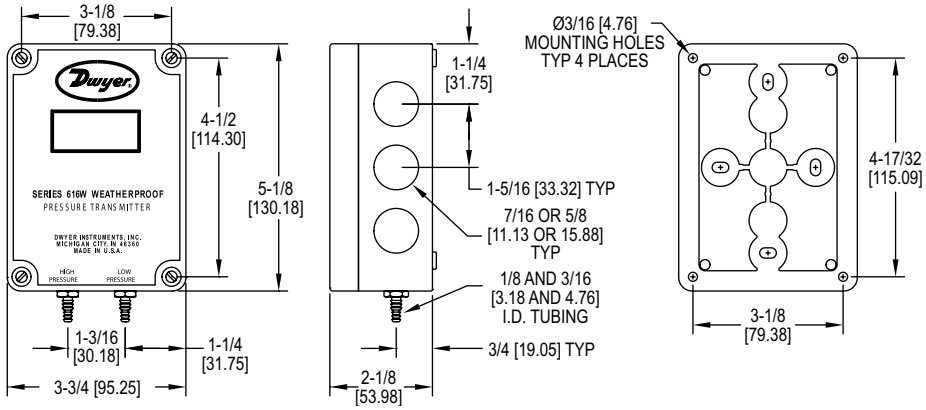
Series 616W Differential Pressure Transmitter

Specifications - Installation and Operating Instructions



The **Series 616W Differential Pressure Transmitter** senses the pressure of air and non-combustible, compatible gases and sends a standard 4-20 mA or selectable 0 to 5/0 to 10 VDC output signal. All models, including those featuring an LCD, are factory calibrated to specific ranges. Positive, negative, and differential pressures can be measured within a full-scale accuracy of ±0.25%. This weatherproof unit is enclosed in a polycarbonate case, rated NEMA 4X (IP66). The span and zero controls are for use when checking calibration, and are not intended for re-ranging.

MODEL CHART

Model	Range	Max. Pressure	Digital Display
616W-2	0 to 6 in w.c.	4.5 psig	–
616W-3	0 to 10 in w.c.	4.5 psig	–
616W-4	0 to 20 in w.c.	6 psig	–
616W-5	0 to 40 in w.c.	25 psig	–
616W-6	0 to 100 in w.c.	25 psig	–
616W-2-LCD	0 to 6 in w.c.	4.5 psig	0 to 6.00
616W-3-LCD	0 to 10 in w.c.	4.5 psig	0 to 10.00
616W-4-LCD	0 to 20 in w.c.	6 psig	0 to 20.0
616W-5-LCD	0 to 40 in w.c.	25 psig	0 to 40.0
616W-6-LCD	0 to 100 in w.c.	25 psig	0 to 100.0
616W-6B-LCD	3-0-3 in w.c.	3.6 psig	-3.00-0-3.00
616W-10B-LCD	5-0-5 in w.c.	3.6 psig	-5.00-0-5.00
616W-20B-LCD	10-0-10 in w.c.	4.5 psig	-10.00-0-10.00
616W-2M-LCD	0 to 1.5 kPa	31.0 kPa	0 to 1.50
616W-3M-LCD	0 to 2.5 kPa	31.0 kPa	0 to 2.50
616W-4M-LCD	0 to 5 kPa	41.2 kPa	0 to 5.00
616W-5M-LCD	0 to 10 kPa	172.3 kPa	0 to 10.0

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Accuracy: 0.25% FS @ 77°F (25°C), display accuracy ±0.5%.
Thermal Effect: ±0.02% FS/°F (±0.036% FS/°C).
Stability: ±1% FS/yr.
Temperature Limits: -4 to 158°F (-20 to 70°C).
Pressure Limits: See chart.
Power Requirements: 10-36 VDC (2-wire), 17-36 VDC, or isolated 21.6-33 VAC (3-wire).
Output Signal: 4-20 mA (2-wire), 0-5 VDC, or 0-10 VDC (3-wire).
Zero and Span Adjustments: Digital push-button.
Response Time: Instantaneous (default) or 3 s (selectable).
Loop Resistance: Current output: 0-1250 Ω max.; Voltage output: Min. load resistance 1 kΩ.
Current Consumption: 21 mA max. continuous.
Electrical Connections: 4-wire removable European style terminal block for 16 to 26 AWG.
Process Connections: Barbed, dual size to fit 1/8″ and 3/16″ (3.12 and 4.76 mm) I.D. rubber or vinyl tubing.
Enclosure Rating: NEMA 4X (IP66).
Mounting Orientation: Any orientation.
Weight: Without LCD: 8.9 oz (253 g); With LCD: 9.5 oz (269 g).
Compliance: CE.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyermail.com**

INSTALLATION

1. **Location:** Select a clean, dry mounting location free from excess vibration where the temperature will remain between -4 to 158°F (-20 to 70°C). Distance from the receiver is limited only by total loop resistance. See Electrical Connections below. The tubing supplying pressure to the instrument can be practically any length required, but long lengths will increase response time slightly.

