



PIEZORESISTIVE OEM PRESSURE TRANSMITTERS SERIES D Ei

WITH I²C INTERFACE FOR HAZARDOUS AREAS

Introducing the Keller Intrinsically safe D-line; a unique combination of robust industrial pressure transducers and the popular I²C microcontroller interface for use in hazardous industrial applications (Gas Group II). Pressure transmitters with this interface are typically available only in consumer-grade plastic or ceramic housings, where only compensation parameters are stored in integrated memory. The Keller intrinsically safe D-Line, however, have unprecedented embedded digital signal conditioning core for both the compensation and normalization of the output values.

Interface

The easiest way to couple an OEM pressure transmitter to a microcontroller based system is a digital I/O-compatible interface; no amplification, no analog to digital conversion, no calibration, no temperature coefficients. In short: no problems.


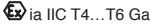
I²C (Inter-Integrated Circuit) is designed for a direct connection between devices on a printed circuit board. It is a BUS-system because it allows the connection of multiple transmitters (slaves) to the same communication lines, but it is not a fieldbus with the classic long distance inter-connectability. So the intrinsically safe D-Line combines an industrial pressure interface for harsh environment with an electrical interface for OEM applications.


The values are in 16 Bit unsigned integer format and the scaling is given by constants or by the memory content of the transmitter (two floating point values IEEE 754 for the pressure scaling).

Performance features

- Ultra low power consumption, optimised for battery powered applications
- Hermetically protected sensor electronics – extremely resistant to environmental influences
- Ultra-compact, robust housing made from stainless steel (optional Hastelloy C-276)
- No external electronics for compensation or signal processing
- Extremely accurate, outstanding long-term stability, no hysteresis
- Pressure ranges of 1 bar to 1000 bar
- Easy to integrate into microcontroller based systems
- Internal two-chip solution with pressure sensor and signal processing separation provides a high degree of flexibility

Ex-Classification

 II 1G
 ia IIC T4...T6 Ga
 EPS 14 ATEX 1661 X
 IECEx EPS 14.0027 X

 0081

Temperature class	Ambient temperature	U _{i max}	≤ 7 V
T4	-40...+110 °C	I _{i max}	≤ 200 mA
T5	-40...+ 80 °C	P _{i max}	≤ 250 mW
T6	-40...+ 65 °C	C _i	220 nF
		L _i	0 mH



I²C is a trademark of NXP



6 LD Ei / 7 LD Ei (high pressure)

Series 4 LD Ei
Ø 11

Series 7 LD Ei
Ø 15

Series 9 LD Ei
Ø 19

Connection

Series 9 FLD Ei
Ø 17 / Ø 21

Series 6 LD Ei
Ø 13 / high pressure

Series 7 LD Ei
Ø 15 / high pressure

For proper handling please check our [installation instructions](#) on our product specific web page.

Label	Description	Wire
SUP	1,8...3,6 V	BK
GND	GND	WH
SCL	I ² C Clock	YE
SDA	I ² C Data	BU
EOC	End of Conversion	RD



Specifications

Pressure Ranges rel.												
PR	0...1	-0,5...0,5	-1...3	-1...10	-1...30							bar

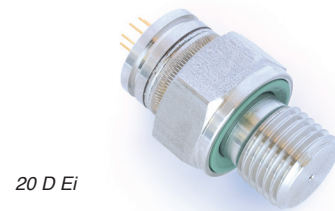
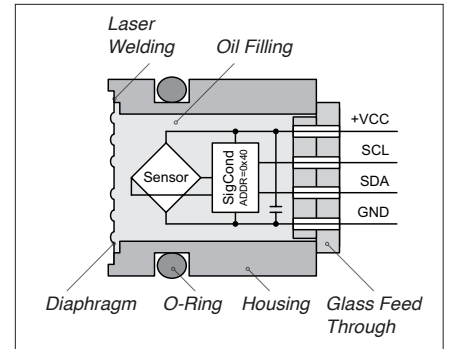
Pressure Ranges abs.												
PA			0...3	0...10	0...30	0...100	0...200	0...400	0...600	0...1000		bar
PAA	0...1	0,5...1,5	0...3	0...10								bar

