

Explosionproof Electronic Pressure Transmitter

Installation and Operation Manual





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Warranty Policy

Ametek ("Seller") warrants these products for a period of one year from the date of shipment that all products manufactured by the seller are free from defects of material and workmanship when used within the service, range, and purpose for which they were manufactured. Seller will, at its option, repair, replace, or refund the purchase price of parts found by Seller to be defective in material or workmanship provided that written notice of such defect requesting instructions for repair, replacement, or refund is received by Seller at the address below within the warranty period and provided that any instructions thereafter given by Seller are complied with.

This warranty shall not apply (i) to the performance of any system of which Seller's products are a component part, (ii) to deterioration by corrosion or any cause of failure other than defect of material or workmanship, or (iii) to any of Seller's products or parts thereof which have been tampered with or altered or repaired by anyone except Seller or someone authorized by Seller, or subjected to misuse, neglect, abuse or improper use or misapplication such as breakage by negligence, accident, vandalism, the elements, shock, vibration, or exposure to any other service, range or environment of greater severity than that for which the products were designed.

SELLER MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF FITNESS OR OF MERCHANTABILITY WITH RESPECT TO ITS PRODUCTS, OR ANY PART THEREOF, OTHER THAN AS EXPRESSLY SET FORTH ABOVE. NOR SHALL SELLER HAVE INCURRED ANY OTHER OBLIGATIONS OR LIABILITIES OR BE LIABLE FOR ANY ANTICIPATED OR LOST PROFITS, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, TIME CHARGES, OR ANY OTHER LOSSES INCURRED IN CONNECTION WITH THE PURCHASE, INSTALLATION, REPAIR OR OPERATION OF ITS PRODUCTS (INCLUDING ANY PARTS REPAIRED OR REPLACED.)

This warranty does not extend to anyone other than the original Buyer from the Seller.



Introduction

The Model 831 Explosion proof pressure and differential pressure transmitters provide fixed range performance and all 316 stainless steel construction in a durable, accurate and cost effective package. The transmitters provide 4-20 mA or Low Power Voltage output and are designed to meet FM & CSA approvals for explosion proof apparatus for use in hazardous locations.

Model 831 provides as standard a 1/2" NPT female process connection for direct mounting to existing piping systems. Optional 1/4" or 1/2" male process connections are also available. It is provided with a 3/4" NPT female conduit connection and a shielded 22AWG cable.

Safety Summary

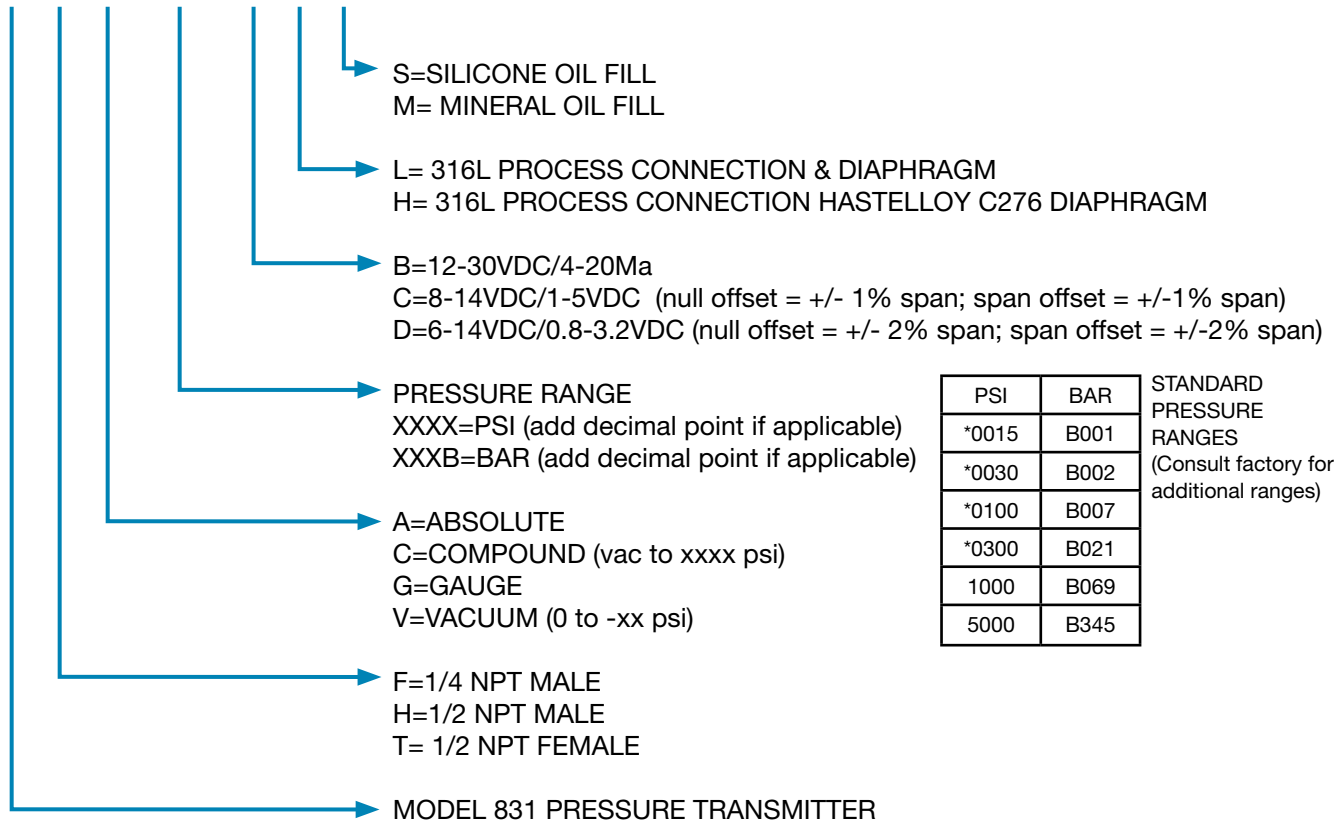
This instrument is designed to prevent an accidental shock to the operator when properly used. However, no design can ensure the safety of an instrument improperly installed or used negligently. Read this manual carefully and completely before operating the instrument. Failure to read this manual in its entirety could result in damage to the instrument or injury to the operator. Standard safety precautions must be used during installation and operation. Important messages located throughout this manual are as follows:

- | | |
|------------------|--|
| WARNING | Denotes a hazardous procedure or condition which, if ignored, could result in injury or death to the operator. |
| CAUTION | Denotes a hazardous procedure or condition which, if ignored, could result in damage or destruction to the instrument. |
| IMPORTANT | Denotes a procedure or condition that is essential to the correct operation of the instrument. |
| NOTE | Specifies supplementary and perhaps essential information in relation to a particular procedure or condition. |

