

Rosemount 1152 Alphaline® Nuclear Pressure Transmitter

INDUSTRY LEADING PERFORMANCE

- Qualified per IEEE Std 323-1971 and IEEE Std 344-1975
- Mild environment qualifications
- 4-20 mA or 10-50 mA output
- Panel or 2-inch pipe mounting
- 0.25% accuracy



CE

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Rosemount 1152

Results Driven by Proven Measurement

Introduction

Rosemount 1152 Alphaline[®] Nuclear Pressure Transmitters are designed for precision pressure measurements in nuclear applications which require reliable performance and safety over an extended service life. These transmitters were qualified per IEEE Std 323-1971 and IEEE Std 344-1975 at radiation levels of 5×10^6 rads TID gamma radiation, seismic levels of 3 g, and for steam-pressure/chemical spray performance. Stringent quality control during the manufacturing process includes traceability of pressure-retaining parts, special nuclear cleaning, and hydrostatic testing.

Transmitter Description

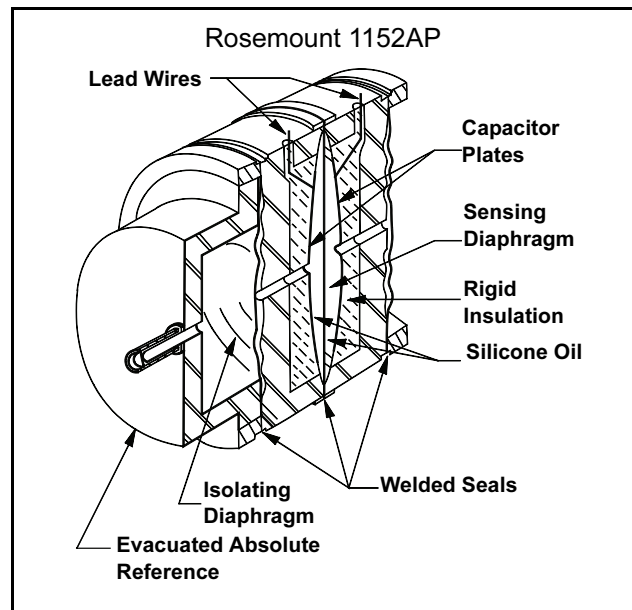
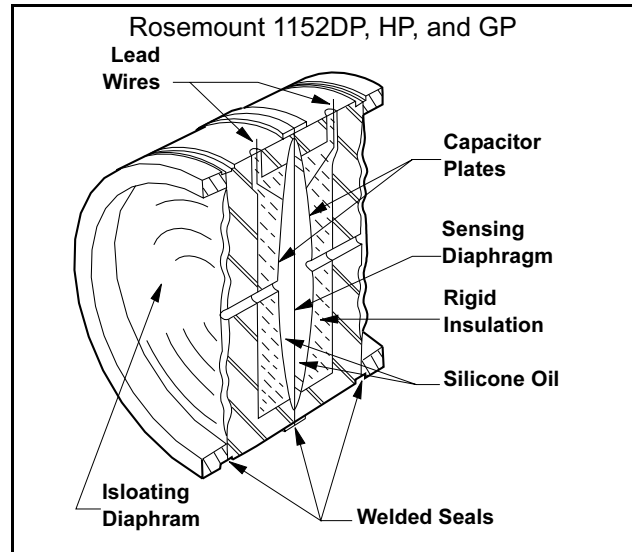
Rosemount 1152 Transmitters are similar in construction and performance to the proven Rosemount 1151 Transmitters. Units are available in absolute (AP), gage (GP), differential (DP), and high-line differential (HP) configurations, with eight pressure range options.

Direct electronic sensing with the completely sealed δ -Cell[™] capacitance sensing element (see Figure 1) eliminates mechanical force transfer and problems associated with shock and vibration. Installation and commissioning are simplified by compact design, 2-wire system compatibility, and external span and zero adjustments. Wiring terminals and electronics are in separate compartments, so the electronics remain sealed during installation.

