



PIEZORESISTIVE OEM PRESSURE TRANSDUCERS

LASER WELDED DIAPHRAGM – COMPATIBLE WITH CORROSIVE MEDIA

KELLER's expertise in laser welding very thin materials enables the production of a line of transducers with a crevice-free media interface while improving on performance and long-term stability.

Each transducer undergoes extensive automated testing and is supplied with calibration data which includes sensitivity, linearity, initial zero offset and thermal effects over the compensated temperature range. This provides the user with the information required to ensure performance within specifications.

The 3 L...10 L transducers feature floating O-ring mounting to avoid errors which can be caused by mechanical stresses imparted to the transducer housing and ensures performance within the specifications. The transducer housing encases the piezoresistive silicon pressure sensor and a small quantity of oil, the latter of which is required to efficiently transfer the pressure exerted on the media-isolation diaphragm to the silicon pressure sensor.

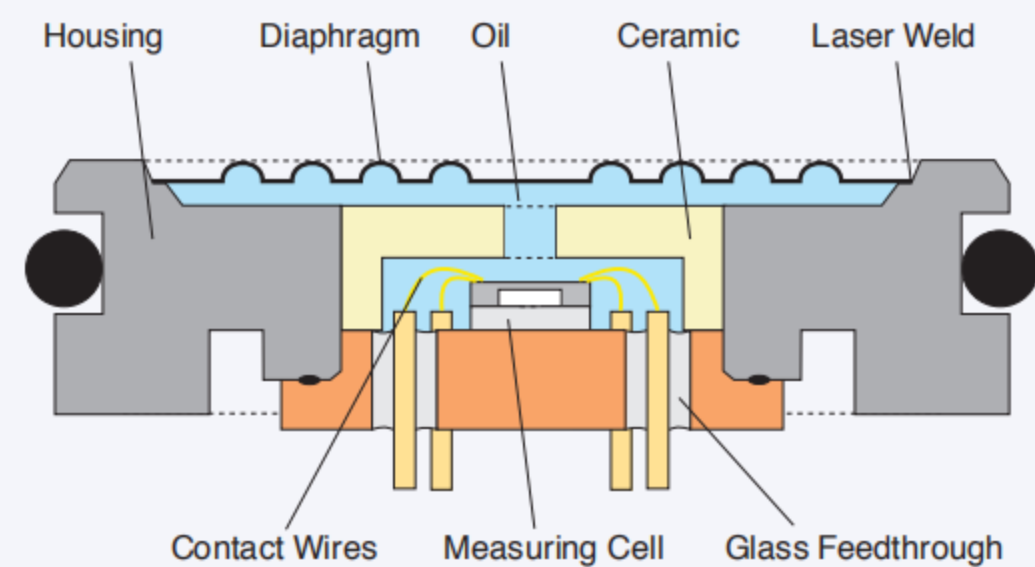
The type of oil is most typically silicone but other oils are available for special applications where silicones are not allowed.

With the laser welded technology, transducers having diameters as low as 9,5 mm can be realised. As can be discerned from the below chart, the lower the pressure ranges are available in only the larger, i.e., Ø 19 mm diameter, due to the inherent increase in diaphragm stiffness as the diameter is reduced.

SERIES 4L, 6L, 8L 6LHP, 7LHP, 10LHP



Type	Dimensions (mm)	Ranges (bar)	Version
4L	Ø 11 x 4,2	10...200	abs.
6L	Ø 13 x 4,5	20...200	abs.
8L	Ø 17 x 7	0,2...200	abs. / rel. (<50 bar)
6LHP	Ø 13 x 8	200...1000	abs.
7LHP	Ø 15 x 8	200...1000	abs.
10LHP	Ø 19 x 15	200...1000	abs. / rel. (<50 bar)





Specifications

Excitation I = 1 mA

Standard Pressure Ranges (FS) in bar

PR	-1	-0,5	-0,2	-0,1	0,1	0,2	0,5	1	2	5	10	20						
PD					0,1	0,2	0,5	1	2	5	10	20	50					
PAA					0,1	0,2	0,5	1	2	5	10	20						
PA								1	2	5	10	20	50	100	200	400	600	1000
Overpressure	-1	-1	-1	-1	2,5	2,5	2,5	3	4	7	15	30	100	200	300	600	900	1100

PR: Vented Gauge. Zero at atmospheric pressure PAA: Absolute. Zero at vacuum PA: Sealed Gauge. Zero at atmospheric pressure (at calibration day) PD: Differential

Bridge Resistance @ 25 °C	3,5 kΩ	± 20%
Constant Current Supply	1 mA nominal	3 mA max.
Insulation @ 500 VDC	100 MΩ	
Compensated Range ⁽¹⁾	-10...80 °C (4L: 0...50 °C)	
Storage- / Operating Temperature	-20...100 °C (4L: -10...80 °C)	
Vibration (20 to 5000 Hz)	20 g	
Endurance @ 25 °C	> 10 Mio. FS cycles	
Housing and Diaphragm	Stainless steel, type 316L ⁽¹⁾	
O-Ring Material	Viton® ⁽¹⁾	
Oil Filling	Silicone oil ⁽¹⁾	
Dead Volume Change @ 25 °C	< 0,1 mm ³ / FS	

