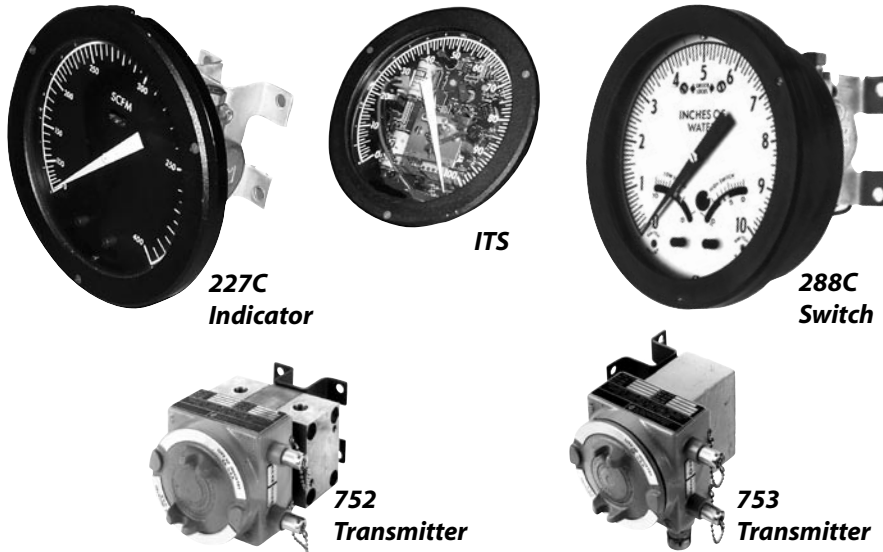


DIFFERENTIAL PRESSURE MEASUREMENT INDICATION, CONTROL, AND COMMUNICATIONS



PRIME DP Indicators, DP Switches, IT/ITS/IS Series DP Indicating Transmitters/Switches, and Explosionproof Electronic Transmitters are available in a variety of safe working pressures and DP ranges for measurement of differential pressure, flowrate, and liquid level applications.

Actuating Unit (DPU)

PRIME Indicators and switches are actuated by a rupture-proof bellows differential pressure unit (DPU) with integral temperature compensation. Available in two models: 197A (Single Bellows) and 224C (Dual Bellows).

The **197A** is a special single bellows unit designed for low-pressure air or gas applications (100 PSI/6.9 bar max.) and maximum DP pressures of 1 PSID — with available ranges from 0-4" to 0-10" w.c. (0-10 to 0-25 mbar) maximum.

The **224C** is a dual, liquid-filled, bellows designed to withstand repeated over-ranges equal to the safe working pressure of the housings without any change in calibration. The 224C SWP ranges from 500 PSI (34 bar) to 10,000 PSI (689 bar), with DP Ranges from 0-30" w.c. to 0-1,000 PSI. *NACE compliant materials available upon request.*

Indicating Mechanism

The indicating pointer traverses a 270° arc, providing excellent readability. It is driven by a precision-jeweled rotary movement that multiplies rotation of the torque tube through a gear and pinion to the pointer. The movement employs a thermally stable Ni-Span-C hair spring. Zero/Range adjustments can be made without removing the scaleplate or pointer. Linearity adjustments are readily accessible after removal of the scaleplate.

Cases

The standard case for indicators and switches is die-cast aluminum with a special epoxy black finish. Models 316C and 450C have weatherproof cases, while Models 226C, 227C, 281C, and IT/ITS/IS feature a NEMA-4/IP65 rated case. The Model 232C has a 304 Stainless Steel case. The Models 290D, 322C, 752, 753, and selected models of the IT/ITS/IS Series have explosionproof cases.

Optional non-indicating "blind" switch cases and 316 Stainless Steel cases (for off-shore/corrosive environments) are available **for selected models**. Consult factory for case option availability and application.

DP INDICATORS, SWITCHES, & TRANSMITTERS

(See Models below)

PubID: 21920

3a (8/04)

MODELS

DPU:

197A, 224C Pages 2-3

Indicators:

226C, 227C, 232C, 247C,
281C, 316C, 450C, 1502 Page 4

Switches:

288C, 290D, 318C, 322C, 1512 Page 5

Indicating Transmitter/Switches:

IT12, IT16, ITS20, ITS24, IS26, IS30 Page 6

Electronic Transmitters:

752, 753 Page 7

Dimensional Drawings Pages 8-14

Weights/Ordering Info. Page 15

FEATURES (selected models)

- SWP to 10,000 PSI (689 bar)
- Weatherproof, NEMA 4/IP65, or Explosionproof cases
- SST versions available
- Seal-welded 224C DPU available for leak-proof metering
- Wide selection of DP Ranges
- Variety of Bellows Fill Fluids
- 3", 3-1/2", 4-1/2" and 6" (76, 89, 114, & 152 mm) indicator dial sizes
- Narrow Deadband Switches
- 1 to 4 Adjustable Switches (SPDT) (DPDT optional on selected models)
- 1 or 2 DPDT Relays (selected models)
- ITS/IS with 2 or 4 SPDT Contacts (can be set for DPDT operation)
- 4-20 mA Output on IT/ITS and 752/753 models
- IT/ITS Internal Battery
- 752/753 Insensitive to normal shock and vibration
- 752/753 all DC circuitry - no RFI generation
- External Sealed Sensors available

APPLICATIONS

- Remote Level Indication
- Differential Pressure
- Absolute Pressure Measurement
- Pressure Drop Across a Filter
- High and Low Flowrate

M197A DPU Specifications

Safe Working Pressure (SWP)

100 PSI (6.9 bar)

Materials:

316 SST Housing; 316 SST bellows material on HP Side (LP side contains copper alloy material) ; Beryllium Copper Torque Tube

DP Ranges:

0-4" w.c. to 0-10" w.c. (0-10 mbar to 0-25 mbar)

Accuracy/Max. Non-linearity:

(with adequate linkage)

±1.5% of full scale

Overrange Limit

27.8" w.c. (1 PSI) (69 mbar) Maximum

Temperature Limits:

-40°F/°C to +150°F (+66°C)

Note: With the single dry bellows construction, the process touches the torque tube; therefore, the instrument should only be used for clean, noncorrosive, nontoxic gas or air service.

M224C DPU Specifications

(Refer to Table 1 on page 3)

Housings (Material/SWP):

Forged Brass/500 PSI (34 bar)

Carbon Steel /1,500, 3000, & 6,000 PSI (103, 207, & 404 bar)

316 SST/500, 1,500, 3,000, & 6,000 PSI (34, 103, 207, & 414 bar)

Alloy Steel/10,000 PSI (689 bar)

Bellows Material:

Be-Cu, 316 SST, or Inconel

DP Ranges:

500 PSI (34 bar) SWP

0-30" w.c. to 0-500 PSI
(0-75 mbar to 0-34 bar)

1,000 PSI (69 bar) SWP

0-60" w.c. to 0-1,000 PSI
(0-149 mbar to 0-69 bar)

1,500 PSI (103 bar) SWP

0-60" w.c. to 0-1,000 PSI
(0-149 mbar to 0-69 bar)

3,000 PSI (207 bar) SWP

0-60" w.c. to 0-1,000 PSI
(0-149 mbar to 0-69 bar)

6,000 PSI (414 bar) SWP

0-60" w.c. to 0-1,000 PSI
(0-149 mbar to 0-69 bar)

10,000 PSI (689 bar) SWP

0-100" w.c. to 0-1,000 PSI
(0-248 mbar to 0-69 bar)

(Continued on next page)

DPU DETAILS

MODEL 197A (Single Bellows)

The single bellows design consists of a bellows, centerplate, torque tube, and range spring assembly. The bellows is attached to the HP side of the centerplate and enclosed by a pressure housing. The range spring assembly is attached on the LP side of the centerplate.

Variations in DP within the housing cause the bellows to move in the direction of the lowest pressure. The torque tube assembly responds to the bellows movement and provides a mechanical output. The torque tube is connected to an instrument for visual indication or control of the process.

MODEL 224C (Dual Bellows)

The 224C is a lightweight compact sensor that incorporates a rupture-proof bellows in a common-head design housing. It has an exceptionally fast response time, is self draining, and has built-in temperature compensation.

The 224C DPU consists of a Bellows Unit Assembly (BUA) and removable pressure housings. Within the BUA, flexible bellows are secured to a centerplate. In dual-bellows models, the movable bellows are rigidly connected by a dual valve stem that passes through the centerplate. Valve seats, in the centerplate passage, form a seal with the valves. Contacting the valve stem in the centerplate is a drive arm pivoted on the end of a sealed torque tube. The bellows is filled with a clean, noncorrosive, low-freezing point liquid. A range spring assembly provides tension against applied pressures.

In operation, pressure is applied to both sides of the bellows. Any difference in pressure causes the bellows to move until the spring effect (range springs) balances out the force. The linear motion of the bellows (proportional to the DP) is transmitted as a rotary motion through the torque tube.

In dual-bellows units, if the bellows are subjected to a DP greater than the unit's DP rating, a valve closes and "traps" the fill liquid in the bellows — fully supporting the bellows and preventing rupture. Since opposing valves are used, full protection is provided in either direction.

Common Components

Bellows Construction - Individual diaphragms, stamped and formed from selected materials, are assembled using highly specialized techniques, the results — exacting linearity characteristics, a long cycle life, and freedom from effects of work hardening commonly encountered with the hydraulically formed or mechanically rolled types.

Torque Tube - eliminates possibility of leakage and need for lubrication. The needle bearing (inboard end) and ball bearing (on follower drive arm) operate with a minimum of friction — resulting in high sensitivity over the life of the unit.

The torque tube assembly consists of a tube, shaft, and supporting members. The outboard end of the torque tube is attached to the centerplate. The shaft passes through the center of the tube and is welded to the inboard end.

Since its outer end is attached to the centerplate, the tube must twist when subjected to torque. The shaft, freely supported at its outer end and attached to the tube and drive arm at its inner end, rotates through the same angle as the drive arm — the mechanical output of the DPU.

Range Springs - determine the DP range of the unit, based upon their number and strength. They have extremely low hysteresis and exceptional temperature stability. The M224 range springs are part of the bellows unit assembly (BUA) — they are not individually replaceable parts.

Model 224C with NACE complaint materials is available upon special request.

Special Configurations

Model 224C Absolute Pressure

A special version of the M224C provides direct measurement of absolute pressure — eliminating the effects of varying atmospheric pressure. The LP bellows assembly is enclosed within a capsule. This capsule is evacuated to a very low level of absolute pressure and then hermetically sealed. Process pressure applied to the HP housing is compared with the established atmospheric pressure in the LP side, which provides a reference as close to “absolute zero” as possible. The capsule is further contained within a housing that does not have pressure ports. The HP housing has both top and bottom ports for process connection, or for automatic draining of fluids or venting of gases.

