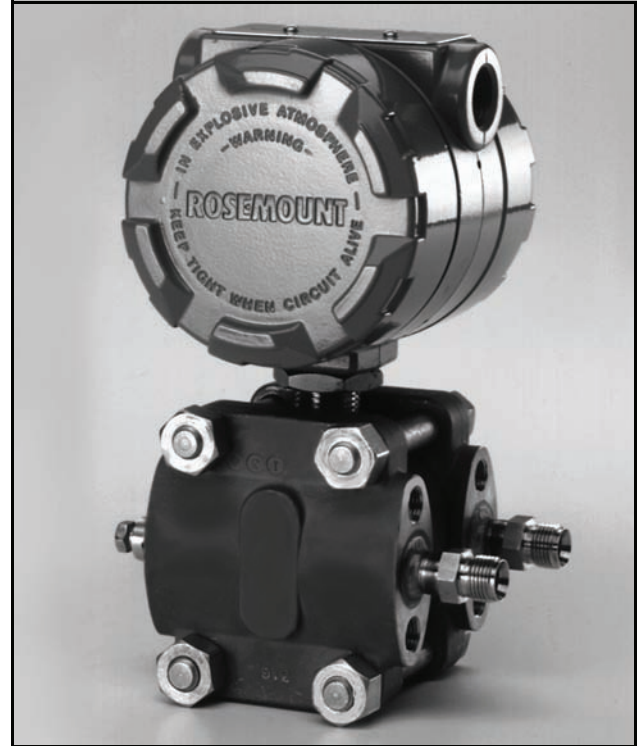


Rosemount 1153 Series B Alphaline® Nuclear Pressure Transmitter

INDUSTRY LEADING PERFORMANCE

- Qualified per IEEE Std. 323-1974 and IEEE Std. 344-1975
- 2.2×10^7 rads TID gamma radiation
- 4 g's ZPA seismic
- 318 °F (158.9 °C) steam temperature
- 0.25% accuracy



CE

Product Discontinued

Contents

Introduction	page 2
Transmitter Description	page 2
Operation	page 2
Dimensional Drawings	page 3
Nuclear Specifications	page 4
Performance Specifications	page 5
Functional Specifications	page 6
Physical Specifications	page 7
Ordering Information	page 10

Rosemount 1153 Series B

Results Driven by Proven Measurement

INTRODUCTION

The Rosemount 1153 Series B Alphaline® Pressure Transmitters are designed for precision pressure measurements in nuclear applications requiring reliable performance and safety over a specified qualified life. These transmitters were qualified per IEEE std. 323-1974 and IEEE std. 344-1975 to radiation levels of 22 megarads TID gamma radiation, seismic levels of 4 g's, and for steam-pressure performance. Stringent quality control during the manufacturing process includes traceability of pressure-retaining parts, special nuclear cleaning, and hydrostatic testing.

TRANSMITTER DESCRIPTION

The Rosemount 1153 Transmitters are uniquely built for class 1E nuclear service while retaining the working concept and design parameters of the Rosemount 1151 Series that have become a standard of reliable service. Units are available in Absolute (A), Gage (G), Differential (D), and High-Line Differential (H) configurations, with a variety of pressure range options.

