

BARTON®

# DP Indicators, Switches & Transmitters



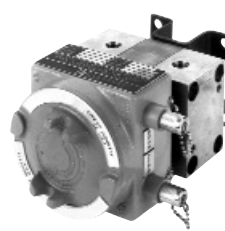
227C Indicator



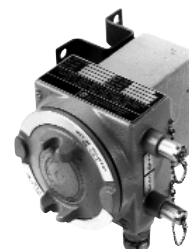
ITS



228C Switch



752 Transmitter



753 Transmitter

Barton DP indicators, DP switches, IT / ITS / IS Series DP indicating transmitters/switches, and explosion-proof 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)

Barton indicators and switches are actuated by a rupture-proof bellows DPU with integral temperature compensation.

The 224C DPU is a dual, liquid-filled, bellows designed to withstand repeated overranges equal to the safe working pressure of the housings without any change in calibration. The 224C SWP ranges from 500 psi (34 bar) to 6,000 psi (414 bar), with DP Ranges from 0-30" w.c. to 0-1,000 psi. NACE-compliant materials are 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, and IT / ITS feature a NEMA-4 / IP65 rated case. The Model 232C has a 304 stainless steel case. The Models 290D, 322C, 752, 753, and select models of the IT / ITS Series have explosion-proof cases.

Optional non-indicating "blind" switch cases and 316 stainless steel cases (for offshore/corrosive environments) are available for select models. Consult factory for case option availability and application.

## Features (select models)

- SWP to 6,000 psi (414 bar)
- Weather-proof, NEMA 4 / IP65, or explosion-proof cases
- Stainless steel (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 with 2 or 4 SPDT contacts (can be set for DPDT operation)
- 4-20 mA output on IT / ITS & 752 / 753 models
- IT/ITS internal battery
- 752 / 753 Insensitive to normal shock & 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 flow rate

## DPU Details

### Model 224C (Dual Bellows)

The 224C DPU 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.

## 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 BUA — they are not individually replaceable parts.

Model 224C with NACE-complaint materials are 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.,  $N_2O_2$ , 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 0-400 psi (0-75 mbar to 0-27.6 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 on page 3.

### External Sensors

Refer to the Sealed Sensors Bulletin for details on applications requiring external sealed sensors, such as corrosive, high temperature and hazardous fluids.

## M224C DPU Specifications

(Refer to Table 1 below)

|                                |                                                                                                                                                                                          |                                                                                                                                     |                                                                                                                                                 |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Housings (Material/SWP)</b> | Forged Brass<br>Carbon Steel<br>316 SST<br>Monel                                                                                                                                         | 500 psi<br>1,500, 3000, & 6,000 psi<br>500, 1,500, 3,000, & 6,000 psi<br>3,000 psi                                                  | (34 bar)<br>(103, 207, & 404 bar)<br>(34, 103, 207, & 414 bar)<br>(207 bar)                                                                     |
| <b>Bellows Material</b>        | Be-Cu, 316 SST, or Inconel                                                                                                                                                               |                                                                                                                                     |                                                                                                                                                 |
| <b>DP Ranges</b>               | 500 psi (34 bar) SWP<br>1,000 psi (69 bar) SWP<br>1,500 psi (103 bar) SWP<br>3,000 psi (207 bar) SWP<br>6,000 psi (414 bar) SWP                                                          | 0-30" w.c. to 0-500 psi<br>0-60" w.c. to 0-400 psi<br>0-60" w.c. to 0-400 psi<br>0-60" w.c. to 0-400 psi<br>0-60" w.c. to 0-400 psi | (0-75 mbar to 0-34 bar)<br>(0-149 mbar to 0-27.6 bar)<br>(0-149 mbar to 0-27.6 bar)<br>(0-149 mbar to 0-27.6 bar)<br>(0-149 mbar to 0-27.6 bar) |
| <b>Bellows Fill Fluids</b>     | Mineral Oil (Standard M-Fill)<br>Ethylene Glycol/Water<br>Distilled Water<br>Silicone<br>Fluorolube for O <sub>2</sub> Service<br>Others available (Contact PRIME)                       |                                                                                                                                     |                                                                                                                                                 |
| <b>Weight (approximate)</b>    | Forged Brass<br>Carbon Steel, Stainless Steel, and Monel                                                                                                                                 | 500 psi SWP<br>500, 1000, & 1500 psi SWP<br>3000 & 6000 psi SWP                                                                     | 3.5 lbs (1.6 kg)<br>4.5 lbs (2 kg)<br>6.5 lbs (2.9 kg)                                                                                          |
| <b>Temperature Limits</b>      | -40°F/°C to +180°F (+82°C)                                                                                                                                                               |                                                                                                                                     |                                                                                                                                                 |
| <b>Ordering</b>                | When ordering, specify:<br><br>Quantity<br>Model Number<br>Housing Pressure Rating (SWP)<br>Housing & Bellows Materials<br>Bellows Fill Fluid<br>Differential Pressure Range<br>Mounting |                                                                                                                                     |                                                                                                                                                 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             | Table 1 - 224/224C DPU General Specifications Table (2/06a) |                                                 |                                                 |                                                |                                                | PRESSURE CONNECTIONS |                        |            |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|------------------------------------------------|------------------------------------------------|----------------------|------------------------|------------|----------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             | BODY                                                        | AVAILABLE DIFFERENTIAL PRESSURE RANGES          |                                                 |                                                |                                                |                      |                        |            |          |
| SWP psi (bar)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |             | Housing Material                                            | Stainless Steel or Inconel Bellows              | Beryllium Copper Bellows (224C Only)            |                                                | Inconel Bellows                                |                      | Top                    | Bottom     |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             |                                                             | 1-5/8" (41mm) O.D.                              | 1-5/8" (41mm) O.D.                              | 3/4" (19mm) O.D.                               | 3/4" (19mm) O.D.                               | 5/8" (16mm) 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) | 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) | 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) | 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) | 0-61 psi (0-4.2 bar) to 0-400 psi (0-27.6 bar) | 1/4" NPT             |                        | 1/4" NPT   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             | 3,000 (207) | Cold Rolled Steel (C1018) Stainless Steel (316) Monel       |                                                 |                                                 |                                                |                                                | 1/2" NPT             |                        | 1/4" NPT   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             | 6,000 (414) | Cold Rolled Steel (C1018) Stainless Steel (316)             |                                                 |                                                 |                                                |                                                | 1/2" NPT             |                        | 1/4" NP"   |          |
| 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 cu.in. (cu. cm) for full-scale Travel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |             | 0.14" (2.3 cc)                                              | 0.14" (2.3 cc)                                  | 0.03" (0.49 cc)                                 | 0.03" (0.49 cc)                                | 0.025" (0.41 cc)                               |                      |                        |            |          |
| Performance: Torque Tube Rotation = 8° ±10%; Torque Tube Material = Beryllium Copper (BeCu); Temperature Limits = -40°F/°C to +180°F (+82°C); Maximum Non-linearity = per Range; Repeatability = 0.2% of full scale differential pressure (see DP Indicators, Switches, & Transmitters bulletin #21920 for additional information).                                                                                                                                                                                                                                                                        |             |             |                                                             |                                                 |                                                 |                                                |                                                |                      |                        |            |          |
| Notes: Zero center or split ranges available on special order (e.g., 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 mbar). Other sizes and types of connections (welding stubs, MA, 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. |             |             |                                                             |                                                 |                                                 |                                                |                                                |                      |                        |            |          |

