KELLER

Transmitters for Bio-Reactors

Series 35 HT / HTT

Digitally compensated / rangeable / digital and analog output

Piezoresistive pressure transmitter for applications in bio-reactors or autoclaves. The transmitter is compensated up to 150 °C and may be operated continuously or sterilised at this level, including the special circuit electronics.

The transmitters are supplied in absolute or gauge versions, with current or voltage output.

The sensing component is a micro-machined silicon pressure 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 analogue output signal is generated by a 16-bit D/A converte and 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.

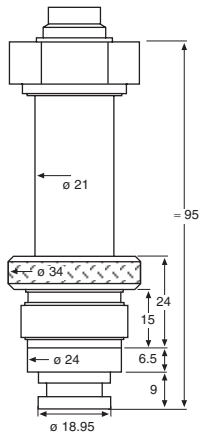
The transmitter has great manufacturing flexibility and can be produced with various types of pressure connection. Among its features are standard plates which hold the connector, enabling the same transmitter to be supplied with different electrical connectors that can be exchanged by the user as an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

- Series 35 HT Manometer Pressure Port
- Series 35 HTT Pressure Port G1/2", Flush Diaphragm
- PAA-35 HT / HTT Absolute Pressure, Zero at Vacuum
- PA-35 HT / HTT Sealed Gauge, Zero at 1 bar abs.
- PR-35 HT / HTT Vented Gauge, Zero at atmospheric

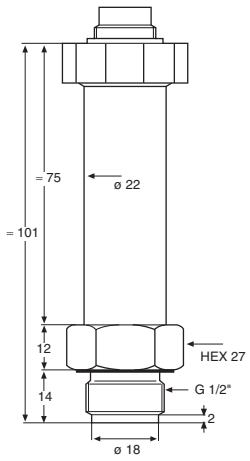
Series 35 HT

Series 35 HTT

CE



Series 35 HT
(Manometer Pressure Port)



Series 35 HTT
(G 1/2")

PIN ASSIGNMENT

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

KELLER AG für Druckmesstechnik St. Gallerstrasse 119 CH-8404 Winterthur Tel. 052 - 235 25 25 Fax 052 - 235 25 00
KELLER Gesellschaft für Druckmesstechnik mbH Schwarzwaldstrasse 17 D-79798 Jestetten Tel. 07745 - 9214 - 0 Fax 07745 - 9214 - 50

KELLER

SPECIFICATIONS

	Standard Pressure Ranges (FS) and Overpressure in Bar						
Version Absolute / Gauge	0,5	1	2	5	10	20	bar
Overpressure	2	3	4	8	15	30	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.

Operating Temperature Range	-20…150 °C
Compensated Temperature Range	20…120 °C
Accuracy (10…40 °C) (1) (2) (3)	0,05 %FS
Accuracy (20…120 °C) (1) (2) (3)	0,3 % max. / typ. 0,2 %
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)	
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...5'000 Hz,
Shock Endurance	20 g half-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 35 HT / HTT ≈ 160 g
Dead Volume Change	< 0,1 mm³

Options

Any Pressure Ranges between 0,5 and 1000 bar / Other Compensated Temperature Ranges / Supply 32 V / Electrical Cable Output / Oil Filling: Fluorized Oil (O_2-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:

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

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 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

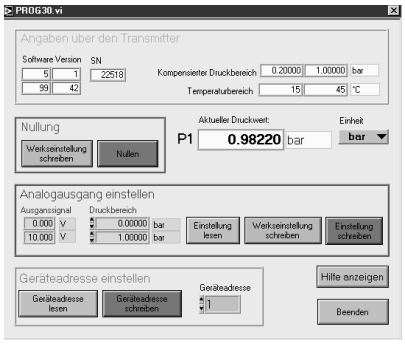
- Call up of information (pressure- and temperature range, version of software etc.)
- Indication of actual pressure value
- Selection of the units
- Setting of a new zero for the transmitter
- Reprogramming of the analog output (i.e. different unit, other pressure range)
- Setting of the instrument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

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)

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.

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.

KELLER AG für Druckmesstechnik St. Gallerstrasse 119 CH-8404 Winterthur Tel. 052 - 235 25 25 Fax 052 - 235 25 00
KELLER Gesellschaft für Druckmesstechnik mbH Schwarzwaldstrasse 17 D-79798 Jestetten Tel. 07745 - 9214 - 0 Fax 07745 - 9214 - 50