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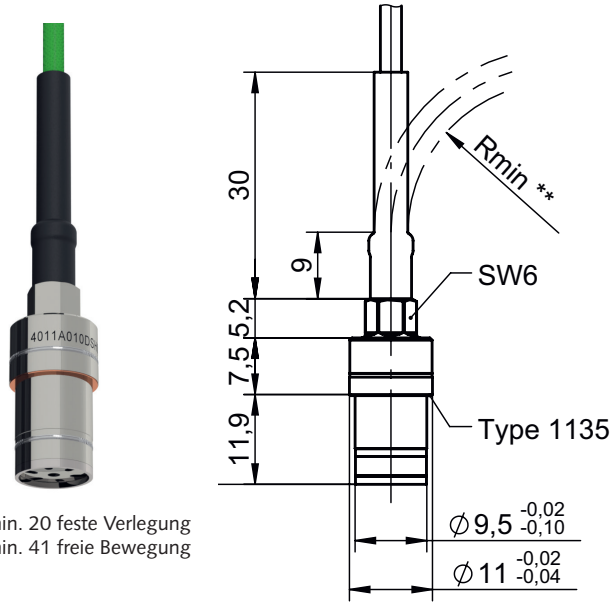
Universal absolute pressure sensor

Type 4011A...DS...

Digital compensation - modular adaptability

Absolute pressure sensor suitable for universal use.

- Pressure range from 0 … 5 bar to 0 … 500 bar
- Compensated temperature range -20 … 120°C and 15 … 180°C
- Media separation with steel diaphragms
- Temperature output for sensor monitoring
- Digital temperature compensation and PiezoSmart
- ATEX/IECEx (Ex ec) Approval for Hazardous area (optional)



Rmin. 20 feste Verlegung
Rmin. 41 freie Bewegung

Description

In the Type 4011A...DS... sensor, the pressure acts on a silicon load cell via a thin steel diaphragm and via oil as the transmission medium. The load cell contains implanted piezoresistive resistors connected to provide a Wheatstone measuring bridge. This bridge is unbalanced due to the action of pressure, producing an output signal that is proportional to the pressure. Excellent media compatibility is achieved by separation of the measuring element and the medium. Thanks to its modular structure, Type 4011A... is highly versatile.

All 4011A... versions have fully shielded cabling in order to deliver better signal quality. Kink protection minimizes cable damage.

Connections, extension cables and amplifiers are standardized throughout the digitally compensated DS sensor family, which is equipped with PiezoSmart. This means that Type 4011A... can be integrated seamlessly with piezoresistive SCP amplifiers (Types 4624A..., 4665... and 4665B...). Time is saved on measurements, and less equipment is required.

Digital temperature compensation additionally minimizes temperature-induced zero point and sensitivity changes, without impairing the signal bandwidth. Two compensation ranges are available for optimal coordination to the purpose of use. Furthermore, digital temperature compensation allows monitoring of the sensor temperature (amplifiers: Types 4665B... and 4624A...).

The sensor Type 4011A... is available with options for use in hazardous area: Zone 2, Increased safety "Ex ec".

Application

Thanks to a varied range of detachable adaptations, the basic sensor can fully replace the predecessor versions, Type 4043 / 4045 and Type 4073 / 4075, thereby offering improved measurement performance. The detachable pressure fitting ensures user-friendly mounting in the cooled switching adapter, Type 7533B12. Because it offers such diverse application options, the basic version (Type 4011A...) helps to limit the variety of types needed in test laboratories. Adapters are available either as a set with the sensor, or singly.

Type 4011A..., with its permanently welded M5, M6 and M8 pressure connections, extends the range of potential applications. The M5 version is an excellent choice for gas exchange analysis or for measuring water, fuel and oil pressures.

For hydraulic applications, the version with an M6 connection and an FPM sealing ring offers optimal characteristics.

The M8 version with a screen insert was specifically developed to measure exhaust gas pressure. Compact dimensions allow mounting in cylinder heads with integrated exhaust manifold cooling, where access is difficult. Depending on the engine and the temperatures, the M8 version can either be cooled passively, direct in the aluminum, or it can be screwed in through the cylinder head cooling jacket with the help of a mounting sleeve. The integrated temperature output is especially helpful here for monitoring the condition of the sensor.