2. **Position:** A vertical position, with the pressure connection pointing down, is recommended. That is the position in which all standard models are spanned and zeroed at the factory. They can be used at other angles, but final spanning and zeroing must be done while the transmitter is in that alternate position.

3. **Pressure Connections:** Two integral barbed tubing connections are provided. They are dual-sized to fit both 1/8″ and 3/16″ (3.12 and 4.76 mm) I.D. tubing. Be sure the pressure rating of the tubing exceeds that of the operating range. On ranges over 20 psi, we recommend use of a suitable hose clamp to assure the integrity of the connection.

ELECTRICAL CONNECTIONS

The 616W transmitter utilizes a **2-wire 4-20 mA Current Output**, or a **3-wire 0-5 V / 0-10 V Voltage Output**. It is also capable of **Simultaneous Current and Voltage Output**. The power and signals interconnect via a removable European-style four conductor terminal block, or optionally, via the included tooless terminal block.

NOTICE If equipped, the LCD must be removed before wiring. Pull the LCD directly away from the product to remove. Reinstall the LCD after wiring is completed.

2-Wire 4-20 mA Current Output

CAUTION DO NOT EXCEED SPECIFIED SUPPLY VOLTAGE RATINGS. PERMANENT DAMAGE NOT COVERED BY WARRANTY WILL RESULT. SIMULTANEOUS OUTPUTS ARE NOT DESIGNED FOR AC VOLTAGE OPERATION.

The connections to the transmitter are made through terminals VDC and COM on the terminal block as shown in **Figure 1**. The terminal block is removable and each of the terminals are labeled next to the terminal block on the circuit board. Polarity is indicated by VDC and COM. See **Figure 1**.

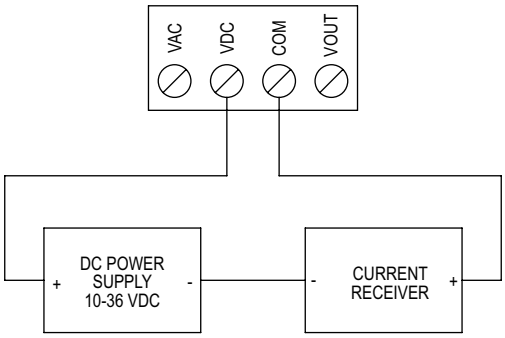


Figure 1

The maximum receiver load resistance (RL) for a given power supply voltage (Vps) is defined by the formula:

$$R_L = \frac{V_{ps} - 10.0}{20 \text{ mA DC}}$$

Shielded 2-wire cable is recommended for control loop wiring. Ground the shield at the power supply end only.

The receiver may be connected to either the negative or positive side of the loop, whichever is most convenient. Should polarity of the transmitter or receiver be inadvertently reversed, the loop will not function properly but no damage will be done to the transmitter.

The maximum length of connecting wire between the transmitter and the receiver is a function of wire size and receiver resistance. That portion of the total current loop resistance represented by the resistance of the connecting wires themselves should not exceed 10% of the receiver resistance. For extremely long runs (over 1,000 feet), it is desirable to select receivers with lower resistances in order to keep the size and cost of the connecting leads as low as possible. In installations where the connecting run is no more than 100 feet, you can use a connecting lead wire as small as No. 22 ga.

3-Wire 0-10 V and 0-5 V Voltage Output

CAUTION DO NOT EXCEED SPECIFIED SUPPLY VOLTAGE RATINGS. PERMANENT DAMAGE NOT COVERED BY WARRANTY WILL RESULT.

The terminal block is removable and each of the terminals are labeled next to the terminal block on the circuit board. Positive polarity is indicated by VOUT. AC/DC selection is made via the terminal block. If the polarity of the transmitter is inadvertently reversed, the unit will not function properly, but no damage will be done to the transmitter.

Selection of using a DC or AC power supply is made via the terminal block.
See **Figure 2** for DC Wiring.
See **Figure 3** for AC Wiring.