## DP Indicators



Model 226C



Model 227C



Model 232C



Model 247C



Model 450C

### Model 226C (w/224C DPU)

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

### Model 227C (w/224C DPU)

A 6-inch (152 mm) indicator that is ideally suited for tank level, flow, and pressure drop across filters. This model is also available in stainless steel (M227CS).

### Model 232C (w/224C DPU)

An economical 6-inch (152 mm) 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  $\pm 2.00\%$  of full scale. The unit can be pipe, wall, or panel mounted.

### Model 246/247C (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 450C (w/224C DPU)

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

## Indicator Specifications

|                    |                                                                             |                          |                            |                   |
|--------------------|-----------------------------------------------------------------------------|--------------------------|----------------------------|-------------------|
| Temperature Limits | -40°F/C to +150°F (+66°C) 1502 Only<br>-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)  | $\pm 2.00\%$ F.S. |
|                    | 226C, 227C, 247C                                                            | 0-30" w.c. to 0-50" w.c. | (0-75 to 0-124 mbar)       | $\pm 0.75\%$ F.S. |
|                    |                                                                             | 0-51" w.c. to 0-60 psi   | (0-127 mbar to 0-4.1 bar)  | $\pm 0.50\%$ F.S. |
|                    |                                                                             | 0-61 psi to 0-150 psi    | (0-4.2 bar to 0-10.3 bar)  | $\pm 0.75\%$ F.S. |
|                    |                                                                             | 0-151 psi to 0-400 psi   | (0-10.4 bar to 0-27.6 bar) | $\pm 1.00\%$ F.S. |
|                    |                                                                             | 0-601 psi to 0-400 psi   | (0-41.4 bar to 0-27.6 bar) | $\pm 4.00\%$ F.S. |
|                    | 450C                                                                        | 0-30" w.c. to 0-400 psi  | (0-75 to 0-27.6 bar)       | $\pm 1.00\%$ F.S. |
|                    |                                                                             | 0-601 psi to 0-400 psi   | (0-41.4 bar to 0-27.6 bar) | $\pm 4.00\%$ F.S. |
| Repeatability*     | $\pm 0.25\%$                                                                |                          |                            |                   |

## DP Switches



Model 288C



Model 290D



Model 318C



Model 322C

### Model 288C

A 6-inch (152mm) indicating-switch that features a NEMA-4 case with operating pressure ratings up to 6,000 psi (414 bar) and DP Ranges from 0-30" w.c. to 0-400 psi (0-75 mbar to 0-27.6 bar). Both single and dual switch units are standard, with up to two additional switches available as an option. Also available in stainless steel (M288CS).

### Model 290D

An explosion-proof 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 explosion-proof case for use in Class I, Div. 1, Group D hazardous areas. The standard unit comes with one SPDT switch.

