

# Piezoresistive Absolute Pressure Sensors

Type 4043A..., 4045A...,  
4073A..., 4075A...

## Universal Precision Pressure Sensors

This series of universal sensors is suitable for measuring absolute pressures in ranges from 0 ... 2 bar to 0 ... 500 bar.

- Compensated for operating temperature ranges: -20 ... 50 °C and 20 ... 120 °C
- Available as basic or PiezoSmart® type with TEDS functionality
- Ideal for gas exchange analysis in internal combustion engines
- Isolated from medium with steel diaphragm. Excellent media compatibility
- High overload capacity
- High natural frequency

### Description

With this family of sensors pressure is applied to a silicon diaphragm via a thin steel diaphragm and transmission fluid. The diaphragm contains implanted piezoresistive resistors connected in a Wheatstone bridge. The applied pressure unbalances the bridge and produces a proportional output signal. Thermal effects are reduced by optimizing the packaging of the sensor and further electrical compensation of each sensor ensures maximum accuracy.

This series is designed for precise measurement of static and dynamic pressure variations. The sensors measure the absolute pressure, that is the pressure relative to a vacuum rather than to atmospheric pressure. These sensors feature good linearity and a high output voltage, the steel membrane which is designed to isolate the medium, ensures universal application suitability. To allow exactly the right choice for a particular application, the sensors are available in pressure ranges of between 0 ... 2 bar to 0 ... 500 bar, in different sizes and over two operating temperature ranges.

For measurements relative to atmospheric pressure, such as checking of fluid levels, relative pressure sensors of the 4053A... series must be used. For detailed information please see data sheet No. 4053A\_000-004.



**PiezoSmart® Type**  
Type 4045A...V200S

**PiezoSmart® Type**  
Type 4075A...V200S

### Applications

Their high precision and high natural frequency has led to piezoresistive sensors of this series proving effective for measuring intake and exhaust pressures (mounted in cooling adapters for gas exchange optimization in combustion engines). Other applications include automotive systems and component development, fuel pump and turbo-charger test applications and rapid pressure changes in hydraulic systems.

### Calibration Current

The bridge is supplied with a constant current determined by factory calibration. The measuring amplifier supplies a calibration current that produces a full scale sensor output (FSO) of 500 mV.

The calibration current is specified for each sensor and can be set on amplifier Type 4603B... Amplifiers Type 4618A... are set with the aid of programming plug Type 4958A0.

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## Technical Data

### Sensor Designs

Sensor Type		4043A...	4073A...	4045A...	4075A...
Process connection		M14x1,25	M12x1	M14x1,25	M12x1
Compensated operating temperature range	°C	-20 ... 50		20 ... 120	
Min./max. temperature	°C	-40/70		0/140	

### General Technical Data for Types 4043A.../4045A...

Sensor Type		A2	A5	A10	A20	A50	A100	A200	A500
Measuring range	bar	0 ... 2	0 ... 5	0 ... 10	0 ... 20	0 ... 50	0 ... 100	0 ... 200	0 ... 500
Overload	bar	5	12,5	25	50	125	250	500	750
Sensitivity at 1cal	mV/bar	250	100	50	25	10	5	2,5	1
Natural frequency	kHz	>30	>80	>120	>150	>180	>200	>200	>200
Linearity (EP)	±%FSO	<0,3							
Thermal zero shift	±%/FSO	<0,7	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5
Thermal sensitivity shift	±%	<1,0							
Tightening torque	N·m	12 ... 20							
Weight	g	33							

### General Technical Data for Types 4073A.../4075A...

Sensor Type		A10	A20	A50	A100	A200	A500
Measuring ranges	bar	0 ... 10	0 ... 20	0 ... 50	0 ... 100	0 ... 200	0 ... 500
Overload	bar	25	50	125	250	500	750
Sensitivity at 1cal	mV/bar	50	25	10	5	2,5	1
Natural frequency	kHz	>120	>150	>180	>200	>200	>200
Linearity (EP)	±%FSO	<0,3					
Tightening torque	N·m	12 ... 20					
Weight	g	28					

### General Technical Data for Types 4043A.../4045A.../4073A.../4075A...

Calibration current	mA	2 ... 5
Reference current	mA	4
Input and output impedance	kΩ	≈3
Stability:		
of sensitivity	%/a	<0,2 (for 1bar ±±0,5%)
of zero measurand output	%FSO/a	<0,5
Thermal zero shift	±%/FSO	<0,5
Thermal sensitivity shift	±%	<±1,0
Acceleration sensitivity	mbar/g	<0,3
Shock resistance	g	1 000
Protection		IP65

