Pressure Sensor - SMO3100 PLd

Variohm Eurosensor

- 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 ≤ 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 13849-1and 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.

Specification

Performance		
Accuracy @ RT	% of the range (gauge and vacuum sensors) < 0.5 BFSL ≤ 0.125 % of the range (absolute sensors) < 1.0	(incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2)
Non-linearity	% of the range ≤ 0.15	
Repeatability	% of the range ≤ 0.10	
Stability/year	% of the range ≤ 0.10	
For pressure ranges above 2000 bar:		
Accuracy @ RT	% of the range (gauge and vacuum sensors) < 1.0 BFSL ≤ 0.5 % of the range (absolute sensors) < 1.0	(incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2)
Non-linearity	% of the range ≤ 0.30	
Repeatability	% of the range ≤ 0.20	
Stability/year	% of the range ≤ 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 ≤ 0,15 / 10K
Mean TC range	% of the range ≤ 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 Ω
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

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Ordering Information

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

Sample Code: SMO3100PLd - A - 01000 - B - 2 -A

Series	Port Configuration	Pressure Range	Pressure Unit	Output Signal	Electrical Interface
SMO3100PLd	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	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

Custom options available on request

* Standard option
** Sealing IP69K

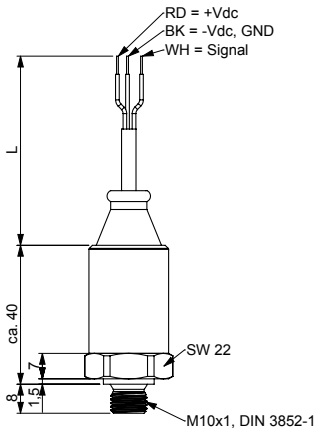
Pressure Range																					
Bar	0.6	1.0	1.6	2,5	4	6	10	16	25	40	50	60	100	160	250	400	600	1000	1600	2000	4000	5000
Order Code	00060	00100	00160	00250	00400	00600	01000	01600	02500	04000	05000	06000	10000	16000	25000	40000	60000	100000	160000	200000	400000	500000

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.

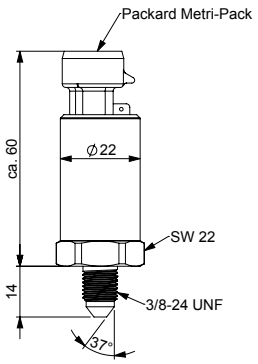
Dimensions

Gauge pressure dimensions

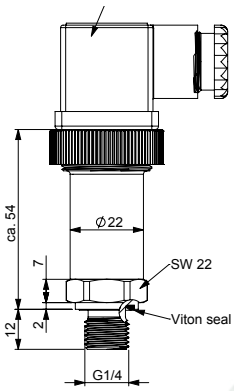
Cable assembly



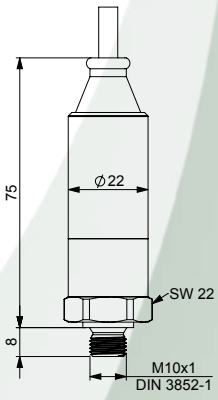
Packard Metripac connector



DIN EN 175301-803 connector



Absolute pressure dimensions



Wiring

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
	Output	PIN A	PIN B	PIN C	-
Packard Metripac	4..20mA	Current output -	+ Supply	N/A	-
	Output	Red	Black	White	Green
Cable assembly	4..20mA	+ Supply	Current output -	N/A	-

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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 circuity 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])

- $MTTF_d$	**= 228(100*) years**
- Failure Rate (λ_F)	**= 0,832310 10^{-6} H^{-1}**
- DC (diagnostic coverage, dangerous failures)	**= 72,17% (considered *low*)**
- 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 $MTTF_d$ 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* $10^{-7}H^{-1}$**
- SFF	**= 83,27%**

The hardware architecture is defined as: 1001
Considered mission profile for failure rate calculation: *Automotive, Motor control cycling of [3]*