## Switch Specifications

|                                |                                                                               |                                                                                                                                |                            |             |
|--------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------|
| Temperature Limits             | -40°F/°C to +150°F (+66°C) 1512 Only<br>-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<br>Resistive = 3.0 amps up to 30 V<br>(Other ratings/switches available)                        |                            |             |
| Relays                         | 1 or 2 DPDT Relays                                                            |                                                                                                                                |                            |             |
| Relay Ratings                  | AC (Contact)                                                                  | Inductive = 5 amps up to 115VResistive = 10 amps up to 115V                                                                    |                            |             |
|                                | AC (Coil)                                                                     | 6V, 12V, 24V, 115V = 5 VA maximum                                                                                              |                            |             |
|                                | DC (Contact)                                                                  | Inductive = 5 amps up to 26.5VResistive = 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. |
|                                | DPDT                                                                          | Add 0.5% to SPDT values<br>Point of Actuation ±10% of F.S. - Add 1/2% to SPDT values<br>Repeatability = 0.25% of full scale DP |                            |             |
| Switch Deadband                | SPDT = ±5.0% max. F.S. DP<br>DPDT = ±6.0% max. F.S. DP                        |                                                                                                                                |                            |             |
| Suppressed Ranges              | Add 1/4%                                                                      |                                                                                                                                |                            |             |

### 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.

### IT / ITS Transmitter/Switches

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



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

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

#### Switch Options

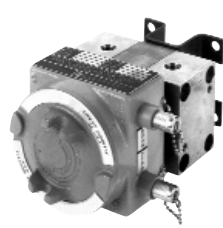
Units are available with 2 or 4 fully-adjustable contacts that can be set for high or low, or both high and low (when two contacts are furnished). By moving jumpers, two switches can be made to operate simultaneously to give a DPDT switch. Jumpers can also be set to give ON-OFF control between two setpoints.

## IT / ITS Specifications

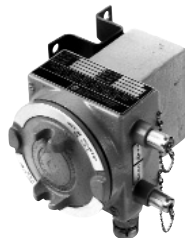
Models IT 12 / ITS 20 / ITS 24

|                             |                                                                                                                                                                         |                                                                   |                                                   |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------|
| Temperature Limits          | Operating<br>Storage                                                                                                                                                    | -40°F/C to +180°F (+82°C)<br>-40°F/C to +200°F (+93°C)            |                                                   |
| Humidity                    | to 95% R.H. @+104°F (+40°C)                                                                                                                                             |                                                                   |                                                   |
| Current Loop                | 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                 | Maximum Turndown                                                                                                                                                        | 2:1 (20 mA with pointer at 1/2 scale)                             |                                                   |
|                             | Accuracy (Pointer Indication)                                                                                                                                           |                                                                   |                                                   |
|                             | includes line hysteresis,                                                                                                                                               | ±0.25% of F.S.<br>±0.2%/10% supply change<br>±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 Only)           | Accuracy                                                                                                                                                                | ±1/0% F.S.                                                        |                                                   |
|                             | Repeatability                                                                                                                                                           | ±0.2% F.S.                                                        |                                                   |
|                             | Deadband                                                                                                                                                                | Adjustable1% to 9% of F.S.                                        |                                                   |
|                             | Setpoints                                                                                                                                                               | 2 or 4 Independent0 to 100% F.S. (pointer indication)             |                                                   |
|                             | Contacts                                                                                                                                                                | 2 or 4 SPDT2 Amp @30 VDC1 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.                                       |
| 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 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 |

## 752 / 753 Explosion-proof Electronic Transmitters



Model 752



Model 753

For liquid, gas, or vapor service, both models feature a liquid-tight, explosion-proof 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 psig capacities available on special order.

### Model 753

The 753 couples the reliability of a bourdon tube with the sensitivity of a silicon strain gauge to deliver 1/2% accuracy for measurements from 0-25 psi to 0-5,000 psi.

### Transmitter Operation

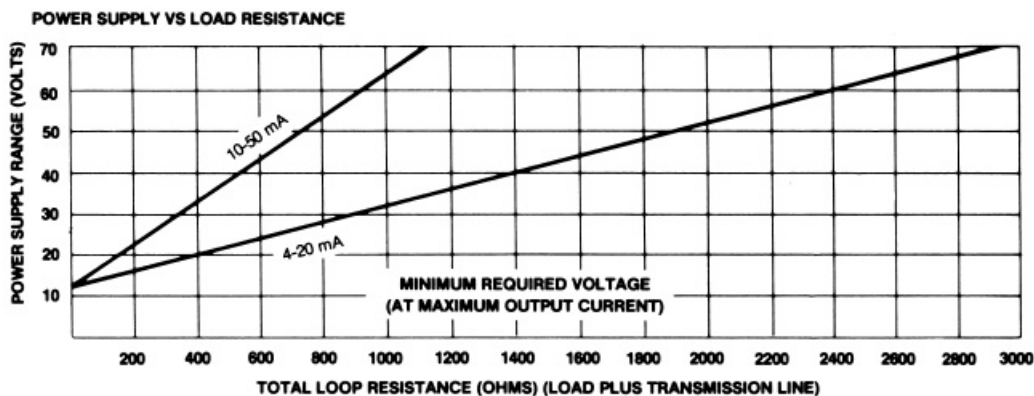
Silicon piezo-resistive strain gauges, carefully matched for delta resistance and temperature coefficients to ensure linearity and stability, are molecularly bonded (no organic compounds) on opposite sides of the beam.

**M752:** The end of the strain gauge 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 gauge 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 gauge and is converted into a resistance change. The tension gauge increases in resistance and the compression gauge decreases in resistance in direct proportion to the deflection of the cantilever beam.

