

- 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.

Specification

| Performance | | | Environment | |
|--|---|---|--|---|
| Accuracy @ RT | % of the range (gauge and vacuum sensors) < 0.5 | (incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2) | Temperature [°C]: | |
| | BFSL ≤ 0.125 | | Measuring medium -40...125 | |
| | % of the range (absolute sensors) < 1.0 | | Ambience -40...105 | |
| | | | Storage -40...125 | |
| | | | Compensated range -20...85 | |
| Non-linearity | % of the range ≤ 0.15 | | Temperature coefficient within the compensated range: | |
| Repeatability | % of the range ≤ 0.10 | | Mean TC offset | % of the range $\leq 0,15 / 10K$ |
| Stability/year | % of the range ≤ 0.10 | | Mean TC range | % of the range $\leq 0,15 / 10K$ |
| | | | Shock | 1000 G, 11 msec., 1/2 Sine |
| For pressure ranges above 2000 bar: | | | Vibration | 25 G peak, 20 to 2000 Hz |
| Accuracy @ RT | % of the range (gauge and vacuum sensors) < 1.0 | (incl. nonlinearity, hysteresis, repeatability, zero-offset and final offset acc. to IEC 61298-2) | Sealing | IP65 up to IP69K |
| | BFSL ≤ 0.5 | | | |
| | % of the range (absolute sensors) < 1.0 | | Electronics | |
| Non-linearity | % of the range ≤ 0.30 | | Output → Supply | 4 - 20 mA → 10 - 32 VDC |
| Repeatability | % of the range ≤ 0.20 | | Output impedance | < 100 Ω |
| Stability/year | % of the range ≤ 0.20 | | Current consumption | < 10 mA |
| Response time | (10..90%) t(ms)1 | | Reverse voltage protection | Yes |
| Overrange pressure | up to 2x rated pressure | | Mechanics | |
| Burst pressure | up to 5x rated pressure | | Housing | 304 stainless steel or titanium >2000 bar |
| Pressure cycles | > 10 million | | Wetted parts | 17-4PH stainless steel |
| MTTFd | > 100 years | | Pressure port | see select table |
| | | | Electrical connection | see select table |
| | | | Weight | ca. 80 g |

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

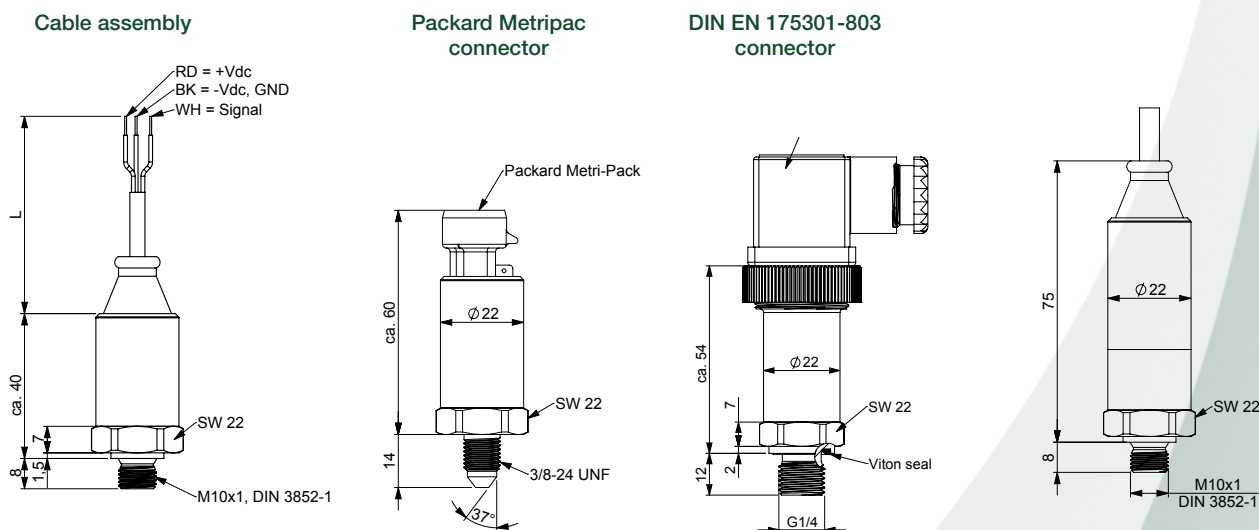
| Bar | 0.6 | 1.0 | 1.6 | 2.5 | 4 | 6 | 10 | 16 | 25 | 40 | 50 | 60 | 100 | 160 | 250 | 400 | 600 | 1000 | 1600 | 2000 | 4000 | 5000 |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| 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

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



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])

- | | |
|--|--|
| - $MTTF_d$ | = 228(100*) years |
| - Failure Rate (λ_p) | = 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]*