

Cavity Pressure Sensor

for Low-Pressure RTM with Front $\varnothing 9$ mm

Type 4001A...

Sensor specifically developed to measure cavity pressure, and contact temperatures in the LP-RTM or autoclave processes.

- Accurate low pressure, high temperature, low viscosity measurements
- Piezoresistive design, so long term static pressure monitoring possible
- 2 independently measured and scaleable pressure channels available
- Low pressure range option ensures high resolution is guaranteed even with the smallest pressure changes, including vacuum
- The integrated temperature sensor also provides information on the temperature conditions in the mold
- Automatic temperature compensation prevents any thermal changes during the process having an influence on the true pressure signal
- High-temperature measuring element accurate up to 275 °C

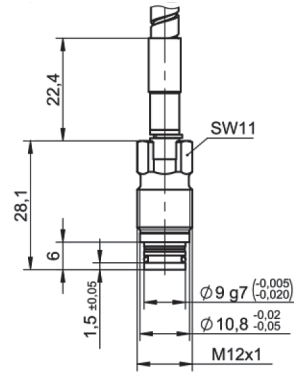
Description

This is a robust, low-pressure measuring chain for high-temperature applications. The design is based on the piezoresistive measurement principle. It therefore includes a signal amplifier matched to its individual sensor. The measuring chain allows both pressure and temperature to be measured simultaneously at the same position in the cavity. The pressure is transferred directly to the high temperature measuring element via a sealed diaphragm which forms part of mold wall.

Application

The measuring chain is designed for use in the manufacturing of fiber-reinforced parts and is particularly suitable for cavity pressure measurement in low-pressure RTM processes. In addition, this measuring chain is suitable for all applications in which low pressures must be measured accurately in thermally unstable environments.

The sensor is integrated into the mold, breaking the cavity wall, and can be used for monitoring the cavity pressure throughout the whole process: filling; during holding and in the curing phase. The measured pressure and temperature signals can be used to optimize and control of the process parameters, by reducing the effect of any unwanted process variables. Or it can be used for quality control, to determine pass/fail criteria during, rather than after, the manufacturing process. The pressure is monitored over two adjustable channels simultaneously. Pressure Channel 1 is used to measure the relatively high pressures in the filling, holding, and curing phases. Its FSO can be set to 10, 20 or 50 bar. While Pressure Channel 2 has FSO options of 2, 5 or 10 bar to monitor the pressure after evacuation.



In addition it has a 30 Hz filter to further improve the accuracy of the measurement, and can therefore be used to detect even the smallest leaks in the mold.

Technical data

Measuring chain

Channel 1 measuring range (pressure)	bar	±10, 20, or 50
Channel 2 measuring range (pressure)	bar	±2, 5, or 10
Channels 1 and 2 output signals	V	±10
Channel 3 temperature output signal	mV/K	10
voltage 0 ... 250 ° = 0 ... 2.5 V		
Overload	bar	100
Weight	kg	0.15

Operating temperatures

Sensor	°C	+20 ... 275
Sensor cable	°C	0 ... +300
Sensor cable extension	°C	0 ... +75
Sensor cable plug and amplifier	°C	0 ... +75
Connecting cable	°C	0 ... +75
Compensated temperature range	°C	35 ... 250

Measuring chain accuracy

Repeatability	%FSO	<0.1
Linearity	%FSO	<±0.5
Hysteresis	%FSO	<0.5
TCO	bar	<±0.15
TCS	%FSO	<±0.5*
Resolution	mV	±5

Amplifier

Supply voltage	V	18 ... 30
Max. current consumption	mA	<40
Frequency range (-3 dB)	kHz	0 ... >1
Degree of protection (EN 60529)		IP65

* For measuring range 2 bar 1%

Installation

The sensor is screwed directly into the M12 inner thread of the mounting bore. It is then tightened to a torque of 10 N·m (with a torque wrench). For mounting bores up to 30 cm deep the mounting tool Type 1300A42 can be used.