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Technical data

Measuring ranges	bar	0 ... 5	0 ... 10	0 ... 20	0 ... 50	0 ... 100	0 ... 250	0 ... 500
Overload	bar	12.5	25	50	125	250	500	750
Electrical connection		5-pole Fischer connector (S103A054)						
Amplifier compatibility	Type	4665, 4665B, 4624A						
Power supply		Integrated in amplifier						
Reference temperature (T_{ref})	°C	15						
Sensor temperature, min./max.	°C	-40 / 180					-40 / 140	
Temperature compensation		digital						
Temperature compensation range	°C	-20 … 120 (L), 15 … 180 (H)						
Max. deviation, pressure*	%FSO	<±0.5						<±0.8
Max. deviation, temperature*	°C	<±3						
Linearity at (T_{ref}) (LSQ)	%FSO	<±0.1						<±0.3
Natural frequency	kHz	>60						
Natural frequency (acoustic)								
M6 version	kHz	>3						
M5/M8 version	kHz	>4						
Acceleration sensitivity								
radial	mbar/g	<0.4						
axial	mbar/g	<0.2						
Media compatibility		Fluids and gases compatible with stainless steel						
Degree of protection	Class	IP67						
Weight (basic sensor, without connector and cable)	Grams	<20						
Tightening torque sensor								
Basic sensor	N·m	15						
M5 version	N·m	2.5						
M6/M8 versions	N·m	6						
Tightening torque, adapter Type 7539	N·m	35						
Tightening torque, screen (M8 version)	N·m	1						
Maximum dynamic load in continuoues operation, M5/M6/M8 versions (50 million cycles @25°C)	bar	Δp <150						

* Measurement results based on digital compensation with DS-compatible amplifier. Deviations include measurement errors due to the sensor characteristic (linearity, hysteresis, temperature effects) and compensation model.

Hazardous area

Type of protection		
Ex-ec	ATEX	II 3G Ex ec IIC T3 Gc SEV 19 ATEX 0318 X
	IECEx	Ex ec IIC T3 Gc IECEx SEV 19.0041X

Note: Special conditions for safe use in potentially Hazardous areas are described in the instruction manual.

Installation

The mounting bores (Figures 2 ... 7) must conform to the specifications. The sealing surface must be clean and free of metal swarf. On the basic version, it always advisable to use a new copper sealing ring, and a new FPM sealing ring should always be used on the M6 version. On all other versions, the seal should be replaced when it is visibly damaged or if there are leaks in the installation.

When mounting, it is essential to comply with the tightening torque for the version in question (see the Technical Data table). The correct mounting tools must be used to prevent damage during mounting. The right tool can be found in the overview of optionally available accessories.

Servicing

If the M8 sensor is used in exhaust gas applications, soot particles may be deposited on the heat shield. To ensure that the sensor operates optimally, it may be necessary to clean or replace the screen.
Kistler recommends annual calibration from the date when the sensor is first used.
For more information, consult the servicing instructions or contact your Kistler agency.

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Sensor overview

Fig. 1: Sensor overview Type 4011A...DS...
1. Basic
2. M5
3. M6
4. M8
5. 4073/4075-compatible
6. 4043/4045-compatible

Dimensions and mounting bores

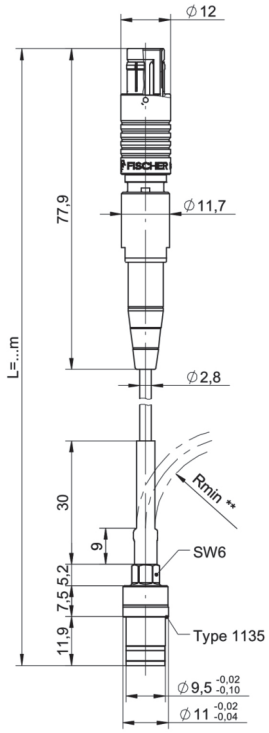
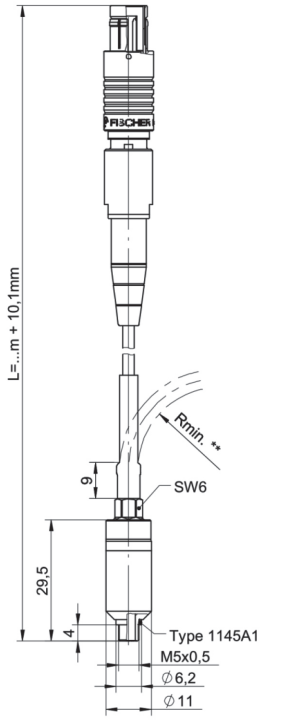


Fig. 2: Basic Type 4011A...DS...0...



