Highly Precise Level 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, piezoresisitive 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 CCS30 software and the KELLER converter K-114, the calculated pressure can be displayed on a computer. The CCS30 software also allows the recording and graphic display of pressure signals. 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 (adjustable). 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 (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.

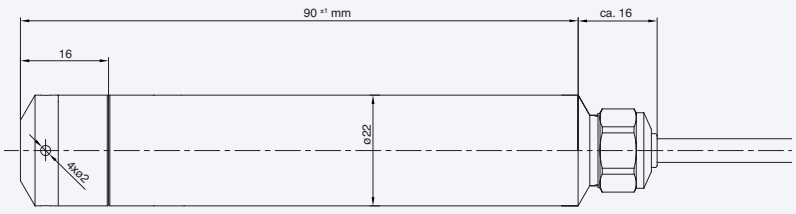
The level transmitters are available in two different versions:

• **PAA-36 X W** Absolute, 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** Gauge, Zero at atmospheric 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	Cable
2-wire Current	OUT/GND	White
	+Vcc	Black
3-wire Voltage	GND	White
	OUT	Red
	+Vcc	Black
Digital	RS485A	Blue
	RS485B	Yellow
Transmitter Housing		Shield

RoHS CE

KELLER AG für Druckmesstechnik
CH-8404 Winterthur
+41 52 235 25 25
info@keller-druck.com

KELLER Ges. für Druckmesstechnik mbH
DE-79798 Jestetten
+49 7745 9214 0
eurocenter@keller-druck.com

Edition 07/2018
Subject to alterations
Companies approved to ISO 9001
www.keller-druck.com

Specifications

Standard Pressure Ranges (FS)						
PR-36 X W	0.3 (1)	1	3	10	30	bar
PAA-36 X W		0.8…2.3	0.8…4	0.8…11	0.8…31	bar
Water column approx.	3	10	30	100	300	mH2O
Overpressure	2	2	5	20	40	bar

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.

Type	**RS485***	**4…20 mA** (2-wire)	**0…10 V** (3-w)	**0.1…2.5 V** (3-w)
Digital Interface	RS485	RS485	RS485	RS485
Supply (U)	8…32 V	8…32 V	13…32 V	3.2…32 V
Accuracy (2) @ RT (digital) typ.	0.02 %FS	0.04 %FS	0.02 %FS	0.02 %FS
Total Error Band (3) (0...50 °C)	0.10 %FS	0.15 %FS (4)	0.15 %FS	0.15 %FS
Power Cons. (without communication)	< 8 mA	3.2…22.5 mA	< 8 mA	< 5 mA

(1) Specified "Accuracy" and "Total error band" multiplied by a factor of 2 ** we recommend the new Series 36 Xi W*
(2) Linearity (best straight line), hysteresis and repeatability
(3) Accuracy and temperature error within the compensated temperature range
(4) Disturbance of the 4...20 mA signal occurs during communication through RS485. 3-wire types are suitable for simultaneous operation of analog output and RS485.

Output Rate	400 Hz
Resolution	0,002 %FS
Long Term Stability typ.	Range ≤ 1 bar: 1 mbar Range > 1 bar: 0,1 %FS
Load Resistance	< (U - 8 V) / 25 mA (2-wire) > 5 kΩ (3-wire)
Electrical connections (cable)	PR: polyethylene (PE) Ø 5.8 mm (vented) PAA: polyolefin (PE-based) Ø 5.8 mm
Insulation	> 10 MΩ / 300 V
Lightning prot. EN 61000-4-5	Line-Line: 50 A @ 8/20 µs Line-Case: 200 A @ 8/20 µs
Storage / Operating Temperature	-20…80 °C (icing not permitted)
Pressure Endurance	10 Million Pressure Cycles 0…100 %FS at 25 °C
Vibration Endurance, IEC 60068-2-6	20 g (10...2000 Hz)
Shock Endurance, IEC 60068-2-27	50 g (11 ms)
Protection	IP 68
CE-Conformity (EMC)	EN 61000-6-1 to -6-4 / EN 61326-1 / EN 61326-2-3
Material in Contact with Media	Stainless Steel 316L (DIN 1.4435) / Viton® / PE
Weight (without cable)	≈ 150 g
Dead Volume Change	< 0,1 mm³

Note: PAA 0.8…2.3 bar: for installation heights greater than 2000 m above sea level, special measuring ranges are required

Options:
- Switch output, programmable via interface
- Special calculations with pressure and temperature
- Different housing-material, oil filling or pressure thread
- Also available in intrinsically safe version (see separate data sheet)
- Different cable, for fuel, drinking water etc.
- Extended lightning protection (only for 4…20 mA and digital; Minimum supply increased by 2 V):
  Line-Line: 10 kA @ 8/20 µs Line-Case: 2 kA @ 8/20 µs

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_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.

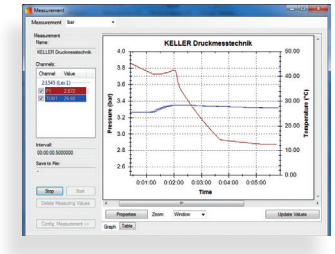
Calculations and conversions are performed at least 400 times per second.

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) and various program examples are available.

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

KELLER AG für Druckmesstechnik
CH-8404 Winterthur
+41 52 235 25 25
info@keller-druck.com

KELLER Ges. für Druckmesstechnik mbH
DE-79798 Jestetten
+49 7745 9214 0
eurocenter@keller-druck.com

Edition 07/2018
Subject to alterations
Companies approved to ISO 9001
www.keller-druck.com