Model 831T Single Port Pressure Transmitter Model Number Code

831 Electronic Pressure Transmitter

831 T G 0015 B L S



PSI	BAR	STANDARD PRESSURE RANGES (Consult factory for additional ranges)
*0015	B001	
*0030	B002	
*0100	B007	
*0300	B021	
1000	B069	
5000	B345	

CSA and FM Approvals

Specifications 15 to 5000 PSI Ranges



SAFETY CLASSIFICATIONS FACTORY MUTUAL
EXPLOSIONPROOF FOR CLASS I, DIVISION 1, GROUPS B, C, D
CLASS II, GROUPS E, F, G
CLASS III HAZARDOUS LOCATIONS
INDOOR AND OUTDOOR NEMA TYPE 4 ENCLOSURE

SAFETY CLASSIFICATION: CSA (CANADA & US)
EXPLOSIONPROOF FOR CLASS I, DIV 1, GROUPS B, C, D
CLASS II, GROUPS E, F, G
CLASS III HAZARDOUS LOCATIONS
ENCLOSURE TYPE 4

CONDUIT SEAL MUST BE WITHIN 18 INCHES OF TRANSMITTER.
MAX AMBIENT = 60°C

ANSI 1227.01-2011 CERTIFIED BY AMETEK FOR RANGES OF
15 THROUGH 300 PSI (NOT CERTIFIED BY FM OR CSA)

*Single seal classification to ANSI 1227.01-2011
certified by AMETEK for ranges 15 through 300 psi

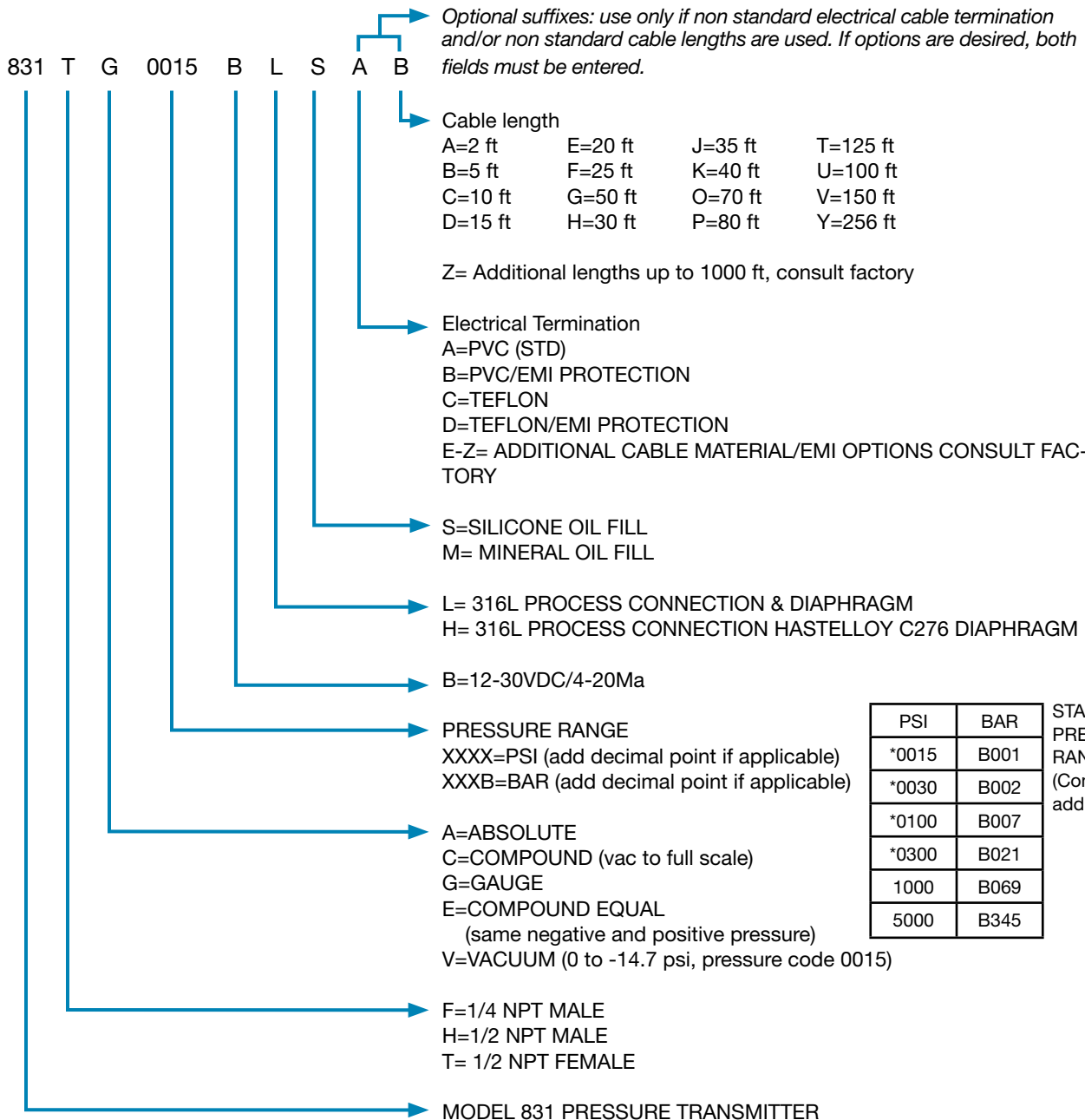


EXAMPLE: Model 831TG5000BLS Electronic
Pressure Transmitter, 1/2" NPT-Female Process Connection,
Gauge Pressure Type, 5000 psi Range, 12-30 VDC Input,
4-20 mA DC Output, 316L Stainless Steel Diaphragm, Silicon
Oil Fill

All units with standard 2ft (24") of PVC jacketed cable
For other ranges and cable options refer to page 1-2, CSA
(U.S. and Canada) approved model codes



Model 831T Single Port Pressure Transmitter Model Number Code



CSA APPROVAL (Canada and U.S.)

