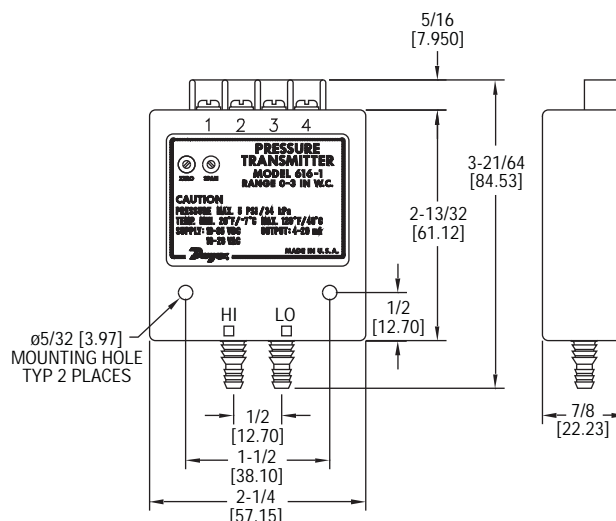




## Series 616 Differential Pressure Transmitter

### Specifications – Installation and Operating Instructions



The Series 616 Differential Pressure Transmitter senses the pressure of air and compatible gases and sends a standard 4-20 mA output signal. A wide range of models are available factory calibrated to specific ranges as listed in the chart below. The span and zero controls are for use when checking calibration. They are not intended for re-ranging to a significantly different span. Versatile circuit design enables operation in 2, 3 or 4-wire current loops.

For applications requiring direct pressure readings or percent of full span output, the optional Model A-701 Digital Readout makes an ideal companion device. It provides a bright red 0.6" high, 3-1/2 digit LED display while supplying power to the Series 616 transmitter. For additional information on these and other transmitters, see the Dwyer Instruments, Inc. Full Line catalog.

#### SPECIFICATIONS

**Service:** Air and non-combustible, compatible gases.

**Wetted Materials:** Consult factory.

**Accuracy:** 616:  $\pm 0.25\%$  F.S.; 616C:  $\pm 1.0\%$  F.S.

**Stability:**  $\pm 1\%$  F.S./yr.

**Temperature Limits:** 20 to 120°F (-6.67 to 48.9°C).

**Pressure Limits:** See Chart.

**Thermal Effect:** 616:  $\pm 0.055\%$  F.S./°F (0.099% F.S./°C); 616C:  $\pm 0.070\%$  F.S./°F (0.125% F.S./°C).

**Power Requirements:** 10-35 VDC (2, 3 or 4 wire); 16-26 VAC (4 wire).

**Output Signal:** 4 to 20 mA.

**Zero and Span Adjustments:** Potentiometers for zero and span.

**Loop Resistance:** DC: 0-1250 ohms maximum; AC: 0-1200 ohms maximum.

**Current Consumption:** DC: 38 mA maximum; AC: 76 mA maximum.

**Electrical Connections:** Screw-type terminal block.

**Process Connections:** Barbed, dual size to fit 1/8" and 3/16" (3.12 mm and 4.76 mm) I.D. rubber or vinyl tubing.

**Mounting Orientation:** Vertical, consult factory for other position orientations.

**Weight:** 1.8 oz. (51 grams).

#### Series 616 Transmitter Models and Ranges\*

Model	Range	Max. Press.	Model	Range	Max. Press.
616-00	0-1 in. w.c.	2 psig	616-8	0-10 psid	29 psig
616-0	0-2 in. w.c.	2 psig	616-9	0-20 psid	58 psig
616-1	0-3 in. w.c.	2 psig	616-10	0-30 psid	58 psig
616-2	0-6 in. w.c.	5 psig	616-11	0-50 psid	150 psig
616-3	0-10 in. w.c.	5 psig	616-12	0-100 psid	150 psig
616-4	0-20 in. w.c.	11 psig	616-3B	1.5-0-1.5 in. w.c.	2 psig
616-5	0-40 in. w.c.	11 psig	616-6B	3-0-3 in. w.c.	5 psig
616-6	0-100 in. w.c.	29 psig	616-10B	5-0-5 in. w.c.	5 psig
616-7	0-200 in. w.c.	29 psig	616-20B	10-0-10 in. w.c.	11 psig

\*All models available with 0.25% F.S. Accuracy.

Models available with 1.0% F.S. Accuracy include 616-1 through 616-20B.

## Installation

### 1.0 Location

Select a clean, dry mounting location free from excess vibration where the temperature will remain between 20 and 120°F (-6.7 and 48.9°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 pressure connections 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 transmitter is in that alternate position.

### 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 ranges. On ranges over 20 psi, we recommend use of a suitable hose clamp to assure the integrity of the connection.

