| Shock resistance | g | ≥2 000 |
| Operating temperature range | °C | –20 ... 350 |
| Min./max. temperature non-cooled | °C | –40 ... 400 |
| Sensitivity shift | | |
| 23 ° ... 350 °C | % | ≤±1.5 |
| 50 ° ±30 °C | % | ≤±0.2 |

KISTLER
measure. analyze. innovate.

**Technical data** (continuation)

| | | |
|---|---|---|
| Thermal shock error<br>(at 1 500 1/min, IMEP = 9 bar)<br>Δp (short-term drift) | bar | ≤±0.2 |
| ΔIMEP | % | ≤±1 |
| $\Delta p_{max}$ | % | ≤±1 |
| Insulation resistance<br>at 23°C and 50 °C | Ω | $>10^{13}$ |
| Tightening torque | N·m | 6 |
| Capacity, sensor only | pF | 12 ±2 |
| Weight, sensor with cable | g | 29 ±2 |
| Connector, ceramic insulator | – | M3x0.35 |

## Application

The miniature sensor Type 6041C is ideally suited for thermodynamic measurements in compact multivalve engines with limited installation space.


**Water cooling requirements**

Never operate the sensor with water from the main supply. The lime- and mineral content may lead to deposits and affect the measurement accuracy, stability and lifetime the sensor. The use of the Kistler Type 2621 cooling system is recommended.

## Cooling fluid specification

- Demineralized / distilled water according to norm VDE-Norm 0510
- Cooling fluid additive GLYSANTIN G30, G40 or G65 (do not mix with each other)
- Mixing ratio: The concentration of GLYSANTIN must be within 33% (min.) and 60% (max.)
- For further details see operating instructions 002-027

## Installation

The pressure sensor Type 6041C can be installed directly into an M8x0.75 bore, either flush or recessed mounted. Similar to its predecessors, Type 6041C does not require excessive space and can be mounted in existing bores of Types 6041A/B. With tool Type 1300A73 mounting in a bore with diameter 12 mm is possible.

## Direct installation (Fig. 1 + 2)

Note that the bore must be machined exactly to specification. Kistler tap Type 1361 ensures the correct tolerances are achieved. To avoid pipe oscillations, the flush mounted installation is recommended (Fig. 1), a reduction of the thermal load can be achieved with an up to 2 mm recessed mounting position.

The further recessed mounting, with a small gas channel in front of the diaphragm offers excellent thermal-shock protection but can be prone to pipe oscillations (Fig. 2).

Additional information is provided in the instruction manual – and your Kistler representative will provide you further information and support such as e.g., the preferred location of the indicating bore in the combustion chamber.

## Sleeve installation (Fig. 3)

Where space allows or if the sensor must be mounted through the water jacket of the cylinder head, it is recommended to use a mounting sleeve Type 6556AQ… which is manufactured according to customer specifications.

On request, Kistler will support you on your individual mounting situation – creating drawings and manufacturing the customized mounting sleeves.

## Maintenance

Kistler recommends an annual calibration from the first use of the sensor. For further information refer to the instruction manual or contact your Kistler representative.

6041C_003-591e-07.24

GLYSANTIN is a registered trademark of the BASF SE.

KISTLER
measure. analyze. innovate.