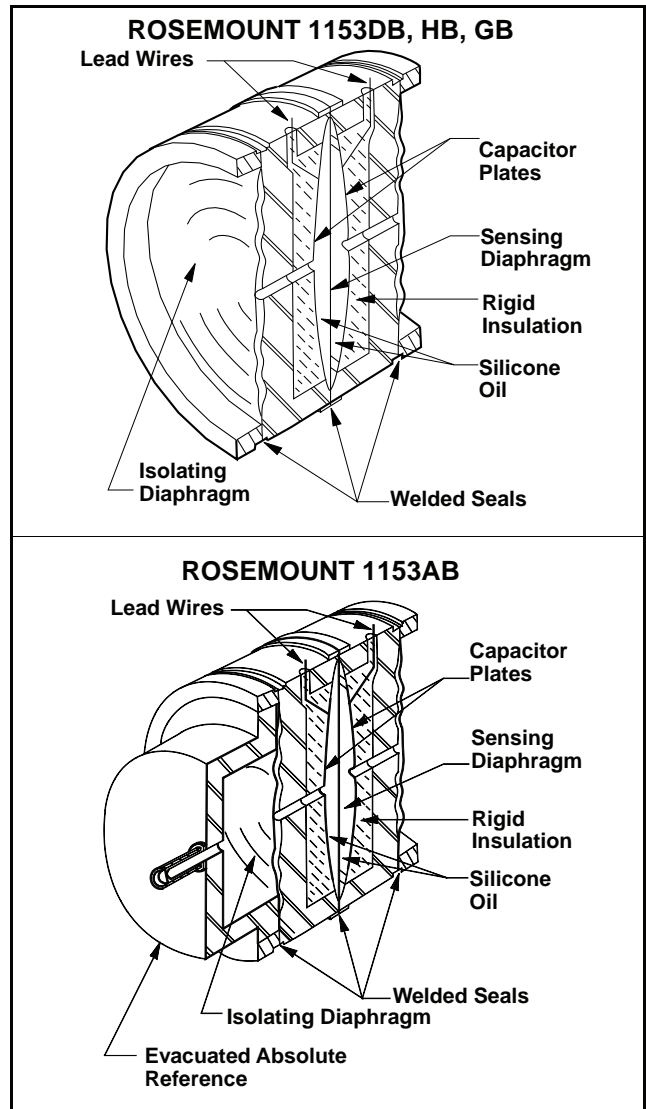
Direct electronic sensing with the completely sealed δ -Cell capacitance sensing element eliminates mechanical force transfer and problems associated with shock and vibration. Installation and commissioning are simplified by the compact design and 2-wire system compatibility. Wiring terminals and electronics 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. Its simple design concept is recognized as a landmark in transmitter engineering. As shown in Figure 1, process pressure is transmitted through an isolating diaphragm and silicone oil fill fluid to a sensing diaphragm in the center of the δ -Cell. A reference pressure is transmitted in like manner to the other side of the sensing diaphragm.