Accuracy max. $\pm 0,15$ %FS (Linearity best straight line@RT, hysteresis, repeatability)
 Overpressure 4 x pressure range (max. 350 bar resp. 1200 bar for 6 LD Ei / 7 LD Ei (high pressure))
 Long Term Stability typ. $\pm 0,1$ %FS, max. $\pm 0,2$ %FS (limited to max. ± 3 mbar)

Type/ Version	Dimensions [mm] ⁽⁴⁾	Pressure Range	Operating Temperature	Comp. Temp. Range	TEB ⁽¹⁾ [%FS]
4 LD Ei	$\varnothing 11 \times 4,2$	3...200 bar abs. ⁽²⁾	-10...+80 °C	0...50 °C	$\pm 0,7$ %FS
7 LD Ei	$\varnothing 15 \times 5$	3...200 bar abs. 3...30 bar rel. ⁽³⁾	-40...+110 °C	0...50 °C -10...80 °C	$\pm 0,5$ %FS $\pm 0,7$ %FS
9 LD Ei	$\varnothing 19 \times 5$	1...200 bar abs. 1...30 bar rel.	-40...+110 °C	0...50 °C	$\pm 0,5$ %FS
9 FLD Ei	$\varnothing 17 \times 5,5$ Flange $\varnothing 21$	1...30 bar abs. 1...30 bar rel.		-10...80 °C	$\pm 0,7$ %FS
6 LD Ei	$\varnothing 13 \times 8$	400...1000 bar abs.	-40...+110 °C	0...50 °C	$\pm 0,7$ %FS
7 LD Ei	$\varnothing 15 \times 8$			-10...80 °C	$\pm 1,0$ %FS

⁽¹⁾ TEB (Total Error Band): Maximum deviation within specified pressure and compensated temperature range
⁽²⁾ abs: Absolute Pressure Measurement (PAA: Absolute, Zero at vacuum PA: Sealed Gauge, Zero at 1,0 bar abs.)
⁽³⁾ rel: Referential version (PR: Vented Gauge, Zero at atmospheric pressure)
⁽⁴⁾ Dimensions without glass feed through

Interface digital I²C (serial synchronous)
 Signal Output P [bar], T [°C]: normalised to 16 Bit unsigned integer
 Pressure Range Reserve typ. ± 10 %FS, min. ± 5 %FS
 Supply 1,8...3,6 V
 Power Consumption typ. 1,5 mA during conversion
 typ. 100 nA in idle mode
 Bit Rate ≤ 400 kHz
 Start-up Time (Supply ON) < 1 ms
 Conversion Time typ. 6 ms, max. 8 ms (for P and T)
 Logic Levels LOW: max. 15 %V_{SUP}, HIGH: min. 85 %V_{SUP}
 Noise Floor max. $\pm 0,015$ %FS (temperature 4 Bit)
 Temperature Accuracy typ. ± 2 °C
 Supply Voltage Dependency none
 Isolation > 100 M Ω @ 500 VDC
 ESD – Human Body Model > 4 kV (HBM: C = 100 pF / R = 1,5 k Ω)
 Material in Contact with Media
 – Stainless Steel AISI 316L (DIN 1.4404 / 1.4435)
 – O-Ring: Viton® Shore A (-20...200 °C, exchangeable)
 Oil Filling Silicone oil, others on request
 Pressure Endurance 0...100 %FS @ 25 °C: > 10 million pressure cycles
 with appropriate installation
 Vibration Endurance 20 g, 5...2000 Hz, X/Y/Z-Achse
 Shock 75 g sine 11 ms
 Electrical Connection
 – Glass feed through pins $\varnothing 0,45$ mm, L = $4 \pm 0,5$ mm
 – Adapter print with plug JST
 – Adapter print with flexible wires or cable
 Options
 – Hastelloy housing (depending on version also Inconel)
 Other possible versions
 – OEM, IP54, and IP68 versions available. See Illustrations.
 – Level Probe 26 D Ei (300 mbar rel. = approx. 3 mH₂O)
 Remarks
 – Intermediate pressure range on request.
 – 21 D Ei / 23 D Ei / 26 D Ei: Shielded cable 0.5 to 3 m
 – Cable capacitance < 200 pF/m
 – Series 21 D Ei / 23 D Ei is not available with plug
 – The complete communication protocol is available on
 the KELLER homepage.
 Recommended Zener barrier Z042 from Pepperl + Fuchs



20 D Ei



21 D Ei (IP54)



23 D Ei (IP68)