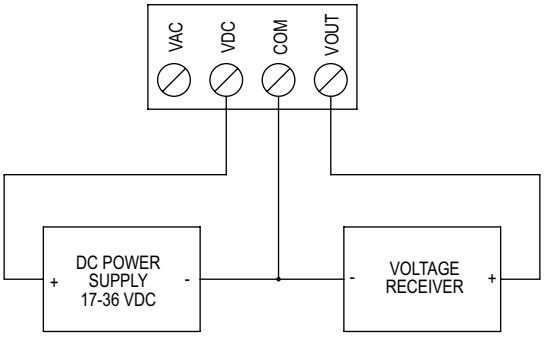


Figure 2: DC wiring

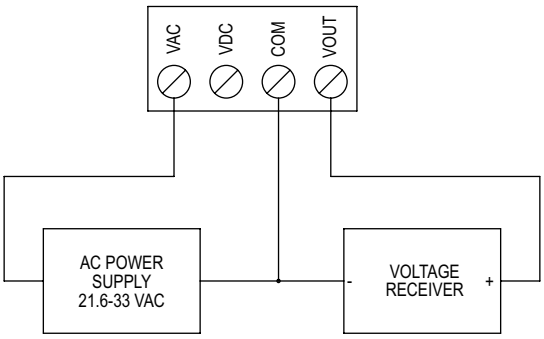


Figure 3: AC wiring

The minimum receiver load is 1 kΩ. The resistance due to the wire should be low compared to the receiver load resistance. While the voltage at the terminal block remains unchanged with a 10 mA current flow, resistive losses in the wiring do cause errors in the voltage delivered to the receiver. For a 1% accurate gage, the resistance of the wires should be less than 0.1% of the value of the receiver load resistance. This will keep the error caused by the current flow below 0.1%.

The output across VOUT and COM will be either 0-5 V, 0-10 V depending on the DIP switch setting. See **DIP Switch Settings Section** for more information.

3-Wire 0 to 10 V and 0 to 5 V Voltage Operation
Simultaneous Current and Voltage Output

CAUTION DO NOT EXCEED SPECIFIED SUPPLY VOLTAGE RATINGS. PERMANENT DAMAGE NOT COVERED BY WARRANTY WILL RESULT. SIMULTANEOUS OUTPUTS ARE NOT DESIGNED FOR AC VOLTAGE OPERATION.

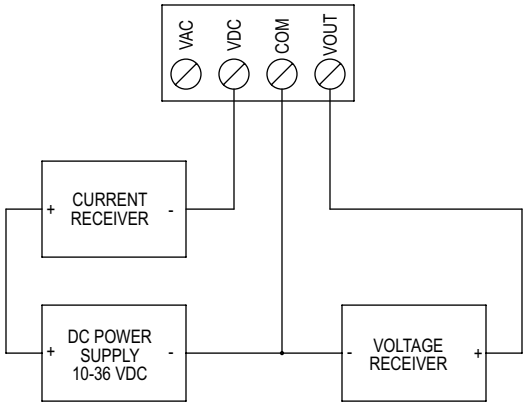


Figure 4: Simultaneous current and voltage output wiring

The terminal block is removable and each of the terminals is labeled underneath the terminal block on the circuit board. Positive polarity is indicated by VOUT. The VDC terminal and a DC power supply must be used for Simultaneous Current and Voltage Output. The voltage output and the power supply must have separate wire leads that are only joined at terminal 2 of the transmitter. Additional error may occur for the voltage output if a single wire is used or if the wires are joined at the power supply or receiver.

For the current output, the maximum allowable loop resistance (wiring + receiver resistance) is dependent on the power supply. The maximum loop voltage drop must not reduce the transmitter voltage below 17 V. The maximum loop resistance (R_{MAX}) for a given power supply voltage (V_{PS}) can be calculated using the following equation:

$$R_{MAX} = \frac{(V_{PS} - 17.0)}{20 \text{ mA DC}}$$

The equation uses 17.0 instead of 10.0 as seen in the equation earlier with **Figure 1**. This represents the minimum voltage supply which is higher on the simultaneous output configuration due to the requirements of the voltage outputs.

Shielded 4-wire cable is recommended for control loop wiring. Ground the shield at the power supply end only. Should the polarity of the transmitter or receiver be inadvertently reversed, the unit will not function properly, but no damage will be done to the transmitter.

For voltage outputs, the minimum receiver load is 1 kΩ. The resistance due to the wire should be low compared to the receiver load resistance. While the voltage at the terminal block remains unchanged with a 10 mA current flow, resistive losses in the wiring do cause errors in the voltage delivered to the receiver. For a 1% accurate gage, the resistance of the wires should be less than 0.1% of the value of the receiver load resistance. This will keep the error caused by the current flow below 0.1%.