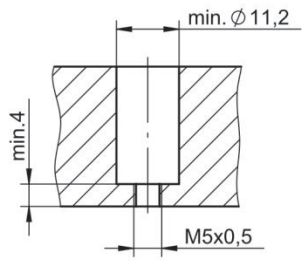
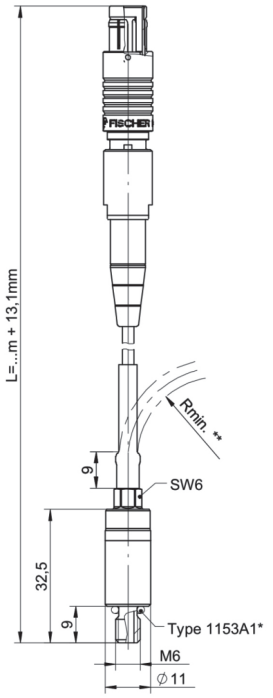


Fig. 3: M5 Type 4011A...DS...5...



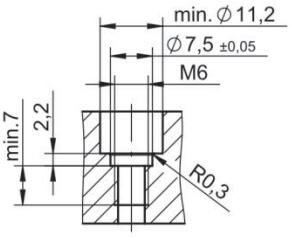


Fig. 4: M6 Type 4011A...DS...6...

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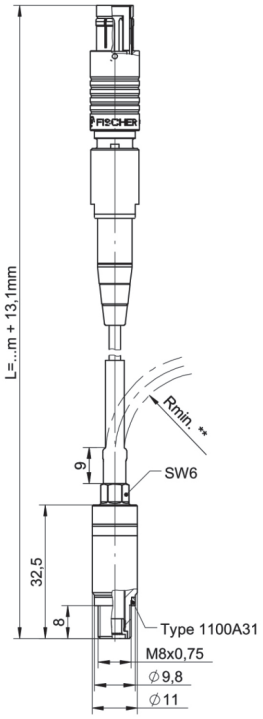
Dimensions and mounting bores (continued)



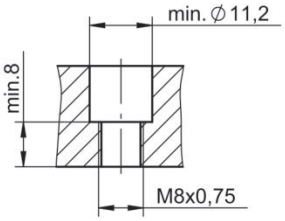
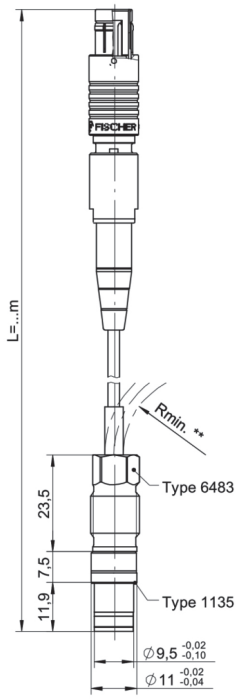


Fig. 5: M8 Type 4011A...DS...8...



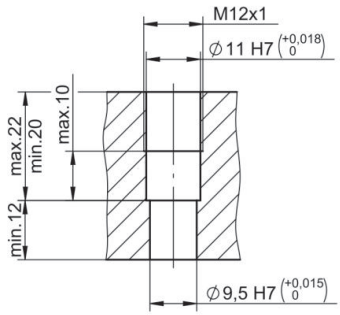
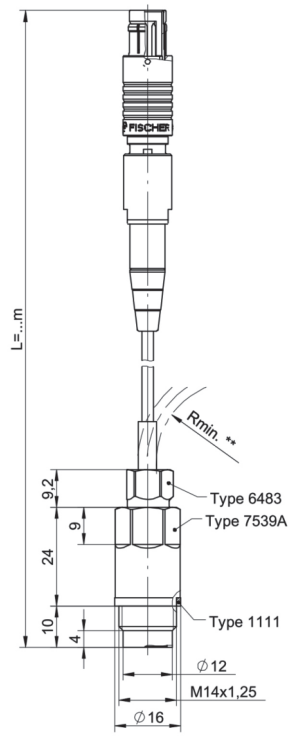


Fig. 6: 4073/4075-kompatibel Type 4011A...DS...7...