Model 224C Seal-Welded

For applications requiring ZERO LEAKAGE, a special seal-welded M224C is available — a heliarc-welded joint replaces the elastomer O-ring. This leak-proof metering is ideal for applications involving hazardous fluids (e.g., N₂O₂, radioactive water, toxic chemicals, etc.), as well as hard to seal gases like helium and hydrogen.

Features

- All-welded chambers for process fluids
- Leak-tested at factory with Helium Mass-spectrometer
- DP Ranges from 0-30" w.c. to 0-1,000 PSI (0-75 mbar to 0-69 bar)
- SWP from 500 PSI to 6,000 PSI (34 bar to 414 bar)
- 316 SST Housing/Centerplate Material
- 316 SST or Inconel Bellows Material

For general specifications (not listed above), see Table 1 below.

External Sensors

External Sensors - For applications requiring external sealed sensors, such as: corrosive, high temp., and dangerous fluids. See Sealed Sensor Bulletin for details.

M224C DPU Specifications (cont.) (Refer to Table 1 on page 3)

Bellows Fill Fluids:

- Mineral Oil (Standard M-Fill)
- Ethylene Glycol/Water
- Distilled Water
- Silicone
- Fluorolube for O₂ Service
- Others available (Contact Barton)

Weight (approximate):

Forged Brass

500 psi SWP3.5 lbs (1.6 kg)

Carbon Steel and

Stainless Steel

500, 1000, &

1500 psi SWP.....4.5 lbs (2 kg)

3000 &

6000 psi SWP.....6.5 lbs (2.9 kg)

Alloy Steel

10,000 psi SWP6.75 lbs (3.1 kg)

Temperature Limits:

-40°F/°C to +180°F (+82°C)

Ordering:

When ordering, specify:

- Quantity
- Model Number
- Housing Pressure Rating (SWP)
- Housing & Bellows Materials
- Bellows Fill Fluid
- Differential Pressure Range
- Mounting

Table 1

			BODY	AVAILABLE DIFFERENTIAL PRESSURE RANGES				PRESSURE CONNECTIONS		
SWP psi (bar)			Housing Material	Stainless Steel or Inconel Bellows	Beryllium Copper Bellows (224C DPU Only)		Inconel Bellows		Top	Bottom
				1-5/8" (41 mm) O.D.	1-5/8" (41 mm) O.D.	3/4" (19 mm) O.D.	3/4" (19 mm) O.D.	5/8" (16 mm) O.D.		
224C	224 (Non-C)	500 (34)	Forged Brass (ASTM-B124#2)		0-30" w.c. (0-75 mbar) to 0-60 psi (0-4.1 bar)	0-61 psi (0-4.2 bar) to 0-400 psi (0-27.6 bar)		0-400 psi (0-27.6 bar) to 0-500 psi (0-34 bar)	1/4" NPT	1/4" NPT
		500 (34)	Cold Rolled Steel (C1018) Stainless Steel (316)	0-30" w.c. (0-75 mbar) to 0-60 psi (0-4.1 bar)			0-61 psi (0-4.2 bar) to 0-400 psi (0-27.6 bar)	0-400 psi (0-27.6 bar) to 0-500 psi (0-34 bar)	1/4" NPT	1/4" NPT
		1,000 (69)	Copper Nickel (70-30) (MIL-C-15726)						MS-16142-4	MS-16142-4
		1,500 (103)	Cold Rolled Steel (C1018) Stainless Steel (316)		0-60" w.c. (0-149 mbar) to 0-60 psi (0-4.1 bar)				1/4" NPT	1/4" NPT
		3,000 (207)	Cold Rolled Steel (C1018) Stainless Steel (316)	0-60" w.c. (0-149 mbar) to 0-60 psi (0-4.1 bar)		0-61 psi (0-4.2 bar) to 0-400 psi (0-27.6 bar)		0-400 psi (0-27.6 bar) to 0-1000 psi (0-69 bar)	1/2" NPT	1/4" NPT
		6,000 (414)	Cold Rolled Steel (C1018) Stainless Steel (316)				0-61 psi (0-4.2 bar) to 0-400 psi (0-27.6 bar)		1/2" NPT	1/4" NPT
		10,000 (689)	Alloy Steel (4140)	0-100" w.c. (0-248 mbar) to 0-60 psi (0-4.1 bar)	0-100" w.c. (0-248 mbar) to 0-60 psi (0-4.1 bar)				1/4" NPT 9/16 AMINCO (1/4" ODT)	1/4" NPT 9/16 AMINCO (1/4" ODT)
		Net Volume cu. in. (cu. cm)	L.P. Head	1.66" (27.2 cc)	1.66" (27.2 cc)	2.51" (41.1 cc)	2.51" (41.1 cc)	2.61" (42.8 cc)		
			H.P. Head	1.55" (25.4 cc)	1.55" (25.4 cc)	2.42" (39.7 cc)	2.42" (39.7 cc)	2.50" (40.9 cc)		
		Displacement in cu. inches for full-scale travel		0.14" (2.3 cc)	0.14" (2.3 cc)	0.03" (0.49 cc)	0.03" (0.49 cc)	.025" (0.41 cc)		
	PERFORMANCE SPECIFICATIONS									
	Torque Tube Rotations (full scale D.P)			8° ±10%						
	Torque Tube Material			Beryllium Copper (BeCu)						
	Temperature Limits			-40°F/°C to +180°F (+82°C)						
	Maximum Non-Linearity			Specified by range						
	Repeatability			0.2% of full scale D.P.						

NOTES: Zero center or split ranges available on special order [e.g., a 0-60" w.c. (0-149 mbar) range may be ordered 30-0-30" w.c. (75-0-75 mbar) or 15-0-45" w.c. (37-0-112 mbar)]. Absolute pressure ranges available from 30" w.c. (75 mbar) to 600 psi. (41.4 bar). Other sizes and types of connections (welding stubs, MS, A.N.D., etc.) available upon request. Outline dimension drawings available upon request. Metric conversions () are approximate. M224C with NACE (MR-01-75) compliant materials available upon request. Model 224 (Non-C) for specific Nuclear/Government applications only.

INDICATOR Specifications

Temperature Limits:

-40°F/°C to +150°F (+66°C) 1502 Only
-40°F/°C to +180°F (+82°C) All Others

Accuracy:

232C

0-50" w.c. to 0-100 PSID

(0-124 mbar to 0-6.9 bar) ...±2.00% F.S.

226C, 227C, 247C

0-30" w.c. to 0-50" w.c.

(0-75 to 0-124 mbar)±0.75% F.S.

0-51" w.c. to 0-60 PSI

(0-127 mbar to 0-4.1 bar) ...±0.50% F.S.

0-61 PSI to 0-150 PSI

(0-4.2 bar to 0-10.3 bar)±0.75% F.S.

0-151 PSI to 0-400 PSI

(0-10.4 bar to 0-27.6 bar)±1.00% F.S.

0-401 PSI to 0-600 PSI

(0-27.7 bar to 0-41.3 bar)±1.50% F.S.

0-601 PSI to 0-1,000 PSI

(0-41.4 bar to 0-69 bar)±4.00% F.S.

281C

(above values plus 0.5%, up to 100 PSI max.)

316C & 450C

0-30" w.c. to 0-400 PSI

(0-75 to 0-27.6 bar)±1.00% F.S.

0-401 PSI to 0-600 PSI

(0-27.7 bar to 0-41.3 bar)±1.50% F.S.

0-601 PSI to 0-1,000 PSI

(0-41.4 bar to 0-69 bar)±4.00% F.S.

Repeatability*±0.25%

1502

0-4" w.c. to 0-10" w.c.

(0-10 to 0-25 mbar)±1.50% F.S.

Repeatability*±0.25%

***Note:** Stated repeatability does not apply to models 232C, 281C, 450C, and 1502.

Mounting:

Pipe, Wall, or Panel

Scales:

White or Black (uniform or square-root)

DP Ranges:

For 1502 see 197A Specifications;

For all others, see 224C Specifications

DP INDICATORS

MODEL 226C (w/224C DPU)

A 3-inch (76mm) indicator is a lightweight and compact instrument for use where panel space is at a premium.



MODEL 227C (w/224C DPU)

A 6-inch (152mm) indicator that is ideally suited for tank level, flow, and pressure drop across filters.



MODEL 232C (w/224C DPU)

An economical 6-inch (152mm) DP indicator that is designed for use in applications where high accuracies are not required. Suitable for tank level, flowrate, and DP across filters applications. It features a 500 PSI (34.5 bar) SWP Maximum and a 0-50" w.c. to 0-100 PSID (0-124 mbar to 6.9 bar) DP Range. The Case and bezel are 304 SST. The housings are forged brass (steel and SST optional) with 1/4" x 1/4" NPT connections. The bellows are BeCu or 316 SST, with an Ethylene Glycol and Water Fill. The indicating accuracy is ±2.00 % of full scale. The unit can be pipe, wall, or panel mounted.



MODEL 247C (w/224C DPU)

A portable 6-inch DP indicator with a built-in 3-valve manifold and bleed valves. This ready-to-use assembly is mounted in a tough leather-like plastic carrying case (w/indicator and manifold mounted to the base). The included neoprene hoses can be stored in the case.

MODEL 281C (w/224C DPU)

A 3-inch (76mm) indicator that features a molded Celcon case that is shock-resistant and highly resistant to acids and caustic fumes — ideal for chemical process environments.



MODEL 316C (w/224C DPU)

A special version of the M450 that is specifically designed to meet MIL-S-901C Shock Grade A and MIL-STD-167 Vibration standards. A 4-1/2 inch (114mm) indicator that is widely used by the US Navy for DP, flow, and liquid level measurement in shipboard installations.

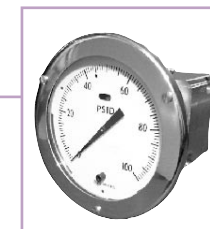
MODEL 450C (w/224C DPU)

A rugged 4-1/2 inch (114mm) indicator that offers economy of space and readability. Available with top/bottom or rears ports.



MODEL 1502 (w/197A DPU)

A 6-inch (152mm) indicator designed for clean, non-corrosive, non-toxic, air or gas applications that have low operating and DP range requirements. The indicator case is die-cast aluminum, finished with a weather-resistant epoxy resin paint.



DP SWITCHES



MODEL 288C

A 6-inch (152mm) Indicating-Switch that features a NEMA-4 case with operating pressure ratings up to 10,000 PSI (689 bar) and DP Ranges from 0-30" w.c. to 0-1,000 PSI (0-75 mbar to 0-69 bar). Both single and dual switch units are standard, with up to two additional switches available as an option.

MODEL 290D

An explosionproof version of the 288C that is housed in a CSA certified case (rated Class I, Div. 1, Groups B, C, & D) — ideal for high shock and vibration environments.



