

# Ultra Low Pressure Transmitter ULP

Installation Instructions



#### **Introduction**

The Ultra Low Pressure Transmitter 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 Pressure Transmitter. 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, as shown in figure 1.

The enclosure has a hinged cover with latch. Open cover by pulling slightly on the latch on the right side of the enclosure. At the same time pulling on the cover, as illustrated in figure 2.

Feed conduit/cable gland fitting through the provided hole in side of enclosure and secure with a lock nut as show in figure 3. It is recommended that weather proof conduit or cable gland fittings be used.

Make wiring connections as per the "Wiring" illustrations on Page 3.

Swing door closed until securely latched. For added security, 2 screws are provided that may be installed in the integrated screw tabs. See figure 4.





## **Hardware Setup**

**The analog output type must be set before the device is connected.** Slide the switch labelled VOLT and mA to the correct position for the required output signal type, either 4-20 mA or 0-5/10 Vdc. See figure 5. 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.

## DIP Switch Configuration (See figure 6)

BL OFF / BL ON	Sets the LCD backlight on or off
"WC / Pa	Sets the pressure units to "WC or Pascals
HI Range / LO Range*	Sets the pressure range (See chart below)
+/- 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 (N/A when mA output is selected)
LO Delay / HI Delay	Sets the alarm delay to 10 or 60 seconds (N/A if no relay is ordered)
Normal / Reverse	Sets the alarm action (N/A if no relay is ordered)
Normal / Reverse	Sets the alarm action (N/A if no relay is ordered)

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

		Model			
Pressure	Pressure	ULP*1		UL	P*2
Units	Range	± Max	0 - Max 🔺	± Max	0 - Max
"WC	HI Range	± 1 "wc	0-1 "wc	± 0.25 " <mark>w</mark> c	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



#### **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. See figure 7.

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. See figure 8.

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. See figure 9.

## Wiring Instruction (con't)



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	
0-5 \	/dc	
0-10	Vdc	

Pressure = [(Output current – 4 mA) / 16 mA] x Range Pressure = (Output voltage / 5 V) x Range Pressure = (Output voltage / 10 V) x 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  $\pm 1$  "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:

4-20 mA	Pressure = $[(Output current - 4 mA) / 16 mA] \times 2 \times Range - Offset$
0-5 Vdc	Pressure = (Output voltage / 5 V) x 2 x Range – Offset
0-10 Vdc	Pressure = (Output voltage / 10 V) x 2 x Range – Offset

#### Normal Operation con't

In the case of  $\pm 1$  "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.

Dimensions

# Specification:

specification:		•				
Pressure Ranges: ULP*1	± 1 "wc, 0-1 "wc, ± 0.5 "wc, 0-0.5 "wc,			◀	145 mm 5.7 "	►
	± 250 Pa, 0-250 Pa, ± 125 Pa, 0-125 Pa					
ULP*2	± 0.25 "wc, 0-0.25 "wc, ± 0.125 "wc, 0-0.125 "wc,			∢	114.3 mm	►
	± 60 Pa, 0-60 Pa, ± 30 Pa, 0-30 Pa				4.5	
Accuracy	± 1% FS of selected range	*				
Stability	± 1% FS (1 year)		t	+•/		$\setminus \bigcirc  $
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 ULP*1,					
	40 "wc (9.96 kPa) for ULP*2	100 mm	88.9 mm			
Burst Pressure	200 "wc (49.8 kPa) for ULP*1.	5.55	3.5 "			
	80 "wc (19.9 kPa) for UI P*2					
Operating Conditions	$.0 - 60^{\circ}C(32 - 140^{\circ}F).$					
operating containers in	0 - 90 %RH non-condensing					
Storage Temperature	-40 - 95 °C (-40 - 203 °F)	Ļ	*	-+0		/ 0 ]
Media Compatibility	. Dry air or inert gas			High Port	Low Port	
Zero Adjust	Pushbutton or digital input auto-zero					Mounting Holes (X4) Ø 0.200"
Power Supply	24Vac/dc + 10%			1/0" Parked for 2/16 ID	tubing	
Power Consumption	55 mA max with relay option			1/8 barbed for 5/101b	tubing	
Output Signal	4-20  mA (3-wire) 0-5  or  0-10  Vdc (3-wire)				63 mm	
output signal	field selectable				2.5 "	
	7500  max (4-20  mA) 2  KO min (voltage)					
Optional Display	31/2 digit LCD 0.45" digit beight					
optional Display	unit symbols and backlight					
Optional Alarm Belay	MO 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	Scrow torminal block (14 to 22 AWG)				.	
Prossure Connections	Barbad ports for 1/8" to 3/16" ID tubing				'	
Conduit Connection	Access hole for 1/8" NPT conduit or coble gland					
	Grow APS with gasket 11.04 5VP ID65 (NEMA 4V)				l	
	$145 \text{ mmW} \times 101 \text{ mmH} \times 62 \text{ mmD} (5.7" \times 4.0" \times 2.5")$					
Waight	$(5.7 \times 4.0 \times 2.5)$				Ħ	
weight	200 y (9.2 02)					