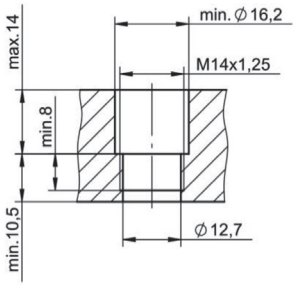


Fig. 7: 4043/4045-kompatibel Type 4011A...DS...4...

* including accessories (not mounted)
** Rmin. 20 fixed installation
Rmin. 41 free movement

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Dimensions of accessories

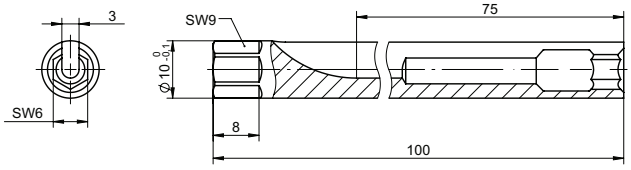

Fig. 8: Mounting tool Type 1300A165, SW9 ... SW6

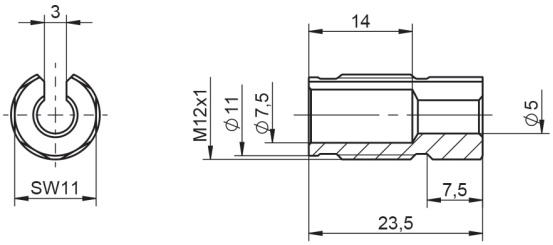

Fig. 9: Pressure fitting Type 6483

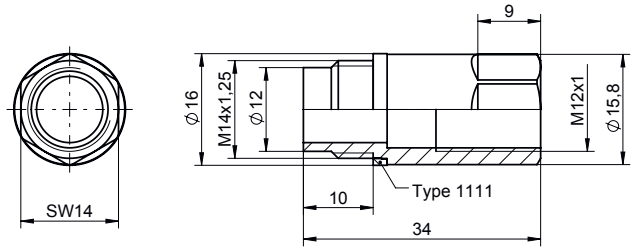

Fig. 10: Adapter Type 7539A

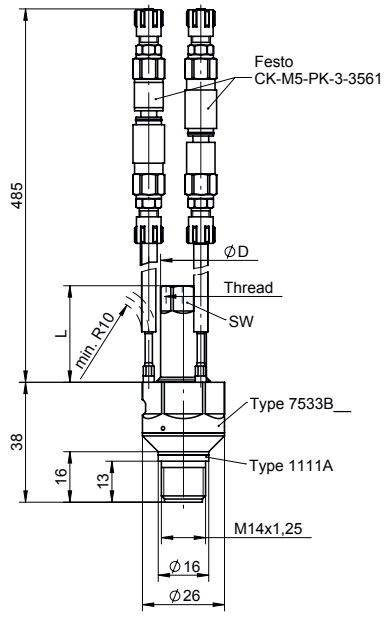

Fig. 11: Cooled switching adapter Type 7533B12 for Type 4011A...DS...7

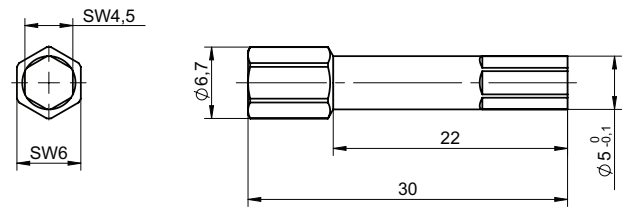

Fig. 12: Mounting tool Type 1300A167 Type 1193A

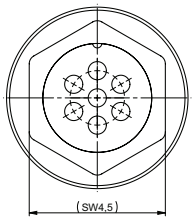

Fig. 13: Screen insert Type 1193A