### Materials

Diaphragm	Mat. No.	1.4435
Sensor case	Mat. No.	1.4301
Cable		Viton®

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**Basic Sensor Types 4043A... and 4045A...**

**Basic Sensor Types 4073A... and 4075A...**

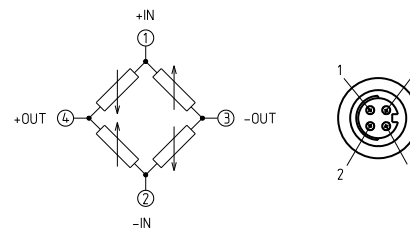
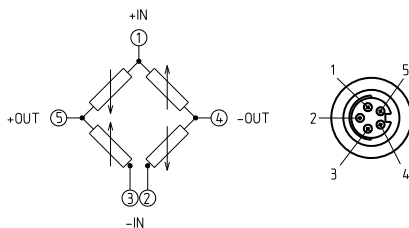
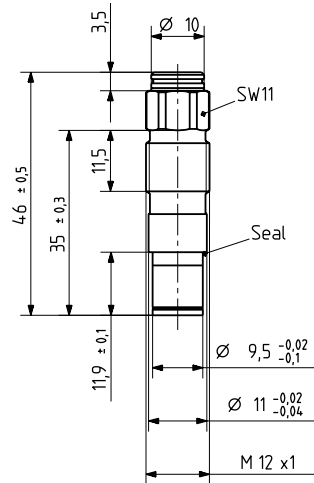
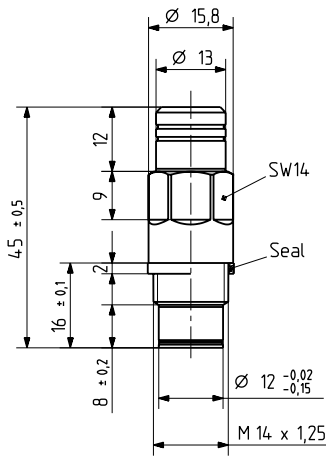


Fig. 1a: Sensor Bridge and Pin Allocation

Fig. 1b: Sensor Bridge and Pin Allocation

**Measuring Chains**

The sensors can be used with different amplifiers:

- Laboratory amplifiers, such as Type 4603B...
- Amplifier module for multichannel signal conditioning, e.g. Types 4643 and 4665
- Measuring chain amplifiers, such as Type 4618A...

Please contact your Kistler distributor for detailed advice.

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**PiezoSmart® Types with TEDS Functionality  
 Types 4045/4075A...V200S**

PiezoSmart is an automatic sensor identification system based on the IEEE 1451.4 standard. Kistler supplies piezoelectric and piezoresistive sensors for the Signal Conditioning Platform (SCP) which are characterized by TEDS functionality (sensor identification) and automatic configuration (plug & play) for maximum process reliability.

Please see the brochure, Doc. No. 100-421, for detailed information about PiezoSmart.

The oil-filled series, Types 4045/75A... are available with TEDS functionality and may be identified by their type number ending: \_V200S. These versions should be chosen for engine applications with intake and exhaust measurement as standard and ideally operated with the two-channel amplifier Type 4665.

Please see data sheet Doc. No. 2854A\_000-409 for detailed information about amplifier Type 4665.

**PiezoSmart® Type 4045A...V200S**

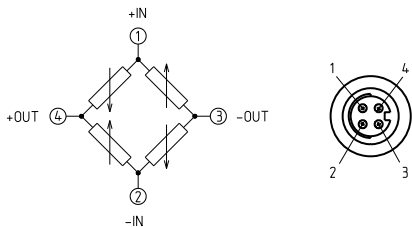
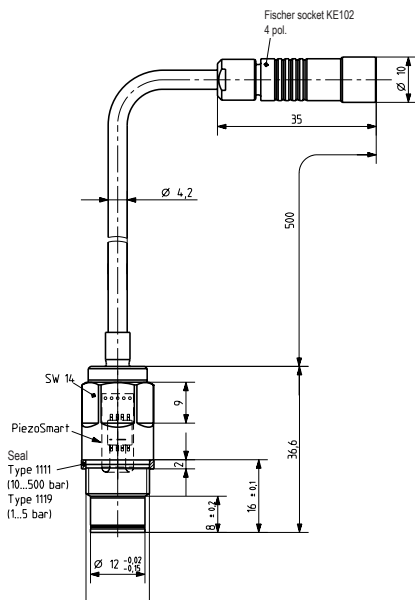