MODEL 318C

A 4-1/2 inch (114mm) Indicating-Switch designed to meet MIL-S-901C Grade A and MIL-STD-167 Vibration standards — used in US Navy Shipboard applications.



MODEL 322C

A blind DP switch that is housed in an explosionproof case for use in Class I, Div. 1, Group D hazardous areas. The standard unit comes with one SPDT switch, with an optional two switch version available.



MODEL 1512

A 6-inch (152mm) Indicating-Switch designed for use in clean, non-corrosive, non-toxic air or gas applications that have low operating and DP ranges. The case is die-cast aluminum with a weather-resistant resin paint finish.

For additional switches and Indicating-Transmitters, see IT/ITS/IS Series instrumentation on page 6.

Switch Contacts

Switch models can be ordered with 1 to 4 adjustable snap-acting type SPDT switches (DPDT and hermetically-sealed switches available as specials on selected models). Switches can be set for high, low, or both high and low on units with two or more contacts. Contacts are adjustable from 5 to 95% of full scale and are set with a control screw located flush with the scaleplate. Contacts can be set to open or close with increasing or decreasing DP — providing maximum flexibility.

Relays

Some models can be ordered with 1 or 2 DPDT relays (mounted inside the case) for greater switching action and increased current handling capacity without the need for external mounting or wiring.

SWITCH Specifications

Temperature Limits:

-40°F/°C to +150°F (+66°C) 1512 Only
-40°F/°C to +180°F (+82°C) All Others

Switches:

1-4 SPDT Standard (DPDT and sealed switches optional)

Switch Contact Ratings:

AC 5 amps, up to 250V

DC Inductive = 1.0 amp up to 30 V
Resistive = 3.0 amps up to 30V

(Other ratings/switches available)

Relays:

1 or 2 DPDT Relays

Relay Ratings:

AC (Contact)

Inductive = 5 amps up to 115V

Resistive = 10 amps up to 115V

AC (Coil)

6V, 12V, 24V, 115V = 5 VA maximum

DC (Contact)

Inductive = 5 amps up to 26.5V

Resistive = 10 amps up to 26.5V

DC (Coil)

6V, 12V, 24V, 120V = 2W maximum

Indicating Accuracy (DP Range):

SPDT

0-30" w.c. to 0-50" w.c.

(0-75 to 0-124 mbar) ±1.25% F.S.

0-51" w.c. to 0-60 PSI

(0-127 mbar to 0-4.1 bar) . ±1.00% F.S.

0-61 PSI to 0-150 PSI

(0-4.2 bar to 0-10.3 bar) ±1.25% F.S.

0-151 PSI to 0-400 PSI

(0-10.4 bar to 0-27.6 bar) .. ±1.50% F.S.

0-401 PSI to 0-600 PSI

(0-27.7 bar to 0-41.3 bar) .. ±2.00% F.S.

0-601 PSI to 0-1,000 PSI

(0-41.4 bar to 0-69 bar) ±4.50% F.S.

DPDT

Add 0.5% to SPDT values

Point of Actuation:

±10% of F.S. - Add 1/2% to SPDT values

Repeatability = 0.25% of full scale DP

Switch Deadband:

SPDT = ±5.0% max. F.S. DP

DPDT = ±6.0% max. F.S. DP

Suppressed Ranges = Add 1/4%

DP Ranges:

For 1512, see 197A Specifications

For all others, see 224C Specifications

IT/ITS/IS Specifications

Temperature Limits:

Operating: -40°F/°C to +180°F (+82°C)

Storage: -40°F/°C to +200°F (+93°C)

Humidity:

to 95% R.H. @ +104°F (+40°C)

Current Loop (IT/ITS Only):

Supply Voltage

(Min. to Max.) 14-30V DC*

Output Current 4-20 mA

Load Resistance 0-800 Ohms

*Either terminal 0 to +30VDC with respect to earth ground (green wire). Minimum voltage across transmitter under conditions of maximum load and current (20 mA) 14 VDC.

Transmitter (IT/ITS Only):

Maximum Turndown 2:1 (20 mA with pointer at 1/2 scale)

Accuracy (Pointer Indication)

includes line hysteresis, ... ±0.25% of F.S.;

±0.2%/10%

supply change;

±0.1%/100 Ohm

change

Internal Battery (ITS Only):

Voltage 6 VDC

Size (2) Lithium C-Cells

(Switch Only)

Life 10 years (w/loop power)

Switch (ITS/IS Only):

Accuracy ±1/0% F.S.

Repeatability ±0.2% F.S.

Deadband Adjustable

1% to 9% of F.S.

Setpoints 2 or 4 Independent

0 to 100% F.S. (pointer

indication)

Switch (ITS/IS Only) (Cont.):

Contacts 2 or 4 SPDT

2 Amp @30 VDC

1 Amp @125 VAC

Indicator Accuracy:

0-30" w.c. to 0-50" w.c.

(0-75 to 0-124 mbar) ±0.75% F.S.

0-51" w.c. to 0-60 PSI

(0-127 mbar to 0-4.1 bar) ... ±0.50% F.S.

0-61 PSI to 0-150 PSI

(0-4.2 bar to 0-10.3 bar) ±0.75% F.S.

0-151 PSI to 0-400 PSI

(0-10.4 bar to 0-27.6 bar) ±1.00% F.S.

0-401 PSI to 0-600 PSI

(0-27.7 bar to 0-41.3 bar) ±1.50% F.S.

0-601 PSI to 0-1,000 PSI

(0-41.4 bar to 0-69 bar) ±4.00% F.S.

Repeatability:

0.25%

Mounting: Pipe, Wall, or Panel

Scales:

White or Black (uniform or square-root)

DP Ranges:

See 224C Specifications

Ordering Information:

When ordering an IT/ITS/IS Series instrument, please specify:

- Unit Type (Case assembly or kit)
- Quantity
- Model Number
- Housing Pressure Rating (SWP)
- Housing Material
- Bellows Material
- Material Contacting Bellows
- Differential Pressure Range
- Type of Scale (Uniform or Sq. Rt.)
- Scale Graduations
- Mounting (pipe, wall, flush panel)

Note: Pipe mounting only on

Explosionproof models

IT/ITS/IS TRANSMITTER/SWITCHES



Indicating mechanism is driven directly off the process — independent of external power. Transmitter produces a 4-20 mA output. On ITS/IS models, switches (either 2 or 4) can be used SPDT or DPDT, with setpoints manually set to eliminate the need for calibration.

ITS/IS switch specific applications include on-off pump control and flow alarm.

IT/ITS/IS models are actuated by the Model 224 DPU.

Operation

The pointer movement is directly coupled to a precision potentiometer that develops the mechanical to electrical signal to drive the linear 4-20 mA output transmitter (IT/ITS only) and switch (ITS/IS only).

Calibration

Output calibration jacks are provided. The movement has a micrometer screw for convenient range adjustments. Zero and range adjustments can be made without removing the scaleplate or pointer. Linearity adjustments are readily accessible after removal of the scaleplate.

On ITS/IS, switch setpoints are adjustable by hand (with control screw), no calibration equipment is required.

Switch Options

Units are available with 2 or 4 fully-adjustable contacts that can be set for high or low, or both high and low (when two contacts are furnished). By moving jumpers, two switches can be made to operate simultaneously to give a DPDT switch. Jumpers can also be set to give ON-OFF control between two setpoints.

Model	Enclosure (Case with 6-inch Dial)
IT = Indicating-Transmitter ITS = Indicating Transmitter-Switch IS = Indicating-Switch	
IT12	Watertight, NEMA-4/IP65
IT16	Explosionproof, Class I, Div. 1, Groups B, C, & D; Class II, Groups E, F, & G, hazardous locations; NEMA-4/IP65
ITS20	Watertight, NEMA-4/IP65
ITS24	Explosionproof, Class I, Div. 1, Groups B, C, & D; Class II, Groups E, F, & G, hazardous locations; Class III, NEMA-4/IP65
IS26	Watertight, NEMA-4/IP65
IS30	Explosionproof, Class I, Div. 1, Groups B, C, & D; Class II, Groups E, F, & G, hazardous locations; Class III, NEMA-4/IP65

752/753 EXPLOSIONPROOF ELECTRONIC TRANSMITTERS

For liquid, gas, or vapor service, both models feature a liquid-tight, explosionproof case (no aluminum). Any calibrated range, including absolute variations, is available as standard within the stated ranges. Units are insensitive to normal vibration and shock, with the best available zero stability. Zero and Span adjustments are easily accessible.

- No RFI Generation (All DC circuitry)
- Outstanding Temperature Stability
- Independent, limited interacting Range and Zero controls
- Model 752 can be ordered with zero center or split ranges.
- Model 753 overpressure to 150% of pressure range without damage; Model 752 up to SWP.
- Alloy Steel (cadmium plated) Case and Brackets
- Local Indicator Option



Model 752

The 752 DP Electronic Transmitter delivers 1/2% accuracy with standard ranges from 0-50" w.c. to 0-300 psid. The 752 can handle static pressures to 3,000 psig on standard models, with 6,000 and 10,000 psig capacities available on special order.

Model 753

The 753 couples the reliability of a bourdon tube with the sensitivity of a silicon strain gage to deliver 1/2% accuracy for measurements from 0-25 psi to 0-5000 psi.

Transmitter Operation

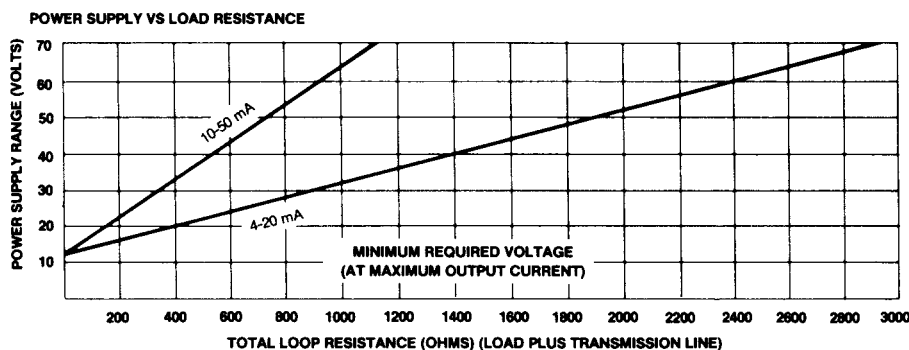
Silicon piezo-resistive strain gages, carefully matched for delta resistance and temperature coefficients to ensure linearity and stability, are molecularly bonded (no organic compounds) on opposite sides of the beam.

M752: The end of the strain gage beam is secured inside a cutout in the shaft connecting the two bellows of the DPU. Input variations across the bellows cause a linear motion of the bellows, which deflects the strain gage beam proportionally.

M753: Input pressure variations cause the bourdon tube to change shape, which in turn bends the cantilever beam proportionally.