SAFETY CLASSIFICATION: CSA (CANADA & US)
EXPLOSIONPROOF FOR CLASS I, DIV 1, GROUPS B, C, D
CLASS II, GROUPS E, F, G
CLASS III HAZARDOUS LOCATIONS
ENCLOSURE TYPE 4

CONDUIT SEAL MUST BE WITHIN 18 INCHES OF TRANSMITTER.
MAX AMBIENT = 60°C

ANSI 1227.01-2011 CERTIFIED BY AMETEK FOR RANGES OF
15 THROUGH 300 PSI (NOT CERTIFIED BY FM OR CSA)



*Single seal classification to ANSI 1227.01-2011
certified by AMETEK for ranges 15 through 300 psi



EXAMPLE: Model 831TG5000BLSAC Electronic Pressure Transmitter, 1/2" NPT-Female Process Connection, Gauge Pressure Type, 5000 psi Range, 12-30 VDC Input, 4-20 mA DC Output, 316L Stainless Steel Diaphragm, Silicon Oil Fill with 10 FT of Cable



Description

The Model 831 is the most durable and cost effective pressure transmitter presently available. A fixed range, all stainless steel transmitter, it is designed to continuously measure process pressure for years of stable performance in even the toughest environmental and media conditions. The silicon piezoresistive sensing element consists of four ion implanted strain gauges forming a Wheatstone bridge circuit which will vary its resistance when subjected to process pressure. The Model 831 meets FM & CSA approval for explosion-proof rating in hazardous locations.

The small size and light weight of the Model 831 transmitter eliminates the need for complicated mounting hardware and mechanical supports, thereby reducing installation time substantially. The inline connection permits simple field wiring without the need for additional hardware, adding to the speed and ease of installation. Its profile allows for mounting in places too tight for other transmitters.

With all 316 stainless steel welded construction, the Model 831 is compatible with corrosive media and hazardous environments. The transmitter is weather proof and capable of withstanding direct spray. The Model 831 also meets NACE standards for offshore applications.

Specifications (Single Port)

FUNCTIONAL SPECIFICATIONS

Service: Liquid, Gas or Vapor

Pressure Range Limits:

-14.7 to 5000 PSI (-1.0 to 345 BAR)

Input (Power Supply)/ Output:

B Option = 12-30 VDC/4-20 mAADC
Limited to 30 mAADC

C Option = 8-14 VDC/1-5 VDC

D Option = 6-14 VDC/0.8-3.2 VDC

Offset:

B Option = 4.0 mA ± 2% Span

C Option = 1 VDC ± 2% Span

D Option = 0.8VDC ± 2% Span

Span:

B Option = 16.0 mA ± 1% Span

C Option = 4.0 VDC ± 1% Span

D Option = 2.4 VDC ± 2% Span

Loop Resistance: 900 ohms max @ 30 VDC
(B Output Option Only)

CSA AND FM APPROVED

(CURRENT & VOLTAGE MODELS)

SPECIFICATIONS (15-5000 psi standard ranges only)*

Input (power supply)/Output

12-30 VDC/4-20 mAADC

Performance Specifications

Output 4-20 mAADC, limited to 30 mAADC

Null offset (at 77°F (25°C) 4.0mA, ±2% Span

Span offset (at 77°F (25°C) 16.0mA, ±1% Span

Power supply 12 - 30 VDC with reverse polarity

(transmitter must be powered by an approved power supply)

Loop resistance 900 OHMS max @ 30 volts

Temperature limits Operating :-40° to 185°F (-40° to 85°C)

Electronics (ambient): -40° to 140°F (-40° to 60°C)

Process Interface: -40° to 212°F (-40° to 100°C)

Storage: -40° to 212°F (-40° to 100°C)

Compensated: -20° to 160°F (-29° to 71°C)

Overrange Limit 300%

Humidity Limits 1-100% RH

Accuracy ±0.30% of full scale including linearity (BFSL),
hysteresis and repeatability at 25°C and 12 VDC
excitation

Stability ±0.5% full scale per 6 months

Temperature effect ±2.0% per 50°F (28°C)

Includes zero & span
between -20° and 180°F (-29° to 82°C)
referenced to 77°F (25°C)

Vibration effect ±0.1% for 3g to 200 Hz

Overrange effect ±0.15% F.S. per 200% of maximum range

Position effect zero shifts up to 0.075 PSI

Power supply effect ±0.005% F.S. per volt

Physical Specifications

Materials of construction

Process wetted parts 316L (std) or Hastelloy C276

Non wetted parts 316 SS, PVC cable jacket (std)

nylon cable strain relief, buna-n cable seal

Fill fluid DC 200 silicone (std) or mineral oil

Process connection 1/2 npt female, 1/4 npt male

Electrical connection #22AWG 3 wire shielded cable, PVC jacket

Weight 0.83 lbs (376 grams)

Cable length 24 inches (61 cm), 22 AWG

8-14 VDC/1-5 VDC and 6-14 VDC/0.8-3.2 VDC

Performance Specifications

Output 1-5 or 0.8-3.2 VDC, limited to 40 VDC

Null offset (at 77°F (25°C) refer to model code

Span offset (at 77°F (25°C) refer to model code

Power supply 8 to 14 or 6 to 14 VDC with reverse polarity

(transmitter must be powered by an approved power supply)

Loop resistance 50K OHMS

Current consumption Approx. 2mA under reference operating conditions
(worse case 3.5mA)

Turn on time Performance within specs in less than 200mSEC
after power is applied

Temperature limits Operating :-40° to 185°F (-40° to 85°C)

Electronics (ambient): -40° to 140°F (-40° to 60°C)

Process Interface: -40° to 212°F (-40° to 100°C)

Storage: -40° to 212°F (-40° to 100°C)

Compensated: -20° to 160°F (-29° to 71°C)

Overrange Limit 300%

Humidity Limits 1-100% RH

Accuracy ±0.30% of full scale including linearity (BFSL),
hysteresis and repeatability at 25°C and 12 VDC
excitation