Fig. 2a: Sensor Bridge and Pin Allocation

**PiezoSmart® Type 4075A...V200S**

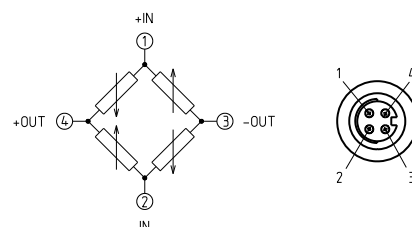
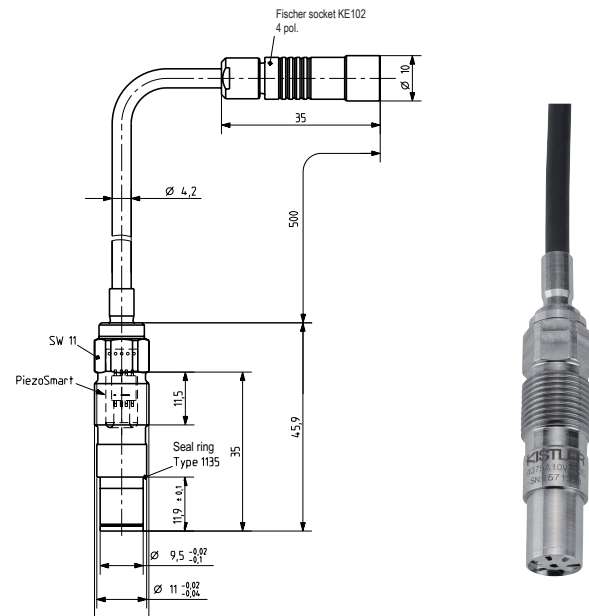


Fig. 2b: Sensor Bridge and Pin Allocation

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### Mounting

When direct mounting is used the dimensions shown in Figures 3a and 3b must be met. For measurements of a compressible medium under highly dynamic flow conditions (such

as those encountered during measurement of engine intake pressures) the sensor must be mounted with its front flush. The sensor must be tightened to a torque of 12 ... 20 N·m.

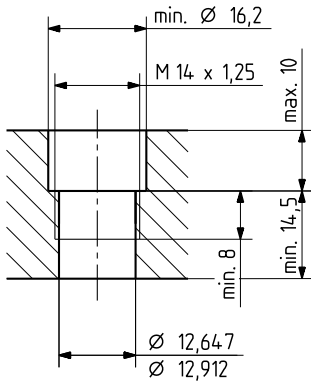


Fig. 3a: Mounting hole for Types 4043A.../4045A...

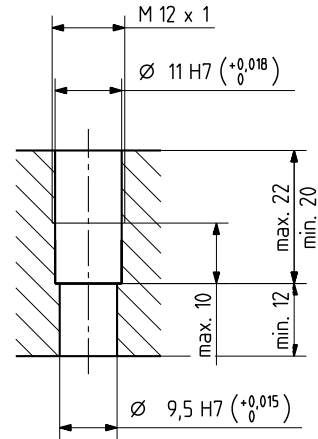


Fig. 3b: Mounting hole for Types 4073A.../4075A...