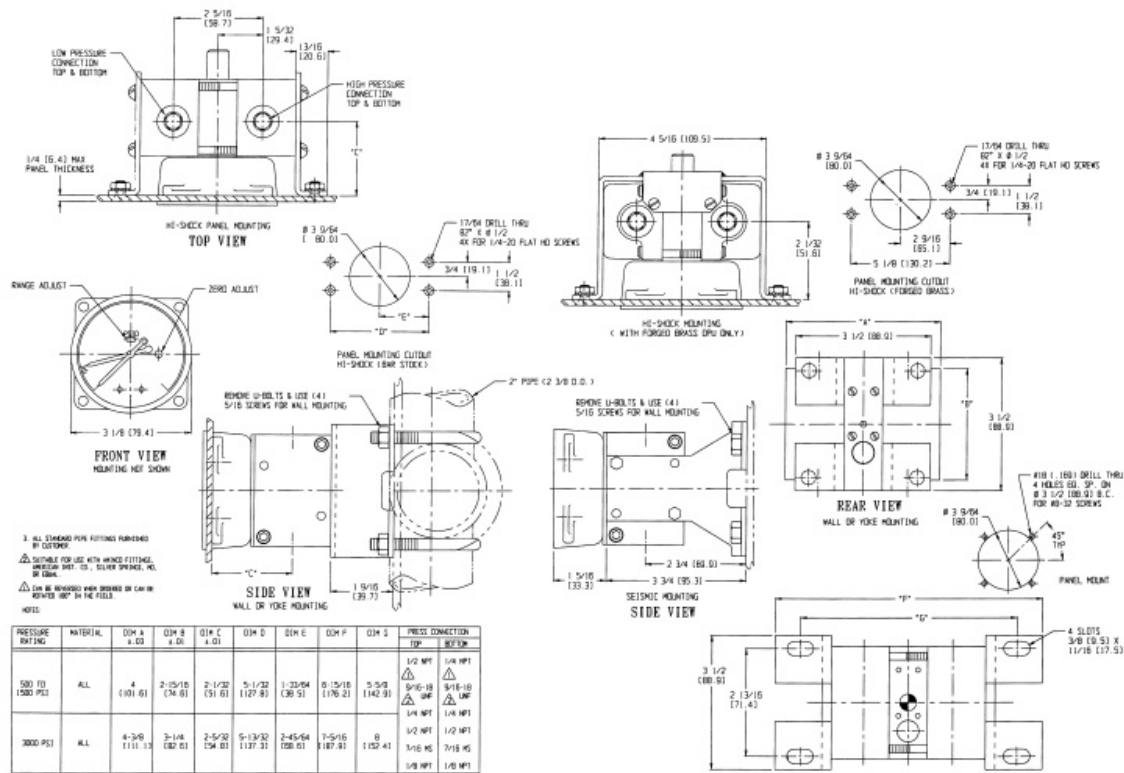
The tension and compression gauges form two active elements of a wheatstone bridge network. The transmitter electronics condition and convert the bridge output signal to a 4-20 mA or 10-50 mA output signal.