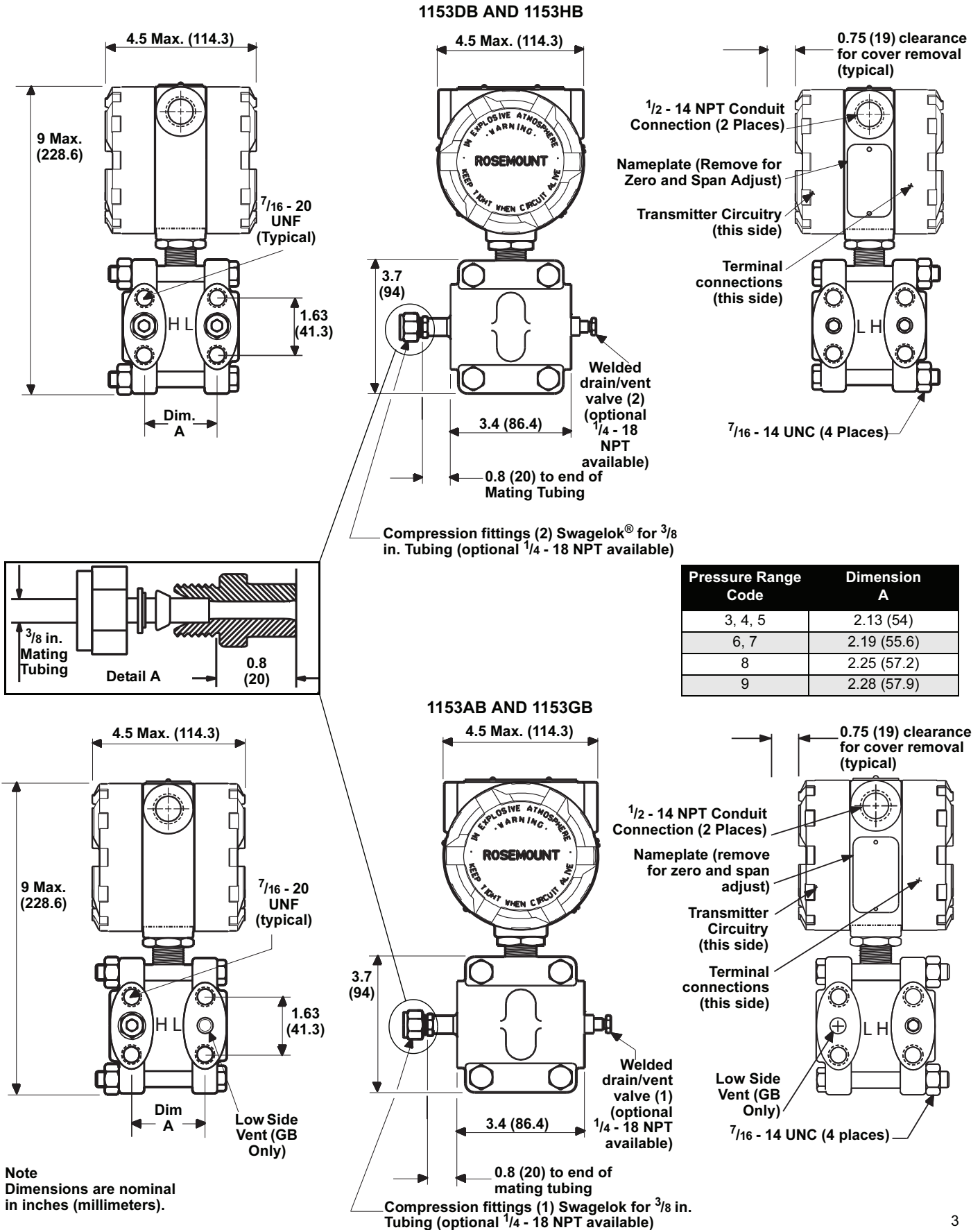
Displacement of the sensing diaphragm, a maximum motion of 0.004 inches (0.1 mm), is proportional to the pressure differential across it. The position of the sensing diaphragm is detected by capacitor plates on both sides of the sensing diaphragm. Differential capacitance between the sensing diaphragm and the capacitor plates is converted electronically to a 2-wire, 4–20 mA DC signal.

FIGURE 1. The δ -Cell



Rosemount 1153 Series B

FIGURE 2. Transmitter Dimensional Drawings



Rosemount 1153 Series B

SPECIFICATIONS

Nuclear Specifications

Qualified per IEEE Std. 323-1974 and IEEE Std. 344-1975 as stated in Rosemount Report 108025.

Output Code “P”

Radiation

Accuracy within $\pm 8.0\%$ of upper range limit during and after exposure to 2.2×10^7 rads, total integrated dosage of gamma radiation.

Seismic

Accuracy within $\pm 0.5\%$ of upper range limit during and after a seismic disturbance defined by a required response spectrum with a ZPA of 4 g's.

Steam Pressure/Temperature

Accuracy within $\pm(4.5\%$ of upper range limit +3.5% span) during and after sequential exposure to steam at the following temperatures and pressures:

318 °F (158.9 °C), 73 psig for 8 hours.

265 °F (129.4 °C), 24 psig for 56 hours.

Accuracy within $\pm 5.0\%$ of upper range limit during and after exposure to 265 °F (129.5 °C), 24 psig, for 35 hours.

Post DBE Operation

Accuracy at reference conditions shall be within $\pm 5\%$ of upper range limit for one year following DBE.

Output Code “R”

Radiation

Accuracy within $\pm 4.0\%$ of upper range limit during and after exposure to 2.2×10^7 rads, total integrated dosage of gamma radiation.

Seismic

Accuracy within $\pm 0.5\%$ of upper range limit during and after a seismic disturbance defined by a required response spectrum with a ZPA of 4 g's.

Steam Pressure/Temperature

Accuracy within $\pm(4.5\%$ of upper range limit +3.5% span) during and after sequential exposure to steam at the following temperatures and pressures:

318 °F (158.9 °C), 73 psig for 8 hours.