### Cooling Adapters

for Measurements in Engine Exhaust System

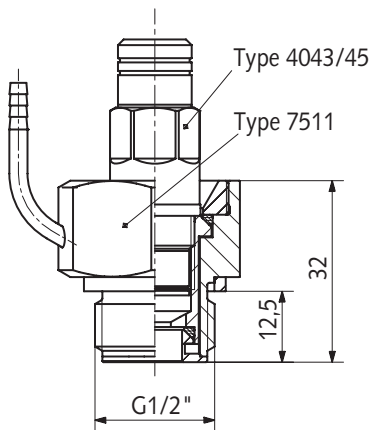


Fig. 4a: Mounting sensor Type 4045A... in damped cooling adapter Type 7511

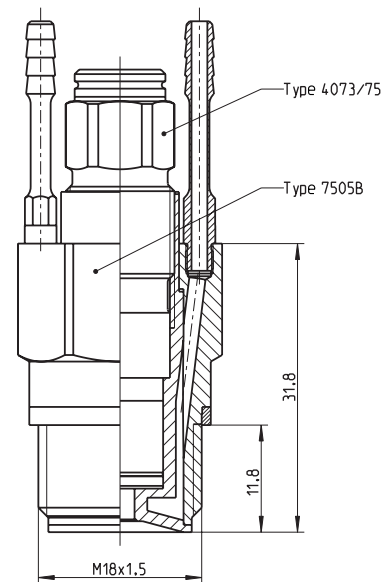


Fig. 4b: Mounting sensor Type 4075A... in cooling adapter Type 7505B

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**Switching Adapter Type 7533A11 (Water-Cooled) for Sensor Type 4045A...**

**Switching Adapter Type 7533A12 (Water-Cooled) for Sensor Type 4075A...**

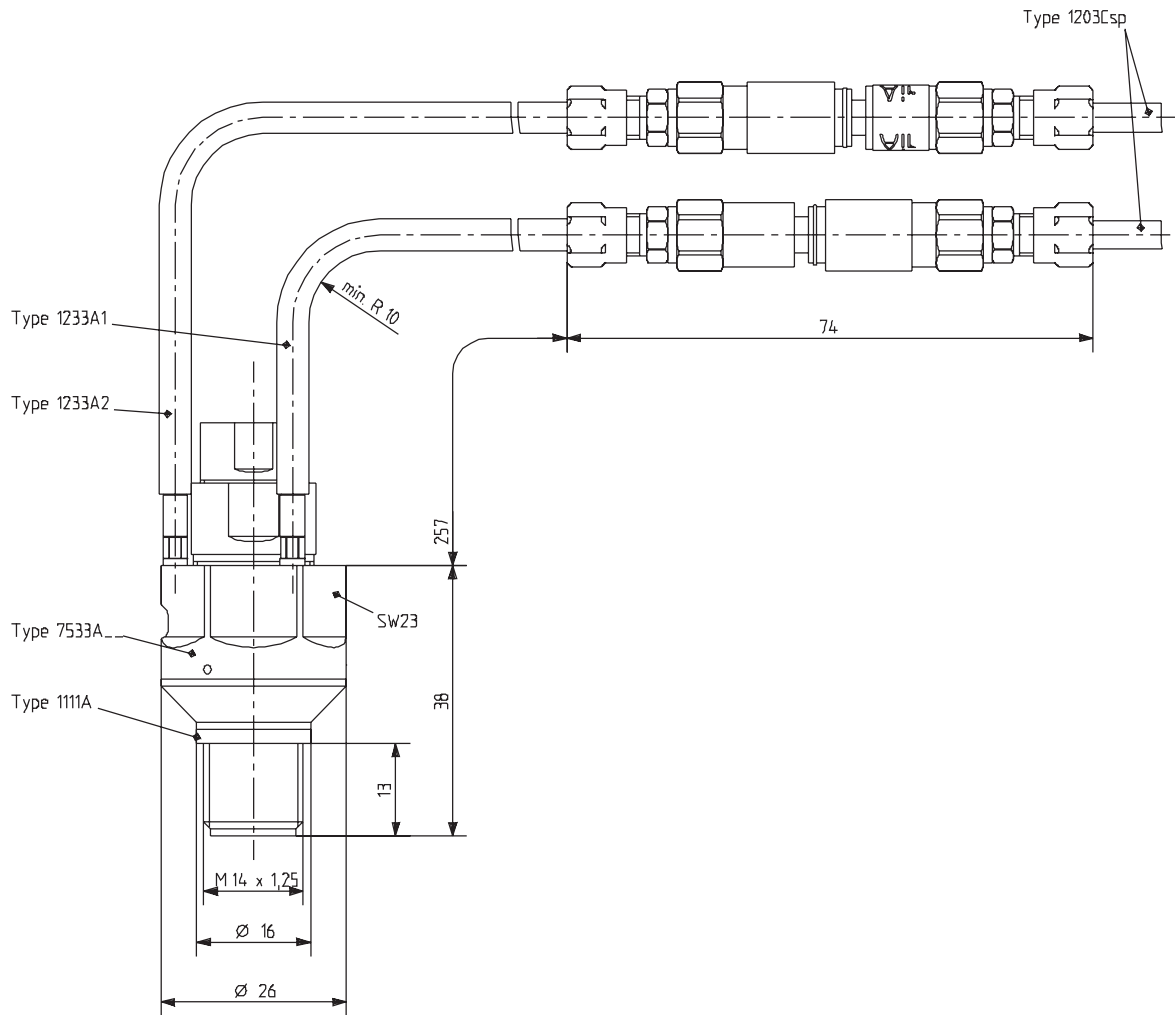


Fig. 5a: Switching adapter (water-cooled) Type 7533A...

