



HIGHLY PRECISE LEVEL PRESSURE TRANSMITTERS

SERIES 36 X W

DIGITALLY COMPENSATED / RANGEABLE / DIGITAL AND ANALOG OUTPUT

These pressure transmitters are designed for level measurements where the highest accuracy is required.

Digital Output of Transmitter

This Series is based on the stable, piezoresistive transducer and a micro-processor electronics 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

The micro-processor integrates a D/A converter of 16 bit for analog signal outputs of 4...20 mA or 0...10 V. The output rate is 100 Hz (adjustable). The digital output is available on all transmitters with analog output.

Programming

With the KELLER software READ30 and PROG30, a RS485 converter (i.e. K-102, K-104 or K-107 from KELLER) and a PC (Laptop), 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.

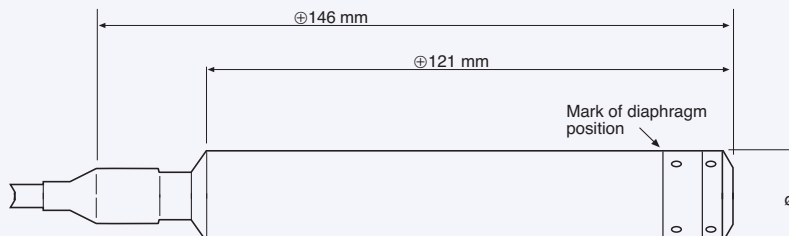
The level transmitters are available in two different versions:

• PAA-36 X W Absolute Pressure, Zero at Vacuum

This probe is applied when the atmospheric pressure is measured by a separate barometer and when the water level is calculated as the difference between the absolute value and the ambient pressure.

• PR-36 X W Relative Pressure, Zero at ambient Pressure

This probe is fitted with durable cable with an integral vent tube to the atmosphere. These level transmitters can be subject to internal condensation caused by installations in cold water on warm, humid days. If the reference tube is not terminated in a warm, dry enclosure, KELLER recommends the use of a purpose built cartridge filled with a silica gel which is fitted at the end of the reference tube.



Electrical Connections

Output	Function	Wire Color
4...20 mA	OUT/GND	White
2-wire	+Vcc	Black
0...10 V	GND	White
3-wire	OUT	Red
	+Vcc	Black
Program- ming	RS485A	Blue
	RS485B	Yellow





Specifications

	STANDARD PRESSURE RANGES (FS) AND OVERPRESSURE IN BAR			
PR-36 X W	1	3	10	30
PAA-36 X W	1	3	10	30
Overpressure	3	5	20	60
Output	(digital)	(analog)	(analog)	
	RS 485	4...20 mA (2-wire)	0...10 V (3-wire)	
Supply (U)	8...28 Vcc	8...28 Vcc	13...28 Vcc	
Accuracy, Error Band ¹⁾ (0...50 °C)	0,1 %FS	0,15 %FS	0,15 %FS	

¹⁾ Linearity + Hysteresis + Repeatability + Temp. Coeff. + Zero + Span Tolerance

Linearity (best straight line)	0,025 %FS
True Output Rate	100 Hz
Resolution	0,002 %FS
Long Term Stability typ.	Range ≤ 1 bar: 1 mbar Range > 1 bar: 0,1 %FS
Load Resistance (Ω)	< (U - 7 V) / 0,02 A (2-wire) > 5'000 (3-wire)
Electrical Connection	Cable: Polyethylene (PE), vented
Insulation	> 100 MΩ / 50 V
Storage-/Operating Temperature Range	-20...80 °C
Pressure Endurance	10 Million Pressure Cycles 0...100 %FS at 25 °C
Vibration Endurance, IEC 68-2-6	20 g (5...2000 Hz, max. amplitude ± 3 mm)
Shock Endurance	20 g (11 ms)
Protection	IP 68
CE-Conformity	EN 61000-6-1 to -6-4
Material in Contact with Media	Stainless Steel 316L (DIN 1.4435) / Viton® / PE
Weight (without cable)	≈ 200 g
Dead Volume Change	< 0,1 mm ³

Remark: - RS485 pins (for digital output and for programming) is available on all types.

Options: - Switch output, programmable via interface
- Special calculations with pressure and temperature
- Different housing-material, oil filling or pressure thread

Note: The ranges 100, 200 or 500 mbar are realized with the 1 bar transmitter. Accuracy for these ranges is ± 1 mbar (0...50 °C)

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

Option: Adjustment directly to intermediate ranges against surcharge.

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:

$$\begin{aligned} A(T) &= A_0 \cdot T^0 + A_1 \cdot T^1 + A_2 \cdot T^2 + A_3 \cdot T^3 \\ B(T) &= B_0 \cdot T^0 + B_1 \cdot T^1 + B_2 \cdot T^2 + B_3 \cdot T^3 \\ C(T) &= C_0 \cdot T^0 + C_1 \cdot T^1 + C_2 \cdot T^2 + C_3 \cdot T^3 \\ D(T) &= D_0 \cdot T^0 + D_1 \cdot T^1 + D_2 \cdot T^2 + D_3 \cdot T^3 \end{aligned}$$

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 A₀...D₃ 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.

ACCESSORIES SERIES 30

Each Series 30 transmitter also integrates a digital interface (RS485 halfduplex) which you can make use of: Connect the transmitter to a PC or Laptop via a converter RS232-RS485 (i.e. K-102, K-104 or K-107). 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)
- Programming of the switch output
- Changing the output rate

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

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 window. It has several sections: 'Angaben über den Transmitter' with fields for Software Version (5.1), SN (22518), Kompensierter Druckbereich (0.20000 to 1.00000 bar), and Temperaturbereich (15 to 45 °C). Below this is a 'Nullung' section with buttons for 'Werteneinstellung schreiben' and 'Nullen', and a display for 'Aktueller Druckwert: P1 0.98220 bar'. The 'Analogausgang einstellen' section has fields for Ausgangssignal (0.000 to 10.000 V) and Druckbereich (0.00000 to 1.00000 bar), with buttons for 'Einstellung lesen', 'Werteneinstellung schreiben', and 'Einstellung schreiben'. The 'Geräteadresse einstellen' section has buttons for 'Geräteadresse lesen' and 'Geräteadresse schreiben', and a field for 'Geräteadresse' (1). There are also buttons for 'Hilfe anzeigen' and 'Beenden'.