The change in deflection of the beam is sensed by the strain gage and is converted into a resistance change. The tension gage increases in resistance and the compression gage decreases in resistance in direct proportion to the deflection of the cantilever beam.

The tension and compression gages form two active elements of a wheatstone bridge network. The transmitter electronics condition and convert the bridge output signal to a 4-20 mA or 10-50 mA output signal.



752/753 Specifications

Accuracy:

±0.50% of rating span (includes linearity, hysteresis, and repeatability);
±0.25% accuracy optional

DP Ranges:

M752: 0-50" w.c. to 0-300 psid (max.); consult factory for other ranges.

M753: 0-25 psig to 0-5,000 psig (others on special request)

SP Limit (M752): 3,000 psig standard; 6,000 psig & 10,000 psig optional

Static Pressure Effect (M752):

±0.20% max. of rated span per 1,000 psig change.

Ambient Temperature Effect:

Zero and Span ±1.0% per 100°F over the range of +40°F to +135°F standard (-15°F to +135°F optional)

Storage Temperature Limits:

-25°F to +150°F standard

Electrical:

- Output: 4-20 mA or 10-50 mA
- Power: 12 to 70 VDC (per load)
- Load Range: See load graph
- Supply Effect: ±0.025% of calibrated span for ±1V power supply change
- Load Effect: ±0.025%/100 Ohms change for 4-20 mA; ±0.065%/100 Ohms change for 10-50 mA
- Sensitivity: 0.01% of calib. span
- Zero Control: 50% suppression of rated span
- Span Control: 20-100% (rated span)

Physical:

- Pressure Boundary O-rings (M752 only): Viton or EPT standard
- Case Sealing O-rings: Buna-N (standard); EPT or Viton optional
- Fill Fluid: Silicone Oil
- Paint: Baked polyvinyl chloride (standard); Amerlock Gray optional
- Electrical Connections: 1/2" conduit (external junction box optional)
- Basic Config. Weight (approx.): M752 - 14 lbs; M753 - 8 lbs

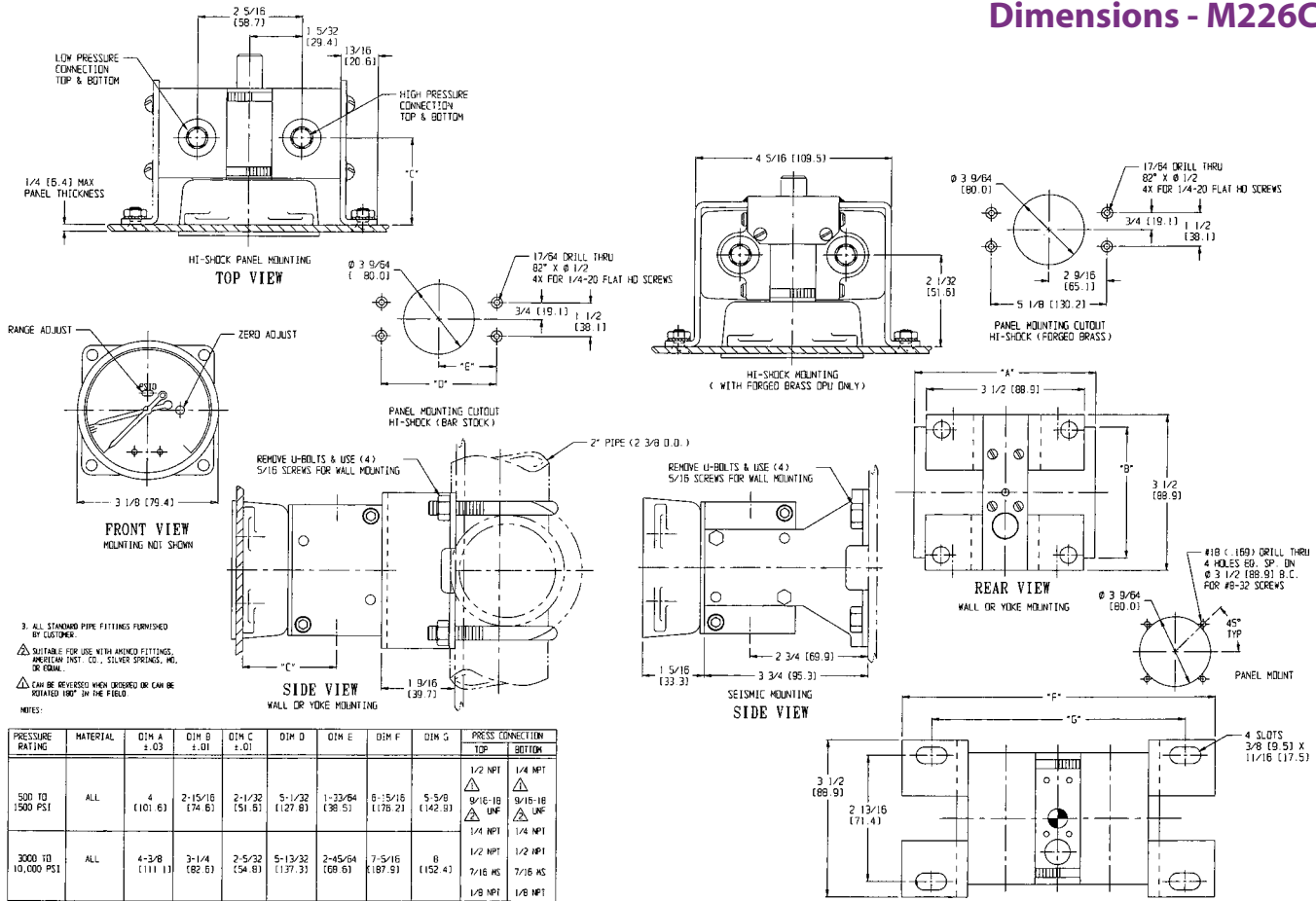
M752

- Process Connections: 1/4" NPT/1/2" NPT; on 2-13/16" centers or (B) 9/16-18 Aminco both sides on 2-13/16" centers
- Materials: Bellows, centerblock, & plugs - 316 SST (standard); Pressure Housings - 316 SST or Carbon Steel

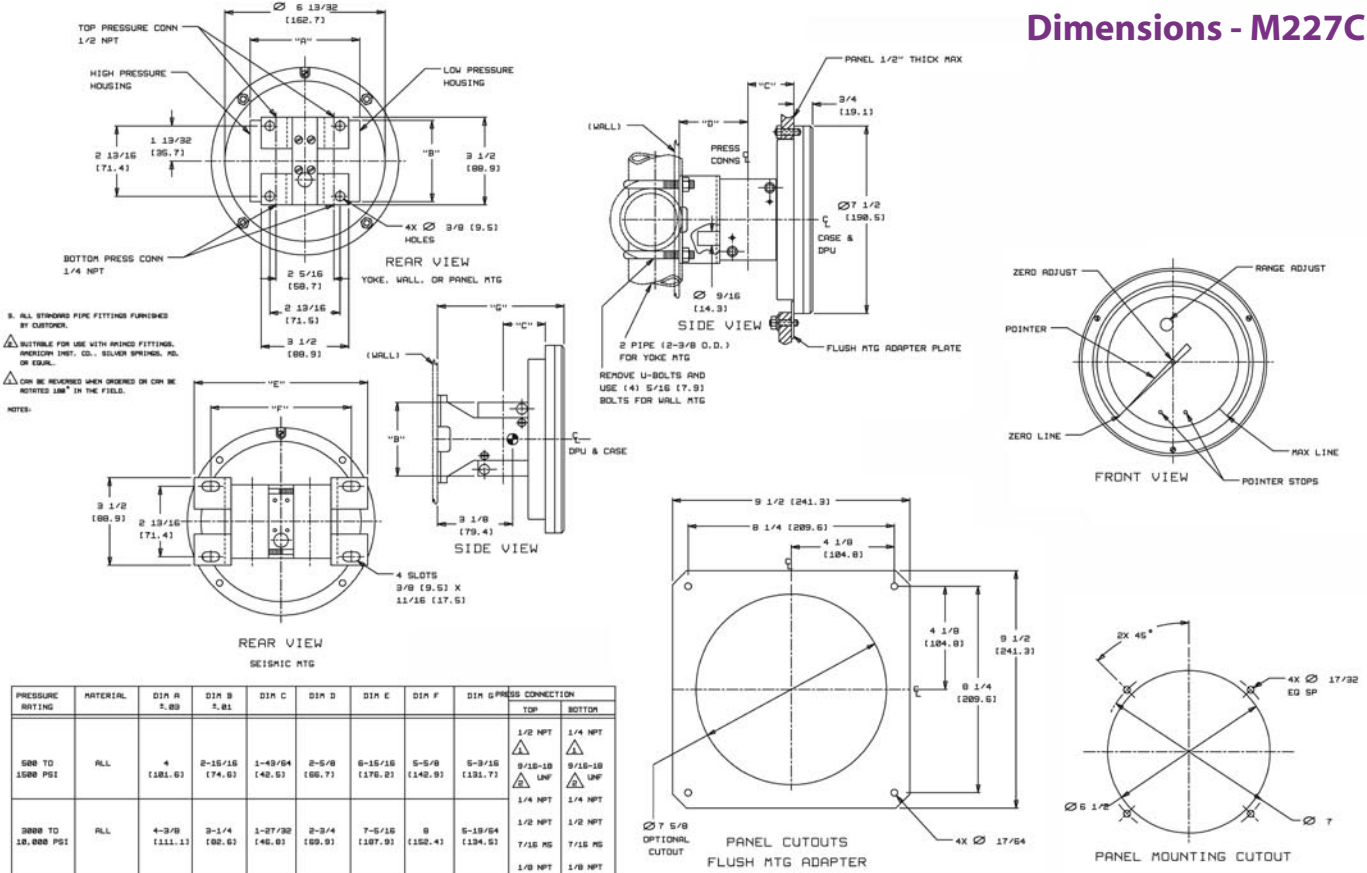
M753

- Process Connections: 1/4" NPT
- Materials: Bourdon Tube - Haynes Alloy 25; Pressure Connection - 316 SST