Stability ±0.5% full scale per 6 months

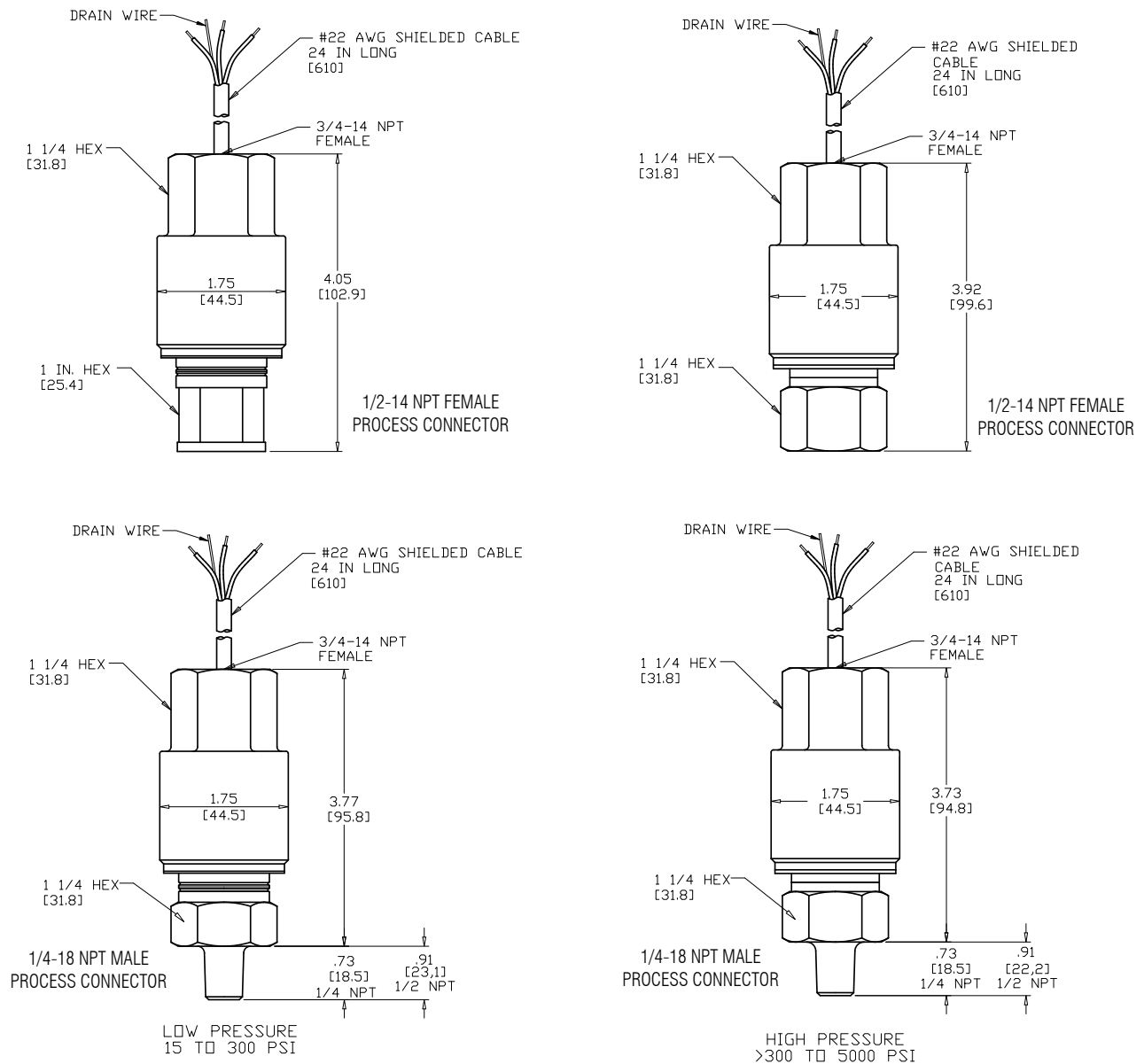
Temperature effect ±2.0% per 50°F (28°C)

**Consult factory for specifications and
approvals on ranges <15 psi**



Standard and Low Power Models

WIRE LEGEND		
CONDUCTOR COLOR	CURRENT OUTPUT (4-20mA)	VOLTAGE OUTPUT (0.8-3.2 OR 1-5VDC)
RED	+VIN	+VIN
BLACK	-VIN	-VIN
WHITE	N/A	+VOUT
GREEN	CASE GROUND	CASE GROUND

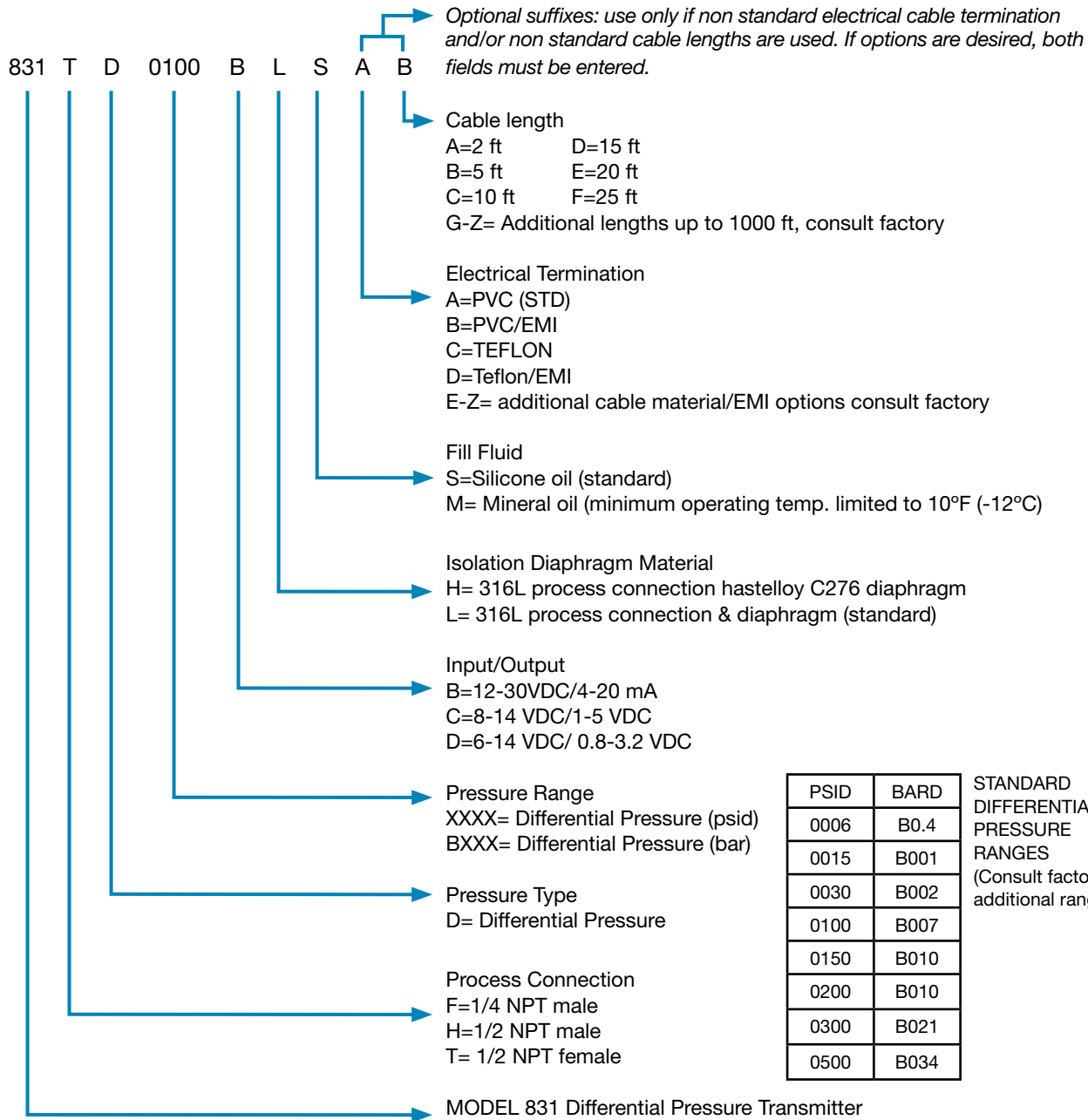


INCHES (MM)