### Electrical Connections

**CAUTION: Do not exceed specified supply voltage ratings. Permanent damage not covered by warranty will result. This unit is not designed for 120 or 240 volts AC line operation.**

Electrical connections are made to the terminal block located on the top of the transmitter. Terminals are marked 1, 2, 3 and 4 (see Fig. B below). Determine which of the following circuit drawings applies to your application and wire accordingly.

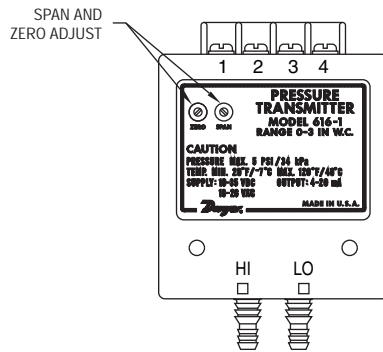


Figure B

### Wire Length

The maximum length of wire connecting transmitter and receiver is a function of wire size and receiver resistance. Wiring should not contribute more than 10% of the receiver resistance to total loop resistance. For extremely long runs (over 1000 feet), choose receivers with higher resistance to minimize size and cost of connecting leads. Where wiring length is under 100 feet, hook-up wire as small as 22 AWG can be used.

### 2-Wire Operation

An external power supply delivering 10-35 VDC with minimum current capability of 40 mA DC (per transmitter) must be used to power the control loop. See Fig. C for connection of the power supply, transmitter and receiver. Note the jumper between terminals 3 and 4. The range of appropriate receiver load resistance ( $R_L$ ) for the DC power supply voltage available is expressed by the formula and graph in Fig. F. Shielded two wire cable is recommended for control loop wiring. If grounding is required, use the negative side of the control loop after the receiver. Otherwise, in 2-wire operation it is not necessary to observe polarity of control loop connections.

#### 2-Wire Connections

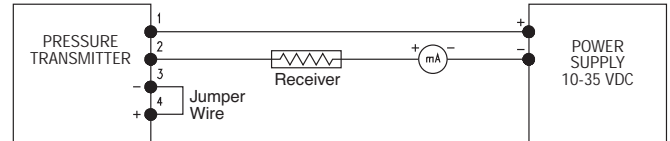


Figure C

### 3-Wire Operation

An external power supply delivering 10-35 VDC with minimum current capability of 40 mA DC (per transmitter) is required. See Fig. D for connection of power supply, transmitter and receiver. The range of appropriate receiver load resistance ( $R_L$ ) for the DC power supply available is expressed by the formula and graph in Fig. F. Shielded cable is recommended for control loop wiring. Do not employ a separate ground in 3-wire operation. Unit will not function properly and/or damage could result. Control loop polarity must be observed in the following respect. Although power supply terminals 1 and 2 are not polarized, the receiver must be connected between terminal 3 of transmitter and negative side of power supply.

#### 3-Wire Connections

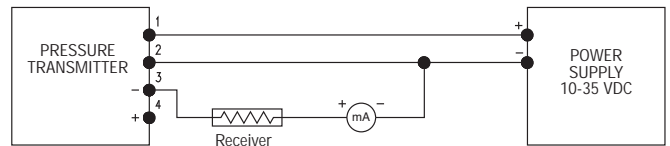


Figure D

### 4-Wire Operation

An external power supply delivering 10-35 VDC with a minimum current capability of 40 mA DC (per transmitter) or 16-26 VAC with a minimum current capability of 80 mA AC (per transmitter) is required. See Fig. E for connection of power supply, transmitter and receiver. The range of appropriate load resistance ( $R_L$ ) for the DC or AC power supply available is expressed by the formulas and graphs in Fig's. F and G. Shielded cable is recommended for control loop wiring. Do not employ a separate ground in 4-wire operation. Unit will not function properly and/or damage could result. Control loop polarity must be observed; terminal 3 is negative and terminal 4 is positive.