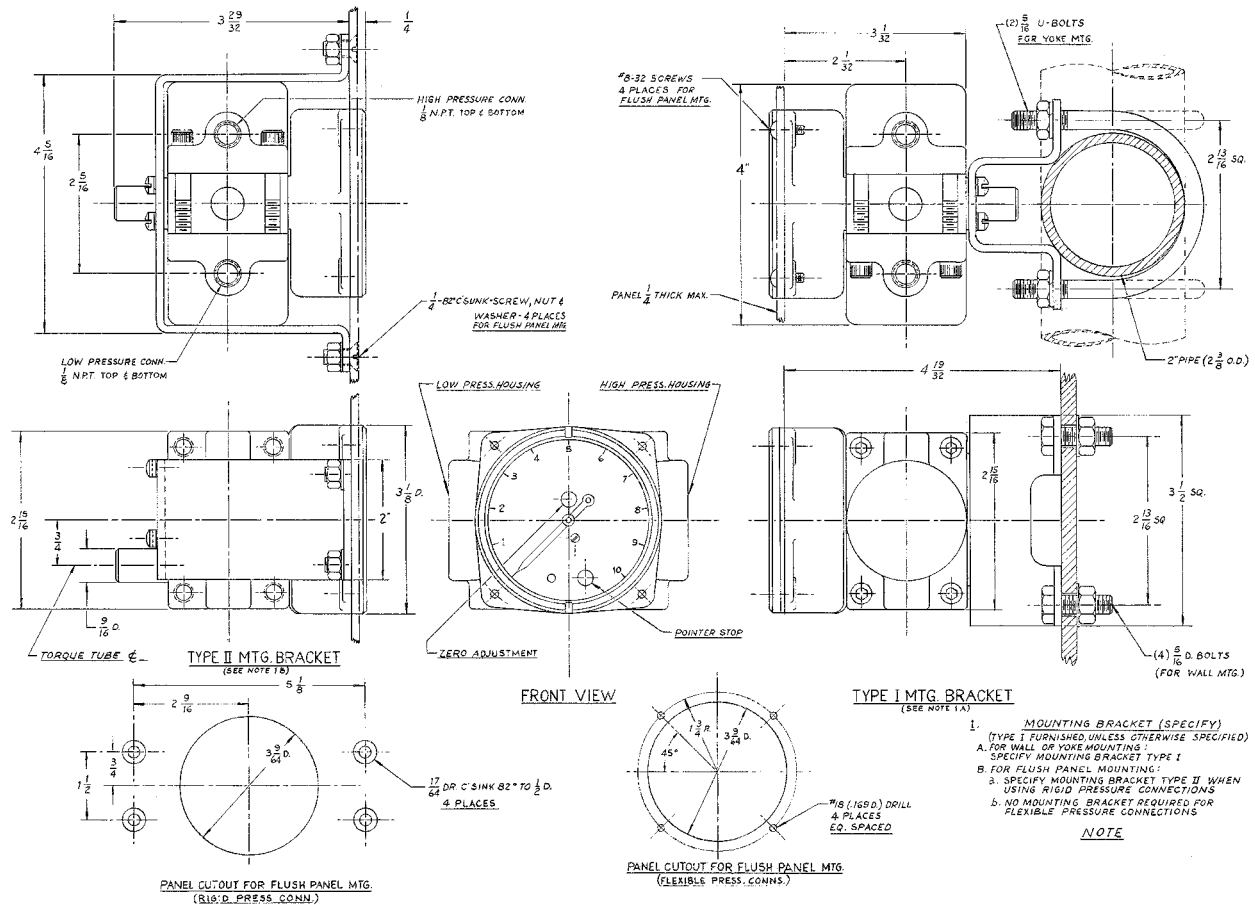
Dimensions - M226C



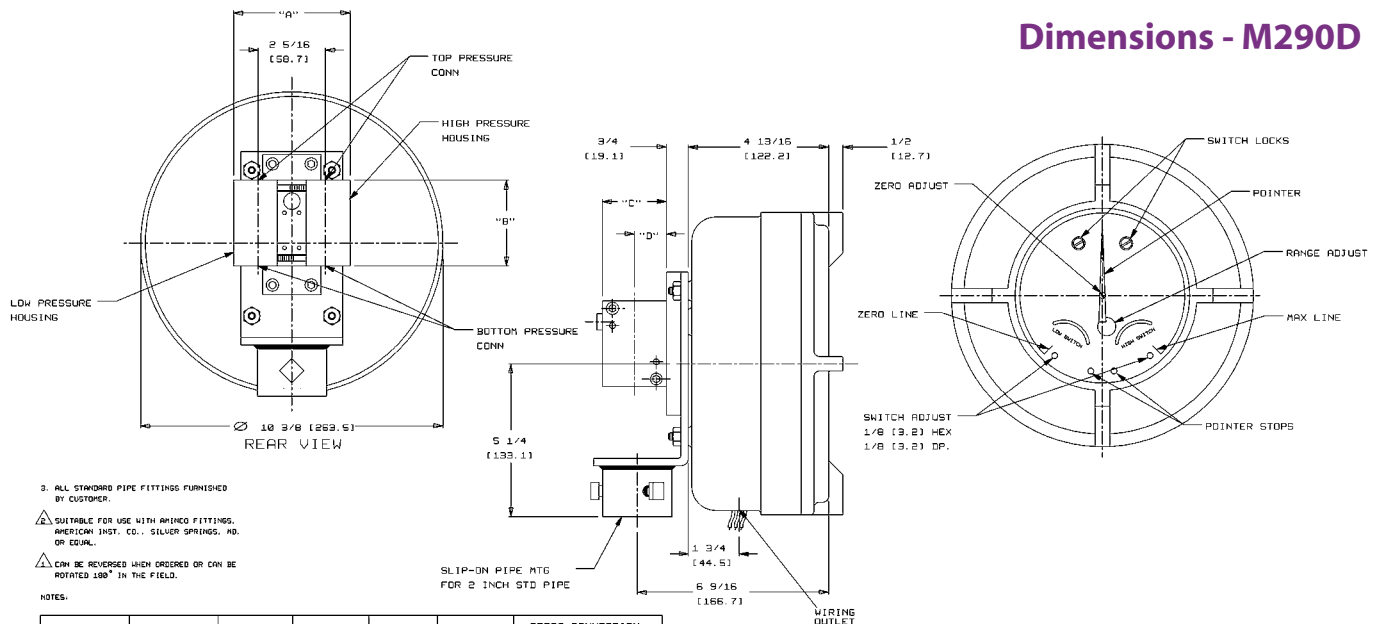
Dimensions - M227C



Dimensions - M281C

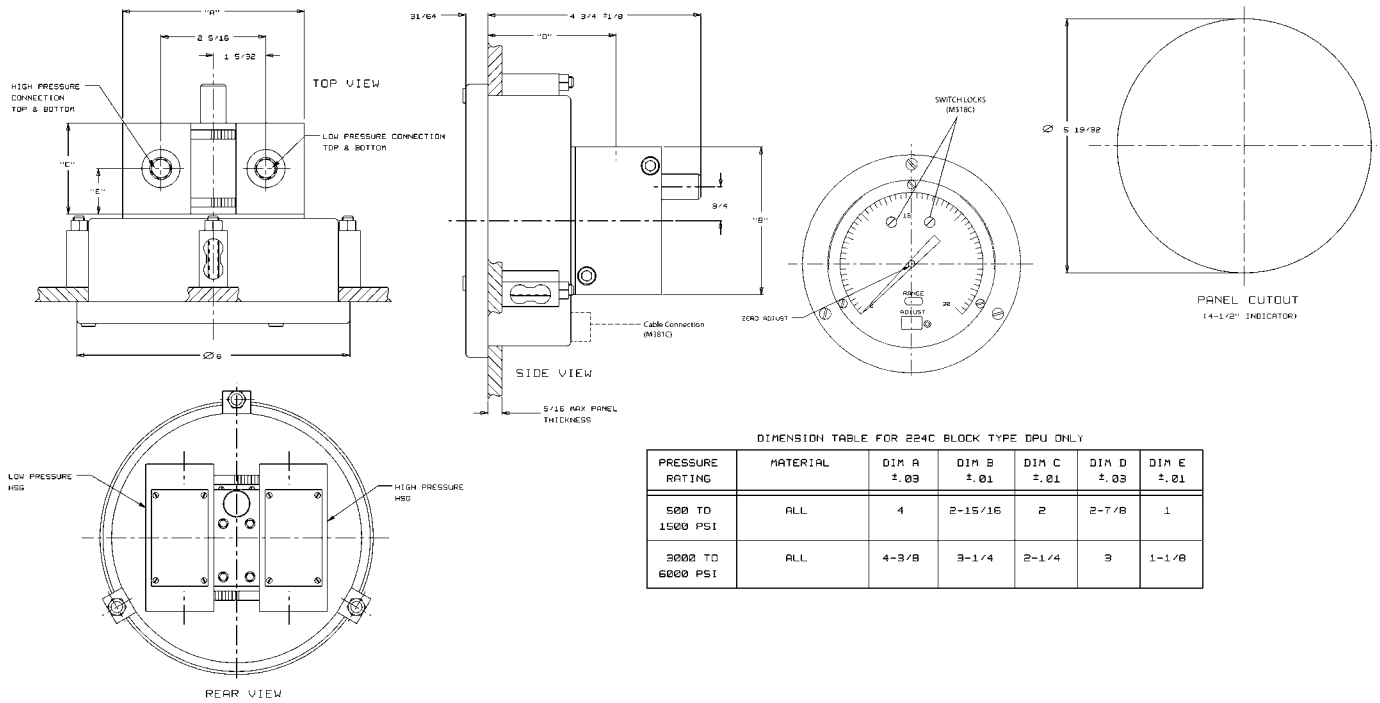


Dimensions - M290D

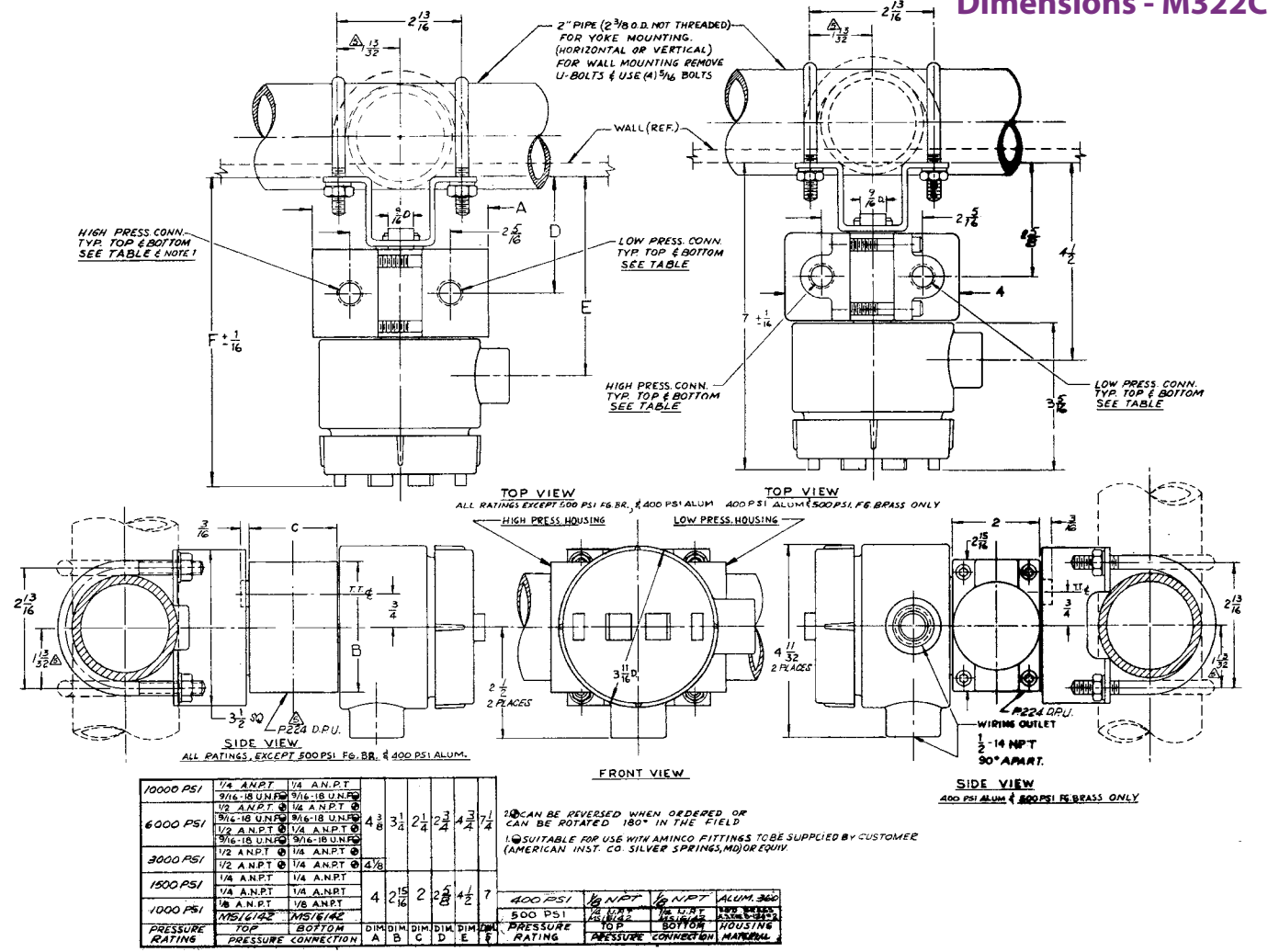


PRESSURE RATING	MATERIAL	DIM A ±.03	DIM B ±.01	DIM C ±.01	DIM D	PRESS CONNECTION	
						TOP	BOTTOM
500 TO 1500 PSI	ALL	4 (101.6)	2-15/16 (74.6)	2 (50.8)	1 (25.4)	1/2 NPT  9/16-18 UNF 	1/4 NPT  9/16-18 UNF 