265 °F (129.4 °C), 24 psig for 56 hours.

Accuracy within $\pm 3.0\%$ of upper range limit during and after exposure to 265 °F (129.5 °C), 24 psig, for 35 hours.

Post DBE Operation

Accuracy at reference conditions shall be within $\pm 3\%$ of upper range limit for one year following DBE.

Both Output Codes

Quality Assurance Program

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

Nuclear Cleaning

To 1 ppm maximum chloride content.

Hydrostatic Testing

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

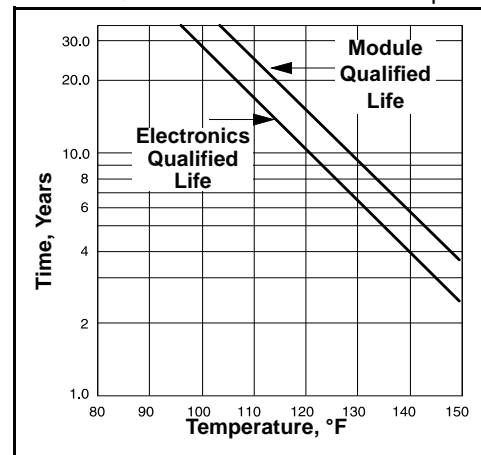
Traceability

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

Qualified Life

Dependent on continuous ambient temperature at the installation site, (see Figure 3). Replacing the amplifier and calibration circuit boards at the end of their qualified life permits extension of the transmitter's qualified life to the module's qualified life. See Rosemount Report 108025 for details.

FIGURE 3. Qualified Life vs. Ambient Temperature



Performance Specifications

(Based on Zero Based Ranges under Reference Conditions)

Accuracy

±0.25% of calibrated span: Includes combined effects of linearity, hysteresis, and repeatability.

Dead Band

None.

Drift

±0.2% of upper range limit for thirty months.

Temperature Effect

Ranges 4 through 9:

±(0.75% upper range limit +0.5% span) per 100 °F (55.6 °C) ambient temperature change.

Range 3:

±(1.5% upper range limit +1.0% span) per 100 °F (55.6 °C) ambient temperature change.

Overpressure Effect

Rosemount 1153DB:

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

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

Rosemount 1153GB and 1153AB:

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

Range Code	Overpressure Effect
3, 4	±0.25% of upper range limit
5-8	±1.0% of upper range limit

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

Range Code	Overpressure Effect
9	±0.5% of upper range limit

Rosemount 1153HB:

Maximum zero shift after 3,000 psi (20.68 MPa) overpressure:

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

Static Pressure Zero Effect

Rosemount 1153DB:

Per 1,000 psi (6.89 MPa):

Range Code	Zero Effect
4, 5	±0.2% of upper range limit
3, 6-8	±0.5% of upper range limit

Rosemount 1153HB:

Per 1,000 psi (6.89 MPa):

Range Code	Zero Effect
All Ranges	±0.66% of upper range limit

Static Pressure Span Effect

The effect is systematic and can be calibrated out for a particular pressure before installation.

Correction uncertainty is ±0.5% of input reading/per 1,000 psi (6.89 MPa).

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 1.5 inH₂O (372 Pa), which can be calibrated out.

Response Time

Fixed time constant (63%) at 100 °F (37.8 °C) as follows:

Range Code	Response Time
3	2 seconds or less
4	0.5 seconds or less
5-9	0.2 seconds or less

Adjustable damping available through special N-option

Rosemount 1153 Series B

Functional Specifications

Service

Liquid, gas, or vapor.

Output

4–20 mA DC.

Power Supply

Design limits as shown in Figure 4 and Figure 5. See qualification report #108025 for additional detail.

