



- ▶ **Pressure transducer for applications with Safety Integrated Level or Performance Level requirements**
- ▶ **Up to max. 5000 bar pressure range**
- ▶ **SIL 2, PL:d**
- ▶ **High accuracy  $\leq 0.5\%$  F.S.**
- ▶ **High strength, rugged stainless steel design**
- ▶ **IP65 up to IP69K protection**

The SMO3100 PLd is a version of the SMO Series intended for applications with safety integrated level or performance level requirements.

This is a high quality all stainless steel pressure transducer for use in the measurement of gases and liquids compatible with stainless steel. The SMO series sensor has well proven use for high accuracy pressure sensing in mobile hydraulics, automotive and industrial equipment amongst others, and now offers ECU and other safety controlled applications compliance with

DIN EN ISO 13849-1 and IEC 61508 and several other recognised safety accreditations.

The electronics in the SMO3100 PLd are fully enclosed in a high-strength stainless steel housing with IP67 protection as standard and up to IP69K on request. Shock and vibration and other environmental performance specifications are more than consistent with the high reliability and long life offered by these premium range sensors.

## Specifications

### Performance

Accuracy @ RT	% of the range (gauge and vacuum sensors) < 0.5 BFSL $\leq 0.125$	(incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2)
	% of the range (absolute sensors) < 1.0	
Non-linearity	% of the range $\leq 0.15$	
Repeatability	% of the range $\leq 0.10$	
Stability/year	% of the range $\leq 0.10$	
For pressure ranges above 2000 bar:		
Accuracy @ RT	% of the range (gauge and vacuum sensors) < 1.0 BFSL $\leq 0.5$	(incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2)
	% of the range (absolute sensors) < 1.0	
Non-linearity	% of the range $\leq 0.30$	
Repeatability	% of the range $\leq 0.20$	
Stability/year	% of the range $\leq 0.20$	
Response time	(10..90%) t(ms)1	
Overrange pressure	up to 2x rated pressure	
Burst pressure	up to 5x rated pressure	
Pressure cycles	> 10 million	
MTTFd	> 100 years	

### Environment

Temperature [°C]:	
Measuring medium	-40...125
Ambience	-40...105
Storage	-40...125
Compensated range	-20...85
Temperature coefficient within the compensated range:	
Mean TC offset	% of the range $\leq 0,15 / 10K$
Mean TC range	% of the range $\leq 0,15 / 10K$
Shock	1000 G, 11 msec., 1/2 Sine
Vibration	25 G peak, 20 to 2000 Hz
Sealing	IP65 up to IP69K

### Electronics

Output -> Supply	4 - 20 mA -> 10 - 32 VDC
Output impedance	< 100 $\Omega$
Current consumption	< 10 mA
Reverse voltage protection	Yes

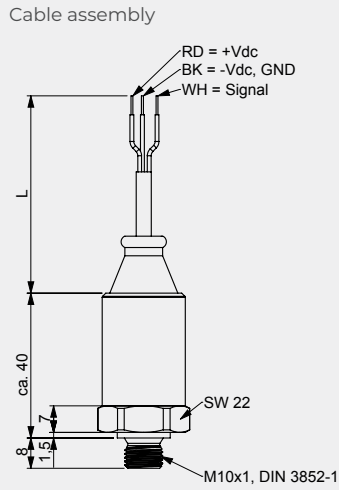
### Mechanics

Housing	304 stainless steel or titanium >2000 bar
Wetted parts	17-4PH stainless steel
Pressure port	see select table
Electrical connection	see select table
Weight	ca. 80 g

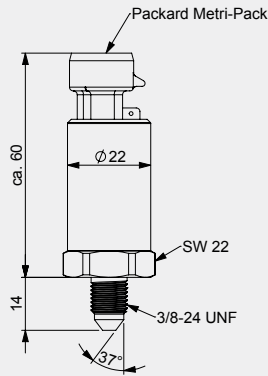


## Gauge pressure dimensions

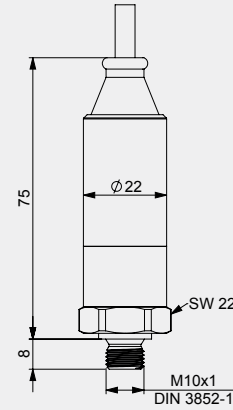
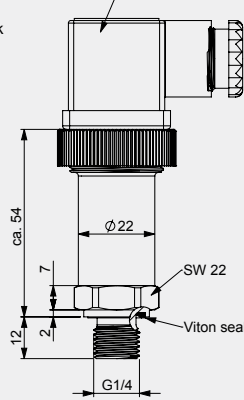
## Absolute pressure dimensions



