

Description

The Ultra Low Pressure Transducer is used to measure differential pressure in the range of 0.125 to 1"wc (30 to 250 Pa). It combines precision high sensitivity silicon sensing capabilities and the latest ASIC technology to substantially reduce offset errors due to changes in temperature, stability to warmup, long term instability and position sensitivity. It is ideal for monitoring pressure for air or other clean inert gas. It features several field selectable uni- or bi-directional pressure ranges and output signal types for the most flexible application. The device has an on-board auto-zero function as well as a connection for remote zeroing. Options include an LCD to display the pressure value and an alarm relay with a variable trip point.

Before Installation

Read these instructions carefully before installing and commissioning the ULP Pressure Transducer. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, as a safety or emergency stop device or in any other application where failure of the product could result in personal injury. Take electrostatic discharge precautions during installation and do not exceed the device ratings.

Mounting

Mount the device using the four holes on the base of the unit. Leave enough space around the unit to connect the pressure tubing and avoid locations with severe vibrations, excessive moisture or rapid temperature changes. It should be mounted on a vertical surface with the pressure ports on the bottom and the cable entrance on the right. The enclosure has a standard ½" conduit opening and may be installed with either conduit and a conduit coupler or a cable gland type fitting. Open the hinged cover by releasing the latch and connect the device according to the wiring instructions. After wiring and setup are complete, close and latch the cover. The cover may be secured with two self-tapping screws in the holes provided.

Hardware Setup

The analog output type must be set before the device is connected. Slide the pcb switch labelled **VOLT** and **mA** to the correct position for the required output signal type, either 4-20 mA or 0-5/10 Vdc. Other parameters may be set on the DIP switches before or after the device is connected. Any DIP switch change will have an immediate effect on the operation.

Wiring Instruction

The transmitter has standard screw block connectors. Use shielded twisted pair wiring of at least 22 AWG for all connections and do not run device wires in the same conduit with wiring used to supply inductive loads such as motors. Disconnect the power supply before making any connections to prevent electrical shock or equipment damage. Make all connections in accordance with national and local electrical codes.

This is a 3-wire sourcing device. Connect the positive dc or the ac voltage hot side (24 Vac/dc \pm 10%) to the **POWER** terminal. The supply common is connected to the **COMMON** terminal. The device is reverse voltage protected and will not operate if connected backwards. It has a half-wave rectified power supply so the supply common is the same as the signal common. Several devices may be connected to one power supply and the output signals all share the same common. Use caution when grounding the secondary of a transformer or when wiring multiple devices to ensure the ground point is the same on all devices and the controller.

The analog output is available on the **PRES OUT** terminal. This signal is switch selectable for either voltage or 4-20 mA active output. In voltage mode the output is 0-5 or 0-10 Vdc. These options are indicated on the circuit board. The current output operates in the Active mode and does not require a loop power supply. This means **the signal current is generated by the transmitter and must not be connected to a powered input or device damage will result**. Check the controller Analog Input to determine the proper connection before applying power. Both current and voltage signals are referenced to the **COMMON** terminal. The voltage output signal has a minimum load that it is able to drive, similarly the current signal has a maximum load. Follow the ratings in the Specification section or inaccurate readings may result.

The remote zero feature may be used by wiring a dry-contact (relay only) digital output between the **ZERO IN** and **COMMON** terminals. Do not apply voltage to the **ZERO IN** terminal.

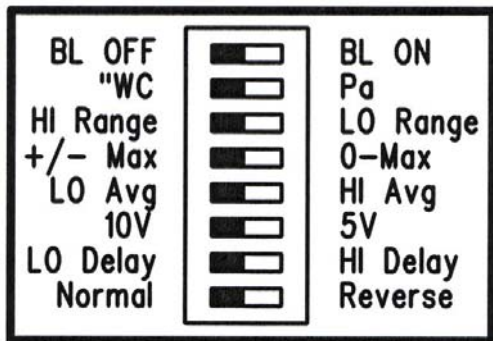
The **RELAY** output is a normally open dry contact. This signal can be used to directly control an alarm, ventilation fan or may be connected to a digital input of the BAS for status monitoring. Ensure any loads connected to the relay is within the relay rating in the Specification section.

Pneumatic Connections

The two pressure ports on the enclosure are labeled **High** and **Low**. The output signal reads a positive value when the port pressure is higher on the **High** port than the **Low** port so ensure these ports are connected correctly. Use 1/8" to 3/16" ID flexible tubing for the pressure connections. A flexible silicone tube is recommended. Arrange the tubing to minimize stress on the connections and ensure there are no kinks in the tubing. For most accurate measurements, do not leave the **Low** port open to the atmosphere, run a return line from the **Low** port to the vicinity of the point being measured.