Please see data sheet 7533A\_000-606 for detailed information about the switching adapter, including available accessories.

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**Included Accessories**  
**for Sensor Types 4043A.../4045A...**

- Delrin®-seal (0 ... 5 bar) 1119
- Copper seal (10 ... 500 bar) 1111

**Optional Accessories** **Typ/Art. Nr.**

- **Seals**
- Nickel seal 1111A

- **Connecting Cables for Basic Type**
- for amplifier Type 4603B... (<70 °C) 4751A...
- for amplifier Type 4603B... (<200 °C) 4761B...
- for amplifier Type 4618A... 4765B...

- **Connecting Cables for TEDS Type**  
 (see also PiezoSmart brochure 100-421)
- for amplifier Type 4665 (<70 °C) 4753A...
- for amplifier Type 4665 (<180 °C) 4763B...

- **Cooling Adapters**
- Cooling adapter, damped, M14x1,25 7511
- Switching adapter (water-cooled) 7533A11

**Included Accessories**  
**for Sensor Types 4073A.../4075A...**

- Copper seal 1135

**Optional Accessories** **Type/Art. No.**

- **Seals**
- Nickel seal 1135A
- Teflon® seal 1137

- **Connecting Cables for Basic Type**
- for amplifier Type 4603B... (<70 °C) 4753A...
- for amplifier Type 4603B... (<200 °C) 4763B...
- for amplifier Type 4618A... 4767B...

- **Connecting Cables for TEDS Type**  
 (see also PiezoSmart brochure 100-421)
- for amplifier Type 4665 (<70 °C) 4753A...
- for amplifier Type 4665 (<180 °C) 4763B...

- **Cooling Adapters**
- Cooling adapter, M18x1,25 7505B
- Cooling adapter, M14x1,25 7507
- Switching adapter (water-cooled) 7533A12
- Switching adapter (water-cooled) 7531

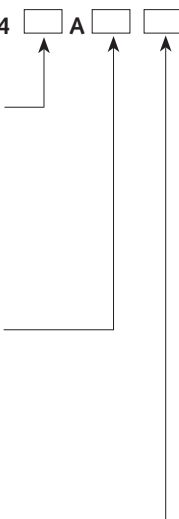
**Ordering Key**  
**Sensor M14x1,25**

Temperature range -20 ... 50 °C	3
Temperature range 20 ... 120 °C	5

<b>Pressure Range</b>	
0 ... 2 bar	2
0 ... 5 bar	5
0 ... 10 bar	10
0 ... 20 bar	20
0 ... 50 bar	50
0 ... 100 bar	100
0 ... 200 bar	200
0 ... 500 bar	500

Basic type	-
With PiezoSmart <sup>1)</sup>	V200S

Type 404  A



<sup>1)</sup> Cable length L = 500 mm. Not available as Type 4043A... .

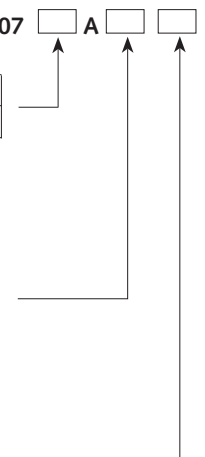
**Ordering Key**  
**Sensor M12x1**

Temperature range -20 ... 50 °C	3
Temperature range 20 ... 120 °C	5

<b>Pressure Range</b>	
0 ... 10 bar	10
0 ... 20 bar	20
0 ... 50 bar	50
0 ... 100 bar	100
0 ... 200 bar	200
0 ... 500 bar	500

Basic type	-
With PiezoSmart <sup>1)</sup>	V200S

Type 407  A



<sup>1)</sup> Cable length L = 500 mm. Not available as Type 4073A... .

Please see the PiezoSmart brochure, Doc. No. 100-421e, for detailed information about PiezoSmart sensor identification.

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