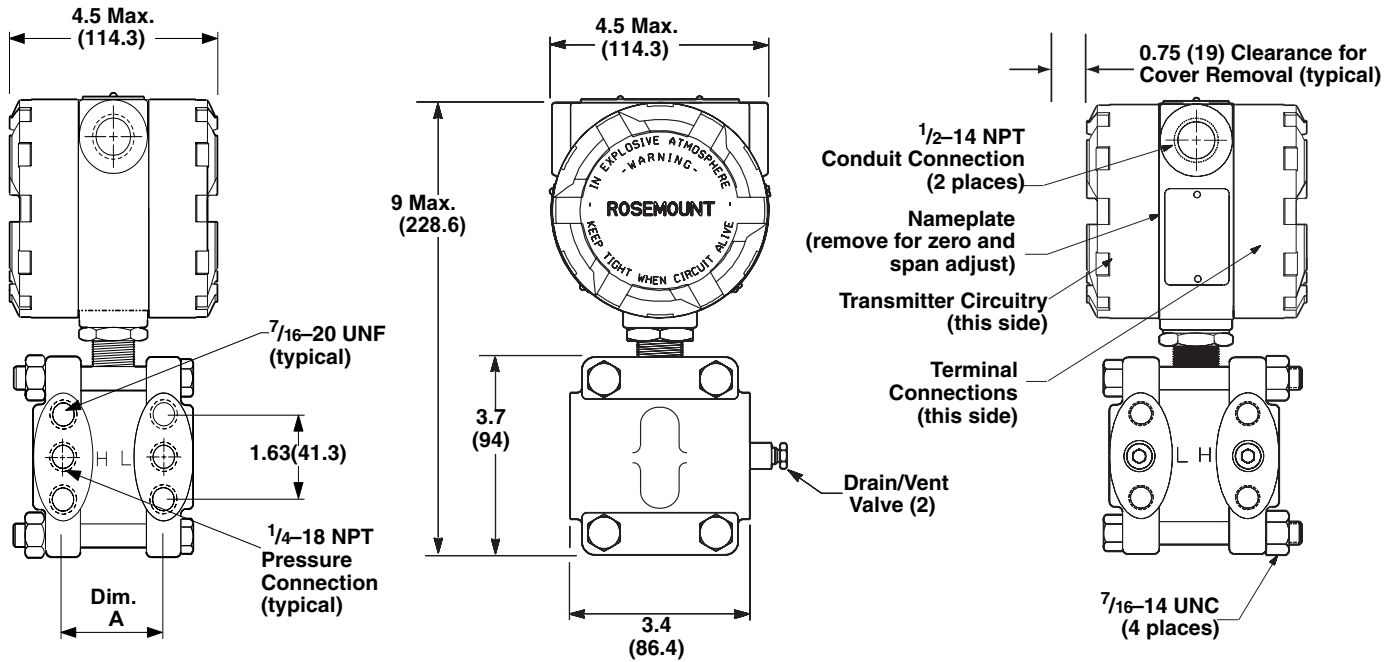
Operation

The completely sealed δ -Cell capacitance sensing element is the key to the unequalled performance and reliability of the Rosemount 1152 Pressure Transmitter. Process pressure is transmitted through an isolating diaphragm and silicone oil fill fluid to a sensing diaphragm in the center of the δ -Cell (see Figure 1). The reference pressure is transmitted in the same manner to the other side of the sensing diaphragm. The displacement of the sensing diaphragm, a maximum motion of 0.004 in. (0.1 mm), is proportional to the pressure differential across it. The position of the sensing diaphragm is detected by capacitor plates on both sides of the sensing diaphragm. Differential capacitance between the sensing diaphragm and the capacitor plates is converted electronically to a 2-wire, 4–20 mA or a 10–50 mA dc signal.

FIGURE 1. The δ -Cell.