FIGURE 1-1
MODEL 831T OUTLINE DIMENSIONS



Model 831TD Differential Pressure Transmitter Model Number Code



Example: Model 831 TD Electronic Pressure Transmitter, 1/2" NPT-Female Process Connection, Defferential Pressure Type, 200 psid Range, 12-30 VDC Input, 4-20 mA DC Output, 316L Stainless Steel Diaphragm, Silicon Oil Fill.



Description

The Model 831 TD is a fixed range, all stainless steel differential transmitter, it is designed to continuously measure process pressure for years of stable performance in even the toughest environmental and media conditions. The silicon piezoresistive sensing element consists of four ion implanted strain gauges forming a Wheatstone bridge circuit which will vary its resistance when subjected to process pressure. The Model 831TD is designed and constructed to meet CSA explosion-proof rating in hazardous locations.

The small size and light weight of the Model 831TD differential transmitter eliminates the need for complicated mounting hardware and mechanical supports, thereby reducing installation time substantially. The inline connection permits simple field wiring without the need for additional hardware, adding to the speed and ease of installation. Its profile allows for mounting in places too tight for other transmitters.

With all 316 stainless steel welded construction, the Model 831TD is compatible with corrosive media and hazardous environments. The transmitter is weather proof and capable of withstanding direct spray. It meets indoor and outdoor rating for NEMA 4 type enclosures. The Model 831TD also meets NACE standards for offshore applications.

Specifications (Differential Pressure)

FUNCTIONAL SPECIFICATIONS

Service: Liquid, Gas or Vapor

Pressure Range Limits: 0-6 to 0-500 psid (0.41 to 34.5 bar differential)

Input (Power Supply)/ Output:

B Option = 12-30 VDC/4-20 mA DC
Limited to 30 mA DC

C Option = 8-14 VDC/1-5 VDC

D Option = 6-14 VDC/0.8-3.2 VDC

Null Offset:

B Option = 4.0 mA \pm 1% Span

C Option = 1 VDC \pm 1% Span

D Option = 0.8VDC \pm 2% Span

Span:

B Option = 16.0 mA \pm 1% Span

C Option = 4 VDC \pm 1% Span

D Option = 2.4 VDC \pm 2% Span

Loop Resistance: (mA)/Load (VDC)

B Option = 900 ohms max @ 30 VDC

C & D Options = 50K OHM min.

CURRENT CONSUMPTION: Approx.

2 mA under reference operating conditions (worse case 3.5 mA)

Temperature Range:

Ambient Operating: -40°F to 140°F
(-40°C to 60°C)

Process Interface: -40°F to 212°F
(-40°C to 100°C)

Storage: -40°F to 212°F (-40°C to 100°C)

Maximum Pressure: 3X Full Scale Pressure
(Either Port)

Burst Pressure: 2500 psig

Humidity Limits: 0-100% RH

PERFORMANCE SPECIFICATIONS

Accuracy: \pm 0.5% Span (BFSL) including linearity, hysteresis and repeatability at 25°C and 12 VDC supply voltage (\pm 1.0% Span for 0-6 psid pressure range)

Stability: 0.5% Span for six months (1.0% Span for 6 psid pressure range)

Temperature Effect: (includes zero & span)

Compensated: 23 to 131°F (-5 to 55°C)

\pm 2.0% Span / 50°F (28°C)

Vibration Effect: \pm 0.1% of Span for 3g to 200 Hz

PHYSICAL SPECIFICATIONS

Materials of Construction

Process Wetter Parts: 316L

Housing Material: 316 SS

Fill Fluid: Silicone (DC200)

Process Connection: 1/2" NPT-Female (Standard)

Electrical Connection: 3/4" NPT-Female / Cable

Weight 1.8 lb. (817 grams)

Cable: 24 inches (61 cm), 22 AWG shielded (Standard)

HAZARDOUS LOCATIONS CLASSIFICATION

Canadian Standards Association

Explosion-proof* for Class I, Division 1, Groups B, C & D, Class II, E, F & G and Class III

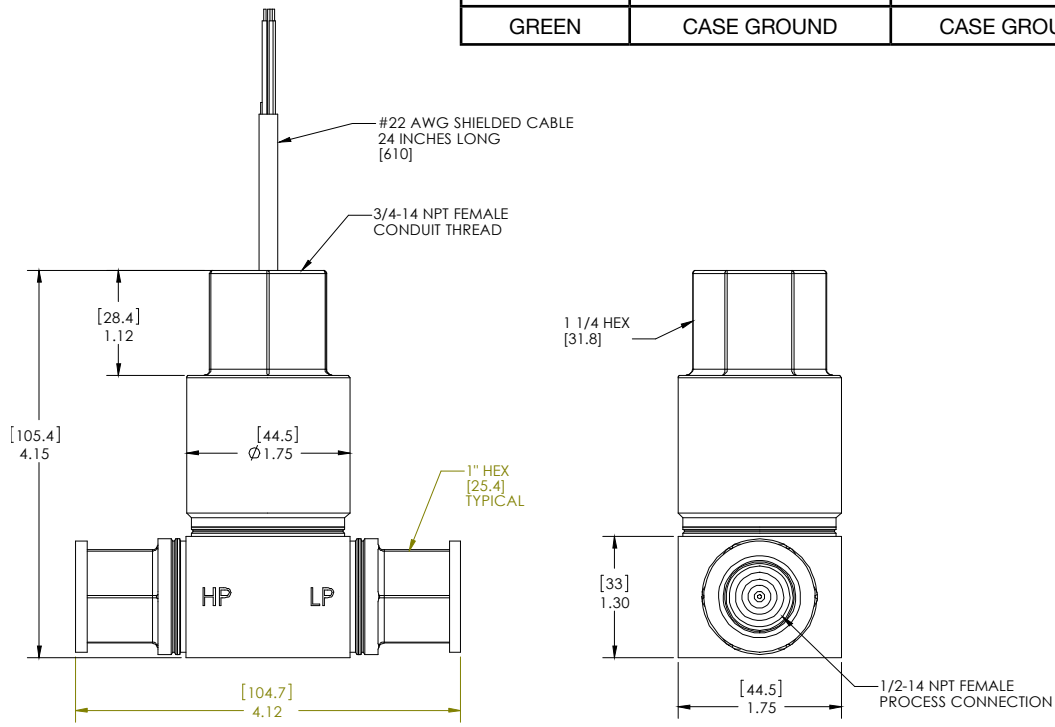
Hazardous Locations and meets CSA requirements for Enclosure 4.

