



HIGH PRECISION PRESSURE TRANSMITTERS

SERIES 33 / 35 S

DIGITALLY COMPENSATED / RANGEABLE / DIGITAL AND ANALOG OUTPUT

These pressure transmitters have conventional analogue outputs but are designed for industrial applications where the highest accuracy is required. They combine the latest technologies of both pressure sensor and electronic compensation.

The pressure sensor is a high stability piezoresistive device designed for use in transmitters where accuracy and stability are essential. The sensor is selected after severe testing under pressure and temperature. The sensing component is a micro-machined silicon chip of high sensitivity mounted in a floating arrangement. An independent temperature sensor is integrated on the surface of the silicon chip.

The processing electronics comprise a PIC 14000 microprocessor with an integral 13...14 bit A/D converter and inputs capable of handling 5 signals. Conversions are performed at a rate of at least 100 operations per second.

The pressure signal compensation uses a mathematical model based on polynomial approximation, which provides almost perfect compensation over the operating temperature range.

The voltage (or current) analogue output signal is generated by a 16-bit D/A converter. The output signal is updated every 10 milliseconds.

The user can, via the RS485 interface and using a KELLER adapter cable, set the zero and the gain of the transmitter by simple software programming.

The transmitter has great manufacturing flexibility and can be produced with various types of pressure connection. Among its features are standard plates which hold the connector, enabling the same transmitter to be supplied with different electrical connectors that can be exchanged by the user as an option.

The Series 33 and 35S transmitters have an exceptional price/performance ratio.

- Series 33 Male Pressure Port G1/4" 0,05 % Total Error Band, over 10...+40 °C
- Series 35 S Pressure Port G1/2", Flush Diaphragm 0,05 % Total Error Band, over 10...+40 °C
- PAA-33 / 35 S Absolute Pressure, Zero at Vacuum (0 bar abs.)
- PA-33 / 35 S Sealed Gauge, Zero at 1 bar abs.
- PR-33 / 35 S Vented Gauge, Zero at atmospheric (0 bar gauge)



Series 33



Series 35 S

Serie 33 (G1/4")

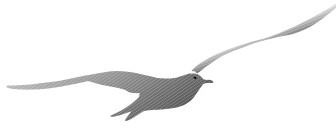
Serie 35 S (G1/2")

PIN ASSIGNMENT

Output	Function	MIL C-26482	Binder 723	DIN 43650
4...20mA	OUT / GND	C	1	1
2 Wire	+Vcc	A	3	3
0...10V	GND	C	1	1
3 Wire	OUT	B	2	2
	+Vcc	A	3	3
Program- ming	RS485A	D	4	
	RS485B	F	5	

Subject to alterations

3/00



SPECIFICATIONS

STANDARD PRESSURE RANGES (FS) AND OVERPRESSURE IN BAR

PR-33		-1	1	3	10	30			
PAA-33	Note:		1	3	10	30			
PA-33	The ranges + / - / ± 0,1, 0,2 or 0,5 bar are realized with the 1 bar transmitter.		1	3	10	30	100	300	1000
PR-35 S	Accuracy for these ranges is ±1 mbar (10...40°C)	-1	1	3	10	30			
PAA-35 S			1	3	10	30			
PA-35 S			1	3	10	30	100	300	
Overpressure		-1	3	7	20	60	200	300	1000

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.

Storage-/Operating Temperature Range	-40...80 °C
Compensated Temperature Range	10...40 °C (-10...80 °C opt.)
Accuracy (10...40 °C) (1) (2) (3)	0,05 %FS
Accuracy (-10...80 °C) (1) (2) (3)	0,1 %FS
True Output Rate	100 Hz
Resolution	≤ 0,01 %FS
Long Term Stability typ.	Range ≤ 2 bar: 0,5 mbar Range > 2 bar: 0,05 %FS

- (1) Linearity + Hysteresis + Repeatability + Temperature Coefficients + Zero + Span Tolerance
(2) Accuracy and Resolution are valid for Basic Pressure Range
(3) Linearity: Best Straight Line

Output Signal	4...20 mA, 2 Wire	0...10 V, 3 Wire
Supply (U)	8...28 Vcc	13...28 Vcc
Load Resistance (Ω)	(U-5V) / 0,02A	> 5 000
Electrical Connection	- MIL C-26482-Plug (6 pole) - Binder-Plug 723 (5 pole) - DIN 43650 Plug (4 pole)	
Programming	RS485 (2 Wire) / option. PROG30, K106 data cable	
Insulation	100 MΩ / 50 V	

Pressure Endurance	10 Million Pressure Cycles 0...100 %FS at 25 °C
Vibration Endurance	20 g, 20 to 5 000 Hz
Shock Endurance	20 g sinus 11 msec.
Protection	IP65 opt.: - IP 67 -IP68 (with cable)
CE-Conformity	EN 50081-2, EN 50082-2
Material in Contact with Media	Stainless Steel 316L (DIN 1.4435) / Viton
Weight	Series 33 ≈ 140 g; Series 35 S ≈ 160 g
Dead Volume Change	< 0,1 mm ³

Options

Any Pressure Ranges between 0,5 and 1000 bar / Other Compensated Temperature Ranges / Supply 32 V / Electrical Cable Output / Oil Filling: Fluorized Oil (O₂-compatible), Olive Oil, Low Temperature Oil / Other Pressure Connections / Other Plug Connections / Other Materials

Polynomial Compensation

This uses a mathematical model to derive the precise pressure value (P) from the 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 100 times per second depending on the format of the signals.

The theoretic resolution is 0.01 to 0.005 %. In practice, however, accuracy is limited to 0.05 % by the calibration equipment.

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 the converter K106 (RS232-RS485). Two programmes 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 for the transmitter
- Reprogramming of the analog output (i.e. different unit, other pressure range)
- Setting of the instrument address (for Bus-operation)

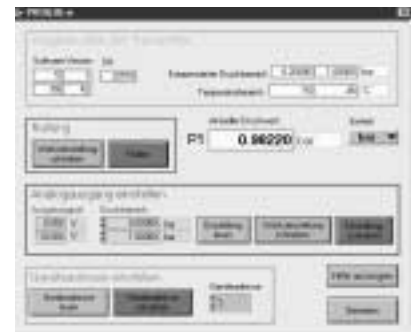
You can also tie up the transmitters into your own software. You have then a documentation, a DLL and LabView VI's at your disposal.

READ30: Data collection with up to ten

Series 30 pressure transmitters with graphs

- Fast read-out and viewing of the pressure signals in a graph
- Documentation of dynamic measurements
- Up to 10 transmitters on one serial connection (Bus-operation)

SOFTWARE PROG30



CHANGING THE PLUG CONNECTOR (optional)

Laboratory applications require the same transmitter to be used at different measurement points with different electrical connection arrangements. To accommodate such applications, KELLER can supply different connectors matching with the internal standard plug. This makes it easy to exchange the electrical connector of the transmitter.