The output across VOUT and COM will be either 0-5 V or 0-10 V depending on the DIP switch setting. See **DIP Switch Settings Section** for more information.

Power Supply
Refer to the following tables for the required supply rating.

Current Output	
Supply Voltage	10-36 VDC
Loop Resistance	0-1250 Ω

Voltage Output	
Supply Voltage	17-36 VDC
	21.6-33 VAC isolated
Minimum Output Load Resistance	1000 Ω

DIP SWITCH SETTINGS
DIP switch settings are marked directly on the PCBA as shown in **Figure 5**. Switches are factory-set, based on the order configuration. You can also use a small screwdriver or pen to change the position of the switches.

NOTICE **Figure 5** is a depiction of a 5 in w.c. pressure board. Other pressure boards, while similar, will vary from the below.

WARNING There are no hazardous voltages if supplied power is within the specified range. However, it is a good idea to shut control systems down while changing DIP switches to prevent erratic control system behavior.

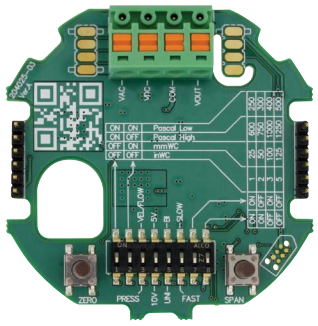


Figure 5: 5 in w.c. pressure board

Key To DIP Switch Settings
DIP Switch 4 - Voltage Output Range
Voltage output range can be either 0-10 V or 0-5 V depending on the position of DIP Switch 4.
- When the switch is in the OFF or down position, the output will be 0-10 V
- When the switch is in the ON or up position, the output will be 0-5 V.

DIP Switch 6 - Response Time Selection
DIP Switch 6 toggles to select the desired response time.
- When the switch is in the OFF or down direction, the transmitter response time will be instantaneous.
- When the switch is in the ON or up direction, the response time will be 3 seconds.

NOTICE The remaining DIP switches are disabled.

CALIBRATION
There is a 3 second delay from the time the zero or span calibration buttons are released until the time that the change in calibration takes place. This delay is used to prevent stress related offsets on the lower ranges.

Zero Calibration
The zero calibration can be set by applying zero pressure to both of the pressure ports and pressing the zero button for 3 seconds. If the LCD display is present, the display will read ZERO and then sequence back to the home display.

Span Calibration

NOTICE For a positive span, apply pressure to the positive “+” port.

The span calibration function allows the pressure value to be adjusted so that the currently applied pressure is the maximum configured pressure. This will in turn set the maximum analog output at the set pressure. It is recommended that the ZERO function be applied before performing a span. Apply the maximum desired pressure to the device, press and hold span for 3 seconds. If the LCD display is present, SPAN is displayed. The span function will be processed 3 seconds after the span button is released.

LCD DISPLAY

The LCD comes with a housing cover, which contains a window. The display plugs into the pins on top of the circuit board. The LCD is 180° rotatable so that it will read properly if the device must be mounted with the connections facing up.

The following error messages will appear if an LCD is present and the device is an error state.

LCD ERROR MESSAGES	
Error Code	**Message**
OVER	The applied pressure is 3% greater than the selected output high value causing an Over Range Error.
UNDR	The applied pressure is 1% less than the selected output low value causing an Under Range Error.
FAIL	When the span button is pressed, the pressure value is out of the range to allow a correct setting.
ER 1	The pressure applied to the sensor is beyond its ability to read.
ER 2	The pressure sensor is communicating but reporting an internal error.
ER 3	The pressure sensor is not communicating.
ER 4	The stored user settings are invalid.
ER 5	The stored factory settings are invalid.
ER 6	Non-volatile user memory has failed.
ER 7	Non-volatile factory memory has failed.

MAINTENANCE/REPAIR

Upon final installation of the Series 616W Differential Pressure Transmitter, no routine maintenance is required. The Series 616W is not field serviceable and is not possible to repair the unit. Field repair should not be attempted and may void warranty.

This symbol indicates waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.

WARRANTY/RETURN

Refer to “Terms and Conditions of Sale” in our catalog and on our website. Contact customer service to receive a Return Goods Authorization number before shipping the product back for repair. Be sure to include a brief description of the problem plus any additional application notes.

Printed in U.S.A. 8/22

FR# 444343-50

DWYER INSTRUMENTS, INC.

P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.

Phone: 219/879-8000 **www.dwyer-inst.com**

Fax: 219/872-9057 **e-mail: info@dwyermail.com**