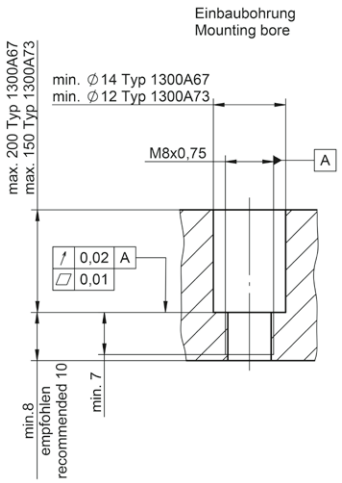



Fig. 1: Flush mounted mouting bore

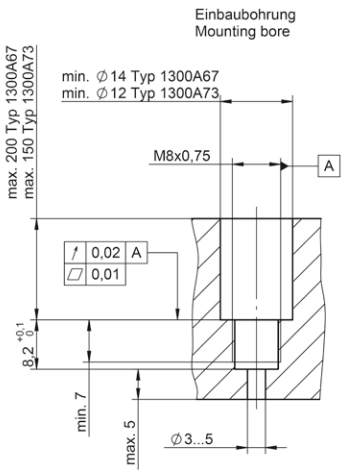



Fig. 2: Recessed mounted mounting bore

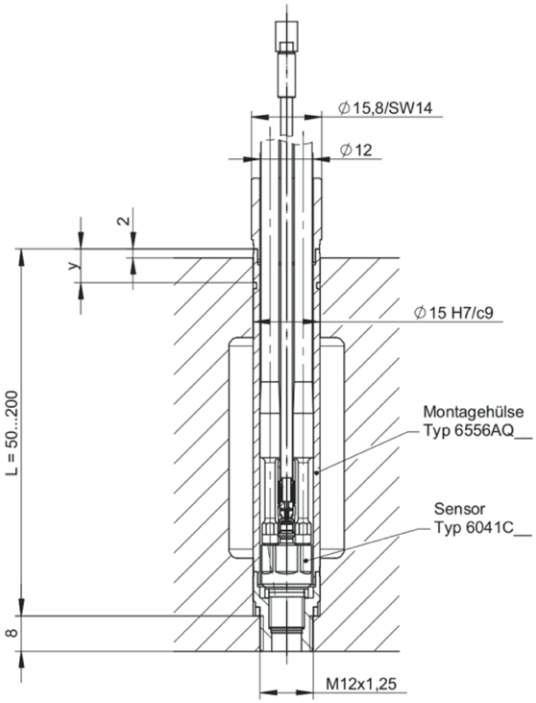



Fig. 3: Sensor installation with mounting sleeve

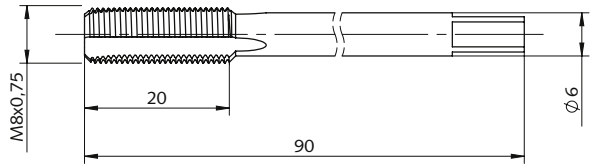



Fig. 4: Screw tapScrew tapScrew tap M8x0.75 Type 1361

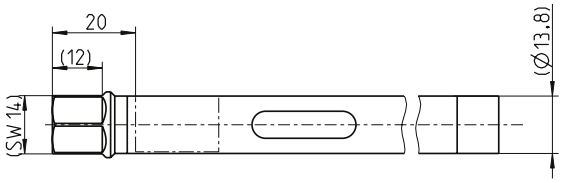



Fig.5: Mounting wrenchMounting wrench ø13.8/SW14 Type 1300A67 for mounting bore ø14 mm

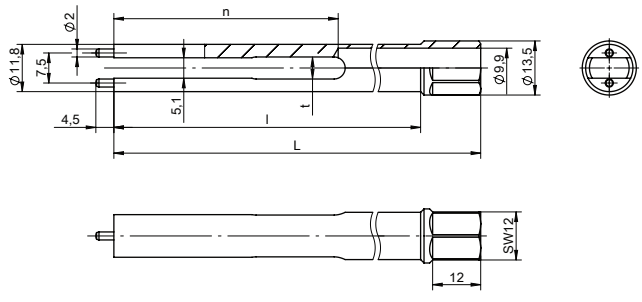



Fig. 6: Mounting key for boreMounting key for bore Ø12 SW12
Type 1300A73 with l = 140/L = 155
Type 1300A73Q01 with l = 190/L = 205

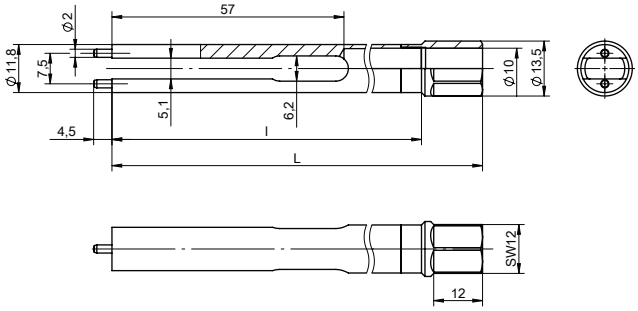



Fig.7: Mounting key for boreMounting key for bore Ø12 SW12
Type 1300A73A250 with l = 250/L = 265
Type 1300A73A300 with l = 300/L = 315

KISTLER
measure. analyze. innovate.

