



# HIGH ACCURACY OEM PRESSURE TRANSMITTERS

# SERIES 9LX

WITH ANALOG AND DIGITAL OUTPUTS

Whether embedded in an OEM product or simply packaged as a high-end pressure transmitter, the Series 9LX enables the OEM to offer superior performance without the need for huge R&D or capital expenditures, and with minimum amount of on hand inventory.

Designed to be easily integrated into a wide variety of applications, the 9LX features a flush-welded diaphragm and highly stable piezoresistive sensing element. Combined with Keller's advanced signal-conditioning circuitry, the 9LX features dual (analog & digital) outputs, re-rangeability and mathematical error correction. The result is outstanding Total Error Band (TEB)<sub>1</sub> accuracy over a wide compensated temperature range.

For more information on the 9LX, or any other Keller product, please contact Keller America, or view the entire Keller catalog at <http://www.kelleramerica.com/datasheets.html>.

## FEATURES

Programmable analog outputs enables infinite range options

Standard dual (analog & RS485) outputs simplify interface to controls, data collection, and telemetry systems

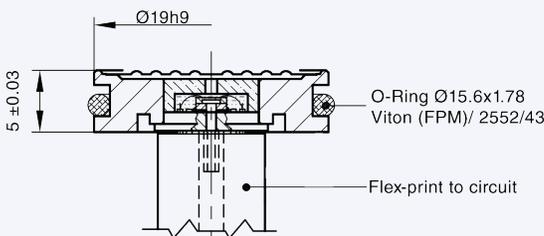
16-bit internal digital correction for cost-effective low  $\pm 0.1\%$  Total Error Band (TEB)<sub>1</sub> accuracy over -10...80°C

Factory calibrated for guaranteed "out-of-the-box" performance.

316L SS flush-diaphragm sensor standard - Optional Titanium or Hastelloy - C276 for severe applications.

RS485 modified-MODBUS compatible interface allows up to 128 transmitters on a single bus.

Separate output for temperature via RS485 interface.



Circuit	Output	Supply	Current Consumption	Dimension
9l 101	4...20mA+RS485	8...32 VDC	3.2...22.5 mA	16.8 x 26.0 x 1.0 mm
9l 104	4...20mA +RS485	8...32 VDC	3.2...22.5 mA	16.8 x 30.89 x 1.0 mm
9l 098	10VDC+RS485	13...32 VDC	Typical 5.5 mA	16.8 x 26.0 x 1.0 mm
9l 113	10VDC+RS485	13...32 VDC	Typical 5.5 mA	16.8 x 30.89 x 1.0 mm
9l 140	RS485 Only	3.2...32 VDC	Typical 2 mA	16.8 x 26.0 x 1.0 mm
9l 145	RS485 Only	3.2...32VDC	Typical 2 mA	16.8 x 30.89 x 1.0 mm

All board versions include identical components. Long versions (30.89 mm) include mounting hole (2.54 mm O.D.) for fixture and case-GND connection.



## Pressure Ranges<sub>1,2</sub>

Relative	1, 3, 10, and 30 Bar
Absolute	2, 4, and 11 bar
Proof Pressure <sub>3</sub>	
1 Bar	3x BR
3 Bar	2x BR
10 Bar	1.5x BR
30 Bar	2x BR
2 Bar	2x BR
4 Bar	2x BR
11 Bar	1.5x BR

1. Basic units are stated in units of bar. Basic ranges also available in intermediate / higher pressure ranges on request. Keller America uses the conversion of 14.504 psi/bar.
2. Intermediate ranges are realized by re-ranging the analog output. Scalability of analog output recommended limits: 10 - 110% of basic range.
3. Proof pressure is stated as multiple of basic range (BR).

## Output

Current	4...20mA + RS485
Voltage	0...10VDC + RS485
Analog Update Rate	400 Hz
Digital	RS485 Only
Resolution <sub>4</sub>	0.002% BR
Baud Rate <sub>5</sub>	9600 / 115200

4. Resolution applies to digital output only. Analog resolution is continuous and limited by the process meter and not the instrument.
5. Baud rate is set at 9600 by default. Switching to 115200 can be accomplished using Keller CCS30 software.

## Accuracy<sub>6</sub>

Static	± 0.05% FS
Total Error Band	± 0.1% FS

6. Static accuracy includes the combined effects of non-linearity, hysteresis, and non-repeatability at room temperature (25°C). Total Error Band (TEB) includes static accuracy plus thermal dependencies, over the compensated temperature range, using mathematical modeling - an error correction technique whereby the internal microprocessor utilizes stored coefficients to calculate the precise pressure value. The transmitter is factory-tested over a matrix of pressure and temperature that fully encompasses the basic pressure, as well as the compensated temperature, ranges. The measured pressure signal (S), together with the corresponding known values for pressure and temperature are used to calculate coefficients A0 - D3. These are written into the EEPROM. The microprocessor measures the signal for the pressure (S) and temperature (T) and calculates coefficients A(T) - D(T) according to:

$$A(T) = A0 \cdot T0 + A1 \cdot T1 + A2 \cdot T2 + A3 \cdot T3$$

$$B(T) = B0 \cdot T0 + B1 \cdot T1 + B2 \cdot T2 + B3 \cdot T3$$

$$C(T) = C0 \cdot T0 + C1 \cdot T1 + C2 \cdot T2 + C3 \cdot T3$$

$$D(T) = D0 \cdot T0 + D1 \cdot T1 + D2 \cdot T2 + D3 \cdot T3$$

Finally the exact pressure value is calculated according to:

$$P(S,T) = A(T) \cdot S0 + B(T) \cdot S1 + C(T) \cdot S2 + D(T) \cdot S3$$

The pressure output is updated at a rate of 400Hz, in order to effectively maintain correction accuracy even during thermal transients.

## Electrical

Supply Voltage		
4-20mA + RS485	8...32 VDC	
10VDC + RS485	13...28 VDC	
RS485 Only <sub>7</sub>	3.2...32VDC or 8...32VDC	
Load Resistance (mA)	<(Supply-8V)/0.022A	
Load Resistance (VDC)	>4k ohm	
Startup Time <sub>8</sub>	Typical 500mS (Max 1 Second)	

7. The RS485-only versions can be manufactured with either low or standard supply voltage. Please specify when ordering.
8. Measured at PC board connector.

## Environmental

Operating Temp.	-30...100° C
Compensated Temp.	-10...80° C
Construction	316 L Stainless Steel
	Titanium, Hastelloy C-276 Optional
	Viton O-Ring: 15.6mm ID x 1.78mm wall, 70 Shore A

## Connectivity

Elec. Connection <sub>8</sub>	Solder pads or Molex milli-grid (2mm)
Bus Compatibility	Modified-MODBUS, up to 128 devices
Software <sub>9, 10</sub>	CCS30

8. Details can be provided for Molex crimp pins, shell and crimp tool, or Keller America can supply mating connectors with wires attached for an additional charge.
9. Converter cable required (sold separately).
10. Keller software can be provided on CD or via free download at [www.kelleramerica.com](http://www.kelleramerica.com). It may be used for all RS485 communication, including configuration setup (scaling, online re-zero, etc.) and data acquisition. Also available, for those who wish to develop in-house communication software, are the DLL file and protocol documentation.

## Installation Recommendations

Housing Bore	Ø.750+-.003/- 0, 32RMS
Axial Clearance	+ .005/+ .010
Circuit Potting	Low viscosity, medium hardness silicone rubber with <0.1% shrinkage during cure.