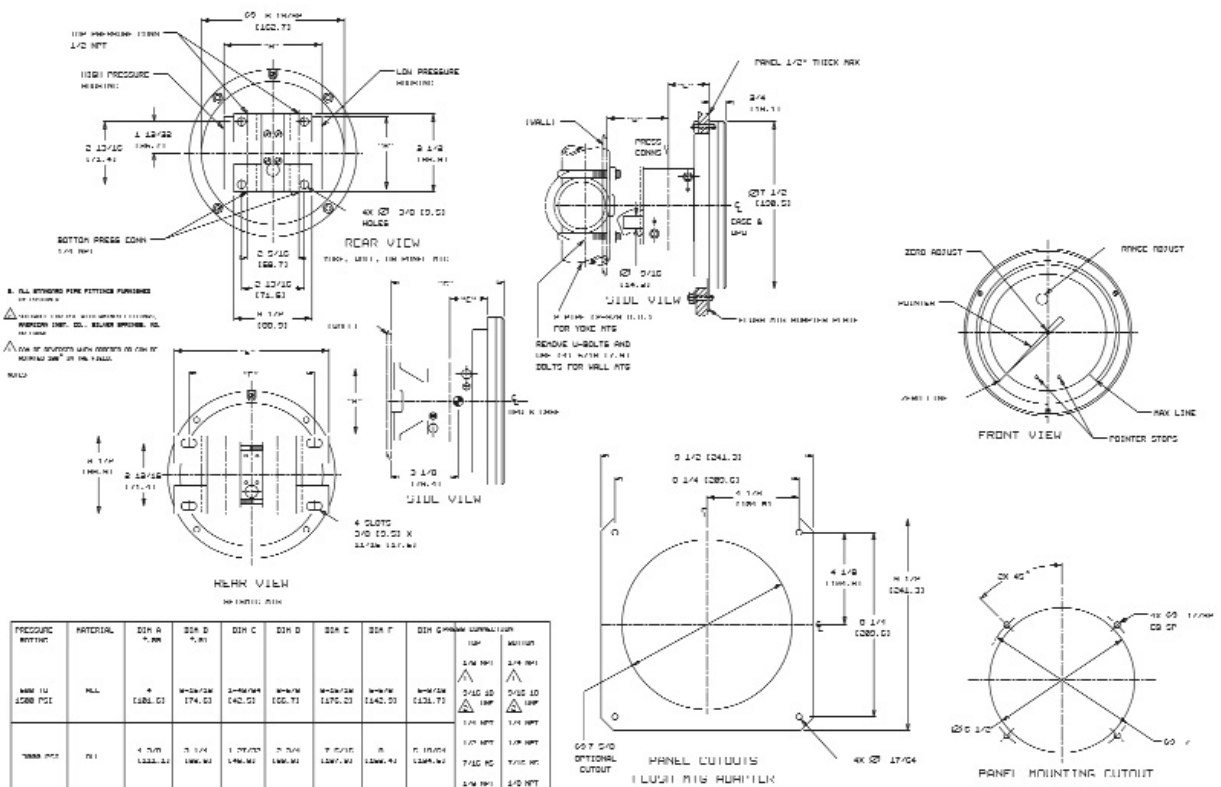
## 752 / 753 Specifications

|                               |                                                                                                       |                                                                                                   |
|-------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Accuracy                      | ±0.50% of rating span (includes linearity, hysteresis, and repeatability)<br>±0.25% accuracy optional |                                                                                                   |
| DP Ranges                     | M752                                                                                                  | 0-50" w.c. to 0-300 psid (max.)<br>consult factory for other ranges.                              |
|                               | M753                                                                                                  | 0-25 psig to 0-5,000 psig<br>(others on special request)                                          |
| SP Limit (M752)               | 3,000 psig standard<br>6,000 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<br>±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 Boundry 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)<br>Amerlock Gray optional                                     |
|                               | Electrical Connections                                                                                | 1/2" conduit (external junction box optional)                                                     |
|                               | Basic Config. Weight (approx.)                                                                        | M752 - 14 lbs<br>M753 - 8 lbs                                                                     |
| M752                          | Process Connections                                                                                   | 1/4" NPT/1/2" NPT on 2-13/16" centers or<br>(B) 9/16-18 Aminco both sides on 2-13/16" centers     |
|                               | Materials                                                                                             | Bellows, centerblock, & plugs - 316 SST (standard)<br>Pressure Housings - 316 SST or Carbon Steel |
| M753                          | Process Connections                                                                                   | 1/4" NPT                                                                                          |
|                               | Materials                                                                                             | Bourdon Tube - Haynes Alloy 25<br>Pressure Connection - 316 SST                                   |