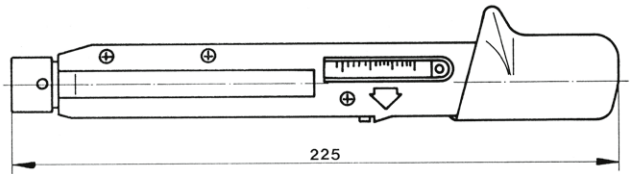



Fig. 8: 4 … 20 N·m torque wrench Type 1300A39

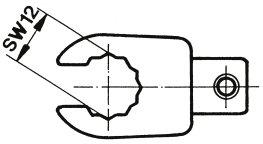



Fig. 9: SW12 fork wrench insert for mounting and torque wrench Type 1300A13

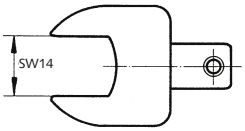



Fig. 10 SW14 fork wrench insert for mounting and torque wrench Type 1300A71

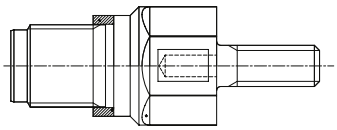


Fig. 11: Dummy sensor Type 6475

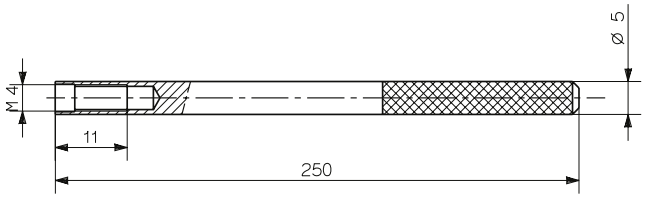



Fig. 12: Extraction tool for dummy sensor Type 1319

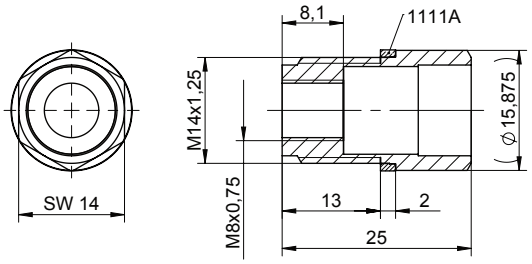



Fig. 13: Adapter Type 6589Q01. Sensor flush mounted

6041C_003-591e-07.24

KISTLER
measure. analyze. innovate.

| Scope of delivery | Type/Mat. No. |
|---|---|
| • Pressure sensor with pressed-on seal 1100A31 | 6041C |
| • Connecting cable acc. to ordering key | |
| • Calibration certificate | |
| • Adapter M4 neg. – BNC pos. (not for PiezoSmart) | 1705 |

| Optional accessories | Type/Mat. No. |
|---|---|
| • PiezoSmart extension cables | |
| – L = 1 m | 1987B1 |
| – L = 2 m | 1987B2 |
| – L = 10 m | 1987B10 |
| • Connecting cables, PFA steel braiding | |
| – L = 1 m | 1989A313 |
| – L = 2 m | 1989A323 |
| – L = 3 m | 1989A333 |
| – L = 1 m (with PiezoSmart)* | 1985A8S311 |
| – L = 2 m (with PiezoSmart)* | 1985A8S321 |
| – L = 3 m (with PiezoSmart)* | 1985A8S331 |
| • Connecting cables, FPM oil-tight | |
| – L = 1 m | 1989A713 |
| – L = 2 m | 1989A723 |
| – L = 3 m | 1989A733 |
| – L = 1 m (with PiezoSmart)* | 1985A8S711 |
| – L = 2 m (with PiezoSmart)* | 1985A8S721 |
| – L = 3 m (with PiezoSmart)* | 1985A8S731 |
| • Cr-Ni seal ring (replacement for pressed-on sensor seal) | 1100A31 |
| • Connecting hose for cooling water length L = 29.5 mm | 1225A5 |
| • Fluoropolymer-hose for cooling water | 1203Csp |
| • Dummy sensorM8x0.75 | 6475 |
| • Extraction tool for dummy sensor Type 6475 | 1319 |
| • Mounting sleeve M12x1.25 [1)] | 6556AQ... |
| • Adapter M14x1.25 for pressure generator Type 6904 | 6589 |
| • Adapter M10x1 for pressure generator Type 6905A | 6929 |
| • Engine adapter M14/M8, flush | 6589Q01 |
| • Engine adapter M14/M8, set back | 6589Q02 |
| • Protective cap for sensor connector | 65006959 |
| • Conditioning system | 2621G |

*with factory calibration data, state SN with order
[1)] Customer specific

| Mounting tools (optional) (optional | Type/Mat. No. |
|---|---|
| • Mounting key for bore Ø12 SW12 | |
| – L = 155 | 1300A73 |
| – L = 205 | 1300A73Q01 |
| – L = 265 | 1300A73A250 |
| – L = 315 | 1300A73A300 |
| • Mounting key for bore ø14/SW 14 | 1300A67 |
| • Wrench jaw insert SW12 for Type 1300A73 | 1300A13 |
| • Wrench jaw insert SW14 for Type 1300A67 | 1300A71 |
| • Torque wrench (4 ... 20 N·m) | 1300A39 |
| • Screw tap M8x0.75 | 1361 |

## Ordering key

**Type 6041C** ☐ ☐ ☐

**PiezoSmart**

| | |
|---|---|
| Without PiezoSmart | – |
| With PiezoSmart | S |

**Cable version**

| | |
|---|---|
| PFA with steel braiding | 3 |
| FPM oil-proof | 7 |

**Cable length**

| | |
|---|---|
| 1 m | -1 |
| 2 m | -2 |
| 3 m | -3 |

## Order examples Type 6041C...

Standard sensor with PiezoSmart and 2 m FPM (cable oil-proof):
Type 6041CS7-2
Standard sensor with PiezoSmart and 1 m PFA cable:
Type 6041C-3-1

6041C_003-591e-07.24

KISTLER
measure. analyze. innovate.

## Description of Icons

| | |
|---|---|
|  | H2 tested:<br>Suitable for the use in hydrogen combustion engines |
|  | Ready to Use:<br>Easy installation - minimal modifications |
|  | Closed Loop Combustion Control:<br>Suitable for closed loop control applications |

| | |
|---|---|
|  | Anti Strain Design:<br>Insensitive to mechanical strain effects |
|  | High Thermal Stability:<br>Temperature stable over measuring range |
|  | High Robustness:<br>High durability with good thermodynamic performance |

6041C_003-591e-07.24