Ensure the tubing to be used is clean and do not allow material to fall into the pressure ports as contamination could damage the sensor. When removing tubing use care to avoid breaking the ports. In some cases it is better to cut the tubing off rather than pulling it off but be careful not to cut the fitting or an air leak may occur.

DIP Switch Configuration



- BL OFF / BL ON Sets the LCD backlight on or off
- "WC / Pa Sets the pressure units
- HI Range / LO Range Sets the pressure range
- +/- Max / 0 - Max Sets bi- or uni-directional pressure range
- LO Avg / HI Avg Sets pressure averaging to 5 or 30 seconds
- 10V / 5V Sets the voltage output scale to 0-5 or 0-10 Vdc
- LO Delay / HI Delay Sets the alarm delay to 10 or 60 seconds
- Normal / Reverse Sets the alarm action

The effect of different DIP switch settings on the pressure range is shown in the following table.

Pressure Units	Pressure Range	Model			
		ULP 01		ULP 02	
		± Max	0 - Max	± Max	0 - Max
"WC	HI Range	± 1 "wc	0-1 "wc	± 0.25 "wc	0-0.25 "wc
	LO Range	± 0.5 "wc	0-0.5 "wc	± 0.125 "wc	0-0.125 "wc
Pa	HI Range	± 250 Pa	0-250 Pa	± 60 Pa	0-60 Pa
	LO Range	± 125 Pa	0-125 Pa	± 30 Pa	0-30 Pa

Power Up Instruction

Before turning on the power, verify all wiring to ensure that it complies with one of the included wiring diagrams and verify that the output signal type is correctly selected on the jumpers. Also, review the specifications to ensure the power supply is correct and that the pressure is within the correct range. The product should be allowed to warm-up for several minutes before attempting to verify accuracy. Allow the device to operate for 20 minutes before any calibration is performed.

Operation can be verified by measuring the output signal. For voltage output configuration, measure the voltage between the **PRESS OUT** and **COMMON** terminals. The voltmeter should read between 0-5 or 0-10 Vdc depending on the output range selected on the DIP switch. For current output configuration, insert a mA meter in series with the **PRESS OUT** terminal and it should read between 4 and 20 mA.

Normal Operation

If the unit is set to a unipolar range such as 0-1 "wc, then the pressure applied to the **High** port must be higher than the pressure applied to the **Low** port. In this case, if the **Low** port is left open to ambient pressure and the **High** port is used to measure a positive pressure, then the output pressure can be calculated as follows:

4-20 mA Pressure = [(Output current – 4 mA) / 16 mA] x Range
 0-5 Vdc Pressure = (Output voltage / 5 V) x Range

$$0\text{-}10\text{ Vdc} \quad \text{Pressure} = (\text{Output voltage} / 10\text{ V}) \times \text{Range}$$

In the case of 0-1 "wc, 4 mA or 0 V = 0 "wc and 20 mA or 5 V or 10 V = 1 "wc. Since the transmitter is linear, 0.5 "wc would be 12 mA or 2.5 V or 5 V. If the positive pressure connection is reversed then the transmitter will always output 4 mA or 0 V.

For a bipolar range such as ± 1 "wc, the pressure applied to the **High** port should be higher than pressure applied to the **Low** port for a positive output response. In this case, differential pressure can be measured using both ports. If the **High** port has a positive pressure with respect to the **Low** port, then the output indicates a positive pressure. Negative pressure is indicated if the **High** pressure is less than the **Low** pressure. For bipolar ranges, the output pressure can be calculated as follows:

$$\begin{aligned} 4\text{-}20\text{ mA} & \quad \text{Pressure} = [(\text{Output current} - 4\text{ mA}) / 16\text{ mA}] \times 2 \times \text{Range} - \text{Offset} \\ 0\text{-}5\text{ Vdc} & \quad \text{Pressure} = (\text{Output voltage} / 5\text{ V}) \times 2 \times \text{Range} - \text{Offset} \\ 0\text{-}10\text{ Vdc} & \quad \text{Pressure} = (\text{Output voltage} / 10\text{ V}) \times 2 \times \text{Range} - \text{Offset} \end{aligned}$$

In the case of ± 1 "wc, 4 mA or 0 V = -1 "wc and 20 mA or 5 V or 10 V = +1 "wc. Since the transmitter is linear, 0 "wc would be 12 mA or 2.5 V or 5 V.