*Conduit seal must be within 18" of transmitter.

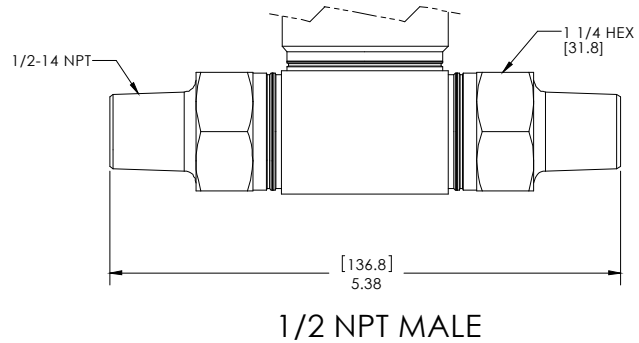
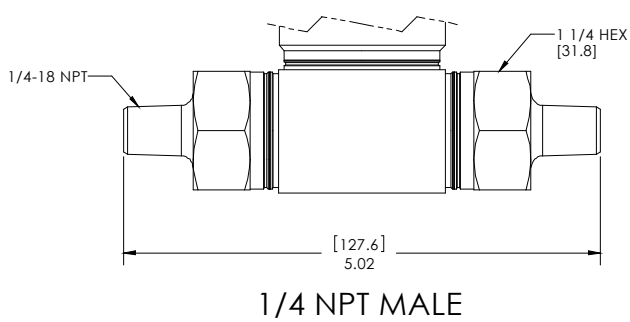


Standard and Low Power Models

WIRE LEGEND		
CONDUCTOR COLOR	CURRENT OUTPUT (4-20mA)	VOLTAGE OUTPUT (0.8-3.2 OR 1-5VDC)
RED	+VIN	+VIN
BLACK	-VIN	-VIN
WHITE	N/A	+VOUT
GREEN	CASE GROUND	CASE GROUND



1/2 NPT FEMALE



INCHES (MM)

FIGURE 2-1
MODEL 831TD OUTLINE DIMENSIONS

Model 831T Single Port Piping

Transmitter mounting and conduit piping is shown in Figure 1A and 1B of Figure 3-1, below. Conduit drain should be provided to prevent moisture buildup in the conduit compartment.

Figure 1C shows a transmitter mounting with an elbow to prevent sediment in the process from clogging the line.

Figure 1D shows a transmitter mounting with an elbow to eliminate trapped vapor.

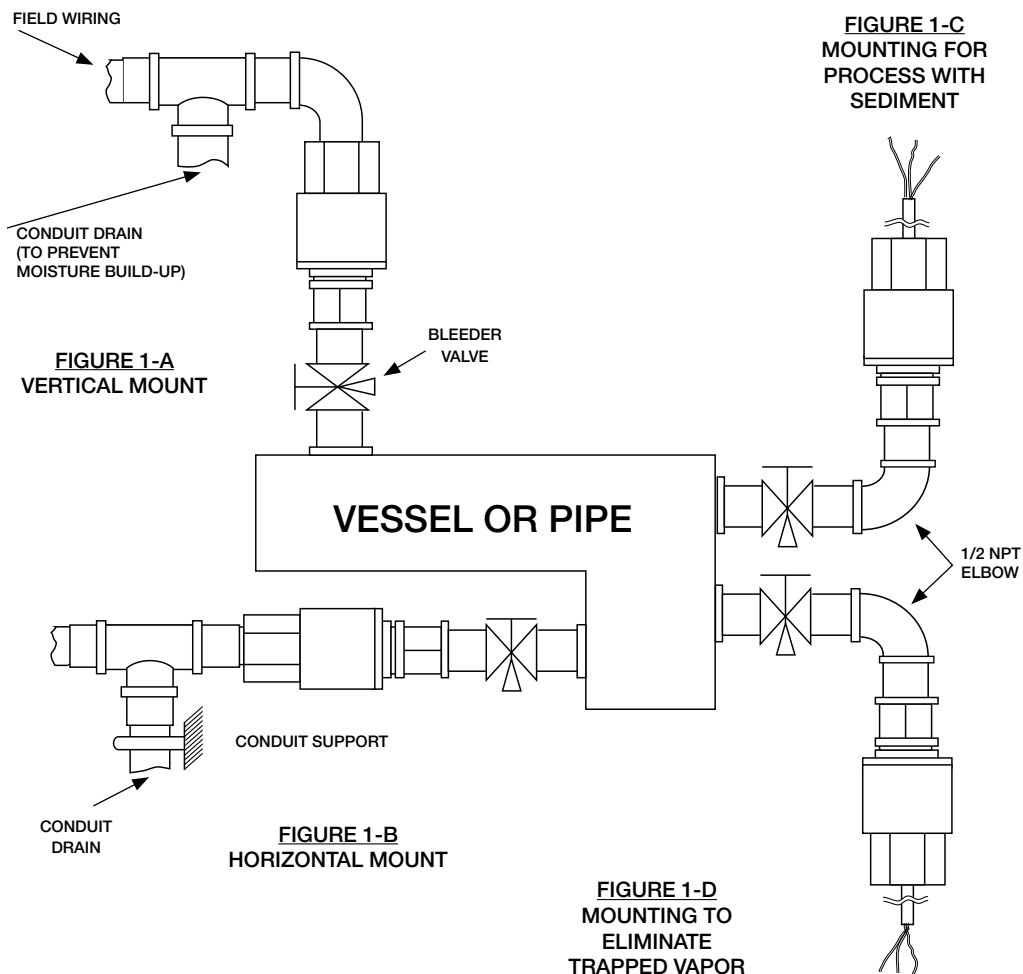


FIGURE 3-1
MODEL 831T PIPING



Model 831TD Differential Piping

WARNING – Pressure in excess of 2,500 psig may result in rupture of the pressure transmitter and release of the media being measured.

CAUTION – Pressure in excess of 3 times full scale may result in damage to the pressure transmitter.