Once installed the front face of the sensor forms part of the cavity wall, therefore the sensor must be fitted so the face is

perfectly flush with it. Please note the front face of the sensor cannot be machined as this would damage the diaphragm. The amplifier should be fitted in a protected location on the outside of the mold, ideally at some distance from the heated mold, as the maximum permissible operating temperature of this amplifier is 75 °C. It is be mounted using four M4 screws supplied.

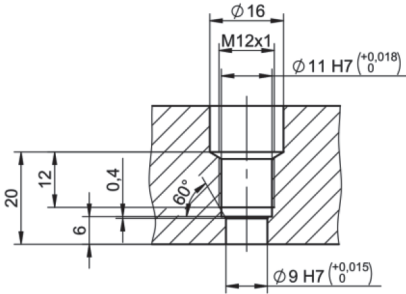


Fig. 1: Mounting bore dimensions

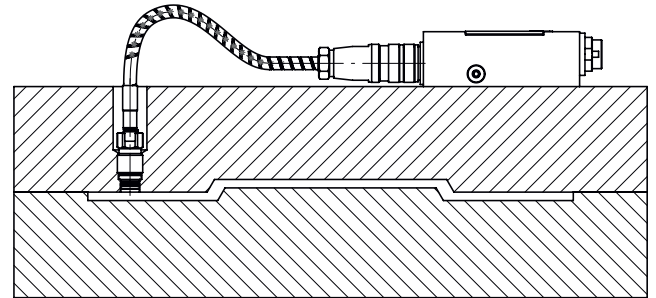


Fig. 3: Example installation in mold

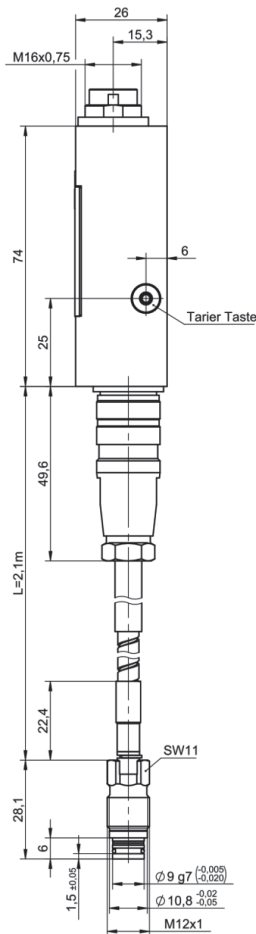
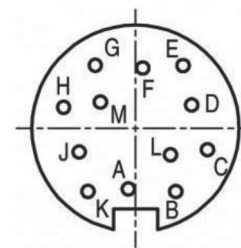


Fig. 2: Dimensioned measuring chain

Amplifier pin assignment:



Pin	Signal name	Wire color
A	Exct GND	white
B	Signal GND	brown
C	Tara	green
D	Signal Out 1	yellow
E	Signal Out 2	gray
F	RS-232C_Rx	pink
G	RS-232C_Tx	blue
H	+Exct 18 ... 30 V DC	red
J	Signal Out 3 (temperature)	black

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Included accessories	Type
• Sensor with amplifier mounted	4001A...
• M4 fixing screws	65012704

Optional accessories	Type
• Dummy plug	6570
• O-ring (replacement): FFKM	55139386
• Mounting tool	1300A42
• Connecting cable with open ends cable length options	
– Cable length L = 2 m	1200A227A2
– Special cable length L (L _{min} = 1 m / L _{max} = 30 m)	1200A227ASp
• Extension cable between sensor and transformer	4757A
• M12x1 screw tap	1355

Ordering key

		Type 4001A	A2,0
Pressure channel 1			
Measuring range ±10 bar	1	↑	
Measuring range ±20 bar	2	↑	
Measuring range ±50 bar	5	↑	
Pressure channel 2			
Measuring range ±2 bar	02		↑
Measuring range ±5 bar*	05		↑
Measuring range ±10 bar*	10		↑
Signal filter on pressure channel 2			
30 Hz filter	F		↑

* Only with Measuring range ±20 or ±50bar on Pressure Channel 1