Issue - Sept 2003

# SERIES 36W

## PIEZORESISTIVE LEVEL PRESSURE TRANSMITTERS

### DIGITALLY COMPENSATED / RANGEABLE / DIGITAL AND ANALOG OUTPUT

These pressure transmitters have conventional analogue outputs but are designed for level measurements 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.

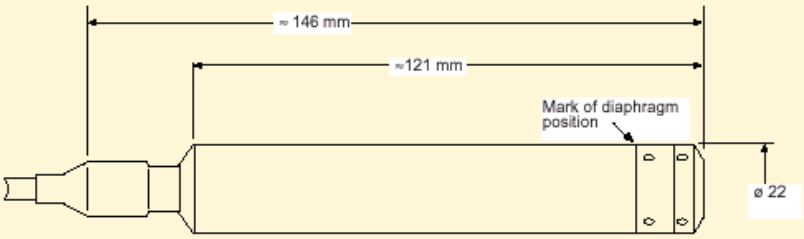
The level transmitters are available in two different versions:

- **PAA-36 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 W** Relative Pressure, Zero at ambient Pressure

This probe is fitted with durable PUR 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, Omi Instruments 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…20mA | OUT / GND | White |
| 2 Wire | +Vcc | Black |
| 0…10V | GND | White |
| 3 Wire | OUT | Red |
| | +Vcc | Black |
| Program- | RS485A | Blue |
| ming | RS485B | Yellow |

Subject to alterations

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# SERIES 36W

## SPECIFICATIONS

### STANDARD PRESSURE RANGES (FS) AND OVERPRESSURE IN BAR

| | | | | |
|---|---|---|---|---|
| PR-36 W | 1 | 3 | 10 | 30 |
| PAA-36W | 1 | 3 | 10 | 30 |
| Overpressure | 3 | 7 | 20 | 60 |

*Note: the ranges +0,1, 0,2 or 0,5 bar are realized with the 1 bar transmitter. Accuracy for these ranges is ±1 mbar (10…40°C)*

All intermediate ranges for the analog output are realized 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 | 0…40 °C (-10…80 °C opt.) |
| Accuracy (0...40 °C) (1) (2) (3) | 0,1 %FS |
| True Output Rate | 100 Hz |
| Resolution | ≤0,01 %FS |
| Long Term Stability typ. | Range ≤ 2 bar: 1 mbar<br>Range > 2 bar: 0,1 %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 |
| Cable | Polyethylene (PE), vented | |
| Programming Interface | RS485 (2 Wire) | |
| Insulation | 100MΩ /50 V | |

| | |
|---|---|
| Protection | IP68 ice-proof |
| CE-Conformity | EN 50081-2, EN 50082-2 |
| Material in contact with Media | Stainless Steel 316L (DIN 1.4435) / Viton / PE |

### *Options*

- Platinum Diaphragm, Hastelloy C-276 Housing
- Other Compensated Temperature Ranges
- Oil Filling: Olive Oil

### 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 micro-processor 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:

$$A(T) = A0 \cdot T^0 + A1 \cdot T^1 + A2 \cdot T^2 + A3 \cdot T^3$$
$$B(T) = B0 \cdot T^0 + B1 \cdot T^1 + B2 \cdot T^2 + B3 \cdot T^3$$
$$C(T) = C0 \cdot T^0 + C1 \cdot T^1 + C2 \cdot T^2 + C3 \cdot T^3$$
$$D(T) = D0 \cdot T^0 + D1 \cdot T^1 + D2 \cdot T^2 + D3 \cdot T^3$$

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 half duplex) which you can make use of: Connect the transmitter to a PC or Laptop via the converter K106 (RS232-RS485). Two programmes are offered:

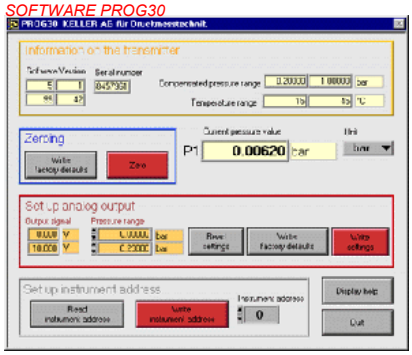
**PROG30**:
Instrument Settings
Call up of information (pressure- and Temperature range, version of software etc.)
Indication of actual pressure value
Selection of the units
Setting of a new zero for the transmitter
Reprogramming of the analog output (i.e. different unit, other pressure range)
Setting 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.

This makes it easy to exchange the electrical connector of the transmitter.

*SOFTWARE PROG30*

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