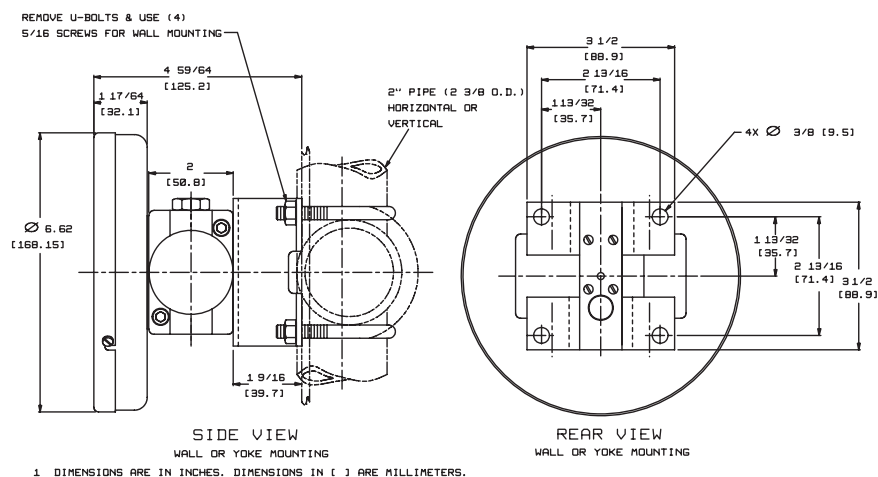
## Dimensions – M226C



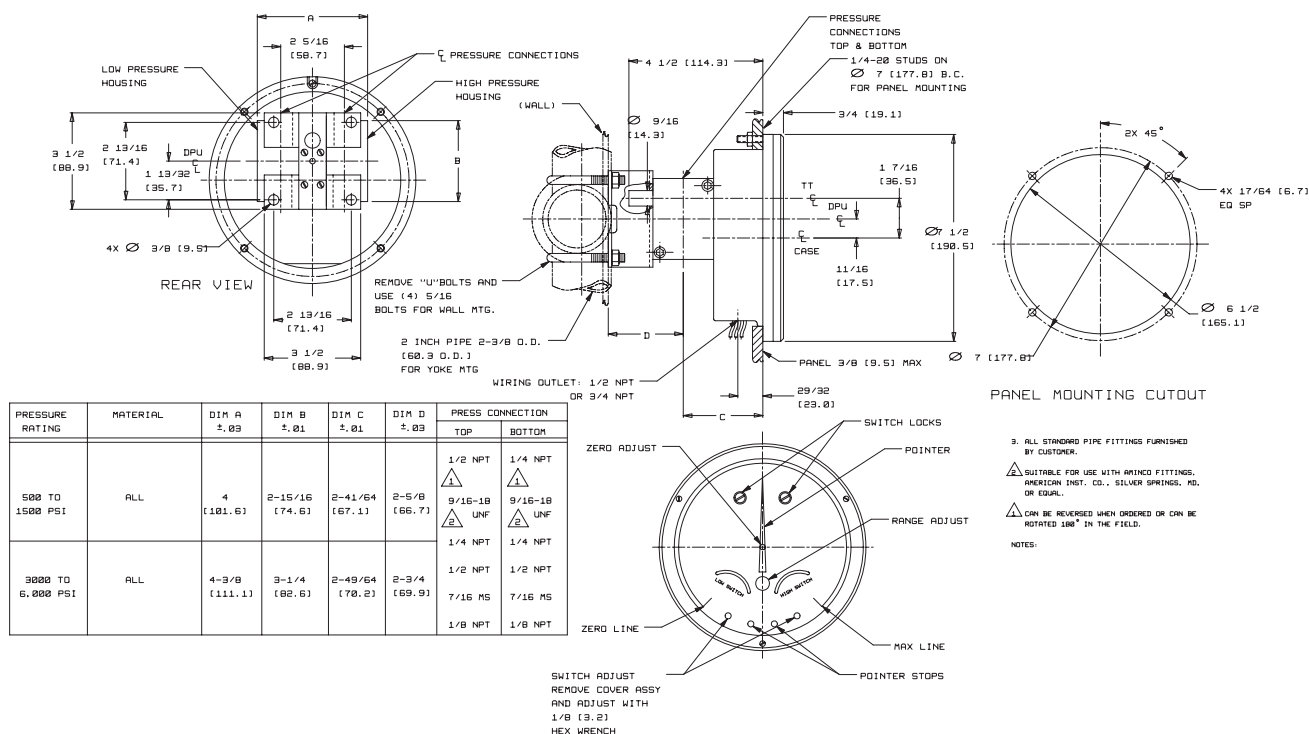
## Dimensions – M227C



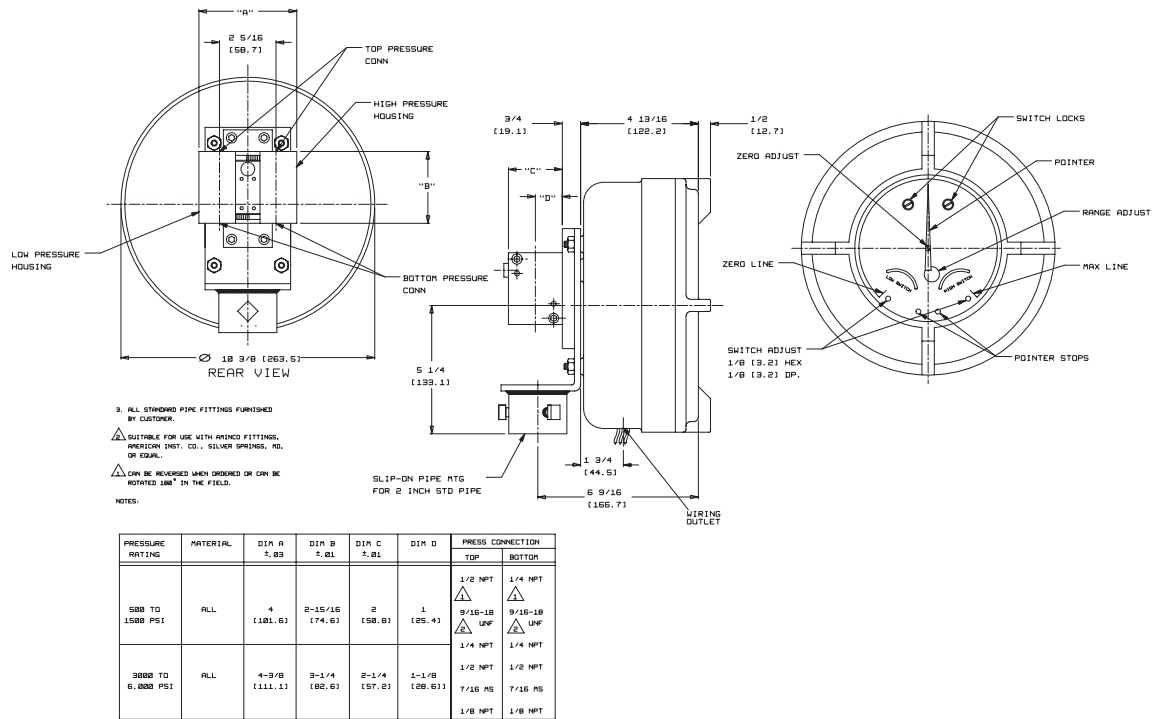
## Dimensions – M232C



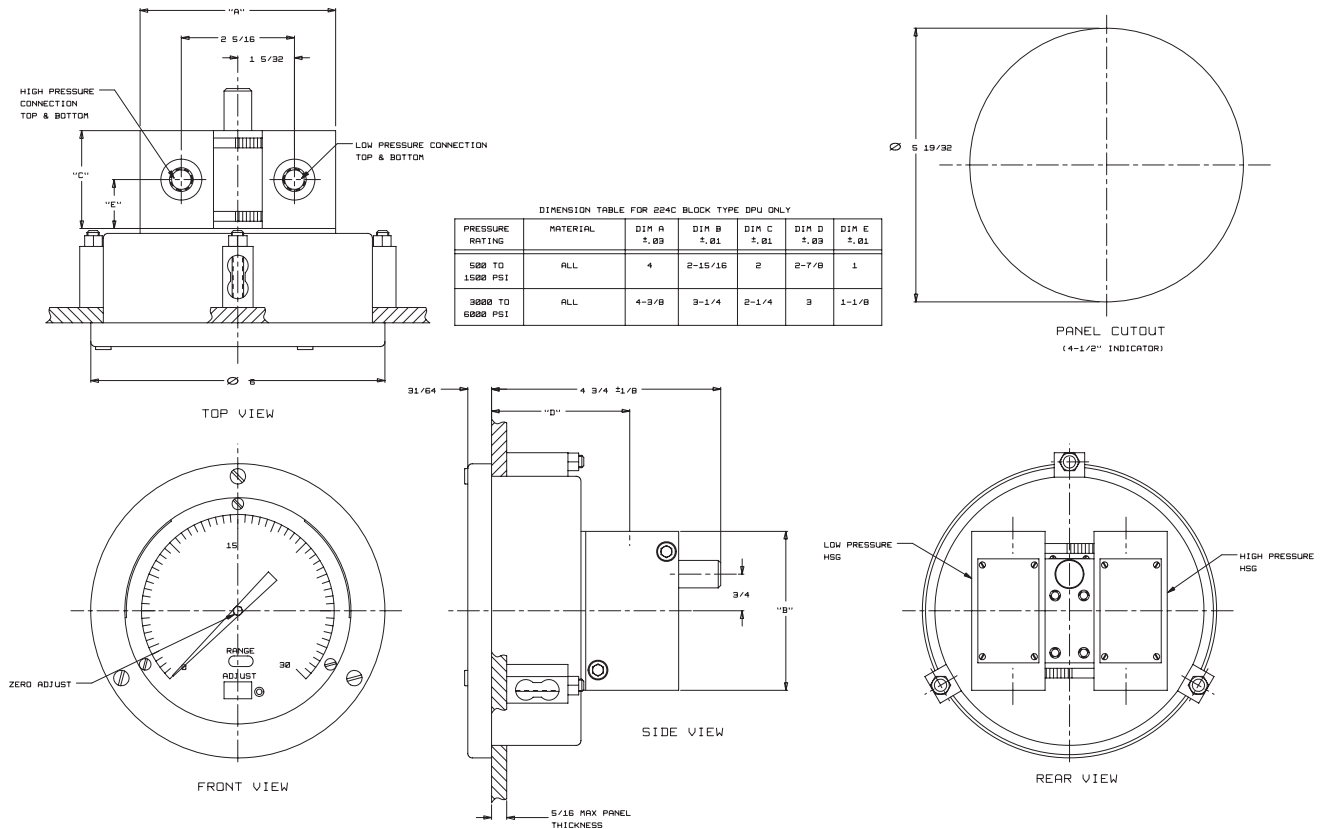
## Dimensions – M288C



## Dimensions – M290D



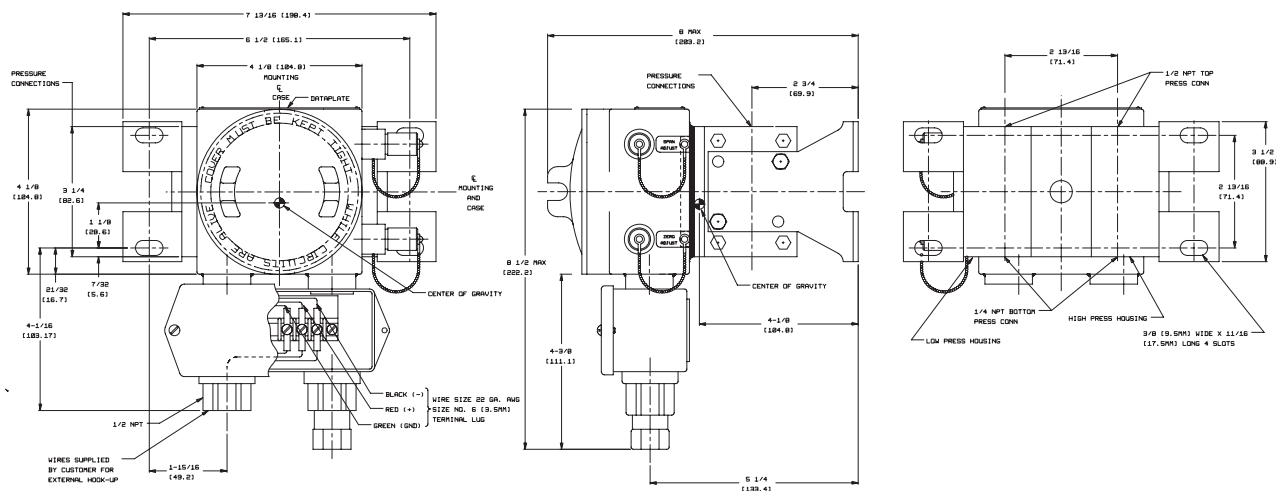
## Dimensions – M316C / 318C



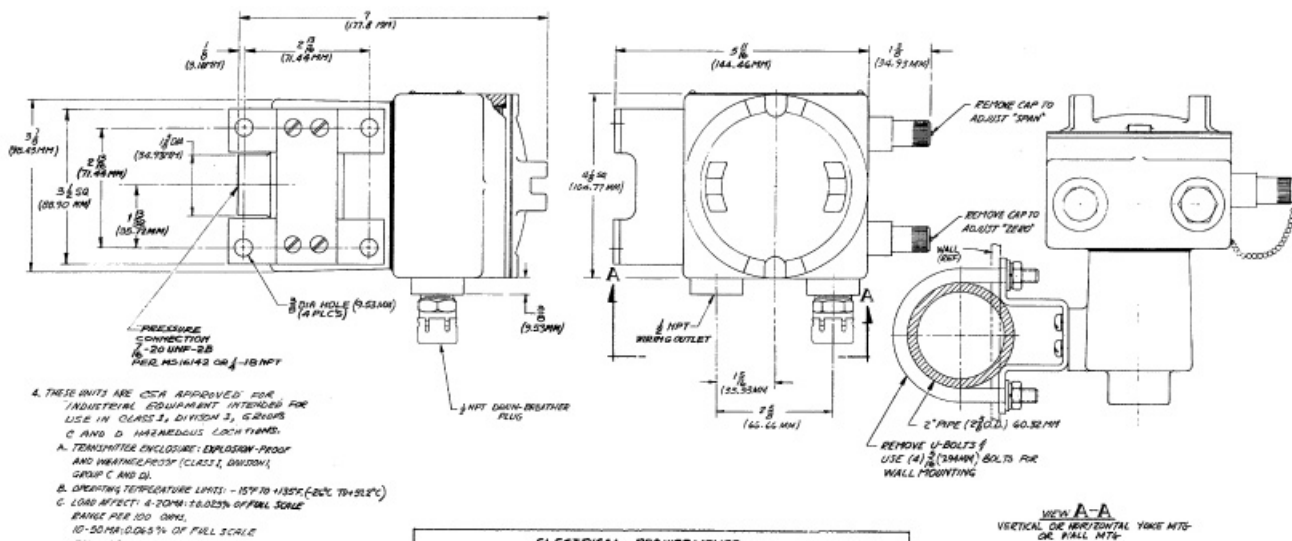




## Dimensions – M752



## Dimensions – M753



4. THESE UNITS ARE CSA APPROVED FOR INDUSTRIAL EQUIPMENT. INTENDED FOR USE IN CLASS I, DIVISION 2, GROUPS C AND D. HARMLESS LOCATIONS.
- A. TRANSMITTER ENCLOSURE: EXPLOSION-PROOF AND WEATHER-PROOF (CLASS I, DIVISION 2, GROUP C AND D).
- B. OPERATING TEMPERATURE RANGE: -15°F TO +135°F (-26°C TO +58°C)
- C. LOAD EFFECT: 4-20MA: ±0.025% OF FULL SCALE RANGE PER 100 OHMS  
10-50MA: 0.05% OF FULL SCALE RANGE PER 100 OHMS
- D. WEIGHT: 8 POUNDS (APPROX) (3.63 KG)
5. ALL STANDARD PIPE FITTINGS ARE FURNISHED BY CUSTOMER.
6. MAX PERMISSIBLE LOAD IS DETERMINED BY SUBTRACTING 1% FROM THE POWER SUPPLY INPUT 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.
7. ACCESSORY POWER SUPPLIES ARE AVAILABLE. SEE BULLETIN FOR MODELS 297, 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.             | 20MA/MIN @ 12-70 VDC               | 0-2900 OHMS       |
| 10-50MA D.C.            | 50MA/MIN @ 12-70 VDC               | 0-1150 OHMS       |

NOTE: NO. 10GA. WIRE HAS APPROX. 6.4 OHMS RESISTANCE PER 1000 FEET, NO. 12GA. WIRE HAS APPROX. 10 OHMS RESISTANCE PER 1000 FEET.

## Weights

| MODEL                              | GROSS WEIGHT (approximate) in lbs (kg) |                                                |            |            |            |            |