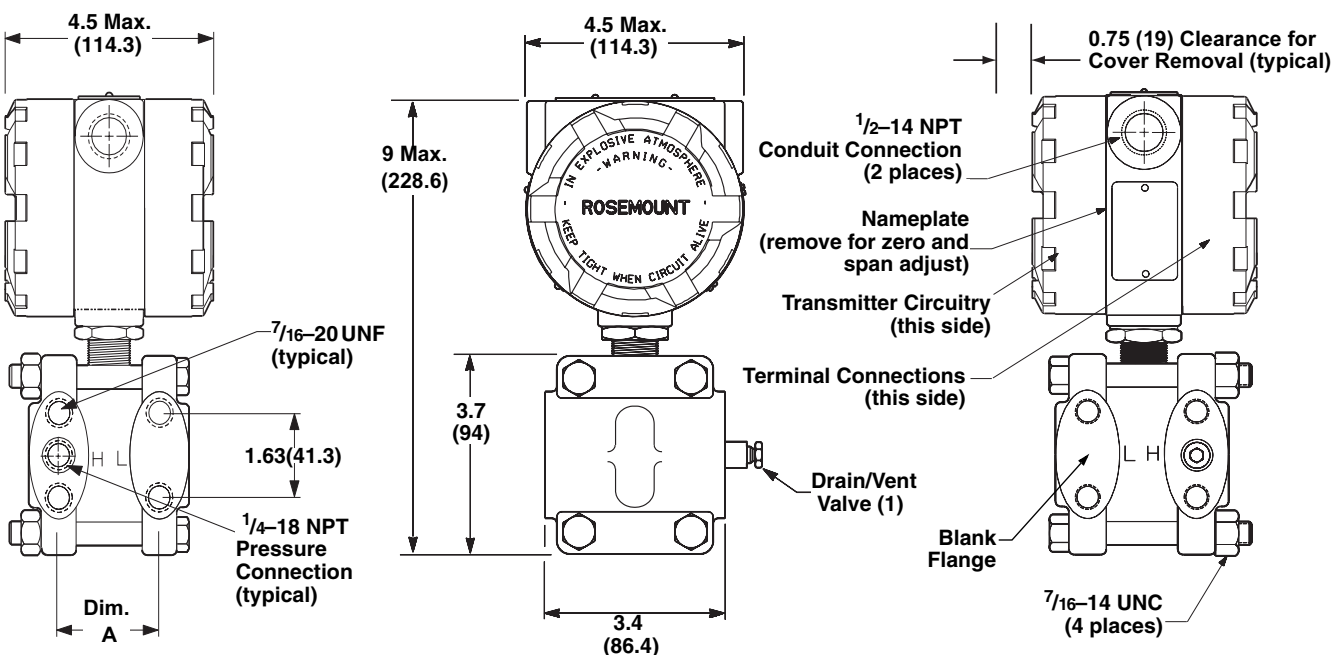


**FIGURE 2. Transmitter Dimensional Drawings
 ROSEMOUNT 1152 DP AND HP**



Pressure Code	Range	Dimension A
3, 4, 5		2.13 (54)
6, 7		2.19 (55.6)
8		2.25 (57.2)
9		2.28 (57.9)
0		2.33 (59.1)

ROSEMOUNT 1152 AP AND GP



NOTE
 Dimensions are nominal in inches (millimeters).

Rosemount 1152

SPECIFICATIONS

Nuclear Specifications

Qualified per IEEE Std 323-1971 and IEEE Std 344-1975 as stated in Rosemount Reports 38019, 58225, and 117415; Rosemount 1152 with Output Code L (10–50 mA), seismic qualification only, per IEEE Std 344-1975 as stated in Rosemount Report D8800058.

Radiation (4–20 mA only)

Accuracy within $\pm 8.0\%$ of upper range limit during and after exposure to 5×10^6 rads, total integrated dosage of gamma radiation at 0.4 Mrad/hr dose rate.

Seismic

Accuracy within $\pm 0.25\%$ of upper range limit during and after seismic disturbance to 3 g over a range of 5–100 Hz in three major axes.

Steam Pressure/Chemical Spray (4–20 mA only)

Accuracy within $\pm 0.75\%$ of upper range limit after sequential exposure to steam at the following temperatures and pressures:

- 316 °F (157.8 °C), 70 psig (482.6 kPa) for 1 hour
- 303 °F (150.5 °C), 55.4 psig (381.9 kPa) for 7 hours
- 230 °F (110 °C), 6 psig (41.4 kPa) for 42 hours

For SST housing option, accuracy within $\pm 0.75\%$ of upper range limit after chemical spray concurrent with the above system pressure cycle.

Quality Assurance Program

In accordance with NQA-1, 10CFR50 Appendix B, ISO 9001:2000, and CSA Z299.1.

Nuclear Cleaning

To 1 ppm chloride content.

Hydrostatic Testing

To 150% of rated line pressure or 2,000 psi (13.8 MPa), whichever is greater.

Range Code 0 tested to 7,500 psi.

Traceability

In accordance with NQA-1 and 10CFR50 Appendix B; chemical and physical material certification of pressure retaining parts.

Performance Specifications

Based on zero-based ranges under reference conditions.

Accuracy

$\pm 0.25\%$ of calibrated span; includes combined effects of linearity, hysteresis, and repeatability.

Dead Band

None.

Drift

$\pm 0.2\%$ of upper range limit for 30 months.

Temperature Effect

Range Codes 4–9 and 0:

$\pm(0.5\%$ upper range limit $+0.5\%$ span) per ambient temperature change of 100 °F (55.6 °C).

Range Code 3:

$\pm(1.0\%$ upper range limit $+1.0\%$ span) per ambient temperature change of 100 °F (55.6 °C).

Overpressure Effect

Rosemount 1152DP:

Maximum zero shift after 2,000 psig (13.8 MPa) overpressure:

Range Code	Overpressure Effect
3, 4	$\pm 0.25\%$ of upper range limit
5	$\pm 1.0\%$ of upper range limit
6, 7	$\pm 3.0\%$ of upper range limit
8	$\pm 6.0\%$ of upper range limit

Rosemount 1152HP:

Maximum zero shift after 4,500 psig (31.0 MPa) overpressure:

Range Code	Overpressure Effect
4	$\pm 1.0\%$ of upper range limit
5	$\pm 2.0\%$ of upper range limit
6, 7	$\pm 5.0\%$ of upper range limit

Rosemount 1152AP and 1152GP:

Range Code	Overpressure Effect
3, 4	2,000 psig (13.8 MPa) will cause a zero shift of less than $\pm 0.25\%$ of upper range limit.
5–8	2,000 psig (13.8 MPa) will cause a zero shift of less than $\pm 1.0\%$ of upper range limit.
9	4,500 psi (31.0 MPa) will cause a zero shift of less than $\pm 0.5\%$ of upper range limit.
0	7,500 psi (51.7 MPa) will cause a zero shift of less than $\pm 1.0\%$ of upper range limit.

