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
- I²C is a trademark of NXP

<table>
<thead>
<tr>
<th>Series 4LD-Ei</th>
<th>ø 11</th>
<th>Series 7LD-Ei</th>
<th>ø 15</th>
<th>Series 9LD-Ei</th>
<th>ø 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>Ambient temperature</td>
<td>Umax</td>
<td>Pmax</td>
<td>C</td>
<td>L</td>
</tr>
<tr>
<td>T4</td>
<td>-40...+110 °C</td>
<td>± 7 V</td>
<td>± 200 mA</td>
<td>220 nF</td>
<td>0 mH</td>
</tr>
<tr>
<td>T5</td>
<td>-40...+ 80 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6</td>
<td>-40...+ 65 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
EOD End of Conversion RD
## Specifications

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

### 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
- Power Consumption: typ. 1,5 mA during conversion
- typ. 100 mA 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 %VSup, HIGH: min. 85 %VSup
- 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)
  - 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
  - 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 26D-Ei: 300 mbar rel. = approx. 3 mH2O
- Remarks:
  - Intermediate pressure range on request.
  - 21D-Ei / 23D-Ei: Shielded cable 0,5 to 3 m
  - Cable capacitance < 200 pF/m
  - Series 21D-Ei / 23D-Ei is not available with plug
  - The complete communication protocol is available on the KELLER homepage.

### Remarks
- 20D-Ei: 21D-Ei / 23D-Ei is not available with plug
- The complete communication protocol is available on the KELLER homepage.

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# Type/Version

## Pressure Ranges

<table>
<thead>
<tr>
<th>Type/Version</th>
<th>Pressure Ranges rel.</th>
<th>Pressure Ranges abs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR</td>
<td>0…1 -0,5…0,5 -1…3 -1…10 -1…30</td>
<td>PA</td>
</tr>
<tr>
<td>PAA</td>
<td>0…1 0,5…1,5 0…3 0…10</td>
<td></td>
</tr>
</tbody>
</table>

### Accuracy
- max. ± 0,15 %FS (600 bar: ± 0,25 %FS / 1000 bar: ± 0,35 %FS)

### Overpressure
- 4 x pressure range (max. 350 bar resp. 1200 bar for 6LHPD-Ei / 7LHPD-Ei (high pressure))

### Long Term Stability
- typ. ± 0,1 %FS, max. ± 0,2 %FS (limited to max. ± 3 mbar)

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