HIGHLY PRECISE (0.01%) PRESSURE TRANSMITTERS
MATHEMATICALLY COMPENSATED / PROGRAMMABLE

Digital Output of Transmitter
These Series are based on the stable, floating piezoresistive transducer and a micro-processor with integrated 16 bit A/D converter. Temperature dependencies and non-linearities of the sensor are mathematically compensated. The high precision of 0.01 %FS is available as an option (a total error band of 0.05 %FS is specified as standard). With the CCS30 software and the KELLER converter K-114, the calculated pressure can be displayed on a computer or PC. The CCS30 software also allows the recording of pressure signals and the graphic display. Up to 128 transmitters can be hooked together to a Bus-system.

Transmitter with Analog Output
Integrated in the processor is a D/A converter of 16 bit for analog signal outputs (4…20 mA, 0…10 V, ...). The output rate is 400 Hz. The accuracy is diminished by this converting process by 0.05 %FS. The digital output is available on all transmitters with analog output.

Programming
With the KELLER software CCS30, a RS485 converter (i.e. K-114 from KELLER) and a PC, the pressure can be displayed, the units changed, a new gain or zero set. The analog output can be set to any range within the compensated range.

Accuracy and Precision
“Accuracy” is an absolute term, “Precision” a relative term. KELLER uses commercial pressure sources that are at least 4 times better than the product to be tested and can therefore guarantee an accuracy of 0.05%. Below this range, KELLER uses the term “precision” for the ability of a pressure transmitter or manometer to be within 0.01% of these commercial standards for every pressure point. These pressure gauges can be adapted to a standard/reference of an accredited laboratory via the digital interface by correcting the zero point and amplification, which guarantees an “accuracy” of 0.01%FS.

Series 33 X
Series 35 X

Series 33 X
G1/4” thread

Series 35 X
G1/2”, flush diaphragm

**ELECTRICAL CONNECTIONS**

<table>
<thead>
<tr>
<th>Output Function</th>
<th>Binder 723</th>
<th>M12, A-coded</th>
<th>DIN 43650</th>
<th>MIL C-26482</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-wire Current</td>
<td>OUT/GND</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>+Vcc</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>3-wire Voltage</td>
<td>GND</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>C</td>
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<tr>
<td></td>
<td>OUT</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>+Vcc</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Digital</td>
<td>RS485A</td>
<td>4</td>
<td>4</td>
<td>–</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>RS485B</td>
<td>5</td>
<td>5</td>
<td>–</td>
<td>F</td>
</tr>
</tbody>
</table>

Transmitter Housing
use shielded cable

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Subject to alterations
Companies approved to ISO 9001
www.keller-druck.com
### Specifications

<table>
<thead>
<tr>
<th>Standard Pressure Ranges (FS) and Overpressure in bar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Digital Interface</td>
</tr>
<tr>
<td>Supply (U)</td>
</tr>
<tr>
<td>Accuracy [2] @ RT (digital) typ.</td>
</tr>
<tr>
<td>Total Error Band [3] (10…40 °C)</td>
</tr>
<tr>
<td>Total Error Band [3] (-10…-80 °C)</td>
</tr>
<tr>
<td>Optional: Precision [3] (10…40 °C)</td>
</tr>
<tr>
<td>Power Consumption (without comm.)</td>
</tr>
</tbody>
</table>

**Note:**
- Dead Volume Change < 0.1 mm
- Weight Series 33 X ≈ 240 g; Series 35 X ≈ 180 g;
- Material in Contact with Media Stainless Steel AISI 316L / Viton
- CE-Conformity (EMC) EN 61000-6-1 to 6-4 / EN 61326-1 / EN 61326-2-3
- Protection IP 65 optional: IP 67 or IP 68 (with cable)
- Shock Endurance, IEC 60068-2-27 50 g (11 ms)
- Vibration Endurance, IEC 60068-2-6 20 g (10...2000 Hz)
- Pressure Endurance 10 Million Pressure Cycles 0…100 %FS @ 25 °C
- Storage-/Operating Temperature -40…120 °C
- Insulation > 5 kΩ
- Output Rate 400 Hz
- Resolution 0.002 %FS
- Load Resistance < (U - 8 V) / 25 mA
- Start-up Time (Supply ON) < 600 ms
- Voltage ± 1 bar: 1 mbar
- Temperature ± 1 bar: 0.1 %FS
- Endurance Time 0…100 %FS @ 25 °C
- Endurance Temperature, IEC 60068-2-6 20 g (10...2000 Hz)
- Shock Endurance, IEC 60068-2-27 50 g (11 ms)
- Protection IP 65 optional: IP 67 or IP 68 (with cable)

**Options:**
- Calculations such as density, differential pressure, flow, absolute value, etc.
- Different housing-material, oil filling, pressure thread or connector

**Polynomial Compensation**

This uses a mathematical model to derive the precise pressure value (P) from the signals measured by the pressure sensor (S) and the temperature sensor (T). The microprocessor in the transmitter calculates P using the following polynomial:

\[ P(S,T) = A(T)S + B(T)S^2 + C(T)S^3 + D(T)S^4 \]

With the following coefficients \( A(T)_..D(T) \) depending on the temperature:

\[ A(T) = A_0 + A_1T + A_2T^2 + A_3T^3 \]
\[ B(T) = B_0 + B_1T + B_2T^2 + B_3T^3 \]
\[ C(T) = C_0 + C_1T + C_2T^2 + C_3T^3 \]
\[ D(T) = D_0 + D_1T + D_2T^2 + D_3T^3 \]

The transmitter is factory-tested at various levels of pressure and temperature. The corresponding measured values of \( S \), together with the exact pressure and temperature values, allow the coefficients \( A_0..D_3 \) to be calculated. These are written into the EEPROM of the microprocessor. When the pressure transmitter is in service, the microprocessor measures the signals (S) and (T), calculates the coefficients according to the temperature and produces the exact pressure value by solving the \( P(S,T) \) equation. Calculations and conversions are performed at least 400 times per second.

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**Interface**

The X-line products have a digital interface (RS485 halfduplex), which supports the MODBUS RTU and KELLER Bus protocols. Details of the communication protocols can be found at www.keller-druck.com. To integrate the communication protocol into your own software, documentation, a Dynamic Link Library (DLL) protocols can be found at www.keller-druck.com. To integrate the communication protocol into your own software, documentation, a Dynamic Link Library (DLL)

**Accessories**

The connection to a computer is established via an RS485-USB interface converter. To ensure smooth operation, we recommend the K-114 with the corresponding mating connector, robust driver module, fast RX/TX switching and connectable bias and terminating resistors.

**Software**

The licence-free software CCS30 is used to carry out configurations and record measured values.

**Measurement collection**
- Graphical live display
- Adjustable measurement and storage interval
- Export function
- Parallel recording in Bus operation

**Configuration**
- Call up of information (pressure and temperature range, software version, serial number etc.)
- Readjustment of zero point and amplification
- Rescaling of analog output (unit, pressure range)
- Adjustment of low-pass filter
- Selection of instrument address and baud rate

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