3000 TO 10,000 PSI	ALL	4-3/8 (111.1)	3-1/4 (82.6)	2-1/4 (57.2)	1-1/8 (29.6)	1/4 NPT 1/2 NPT 7/16 MS 1/8 NPT	1/4 NPT 1/2 NPT 7/16 MS 1/8 NPT

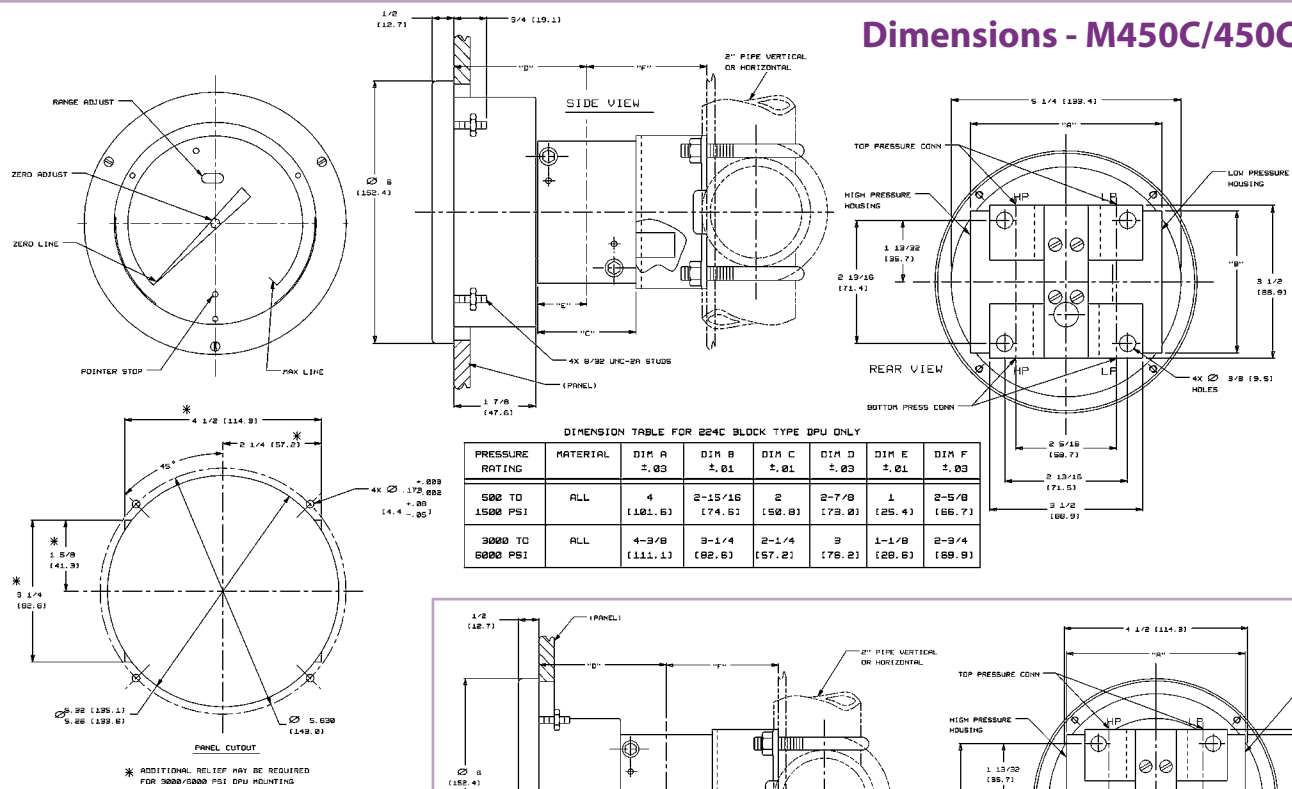
Dimensions - M316C/318C



Dimensions - M322C

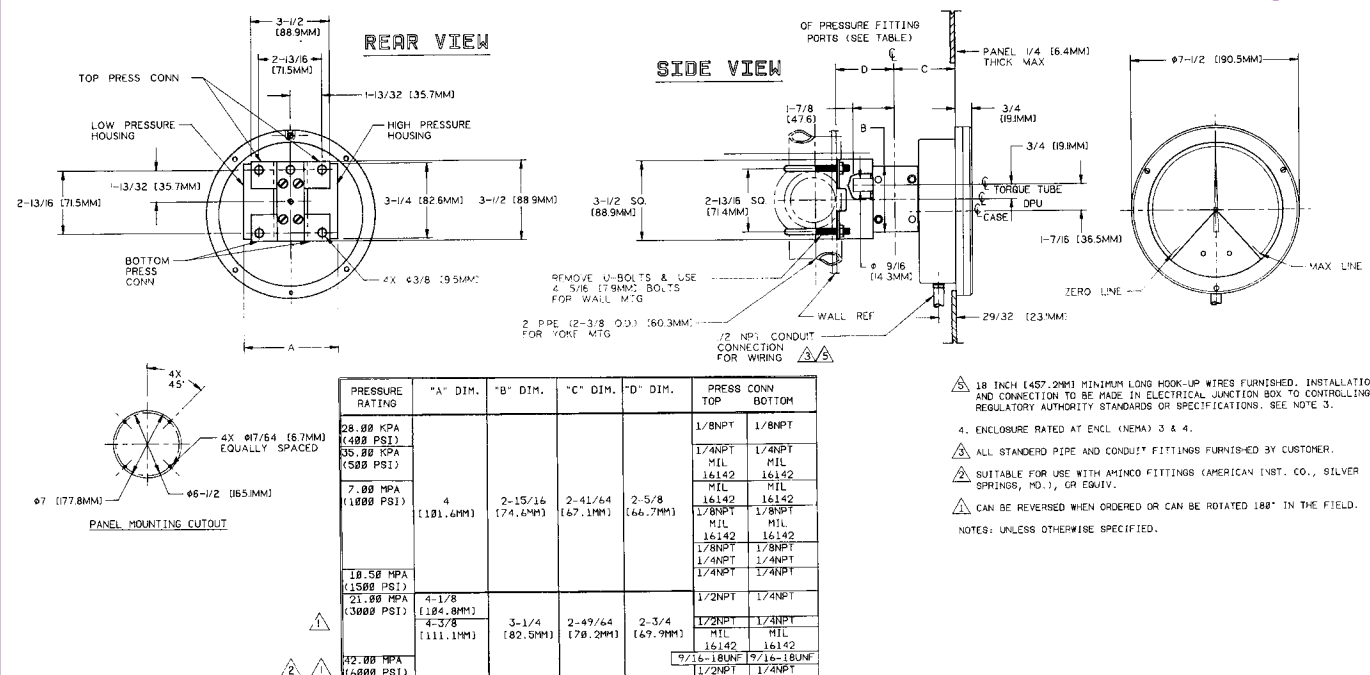


Dimensions - M450C/450C SST

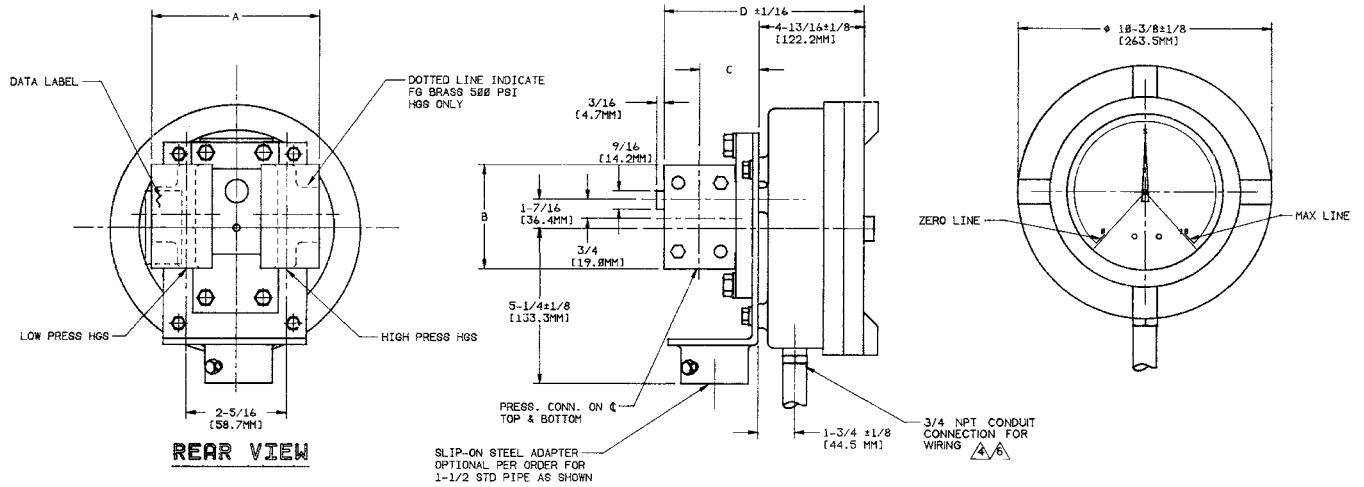


450C SST Version

Dimensions - IT/ITS/IS (Weatherproof)