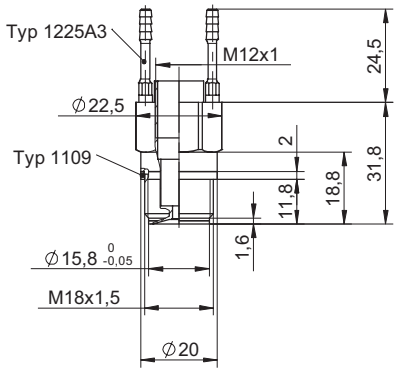

Fig. 14: Cooling adapter M18x1.5 – M12x1 Type 7505B for Type 4011A...DS...7

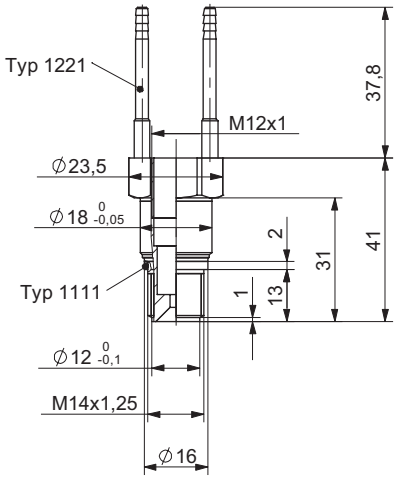

Fig. 15: Cooling adapter M14x1.25 – M12x1 Type 7507B for Type 4011A...DS...7

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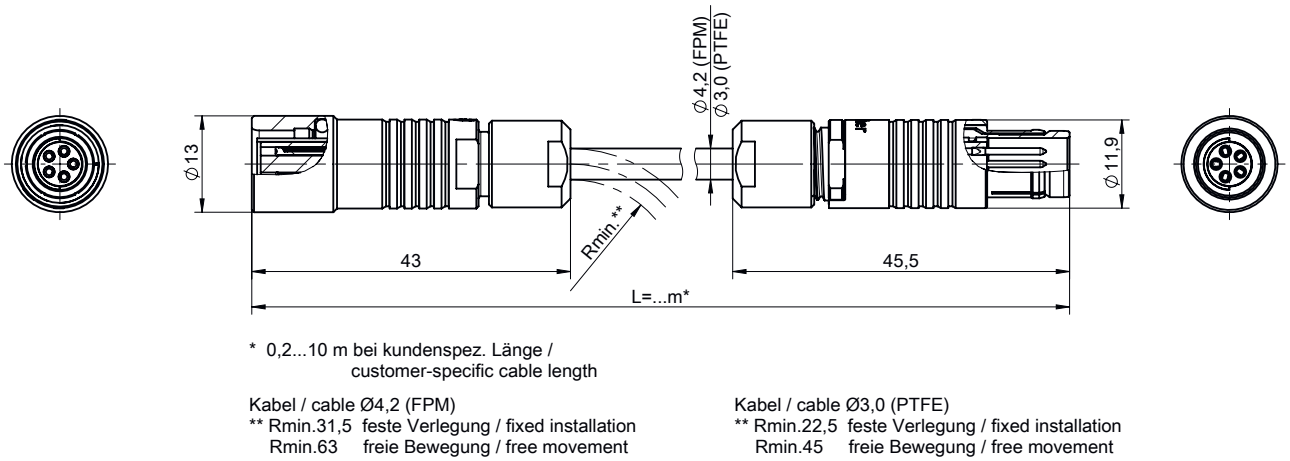

* 0,2...10 m bei kundenspez. Länge /
customer-specific cable length

Kabel / cable Ø4,2 (FPM)
** Rmin.31,5 feste Verlegung / fixed installation
Rmin.63 freie Bewegung / free movement

Kabel / cable Ø3,0 (PTFE)
** Rmin.22,5 feste Verlegung / fixed installation
Rmin.45 freie Bewegung / free movement

Fig. 16: Extension cable Type 4785A_1

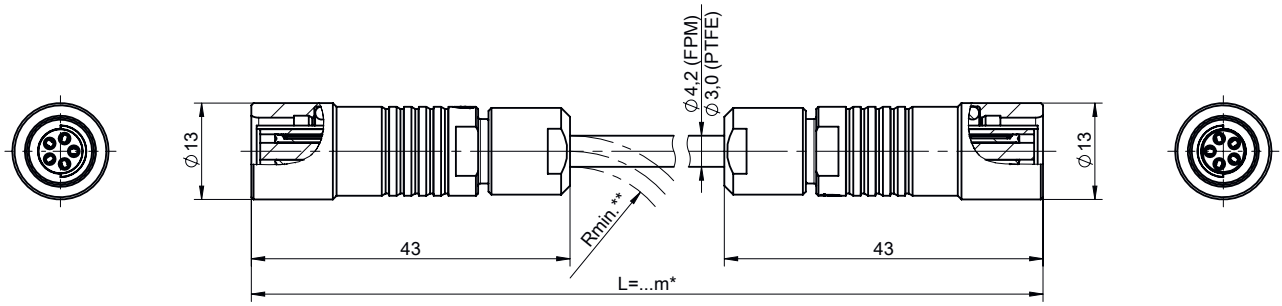

Fig. 17: Adapter cable Type 4785A_2 for an easy connection of DS sensors to existing wiring with Type 4761B...