During normal operation the device reads the pressure sensor and calculates the pressure value depending on the device model ranges and the selected pressure range. The pressure value is displayed on the LCD (if installed) and set as the value for the analog output.

The output signal may be affected by the pressure averaging time setting. The pressure averaging setting controls how many readings are averaged to form the output value. The pressure averaging value can be set to **LO Avg** for a 5 second average of the output signal or to **HI Avg** for a 30 second average to form the output value. This value effectively filters the output to prevent noise and false alarms.

Alarm Operation

During normal operation the device also compares the output pressure value to the alarm setpoint and takes appropriate action. If the pressure value exceeds the setpoint then an alarm condition is set and the device will operate in alarm mode. Alarm mode activation is controlled by certain device settings.

The setpoint can be set using the **Alarm Setpoint** control on the pcb. Moving the control clockwise changes the setpoint from the minimum to the maximum pressure of the selected range, either 0-MAX or -MAX to +MAX, depending on the DIP switch position. The LCD will show the setpoint briefly while it is being adjusted and will revert back to the normal display when adjustment stops.

When the input pressure exceeds the setpoint for the delay time, then the relay contacts will close. When the input pressure decreases below the setpoint for the delay time then the relay contacts will open again. The alarm on/off delay time can be set to either **LO Delay** (10 seconds) or **HI Delay** (60 seconds) via a DIP switch. The operation described above is for the default **Normal Alarm**. A DIP switch can be set to **Reverse Alarm** which will cause the alarm operation to reverse. In this case the alarm condition will be set when the pressure falls below the setpoint, instead of above the setpoint.

Auto Zero Operation

A sensor auto zero can be initiated by pressing and holding the internal auto zero switch for at least 3 seconds. If both pressure ports are close to zero pressure (open to ambient), then the device will calibrate with a new zero point. The auto zero can also be initiated by holding the ZERO IN terminal low for 3 seconds.

Generally, it is not recommended that a span calibration be performed in the field unless a high quality calibrator with low differential pressure ranges is available and the temperature of the sensor can be maintained. Contact the factory for information on this type of calibration.

Specifications

Pressure Ranges	ULP01	± 1 "wc, 0-1 "wc, ± 0.5 "wc, 0-0.5 "wc, ± 250 Pa, 0-250 Pa, ± 125 Pa, 0-125 Pa
	ULP02	± 0.25 "wc, 0-0.25 "wc, ± 0.125 "wc, 0-0.125 "wc, ± 60 Pa, 0-60 Pa, ± 30 Pa, 0-30 Pa
Accuracy	. . . . .	± 1% FS of selected range
Stability	. . . . .	± 1% FS (1 year)
Thermal Effect	. . . . .	± 2% FS max , 10 - 40 °C (50 - 104 °F)
Response Time	. . . . .	5 or 30 Seconds (switch selectable)
Proof Pressure	. . . . .	100 "wc (24.9 kPa) for ULP01, 40 "wc (9.96 kPa) for ULP02
Burst Pressure	. . . . .	200 "wc (49.8 kPa) for ULP01, 80 "wc (19.9 kPa) for ULP02
Operating Conditions	. . . . .	0 - 60 °C (32 - 140 °F), 0 - 90 %RH non-condensing
Storage Temperature	. . . . .	-40 - 95 °C (-40 - 203 °F)
Media Compatibility	. . . . .	Dry air or inert gas
Zero Adjust	. . . . .	Pushbutton or digital input auto-zero
Power Supply	. . . . .	24 Vac/dc ± 10%
Power Consumption	. . . . .	55 mA max with relay option
Output Signal	. . . . .	4-20 mA (3-wire), 0-5 or 0-10 Vdc (3-wire), field selectable
Output Drive	. . . . .	750 Ω max (4-20 mA), 2 KΩ min (voltage)
Optional Display	. . . . .	3 ½ digit LCD, 0.45" digit height, unit symbols and backlight
Optional Alarm Relay	. . . . .	NO contact, 2 Amps @ 120 Vac or 30 Vdc
Alarm Trip Point	. . . . .	Adjustable over the pressure range (forward or reverse acting)
Alarm Delay	. . . . .	10 or 60 Seconds (switch selectable)
Wiring Connections	. . . . .	Screw terminal block (14 to 22 AWG)
Pressure Connections	. . . . .	Barbed ports for 1/8" to 3/16" ID tubing
Conduit Connection	. . . . .	Access hole for ½" NPT conduit or cable gland
Enclosure	. . . . .	Grey ABS with gasket, UL94-5VB
		5.7" W x 4.0" H x 2.5" D (145mm x 101mm x 63mm)
Weight	. . . . .	260 g (9.2 oz)