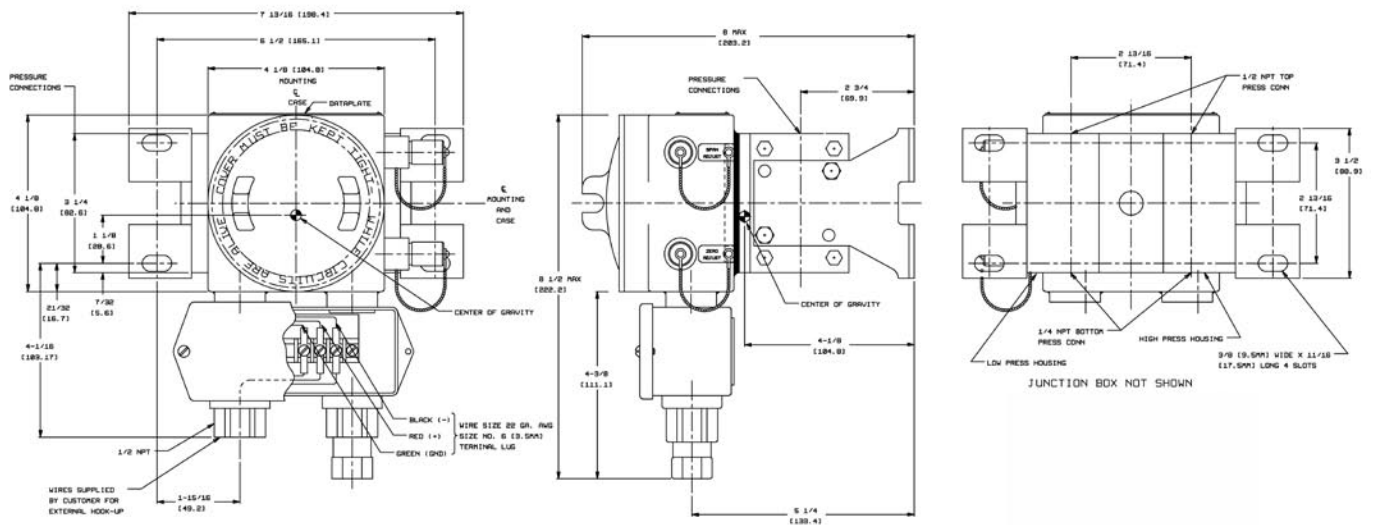
Dimensions - IT/ITS/IS (Explosionproof)



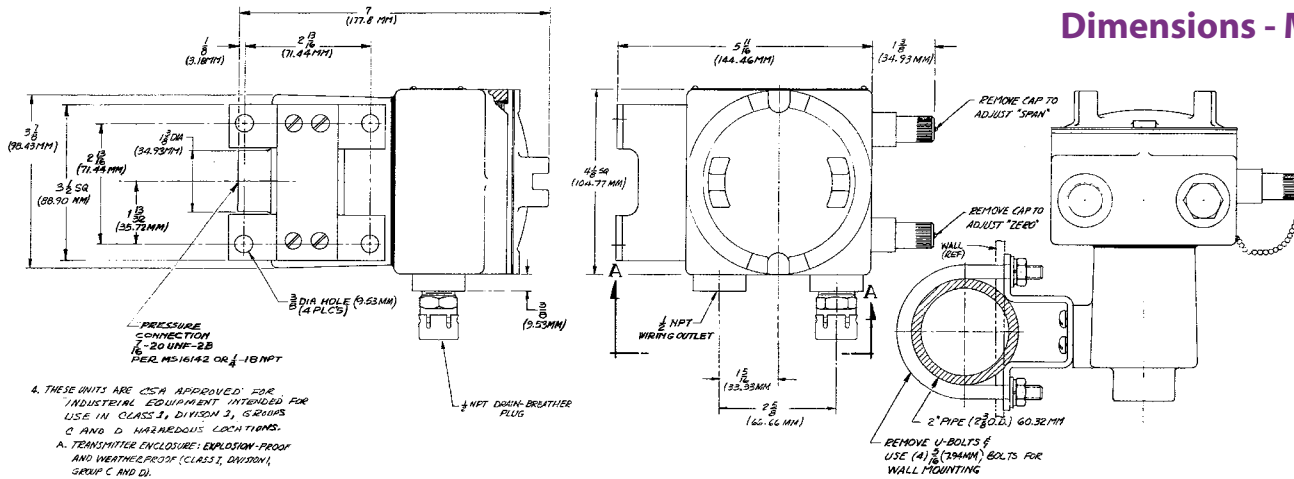
PRESSURE RATING	"A" DIM.	"B" DIM.	"C" DIM.	"D" DIM.	PRESS TOP	CONN BOTTOM
2.8 MPA (400 PSI)	4 [101.6MM]	2-15/16 [74.6MM]	1-51/64 [45.6MM]	6-15/32 [164.3MM]	1/8NPT	1/8NPT
3.5 MPA (500 PSI)					7/16NPT	7/16NPT
7.00 MPA (1000 PSI)					1/4NPT	1/4NPT
					7/16NPT	7/16NPT
					1/4NPT	1/4NPT
					1/8NPT	1/8NPT
					7/16NPT	7/16NPT
					1/4NPT	1/4NPT
10.5 MPA (1500 PSI)	4-1/8 [104.8MM]	3-1/4 [82.6MM]	1-29/32 [48.3MM]	6-23/32 [170.6MM]	1/4NPT	1/4NPT
	4-3/8 [110.7MM]				1/2NPT	1/4NPT
21.00 MPA (3000 PSI)					7/16NPT	7/16NPT
42.00 MPA (6000 PSI)					1/2NPT	1/4NPT
					9/16-18UNF	9/16-18UNF
					1/2NPT	1/4NPT

- FINISHES: PER ORDER
18 INCH (457.2MM) MIN. LONG HOOK-UP WIRES AND
CONNECTION TO BE MADE IN ELECTRICAL JUNCTION BOX TO
CONTROLLING REGULATORY AUTHORITY STANDARDS OR
SPECIFICATIONS. SEE NOTE 4.
5. SPECIFY 1-1/2 OR 2 STANDARD PIPE SIZE WHEN ORDERING ADAPTER.
6. ALL STANDARD PIPE & CONDUIT FITTINGS FURNISHED BY CUSTOMER.
7. FOR HAZARDOUS LOCATIONS CLASS 1, GROUPS B, C, D, CLASS II E,F,G, ENCLOSURE 3 & 4.
8. ADAPTERS FOR USE WITH AMINCO FITTINGS
(AMERICAN INST. CO. SILVER SPRINGS, MD.) OR EQUIV.
9. CAN BE REVERSED WHEN ORDERED OR CAN BE
ROTATED 180° IN THE FIELD.
- NOTES: UNLESS OTHERWISE SPECIFIED.

Dimensions - M752



Dimensions - M753



4. THESE UNITS ARE CSA APPROVED FOR INDUSTRIAL EQUIPMENT INTENDED FOR USE IN CLASS I, DIVISION 2, GROUP C AND D HAZARDOUS LOCATIONS.
- A. TRANSMITTER ENCLOSURE: EXPLOSION-PROOF AND WEATHER-PROOF (CLASS I, DIVISION, GROUP C AND D).
- B. OPERATING TEMPERATURE LIMITS: -15°F TO +135°F (-25°C TO +57°C).
- C. LOAD EFFECT: 4-20MA: ±0.025% OF FULL SCALE RANGE PER 100 OHMS.
10-50MA: 0.065% OF FULL SCALE RANGE PER 100 OHMS.
- D. WEIGHT: 8 POUNDS (APPROX) (3.63 KG).
3. ALL STANDARD PIPE FITTINGS TO BE FURNISHED BY CUSTOMER.
2. MAX PERMISSIBLE LOAD IS DETERMINED BY SUBTRACTING 12 FROM THE POWER SUPPLY RATED VOLTAGE AND DIVIDING BY 0.02 (FOR 4-20MA OUTPUT) OR 0.05 (FOR 10-50MA OUTPUT). THE TRANSMISSION CABLE, RESISTANCE, THE RECEIVER INTERNAL RESISTANCE AND A SERIES RESISTOR, IF REQUIRED, MAKE UP THE LOAD/LOOP RESISTANCE.
1. ACCESSORY POWER SUPPLIES ARE AVAILABLE OPTIONALLY. SEE BULLETIN FOR MODELS 291, 298, 299 AND 300.

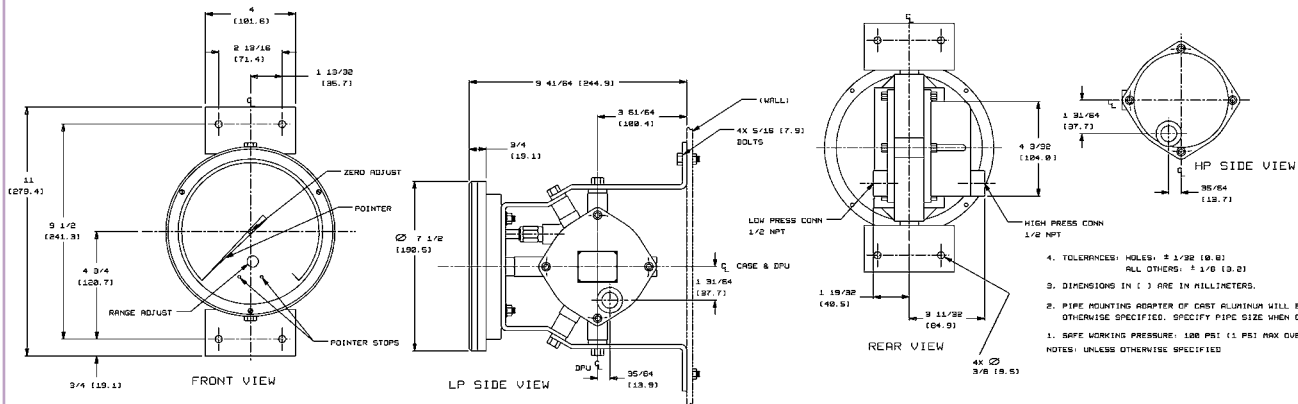
NOTE: UNLESS OTHERWISE SPECIFIED

ELECTRICAL REQUIREMENTS		
OUTPUT RANGE	POWER SUPPLY (RIPPLE ±1% OR LESS)	LOAD (SEE NOTE 2)
4-20MA D.C.	20V MAX @ 12-70 VDC	0-2500 OHMS
10-50MA D.C.	50V MAX @ 12-70 VDC	0-1150 OHMS

