

## HIGHLY PRECISE PRESSURE TRANSMITTERS FOR HAZARDOUS APPLICATIONS



SERIE 33 X Ei / 35 X Ei  
36 XW Ei / PD-33 X Ei

These pressure transmitters are all ATEX approved for use in Hazardous Areas where there is a high risk of explosion.

- Series 33 X Ei Industrial applications, male pressure port G1/4"
- Series 35 X Ei Flush diaphragm
- Series 36 XW Ei Level transmitter
- Series PD-33 X Ei Differential pressure measurement

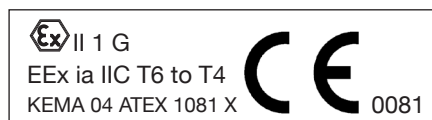
### Digital Output of Transmitter

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. With the READ30 software and the KELLER cable K-107, the calculated pressure can be displayed on a Palmtop, Laptop or PC. The READ30 software also allows the recording of pressure signals and the graphic display on the PC. 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 of 4...20 mA or 0...10 V. The output rate is 400 Hz resp. 100 Hz (adjustable). The accuracy is diminished by this converting process by 0,05 %FS. The digital output is also available on analog transmitters with cable connection.

### Ex-Classification



T4 for  $T_a \leq 100$  °C, T5 for  $T_a \leq 85$  °C, T6 for  $T_a \leq 70$  °C



Series 33 X Ei



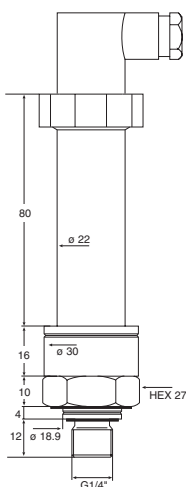
Series 35 X Ei



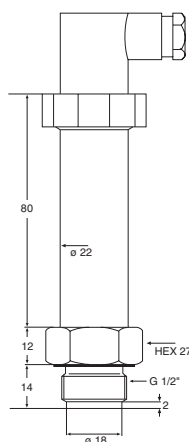
Series 36 XW Ei



Series PD-33 X Ei



Series 33 X Ei (G1/4")



Series 35 X Ei (G1/2")

### PIN ASSIGNMENT

Output	Function	DIN 43650	Cable
4...20 mA 2 Wire	OUT/GND	1	white
	+Vcc	3	black
0...10 V 3 Wire	GND	1	white
	OUT	2	red
	+Vcc	3	black
Digital	RS485A	–	blue
	RS485B	–	yellow
Transmitter Housing			Screen

Plan Serie 36 XW Ei and PD-33 X Ei available on request.



# KELLER

## Specifications

### Standard Pressure Ranges (FS) and Overpressure in Bar

PR-33 X Ei, PR-35 X Ei, PR/PA(A)-36 XW Ei	1	3	10	30			
PA(A)-33 X Ei, PA(A)-35 X Ei (pressure ranges Series PD-33 X Ei on request)	0,8...1,2	3	10	30	100	300	1000
Overpressure	2	5	20	60	200	400	1000

All intermediate ranges for the analog output are realizable with no surcharge by spreading the standard ranges.

Option: Adjustment directly to intermediate ranges (below 20 pieces against surcharge).

Output		(digital) <b>RS 485</b>	(analog) <b>4...20 mA</b> (2-wire)	(analog) <b>0...10 V</b> (3-wire)
Supply (U)		10... <b>30 Vcc</b>	10... <b>30 Vcc</b>	15... <b>30 Vcc</b> †
Accuracy, Error Band	(10...40 °C)	0,05 %FS	0,10 %FS	<b>0,20 %FS</b> †
Accuracy, Error Band	(-10...80 °C)	0,1 %FS	0,15 %FS	<b>0,25 %FS</b>
<b>Optional: Precision*</b>	(10...40 °C)	<b>0,025 %FS</b>		