Packard Metripac Connector



DIN EN 175301-803 Connector



Type	Output	PIN 1	PIN 2	PIN 3	PIN 4
DIN EN 175301- 803-A and C	4..20mA	+ Supply	Current output -	N/A	-
Round connector M12x1 A	4..20mA	+ Supply	N/A	Current output -	N/A
Packard Metripac	<b>Output</b>	<b>PIN A</b>	<b>PIN B</b>	<b>PIN C</b>	<b>-</b>
	4..20mA	Current output -	+ Supply	N/A	-
	<b>Output</b>	<b>Red</b>	<b>Black</b>	<b>White</b>	<b>Green</b>
Cable assembly	4..20mA	+ Supply	Current output -	N/A	-

### Ordering information

(Please use the characters in the chart below to construct your product code)

### Sample Code

SMO3100PLd - A - 01000 - B - 2 - A



Port Configuration	Pressure Range	Pressure Unit	Output Signal	Electrical Interface
A* - G 1/4" Male B* - 1/4" NPT Male C - 1/8" NPT Male D - 7/16" -20 UNF Male E - 9/16" -18 UNF Male F - M14x1.5 Male G - 1/4" SAE Female H - 3/8x24 UNF Male (Dash Size 3) M10 - M10 x 1 Custom options available on request	Please use code from table below	A - absolute pressure B - gauge pressure V - vacuum pressure	2 = 4...20 mA	A - 600 mm cable B - Miniature EN175301-803-C connector C - Packard Metripac connector D - Standard EN175301-803-A connector F - M12x1 Round connector K** - Moulded cable
		* Standard option ** Sealing IP69K		

### Pressure Range

Bar 1.0 1.6 2.5 4 6 10 16 25 40 50 60 100 160 250 400 600 1000 1600 2000 4000 5000

Order Code 00100 00160 00250 00400 00600 01000 01600 02500 04000 05000 06000 10000 16000 25000 40000 60000 100000 160000 200000 400000 500000

The SMO3100 PLd series is backed by a 1 year Warranty. The purchaser is responsible for compatibility of the media, functional adequacy and correct installation of the transmitter.

# PRESSURE SENSOR - SMO3100 PLD



## PRODUCT CONFIGURATION

Product series: SMO  
Output Signal configuration: 18.0

SIL2

## PERFORMANCE LEVEL INFORMATION

The sensor enables and EC-controlled safety system to perform as follows.  
These values have been calculated in accordance to

- [1] DIN EN ISO 13849-1
- [2] EN61508-6
- [3] IEC-TR62380
- [4] EPB-000110 & EPB-000206
- [5] FSM ZSC31050 Rev. 1.00 / April 2015

### Output Signal Safety Limits / diagnostic range:

The electronic circuitry and signal conditioner are providing defined safety limits for the output signal. These limits must be considered in the System ECU to enable the system to go into a safe state upon detecting these.

The *low* diagnostic range is <3,85mA

The *high* diagnostic range is >22mA

Depending on the detected failure, the output signal will go *below* or *above* these limits.

### Detected internal failures:

The following internal failures are detected by the signal conditioner and will actively lead to an output signal *below* or *above* the defined safety limits.

Broken bond wires (connections to the sensing element, in operation)	RESULT: >22mA
Broken bond wires (connection to the sensing element, before power on)	RESULT: <3,85mA
Internal EEPROM errors caused by CRC	RESULT: <3,85mA
Internal Watchdog (will trigger for different internal failures)	RESULT: <3,85mA

### Startup time / power on:

Startup time / power on = max 40 ms

During the defined startup period the output signal may vary between the diagnostic ranges.

The Signal must not be used in the ECU to determine sensor or system status.

### MTTFd Values / Performance Level:

The following performance level values have been determined (ref [4] and [5])

MTTFd	= 228(100*) years
Failure Rate	= 0,832310 10 <sup>-6</sup> H <sup>-1</sup>
DC (diagnostic coverage, dangerous failures)	= 72,17% (considered <i>low</i> )
CCF (common cause failures)	= 65% („use of proven component“ [5])
PERFORMANCE LEVEL	= d, for a category 2 system, acc. Table K1 of [1]

\*According to [1] the MTTFd is limited to 100 years.

The following values are not used for performance level rating, but may be used for system evaluation.

PFH	=1,392*10 <sup>-7</sup> H <sup>-1</sup>
SFF	=83,27%

The hardware architecture is defined as: 1001

Considered mission profile for failure rate calculation: *Automotive, Motor control cycling of [3]*