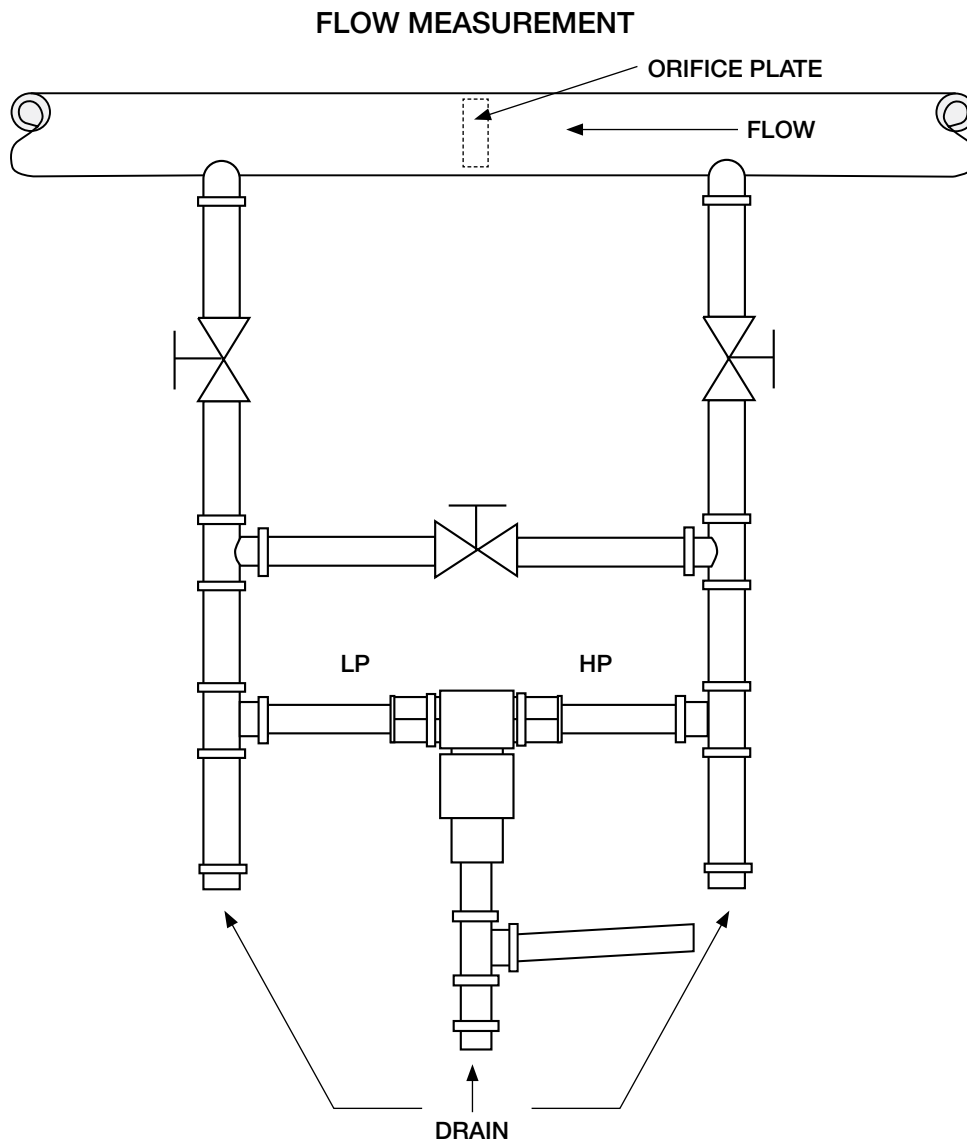


FIGURE 3-2
MODEL 831TD PIPING



Model 831TD Differential Piping

WARNING – Pressure in excess of 2,500 psig may result in rupture of the pressure transmitter and release of the media being measured.

IMPORTANT – To avoid measurement errors due to a liquid "head," the pipe connection to the top of the vessel must be kept free of liquid.

CAUTION – Pressure in excess of 3 times full scale may result in damage to the pressure transmitter.