**The transmitters must only be used in combination with certified intrinsically safe equipment!**

### 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:

$$P(S,T) = A(T) \cdot S^0 + B(T) \cdot S^1 + C(T) \cdot S^2 + D(T) \cdot S^3$$

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

$$A(T) = A_0 \cdot T^0 + A_1 \cdot T^1 + A_2 \cdot T^2 + A_3 \cdot T^3$$

$$B(T) = B_0 \cdot T^0 + B_1 \cdot T^1 + B_2 \cdot T^2 + B_3 \cdot T^3$$

$$C(T) = C_0 \cdot T^0 + C_1 \cdot T^1 + C_2 \cdot T^2 + C_3 \cdot T^3$$

$$D(T) = D_0 \cdot T^0 + D_1 \cdot T^1 + D_2 \cdot T^2 + D_3 \cdot T^3$$

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...D<sub>3</sub> 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.

\* Only for Series PA(A)-33 X Ei and for ranges  $\geq 10$  bar.

True Output Rate (preset)	400 Hz (33 X Ei)	100 Hz (35 X Ei, 36 XW Ei)
Resolution	0,002 %FS	
Long Term Stability typ.	Ranges $\leq 2$ bar: 1 mbar Ranges $> 2$ bar: 0,1 %FS	

Load Resistance (k $\Omega$ )	<(U-10 V) / 20 mA (2-wire)	$\geq 100$ (3-wire) †
Electrical Connection	DIN 43650 Plug (4 pole), cable	
Insulation	100 M $\Omega$ / 500 V	
Operating Temperature Range	-40...+80 °C if an explosive atmosphere may be present continuously, frequently or for long periods. -40...+100 °C for other applications	
Pressure Endurance	10 Million Pressure Cycles 0...100 %FS at 25 °C	
Vibration Endurance, acc. to IEC 68-2-6	20 g (5...2000 Hz, max. amplitude $\pm 3$ mm),	
Shock Endurance	20 g (11 ms)	
Protection	IP 65 optional: IP 67 oder IP 68 (with cable)	
CE-Conformity	EN 61000-6-1 to -6-4	
Material in Contact with Media	Stainless Steel 316L (DIN 1.4435) / Viton®	
Weight	Series 33 X Ei $\approx$ 140 g; Series 35 X Ei $\approx$ 160 g	
Dead Volume Change	$< 0,1$ mm <sup>3</sup>	

- Options:
- Special calculations with pressure and temperature
  - Different housing-material, oil filling, pressure thread

### Accessories Series 30

The transmitter with cable may be connected to a PC or Laptop via a converter RS232-RS485. If the converter is not intrinsically safe (i.e. K-102, K-104 or K-107), the programming must take place outside of the area where there is a high risk of explosion. Two programs are offered:

#### PROG30: Instrument Settings

- Call up of information (pressure- and temperature range, version of software etc.)
- Indication of actual pressure value
- Selection of the units
- Setting of a new zero and gain for the transmitter
- Reprogramming of the analog output (i.e. different unit, other pressure range)
- Setting of the instrument address (for Bus-operation)
- Changing the true output rate

#### READ30: Data collection with graphs

- Fast read-out and viewing of the pressure signals in a graph
- Documentation of dynamic measurements
- Up to 16 transmitters on one serial connection (Bus-operation)

### Software PROG30

The screenshot shows the PROG30 software interface with the following fields and buttons:

- Angaben über den Transmitter:** Software Version (5), SN (22518), Kompenzierter Druckbereich (0.20000 to 1.00000 bar), Temperaturbereich (15 to 45 °C).
- Nullung:** Wekseinrichtung schreiben, Nullen. Aktueller Druckwert: P1 0.98220 bar, Einheit: bar.
- Analogausgang einstellen:** Ausgangssignal (0.000 to 10.000 V), Druckbereich (0.00000 to 1.00000 bar), Einstellung lesen, Wekseinrichtung schreiben, Einstellung schreiben.
- Geräteadresse einstellen:** Geräteadresse lesen, Geräteadresse schreiben, Geräteadresse (4), Hilfe anzeigen, Beenden.

You can also tie up the transmitters into your own software. You have then a documentation, a DLL and numerous examples at your disposal.

Subject to alterations † revised 6.5.2010

08/04

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