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Static Pressure Zero Effect

Rosemount 1152DP:

Per 2,000 psi (13.8 MPa):

Range Code	Static Pressure Zero Effect
4, 5	±0.25% of upper range limit
3, 6–8	±0.5% of upper range limit

Rosemount 1152HP:

Per 4,500 psi (31.0 MPa):

Range Code	Static Pressure Zero Effect
all	±2.0% of upper range limit

Static Pressure Span Effect

Effect is systematic and can be calibrated out for a particular pressure before installation. Correction uncertainty is ±0.25% of input reading/1,000 psi (6.89 MPa) (±0.5% of input reading/1,000 psi for Range Code 3).

Power Supply Effect

Less than 0.005% of output span/volt.

Load Effect

No load effect other than the change in voltage supplied to the transmitter.

Mounting Position Effect

No span effect; zero shift of up to 1 inH₂O, which can be calibrated out.

Functional Specifications

Service

Liquid, gas, or vapor.

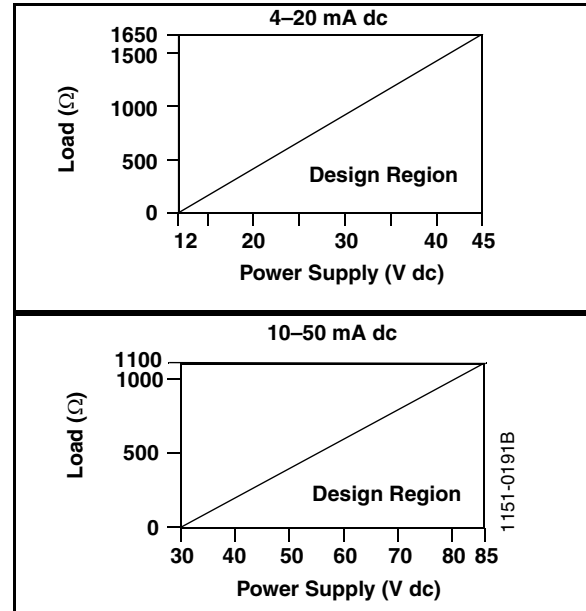
Output

4–20 mA dc or 10–50 mA dc (seismic qualification only).

Power Supply

Design limits are as shown in Figure 3 for 4–20 mA dc and 10–50 mA dc.

FIGURE 3. Transmitter Load Limitations.



Span and Zero

Continuously adjustable externally.

Zero Elevation and Suppression

Maximum zero elevation: 600% of calibrated span (DP, GP, and HP only).

Maximum zero suppression: 500% of calibrated span.

Zero elevation and suppression must be such that neither the span nor the upper or lower range value exceeds 100% of the upper range limit.

Temperature Limits

Amplifier operating: –20 to 200 °F (–28.9 to 93.3 °C)

Sensing element operating: –20 to 220 °F (–28.9 to 104.4 °C).

Storage: –60 to 250 °F (–51.1 to 121.1 °C).

Humidity Limits

0 to 100% relative humidity (NEMA 4X).

Volumetric Displacement

Less than 0.01 in³ (0.16 cm³).

Rosemount 1152

Turn-on Time

2 seconds maximum. No warm-up required.

Response Time

Time constant at 100 °F (37.8 °C) continuously adjustable from 0.2 seconds or less (0.4 seconds or less for Range Code 3) up to 1.67 seconds nominal.

Pressure Ranges

Rosemount 1152DP and 1152HP:

Range Code	Pressure Range
3	0–5 to 0–30 inH ₂ O (0–1.24 to 0–7.46 kPa) (DP units only)
4	0–25 to 0–150 inH ₂ O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)
6	0–17 to 0–100 psi (0–0.12 to 0–0.69 MPa)
7	0–50 to 0–300 psi (0–0.34 to 0–2.07 MPa)
8	0–170 to 0–1,000 psi (0–1.17 to 0–6.89 MPa) (DP units only)

Rosemount 1152AP and Rosemount 1152GP:

Range Code	Pressure Range
3	0–5 to 0–30 inH ₂ O (0–1.24 to 0–7.46 kPa) (GP units only)
4	0–25 to 0–150 inH ₂ O (0–6.22 to 0–37.3 kPa) (GP units only)
5	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)
6	0–17 to 0–100 psi/psia (0–0.12 to 0–0.69 MPa)
7	0–50 to 0–300 psi/psia (0–0.34 to 0–2.07 MPa)
8	0–170 to 0–1,000 psi/psia (0–1.17 to 0–6.89 MPa)
9	0–500 to 0–3,000 psi (0–3.45 to 0–20.68 MPa) (GP units only)
0	0–1,000 to 0–6,000 psi (0–6.89 to 0–41.37 MPa) (GP units only)

Maximum Working Pressure

Rosemount 1152DP and 1152HP:

Static pressure limit.