TANK LEVEL MEASUREMENT

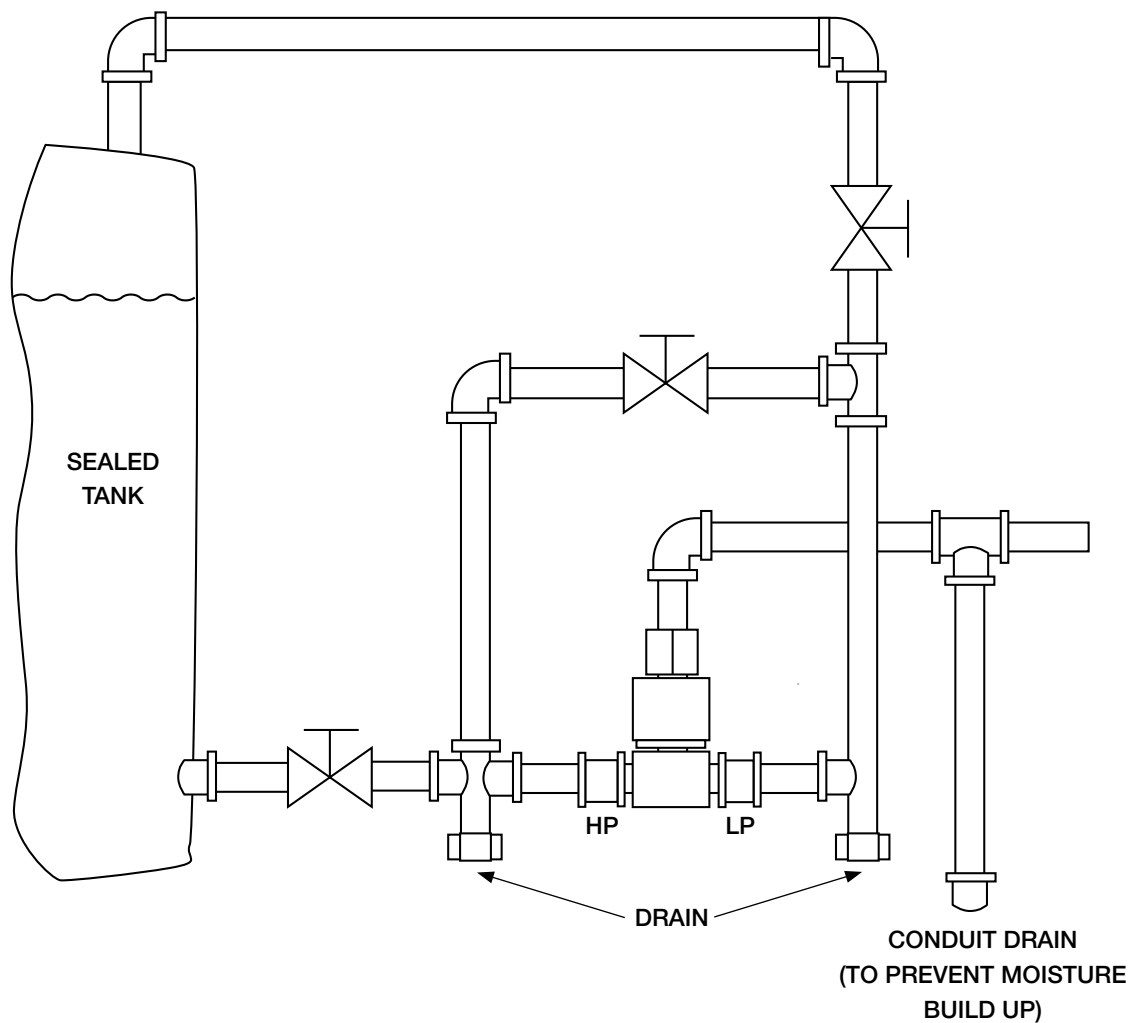


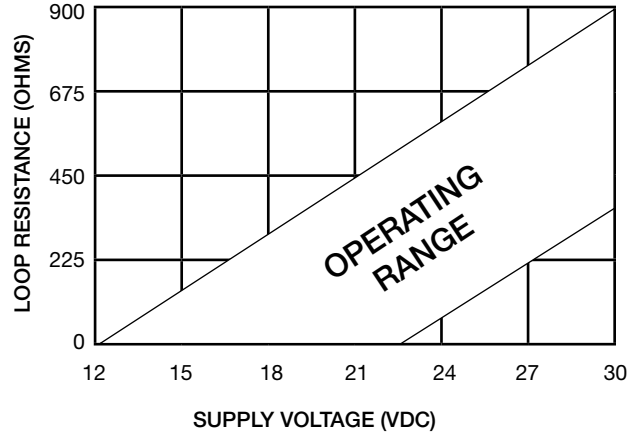
FIGURE 3-3
MODEL 831TD PIPING



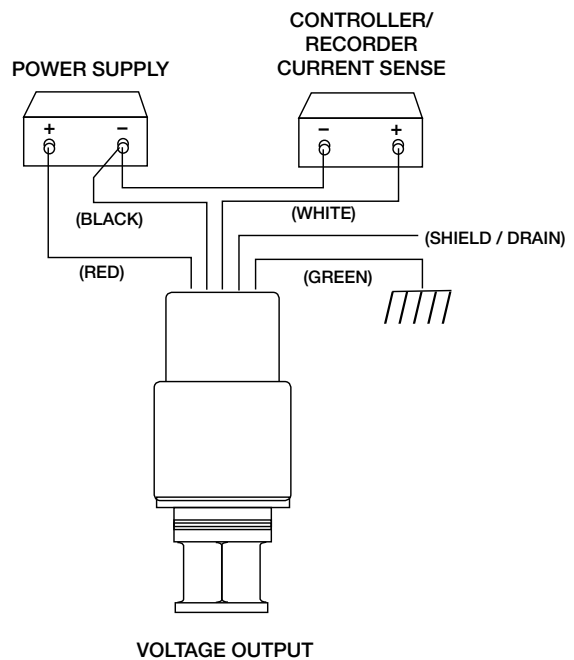
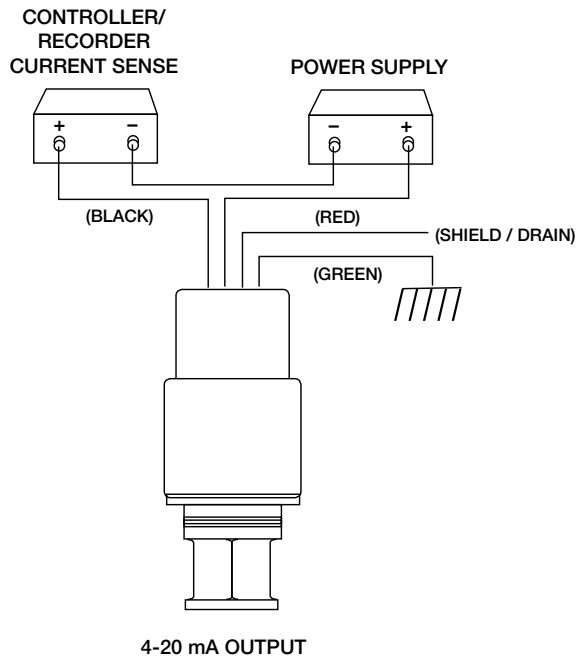
Wiring

CAUTION – Power must be off while connections are made to wires.

IMPORTANT – In order to avoid "Ground Loop" conditions, there should be only one ground in a loop. The shield / drain can be used to provide optional noise rejection if required.



4-20 mA Output Supply Voltage vs Loop Resistance.



LOAD IMPEDANCE: 50K OHMS
CURRENT CONSUMPTIONS: Approx. 2 mA under reference operating conditions (worse case 3.5 mA)

FIGURE 3-4
WIRING

Operation

PRINCIPLE OF OPERATION

The Model 831 Pressure Transmitter series is designed to continuously measure process pressure. The heart of the Model 831 series pressure transmitter is a silicon piezoresistive sensing chip. This miniature microetched semiconductor gives an output proportional to the applied pressure. This chip is isolated from the process media by a stainless steel diaphragm. A silicone oil or other specified fill fluid is used to transmit the process pressure to the sensor.

A surface mount amplifier board, enclosed in a sealed chamber, is used to convert the millivolt signal from the sensor to a calibrated transmitter output. Transmitter electronics are completely surge protected.

Each transmitter is tested over both pressure and temperature ranges. A thick film compensator circuit is used to bring the output of the sensor into specification. After compensation, every transmitter is tested a second time for pressure and temperature effects to ensure that it meets performance specifications.



FACTORY SERVICE

Factory service is available by contacting the service Department. Supply the following information:

1. Instrument Model Number and Serial Number as shown on the Instrument Data Tag.
2. Description of problem being experienced.
3. Description and location of the installation.

For service:

Phone: 215-355-6900
Fax: 215-354-1804

PARTS / ORDERING

When ordering replacement transmitters, supply the following information:

1. Part description and model number
2. Quantity of each transmitter required.
3. Shipping instructions and address.
4. P.O. number and billing address, or phone in your credit card information

Mail, FAX or email orders to:

AMETEK US GAUGE, PMT PRODUCTS
820 Pennsylvania Blvd.
Feasterville, PA 19053

Phone: 215-355-6900
Fax: 215-354-1801
Email: mctpmt.sales@ametek.com
Web: www.ametekusg.com