	Compensated Range 0...50 °C		Compensated Range -10...80 °C	
	TK (Zero) max. ⁽⁴⁾ [mV/°C]	Stability typ. [mV]	TK (Zero) max. [mV/°C]	Stability typ. [mV]
Series 4L	0,0375	0,75	—	—
Series 6L, 6LHP, 7LHP, 8L, 10LHP	0,025	0,50	0,050	0,75

Accuracy ⁽²⁾	0,25 %FS typ. ⁽¹⁾	0,5 %FS max.
Offset at 25 °C	< 5 mV (compensated with R5 of 20 Ω ⁽³⁾)	
Temperature Coefficient Sensitivity	0,02 %/°C typ. (0...50 °C) 0,05 %/°C typ. (-10...80 °C)	
Natural Frequency (Resonance)	> 30 kHz	

The sensor characteristics may be influenced by installation conditions. Please follow the installation instructions on our product-specific web pages.

- (1) Others on request.
- (2) Including linearity, hysteresis and repeatability. Linearity calculated as best straight line through zero.
Note: Generally, accuracy and overload is improved by factor of 2 to 4 if the sensor is used in the range of 0...50 %FS
- (3) External compensation; potentiometer is not supplied.
- (4) Temperature-Coefficients of Zero

Options

- Oil for low temperatures. Oxygen-compatible oil. Olive oil.
- Integrated temperature sensor (version PA, PAA, PR)
- Special characteristics: Linearity, overpressure, lower TC-zero resp. TC-sensitivity
- Extended temperature range from -55 to 150 °C (except 4L and 6L)
- All pressure ranges between 0,1 and 1000 bar
- Compensation PCB fitted
- Mathematical modelling: See data sheet Series 30X

PA-10L/20 BAR/81838.3 ⁽¹⁾ SN E133755 ⁽²⁾ 134				
⁽³⁾ Temp [°C]	⁽⁴⁾ Zero [mV]	^{(5)+1000 [mV]}	⁽⁶⁾ Comp [mV]	⁽⁷⁾ dZero [mV]
-9.8	0.0	-2.6	0.4	0.2
-0.6	0.1	-2.6	0.4	0.1
21.8	0.2	-2.8	0.2	0.0
49.4	0.5	-2.9	0.0	-0.2
79.6	0.8	-3.2	-0.2	-0.4
COMP R1	1000 kOhm ⁽⁸⁾	R4	12.0 Ohm ⁽⁸⁾	
RB	3465 Ohm ⁽⁸⁾			
ZERO	0.2 mV ⁽⁹⁾	P_atm	965 mbar ⁽¹⁰⁾	
SENS	8.43 mV/bar at 1.000 mA ⁽¹¹⁾			
⁽¹²⁾ [bar]	⁽¹³⁾ [mV]	⁽¹⁴⁾ Lnorm [%FS]	⁽¹⁵⁾ LbfsL [%FS]	
0.000	0.0	0.00	-0.11	
5.000	42.4	0.14	0.07	
10.000	84.5	0.15	0.11	
15.000	126.5	0.04	0.04	
20.000	168.3	-0.15	-0.11	
Long Term Stability Ok ⁽¹⁶⁾				
Lot 70590 ⁽¹⁷⁾				
Test 500 Volt ok ⁽¹⁸⁾				
Supply 1.000 mA ⁽¹⁹⁾				
20.06.15 ⁽²⁰⁾ ----- PH02.A03DqK ⁽²⁰⁾				

- Each sensor is delivered with a calibration sheet with the following data:
1. Type (PA-10L) and range (20 bar) of pressure sensor
 2. Serial number of pressure sensor (not standard)
 3. Test temperatures
 4. Uncompensated zero offset in mV
 5. Zero offset values, in mV, with test resistance (1000 kΩ) (for factory computation only)
 6. Zero offset, in mV, with calculated compensation resistors
 7. Temp. zero error, in mV, with compensation resistors
 8. Compensation resistor values R1 / R2 and R3 / R4, RB: Bridge resistance
 9. Offset with compensation resistors R1/ R2 and R3 / R4 fitted (fine adjustment of zero with R5 potentiometer)
 10. Ambient pressure, zero reference for absolute sensors < 20 bar
 11. Sensitivity of pressure sensor
 12. Pressure test points
 13. Signal at pressure test points
 14. Linearity (best straight line through zero)
 15. Linearity (best straight line)
 16. Results of long term stability
 17. Lot-type (on request, identification of silicon chip)
 18. Voltage insulation test
 19. Excitation (constant current)
 20. Date of test -----Test equipment

Remarks:

- The indicated specifications apply only for constant current supply of 1 mA. The sensor must not be supplied more than 3 mA. The output voltage is proportional to the current supply (excitation). By using excitation unlike the calibrated excitation the output signal can deviate from the calibrated values.
- If exposed to extreme temperatures, the compensation resistors should have a temperature coefficient of < 50 ppm/°C. Sensor and resistors can be exposed to different temperatures.
- The sensors may be ordered with integrated compensation resistors (surcharge).