Rosemount 1152AP and 1152GP:

Upper range limit.

Static Pressure and Overpressure Limits

Rosemount 1152DP:

0.5 psia to 2,000 psig (3.4 kPa abs to 13.8 MPa) maximum rated static pressure for operation within specifications; overpressure limit is 2,000 psig (13.8 MPa) on either side without damage to the transmitter.

Rosemount 1152HP:

0.5 psia to 4,500 psig (3.4 kPa abs to 31.0 MPa) maximum rated static pressure for operation within specifications; overpressure limit is 4,500 psig (31.0 MPa) on either side without damage to the transmitter.

Overpressure Limits

Rosemount 1152AP and 1152GP:

Operates within specification from 0.5 psia (3.4 kPa abs) to upper range limit. Overpressure limit is 2,000 psig (13.8 MPa) without damage to the transmitter for all Range Codes, except Range Code 9, which has a limit of 4,500 psig (31.0 MPa) and Range Code 0, which has a limit of 7,500 psig (51.7 MPa).

Physical Specifications

Materials of Construction

Isolating Diaphragms:

316L SST.

Drain/Vent Valves:

316 SST.

Process Flanges:

CF-8M (Cast version of 316 SST).

O-rings:

Ethylene propylene.

Fill Fluid:

Silicone oil.

Flange Bolts and Nuts:

Plated alloy steel, per ASTM A-540.

Electronics Housing:

Low-copper aluminum with epoxy-polyester paint; or austenitic stainless steel.

Mounting Bracket:

Carbon steel, AISI 1010 or 1020, with epoxy-polyester paint; or 316L SST.

Mounting Bolts (Bracket to Transmitter):

SAE J429 carbon steel, Grade 2 or Grade 5.

Process Connections

1/4–18 NPT.

Electrical Connections

1/2–14 NPT conduit with screw terminals.

Weight

12 lb (5.4 kg) with aluminum housing; 16 lb (7.3 kg) with stainless steel housing (excluding bracket).