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Accessories included	Type
Basic sensor (Type 4011A...DS...0)	
• Copper seal	1135
Type 4045-compatible (Type 4011A...DS...4)	
• Adapter M14x1.25	7539A
• Copper seal for M14-Adapter	1111
• Pressure fitting M12x1	6483
• Copper seal	1135
M5 version Type 4005/4007-compatible (Type 4011A...DS...5)	
• Copper seal for M5 pressure connection	1145A1
M6 version Type 4080A/AT-compatible (Type 4011A...DS...6)	
• FPM sealing ring 4.47x1.78 for M6 pressure connection	1153A1
Type 4075-compatible (Type 4011A...DS...7)	
• Copper seal	1135
• Pressure fitting M12x1	6483
M8 version (Type 4011A...DS...8)	
• Steel seal for M8 pressure connection	1100A31
• Screen insert	1193A

Accessories (optional)	Type
Type 4045-compatible (4011A...DS...4)	
• Torque wrench	1300A39
• Fork wrench insert SW14	1300A71
Type 4075-compatible (4011A...DS...7)	
• Cooled adapter M18x1.25	7505B
• Cooled adapter M14x1.25	7507B
• Cooled switching adapter M14x1.25	7533B12
• Fork wrench insert SW 11	1300A75
• Step drill D11/9.5	1333
• Screw tap M12x1	1355
M5-, M6-, M8 versions	
• Mounting tool SW9 ... SW6	1300A165
• Mounting tool for screen insert 1193A	1300A167
• Torque wrench incl. inserts SW6/SW9	1300A17

All versions

• Sensor extension cables FPM (0 ... 180°C)	
– L = 1 m	4785A41-1.00
– L = 2 m	4785A41-2.00
– L = 3 m	4785A41-3.00
– L = 5 m	4785A41-5.00
– L = 7.5 m	4785A41-7.50
– L = 10 m	4785A41-10.0
– L = ... m (L_{min} = 0.5/L_{max} = 10 m)	4785A41-SP-…
• Sensor extension cables, PTFE (-40 ... 180°C)	
– L = ... m (L_{min} = 0.5/L_{max} = 10 m)	4785A11-SP-...
• Adapter cable for connection of DS sensor to 4761B... cable	4785A42...
• Amplifiers	
– Piezoresistive SCP amplifier	4665B...
– Piezoresistive 1-channel amplifier	4624A...

Note: It is advisable to use the latest amplifier firmware (available at: www.kistler.com)

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Order code

Type 4011A ☐☐ DS ☐☐☐☐

Ex certification

Ex certified (Ex ec)	E
Not Ex certified	–

Pressure range

5 bar	005
10 bar	010
20 bar	020
50 bar	050
100 bar	100
250 bar	250
500 bar	500

Compensated temperature range

High temperature 15 ... 180°C *	H
Low temperature -20 ... 120°C	L

Version

Basic sensor	0
Including adapter + pressure fitting (Type 4045 compatible)	4
Thread M5, flat seal **	5
Thread M6, O-ring seal **	6
Incl. pressure fitting (Type 4075-comp.)	7
Thread M8, flat seal **	8

Cable type

PTFE cable (standard)	1

Cable lengths

0.5 m ***	-0.5
2.0 m	-2.0

* not for the 250 and 500 bar pressure ranges
** 250 bar limited strength, not for 500 bar
*** only for 5, 10 and 20 bar

Example of order

Not Ex-certified version: **Type 4011A-005DSH01-2.0**
Ex-certified version: **Type 4011AE005DSH01-2.0**

Basic sensor, pressure range 0 ... 5 bar, high temperature compensation with 2 m PTFE cable and PiezoSmart

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