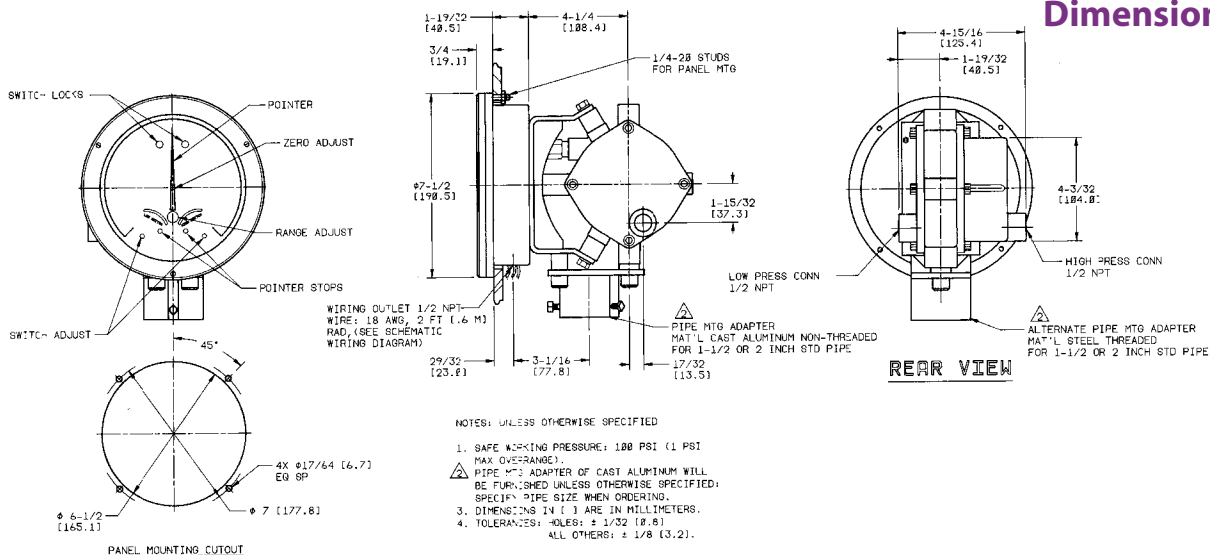
NOTE: NO. 20GA. WIRE HAS APPROX. 6.4 OHMS RESISTANCE PER 1000 FEET.
NO. 20GA. WIRE HAS APPROX. 10 OHMS RESISTANCE PER 1000 FEET.

VIEW A-A
VERTICAL OR HORIZONTAL YOKES MTS OR WALL MTS

Dimensions - M1502



Dimensions - M1512



NOTES: UNLESS OTHERWISE SPECIFIED

1. SAFE WORKING PRESSURE: 100 PSI (1 PSI MAX OVER-RANGE).
2. PIPE MOUNTING ADAPTER OF CAST ALUMINUM WILL BE FURNISHED UNLESS OTHERWISE SPECIFIED. SPECIFY PIPE SIZE WHEN ORDERING.
3. DIMENSIONS IN () ARE IN MILLIMETERS.
4. TOLERANCES: HOLES: ± 1/32 (0.8 mm).
ALL OTHERS: ± 1/8 (3.2 mm).

Weights

Model*	APPROXIMATE GROSS WEIGHT in lbs (kg)						
	Safe Working Pressure Rating (SWP)						
	100 psi SWP	500 psi SWP	1000 psi SWP	1500 psi SWP	3000 psi SWP	6000 psi SWP	10,000 psi SWP
Differential Pressure Units (DPUs)							
197A	100 psi Max. SWP - Contact Factory for Weight						
224C	N/A	3.5 (1.6) Forged Brass 4.5 (2) CS/SST	4.5 (2)	4.5 (2)	6.5 (2.9)	6.5 (2.9)	6.75 (3.1)
Instruments (Includes DPU)							
226C	N/A	4 (1.8) Forged Brass 5 (2.3) CS/SST	5 (2.3)	5 (2.3)	7 (3.2)	7 (3.2)	7.25 (3.3)
227C	N/A	6 (2.7) Forged Brass 7 (3.2) CS/SST	7 (3.2)	7 (3.2)	9 (4.1)	9 (4.1)	9.25 (4.2)
247C	N/A	17 (7.7) Forged Brass 18 (8.2) CS/SST	18 (8.2)	18 (8.2)	N/A	N/A	N/A
281C	N/A	4 (1.8) Forged Brass 5 (2.3) CS/SST	5 (2.3)	5 (2.3)	7 (3.2)	7 (3.2)	7.25 (3.3)
288C	N/A	9 (4)	9 (4)	10 (5)	10 (5)	12 (5)	12(5)
290D	N/A	22 (10)	22 (10)	23 (10)	23 (10)	25 (11)	25 (11)
316C	N/A	5.5 (2.5) Forged Brass 6.5 (2.9) CS/SST	6.5 (2.9)	6.5 (2.9)	8.5 (3.9)	8.5 (3.9)	8.75 (4)
318C	N/A	9 (4)	9 (4)	10 (5)	10 (5)	12 (5)	12 (5)
322C	N/A	9 (4)	9 (4)	10 (5)	10 (5)	12 (5)	12 (5)
450C	N/A	6.25 (2.8) Forged Brass 7.25 (3.3) CS/SST	7.25 (#.3)	7.25 (#.3)	9.25 (4.2)	9.25 (4.2)	9.5 (4.3)
IT/ITS/IS Weatherproof	N/A	9 (4)	9 (4)	10 (5)	10 (5)	12 (5)	12(5)
IT/ITS/IS Explosionproof	N/A	22 (10)	22 (10)	23 (10)	23 (10)	25 (11)	25 (11)
752	Base Configuration - 14 lbs (6.4)						
753	Base Configuration - 8 lbs (3.6)						
1502/1512	100 psi Max. SWP - Contact Factory for Weight						
*Note: For models not listed, contact Factory.							

Ordering

When ordering, specify the following:

- Quantity
- Unit Type (Case assembly or kit)
- Model Number
- Housing Pressure Rating (SWP)
- Differential Pressure Range
- Housing and Bellows Materials
- Process Material Contacting Bellows
- Bellows Fill Fluid (Mineral Oil, Ethylene Glycol/Water, Distilled Water, Silicone, Fluorolube for O2 Service, Other: Specify)
Note: Not all fills available on all models, consult Factory
- Indicating Units: Type of Scale (uniform, square root) and Graduations
- Mounting (pipe, wall, flush panel) Note: Explosionproof models - pipe mounting only
- General Switch Models: Number of Switches (1 to 4), Switch Type (SPDT or DPDT), Switch Setpoints (5-95%), and Optional Relays (1 or 2),
- ITS/IS Only: Number of Switches (2 or 4), Low Contact (close or open) at (w.c. or psi) on (increasing or decreasing) pressure, High (close or open) at (w.c. or psi) on (increasing or decreasing) pressure, and Deadband (1% to 9% F.S.)

Typical Applications

Companion Products

Sealed Sensor Systems

PRIME Sealed Sensor Systems are designed for use with DP and low-pressure instruments for measurement of pressure, liquid level, flow, density, and viscosity with the following requirements:

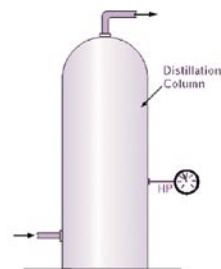
- Instrument must be **isolated** from a process media that is corrosive or toxic, viscous, very hot, might freeze or solidify, or contains suspended solids
- A stable **reference leg** is needed for use in level, density, or viscosity measurement applications (where density of liquid in connective tubing must be constant)
- A system that can be **easily cleaned** for use in food, beverage, and pharmaceutical industries

The sealed sensor system consists of three main components: a sensor assembly, capillary tubing, and a DPU. The sensor contains either a sealed bellows or a diaphragm that serves as an isolating interface between the media and the DPU — transmitting pressures without attenuation. The M305 Bellows Sensor is designed to be mounted inside a vessel in liquid level applications. The M350 Bellows and M422 (Diaphragm Seal) Sensors are designed for mounting outside of the vessel in level or flow measurement applications. The capillary tubing used to connect the sealed sensor to the DPU has a 1/4-inch outside diameter (nominal 1/8-inch inside diameter). It is available in virtually any length that can be bent, looped, or formed to fit requirements. Tubing is available in copper alloys and stainless steel, with joints and connections brazed or welded to prevent leaks. The tubing is filled with a fluid suitable for the intended application.

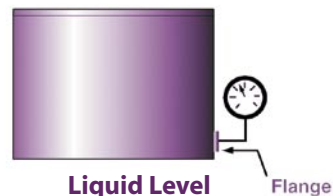
Each system is custom configured to meet specific installation requirements.

Other PRIME Products

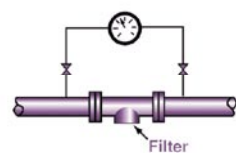
- **CryoScan®** — Distributed Measurement with Remote Telemetry for Cryogenic Applications
- **DataScan®** — Distributed Measurement with Remote Telemetry for Industrial Applications
- **TankScan® T-Series** — Wireless Measurement and Reporting for Distributed Level Measurement Applications (MIR waveguide-based measurement with one-way communications)
- **TankScan® W-Series** — Wireless Measurement and Reporting for Distributed Inventory Applications (multiple sensor types and two-way communications)
- **3500 ATG** — Automatic Tank Inventory Management System
- **Pneumatics** — Transmitters/Controllers
- **330, 340, 343, and 345 XTC® Transmitters** — DP, AP, GP, & Steam Transmitters/Controllers, Critical Pressure Transmitters, and Temperature Transmitters



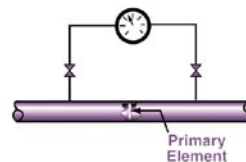
Absolute Pressure



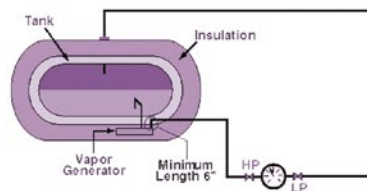
Liquid Level



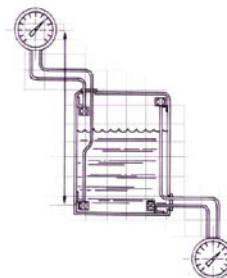
Pressure Drop Across Filters



Hi/Low Flowrate



Cryogenic Liquid Level



Remote Level

PRIME Measurement Products, LLC
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