### 4-Wire Connections

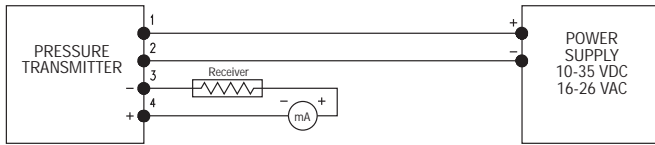


Figure E

### Power Supply Voltage – VDC (2, 3 or 4-wire)

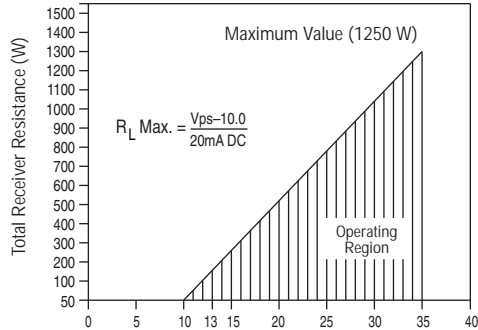


Figure F

### Power Supply Voltage – VAC (4-Wire)

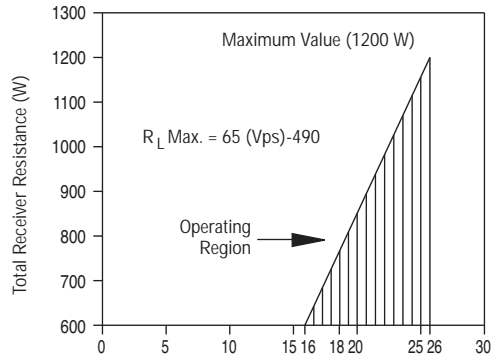


Figure G

1. With the transmitter connected to the companion receiver, insert an accurate milliammeter in series with the current loop. Full scale range should be approximately 30 mA.

2. Connect a controllable pressure source to one leg of a tee with the other two legs connected to the high pressure port of the transmitter and the third leg to an accurate test gage or manometer, in an appropriate range. The low pressure port should be vented to atmosphere. Calibration must be performed with the unit in the same position in which it will be mounted.

3. Apply electrical power to the unit and allow it to stabilize for 10 minutes.

4. With no pressure applied to the transmitter, adjust ZERO control so that loop current is 4 mA.

5. Apply full range pressure and adjust loop current to 20 mA using SPAN control.

6. Relieve pressure and allow transmitter to stabilize for 2 minutes.

7. Zero and span controls are slightly interactive, so repeat steps 4 through 6 until zero and full range pressures consistently produce currents of 4 and 20 mA respectively.

8. Remove the milliammeter from the current loop and proceed with final installation of the transmitter and receiver.

### Voltage Input

Series 616 Transmitters can be easily adapted for receivers requiring 1-5 or 2-10 VDC inputs. Insert a 249 ohm, 1/2 watt (1-5 VDC) or 499 ohm (2-10 VDC) resistor in series with the current loop but in parallel with the receiver input. Locate this resistor as close as possible to the input. Because resistor accuracy directly influences output signal accuracy, we recommend use of a precision  $\pm 0.1\%$  tolerance resistor to minimize this effect. See Fig. H and J below.

### 3-Wire Connection (1-5 or 2-10 VDC Output)

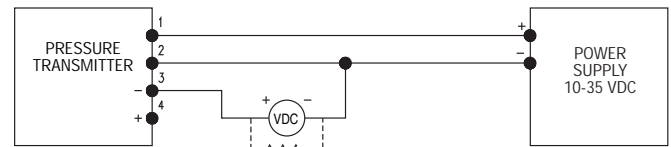


Figure H

### Calibration Check

Each Series 616 Transmitter is factory calibrated to the range given in the model chart. To check calibration and adjust if necessary, the following procedure should be used. For purposes of clarification in these instructions, range is defined as that pressure which, applied to the transmitter, produces 20 milliamps of current in the loop. Zero pressure is always assumed to be 4 milliamps.

#### 4-Wire Connection (1-5 or 2-10 VDC Output)

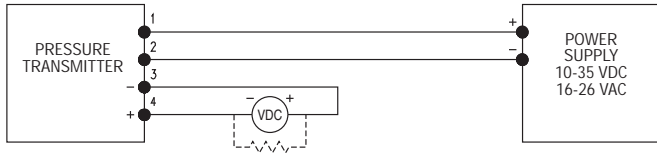


Figure J

#### Maintenance

Upon final installation of the Series 616 Differential Pressure Transmitter and the companion receiver, including the A-701 Digital Readout, no routine maintenance is required. A periodic check of the system calibration is recommended following the procedures explained on page 3 under Calibration Check. The Series 616 Transmitter is not field serviceable and should be returned, freight prepaid, to the factory if repair is required. Please enclose a description of the problems encountered plus any available application information. The A-701 should be returned directly to its manufacturer for service. See the A-701 instructions for address.

#### Multiple Receiver Installation

An advantage of the standard 4-20 mA DC output signal produced by the Series 616 Transmitter is that any number of receivers can be connected in series in the current loop. Thus, an A-701 Digital Readout, an analog panel meter, a chart recorder, process controlling equipment or any combination of these devices can be operated simultaneously. The only requirement is that each component be equipped for a standard 4-20 mA input and the proper polarity of the input connections be observed when inserting the device in the current loop. If any of the units display a negative or downscale reading, the signal input leads are reversed.