# 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.

*4 LD Ei*

*7 LD Ei*

*9 LD Ei*

*9 FLD Ei*

*6 LD Ei / 7 LD Ei (high pressure)*

## 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
CE 0081

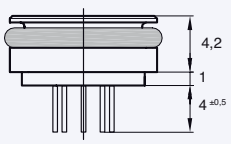
| Temperature class | Ambient temperature |
|---|---|
| T4 | -40…+110 °C |
| T5 | -40…+ 80 °C |
| T6 | -40…+ 65 °C |

| | |
|---|---|
| $U_{i\,max}$ | ≤ 7 V |
| $I_{i\,max}$ | ≤ 57 mA |
| $P_{i\,max}$ | ≤ 100 mW |
| $C_i$ | 10 nF |
| $L_i$ | 0 mH |

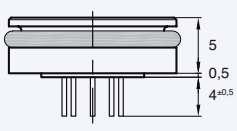
I²C BUS

*I²C is a trademark of NXP*

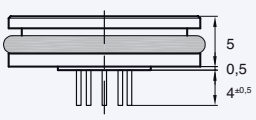
**Series 4 LD Ei**
Ø 11



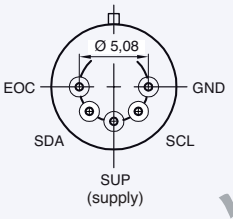

**Series 7 LD Ei**
Ø 15




**Series 9 LD Ei**
Ø 19

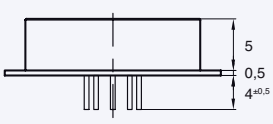



**Connection**

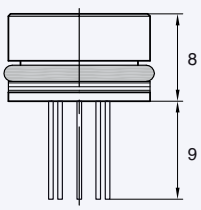



RoHS

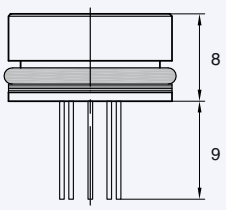
**Series 9 FLD Ei**
Ø 17 / Ø 21




**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 | I²C Clock | YE |
| SDA | I²C Data | BU |
| EOC | End of Conversion | RD |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Companies approved to ISO 9001
www.keller-druck.com

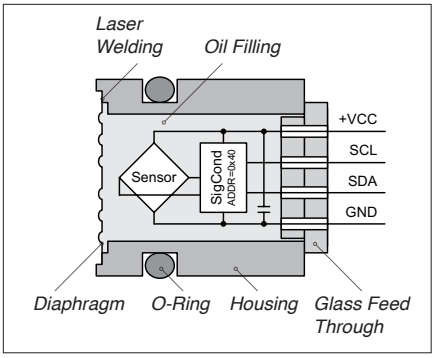
## Specifications

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

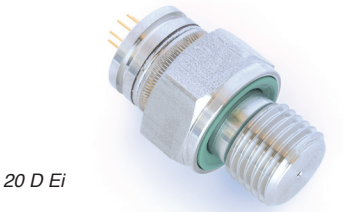
| | |
|---|---|
| Accuracy | max. ± 0,15 %FS (Linearity best straight line@RT, hysteresis, repeatability) |
| Overpressure | 4 x pressure range (max. 350 bar resp. 1200 bar for 6 LD Ei / 7 LD Ei (high pressure) |
| Long Term Stability | typ. ± 0,1 %FS, max. ± 0,2 %FS (limited to max. ± 3 mbar) |

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

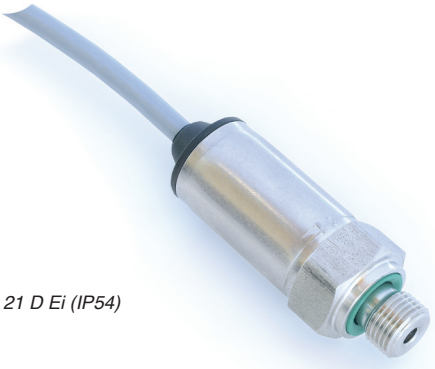
(1) TEB (Total Error Band): Maximum deviation within specified pressure and compensated temperature range
(2) abs: Absolute Pressure Measurement (PAA: Absolute. Zero at vacuum PA: Sealed Gauge. Zero at 1,0 bar abs.)
(3) rel: Referential version (PR: Vented Gauge. Zero at atmospheric pressure)
(4) Dimensions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



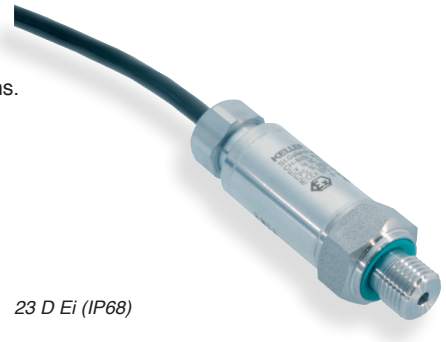

| | |
|---|---|
| Interface | digital I²C (serial synchronus) |
| Signal Output | P [bar], T [°C]: normalised to 16 Bit unsigned integer |
| Pressure Range Reserve | typ. ± 10 %FS, min. ± 5 %FS |
| Supply | 1,8…3,6 V |
| Power Consumption | typ. 1,5 mA during conversion<br>typ. 100 nA in idle mode |
| Bit Rate | ≤ 3,4 MHz |
| 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. ± 0,015 %FS (temperature 4 Bit) |
| Temperature Accuracy | typ. ± 2 °C |
| Supply Voltage Dependency | none |
| Isolation | > 100 MΩ @ 500 VDC |
| ESD – Human Body Model | > 4 kV (HBM: C = 100 pF / R = 1,5 kΩ) |
| Material in Contact with Media | – Stainless Steel AISI 316L (DIN 1.4404 / 1.4435)<br>– 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 ø 0,45 mm, L = 4 ± 0,5 mm<br>– Adapter print with plug JST<br>– 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.<br>– Level Probe 26 D Ei (300 mbar rel. = approx. 3 mH2O) |
| Remarks | – Intermediate pressure range on request.<br>– 21 D Ei / 23 D Ei / 26 D Ei: Shielded cable 0.5 to 3 m<br>– Cable capacitance < 200 pF/m<br>– Series 21 D Ei / 23 D Ei is not available with plug<br>– 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)*

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