FIGURE 4. Electrical Block Diagram

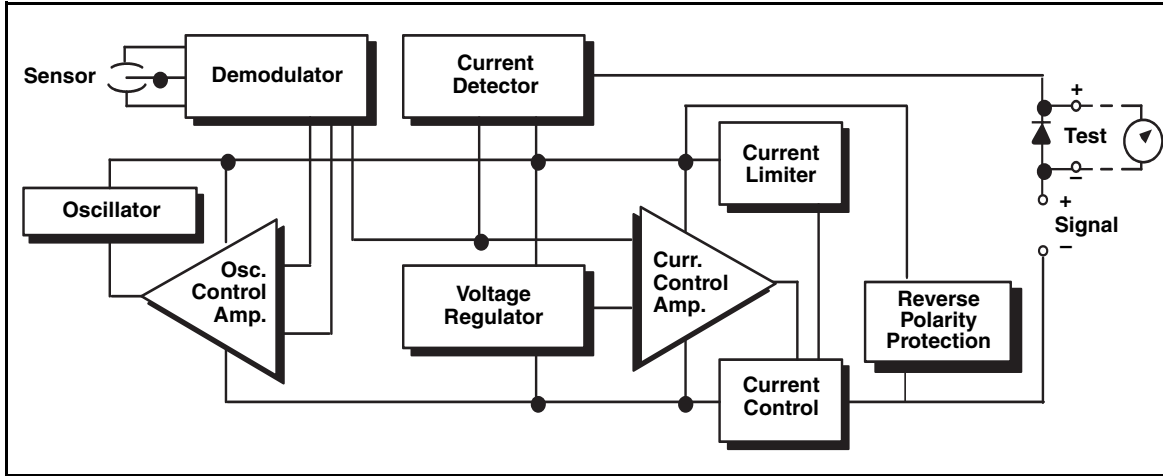


FIGURE 5. Wiring Connections

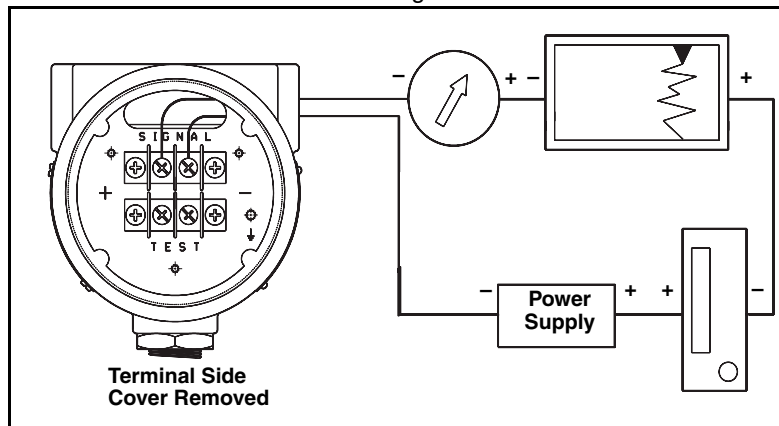


FIGURE 6. Typical Rosemount 1152 Pressure Transmitter Exploded View

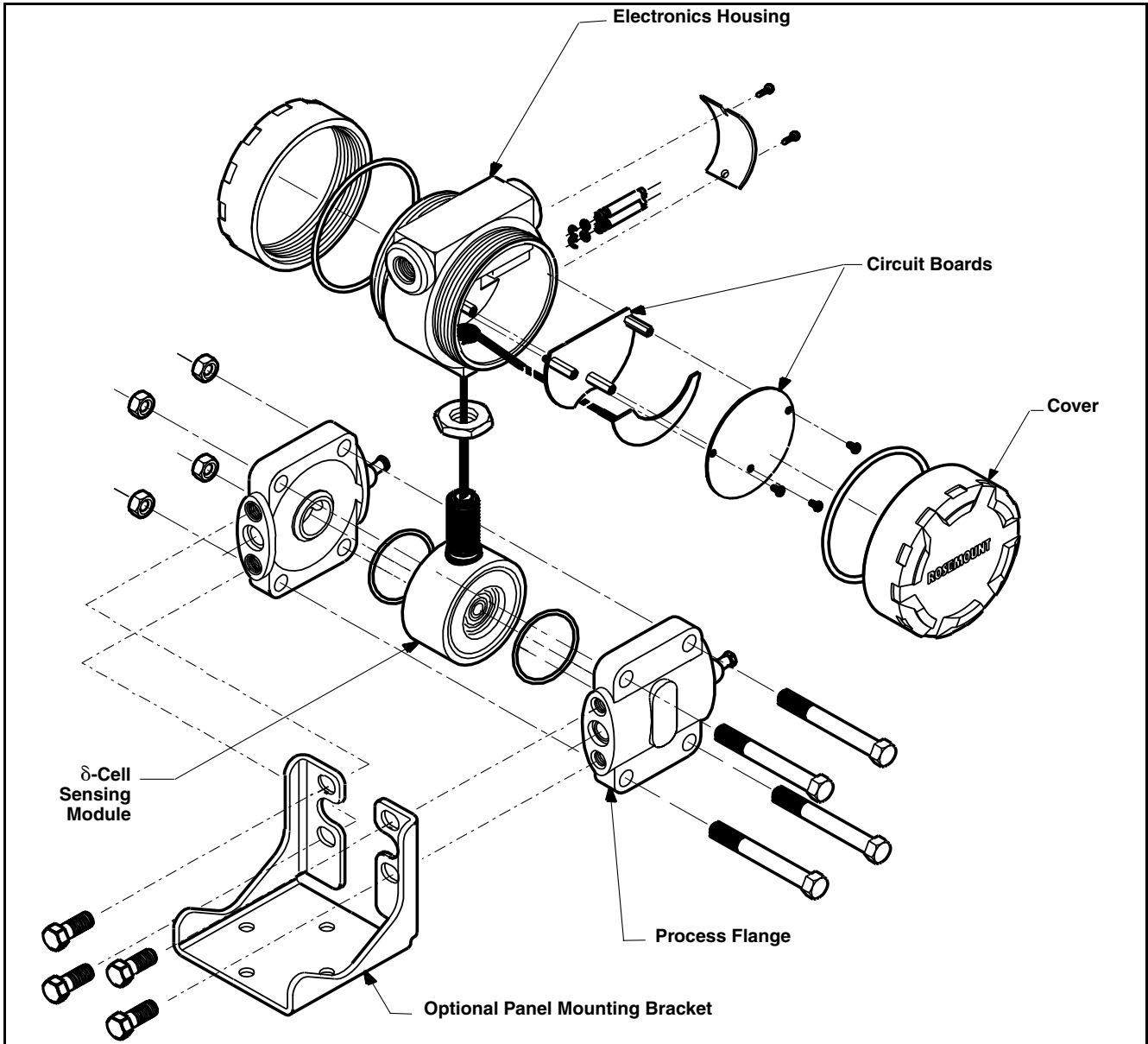
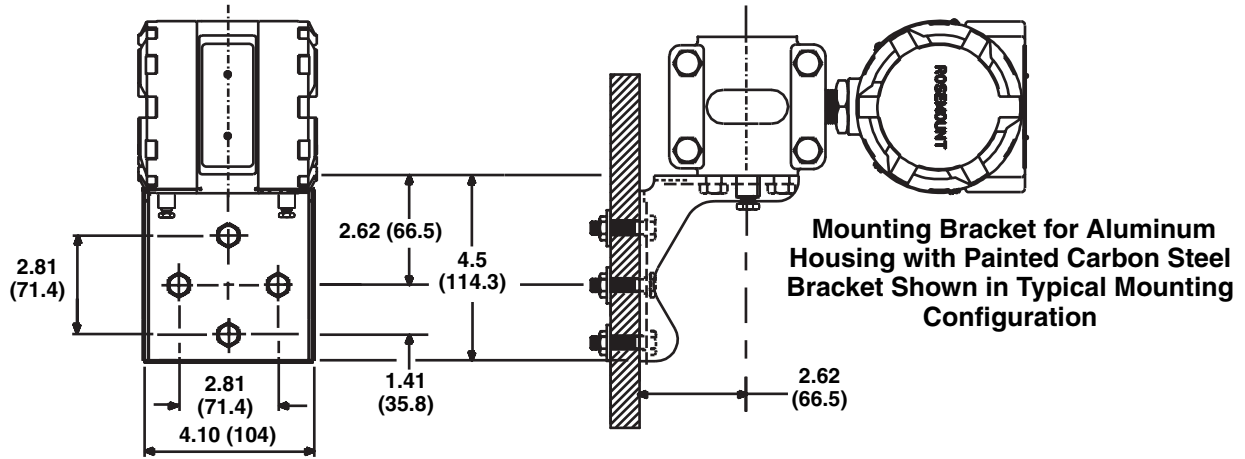
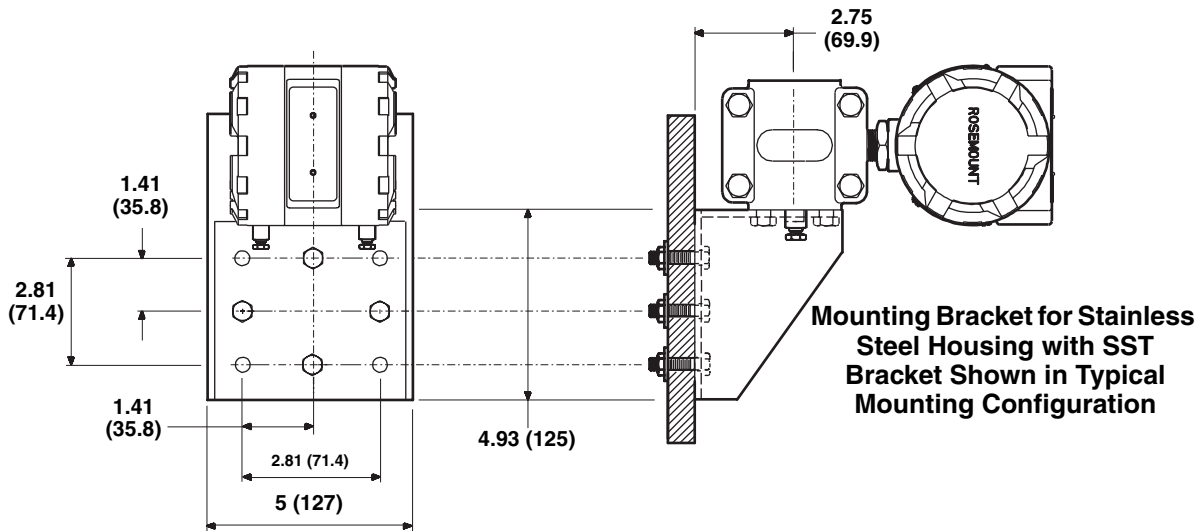