|------------------------------------|----------------------------------------|------------------------------------------------|------------|------------|------------|------------|
|                                    | Safe Working Pressure (psi)            |                                                |            |            |            |            |
|                                    | 100                                    | 500                                            | 1000       | 1500       | 3000       | 6000       |
| Differential Pressure Units (DPUs) |                                        |                                                |            |            |            |            |
| 224C                               | N/A                                    | 3.5 (1.6) Forged Brass<br>4.5 (2) CS / SST     | 4.5 (2)    | 4.5 (2)    | 6.5 (2.9)  | 6.5 (2.9)  |
| Instruments (Includes DPUs)        |                                        |                                                |            |            |            |            |
| 226C                               | N/A                                    | 4 (1.8) Forged Brass<br>5 (2.3) CS / SST       | 5 (2.3)    | 5 (2.3)    | 7 (3.2)    | 7 (3.2)    |
| 227C                               | N/A                                    | 6 (2.7) Forged Brass<br>7 (3.2) CS / SST       | 7 (3.2)    | 7 (3.2)    | 9 (4.1)    | 9 (4.1)    |
| 246c / 247C                        | N/A                                    | 17 (7.7) Forged Brass<br>18 (8.2) CS / SST     | 18 (8.2)   | 18 (8.2)   | N/A        | N/A        |
| 288C                               | N/A                                    | 9 (4)                                          | 9 (4)      | 10 (5)     | 10 (5)     | 12 (5)     |