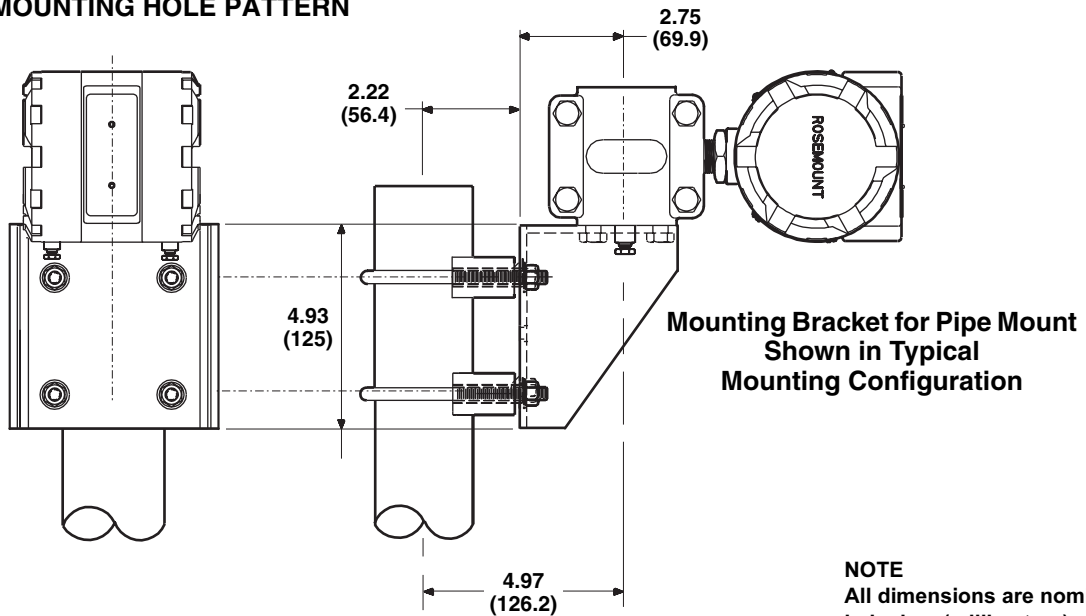
FIGURE 7. Rosemount 1152 Typical Mounting Configuration



PANEL MOUNTING HOLE PATTERN



PANEL MOUNTING HOLE PATTERN



PIPE MOUNTING HOLE PATTERN

NOTE
 All dimensions are nominal
 in inches (millimeters).

ORDERING INFORMATION

Model	Description			
1152	Alphaline Pressure Transmitters for Nuclear Applications			
Code	Pressure Measurement			
DP	Differential Pressure, 2,000 psig (13.8 MPa) Static Pressure Rating			
HP	Differential Pressure, 4,500 psig (31.0 MPa) Static Pressure Rating			
AP	Absolute Pressure			
GP	Gage Pressure			
PRESSURE RANGES at 68 °F				
Code	Rosemount 1152DP (Differential)	Rosemount 1152HP (Differential)	Rosemount 1152AP (Absolute)	Rosemount 1152GP (Gage)
3	0–5 to 0–30 inH ₂ O (0–1.24 to 0–7.46 kPa)	—	—	0–5 to 0–30 inH ₂ O (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH ₂ O (0–6.22 to 0–37.3 kPa)	0–25 to 0–150 inH ₂ O (0–6.22 to 0–37.3 kPa)	—	0–25 to 0–150 inH ₂ O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH ₂ O (0–31.08 to 0–186.4 kPa)
6	0–17 to 0–100 psi (0–0.12 to 0–0.69 MPa)	0–17 to 0–100 psi (0–0.12 to 0–0.69 MPa)	0–17 to 0–100 psia (0–0.12 to 0–0.69 MPa)	0–17 to 0–100 psi (0–0.12 to 0–0.69 MPa)
7	0–50 to 0–300 psi (0–0.34 to 0–2.07 MPa)	0–50 to 0–300 psi (0–0.34 to 0–2.07 MPa)	0–50 to 0–300 psia (0–0.34 to 0–2.07 MPa)	0–50 to 0–300 psi (0–0.34 to 0–2.07 MPa)
8	0–170 to 0–1,000 psi (0–1.17 to 0–6.89 MPa)	—	0–170 to 0–1,000 psia (0–1.17 to 0–6.89 MPa)	0–170 to 0–1,000 psi (0–1.17 to 0–6.89 MPa)
9	—	—	—	0–500 to 0–3,000 psi (0–3.45 to 0–20.68 MPa)
0	—	—	—	0–1,000 to 0–6,000 psi (0–6.89 to 0–41.37 MPa)
Code	Output			
N ⁽¹⁾	4–20 mA dc with Adjustable Damping			
MATERIALS OF CONSTRUCTION				
Code	Flanges	Drain/Vent Valves	Isolating Diaphragms	Electronics Housing/Covers
22	316 SST	316 SST	316 SST	Aluminum
92	316 SST	316 SST	316 SST	Austenitic SST
Code	Options			
PB	Panel Mounting Bracket			
PM	2-in. Pipe Mounting Bracket			
Typical Model Number: 1152DP 4 N 22 PB				

(1) For 10–50 mA output, the “N” is replaced with “L,” and “T1805” is incorporated into the model number, unless another “T” option is required. For example: 1152DP5L22T1805PB. Transmitters with Output Code L have seismic qualification only.

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Standard Accessories

One instruction manual is included with each shipment.

Calibration

Transmitters are factory calibrated to the customer's specified range. If calibration is not specified, transmitters are calibrated at maximum range. Calibration is at ambient temperature and pressure.

Tagging

The transmitter will be tagged, at no charge, in accordance with customer requirements (96 characters maximum). All tags are SST. The standard tag is permanently attached to the transmitter. Standard tag character height is 0.125 in. (3.18 mm). A wire-on tag is available on request.

Documentation

Certification of compliance will be provided for each Rosemount 1152 Pressure Transmitter for nuclear qualification, accuracy, special cleaning, hydrostatic testing, and traceability. Chemical and physical reports and identification of pressure-retaining parts will be on file at Rosemount Nuclear Instruments, Inc.

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