| 290D                               | N/A                                    | 22 (10)                                        | 22 (10)    | 23 (10)    | 23 (10)    | 25 (11)    |
| 316C                               | N/A                                    | 5.5 (2.5) Forged Brass<br>6.5 (2.9) CS / SST   | 6.5 (2.9)  | 6.5 (2.9)  | 8.5 (3.9)  | 8.5 (3.9)  |
| 318C                               | N/A                                    | 9 (4)                                          | 9 (4)      | 10 (5)     | 10 (5)     | 12 (5)     |
| 322C                               | N/A                                    | 9 (4)                                          | 9 (4)      | 10 (5)     | 10 (5)     | 12 (5)     |
| 450C                               | N/A                                    | 6.25 (2.8) Forged Brass<br>7.25 (3.3) CS / SST | 7.25 (3.3) | 7.25 (3.3) | 9.25 (4.2) | 9.25 (4.2) |
| IT / ITS<br>Weather-proof          | N/A                                    | 9 (4)                                          | 9 (4)      | 10 (5)     | 10 (5)     | 12 (5)     |
| IT / ITS<br>Explosion-proof        | N/A                                    | 22 (10)                                        | 22 (10)    | 23 (10)    | 23 (10)    | 25 (11)    |
| 752                                | Base Configuration – 14 lbs. (6.4)     |                                                |            |            |            |            |
| 753                                | Base Configuration – 8 lbs. (3.6)      |                                                |            |            |            |            |

Note: Contact Cameron for models not listed.

**Disclaimer:** This information is being provided for marketing purposes only. Exact specifications should be confirmed with the factory at time of order.