Transmitter Load Limits

FIGURE 4. Output Code P

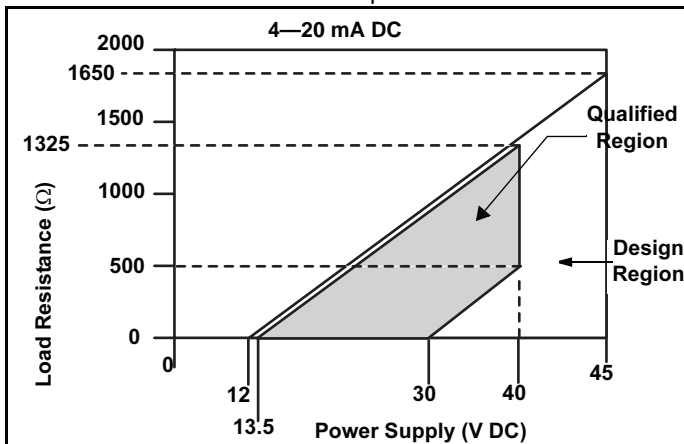
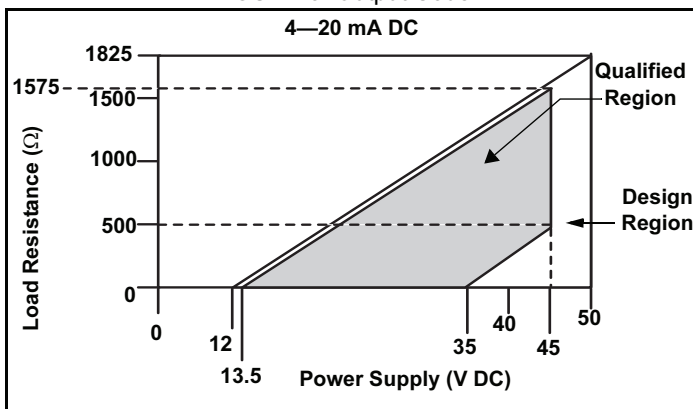


FIGURE 5. Output Code R



Span and Zero

Continuously adjustable externally.

Zero Elevation and Suppression

Maximum zero elevation: 600% of calibrated span (D, G, and H units only).

Maximum zero suppression: 500% of calibrated span.

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

Temperature Limits

Normal Operating Limits: 40 to 200 °F (4.4 to 93.3 °C).

Qualified Storage Limits: –40 to 120 °F (–40 to 48.9 °C).

Humidity Limits

0–100% relative humidity (NEMA 4X).

Volumetric Displacement

Less than 0.01 in³ (0.16 cm³).

Turn-on Time

Two seconds maximum. No warm-up required.

Pressure Ranges

Rosemount 1153DB and 1153HB:

Range Code	Pressure Ranges
3	0–5 to 0–30 inH ₂ O (D units only) (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH ₂ O (0–6.22 to 37.3 kPa)
5	0–125 to 0–750 inH ₂ O (0–31.08 to 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–.34 to 0–2.07 MPa)
8	0–170 to 0–1,000 psi (D units only) (0–1.17 to 0–6.89 MPa)

Rosemount 1153GB and 1153AB:

Range Code	Pressure Ranges
3	0–5 to 0–30 inH ₂ O (G units only) (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH ₂ O (G units only) (0–6.22 to 37.3 kPa)
5	0–125 to 0–750 inH ₂ O (0–31.08 to 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)
9	0–500 to 0–3,000 psi (G units only) (0–3.45 to 0–20.68 MPa)

Product Data Sheet

00813-0100-4302, Rev BA
January 2008

Rosemount 1153 Series B

Maximum Working Pressure

Rosemount 1153DB and 1153HB:
Static Pressure Limit

Rosemount 1153GB and 1153AB:
Upper Range Limit

Static Pressure and Overpressure Limits

Rosemount 1153DB:

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 1153HB:

0.5 psia to 3,000 psig (3.4 kPa abs to 20.7 MPa) maximum rated static pressure for operation within specifications. Overpressure limit is 3,000 psig (20.7 MPa) on either side without damage to the transmitter.

Overpressure Limits

Rosemount 1153GB and 1153AB:

Operates within specifications from 0.5 psia (3.4 kPa abs) to upper range limit. Overpressure limits without damage to transmitter:

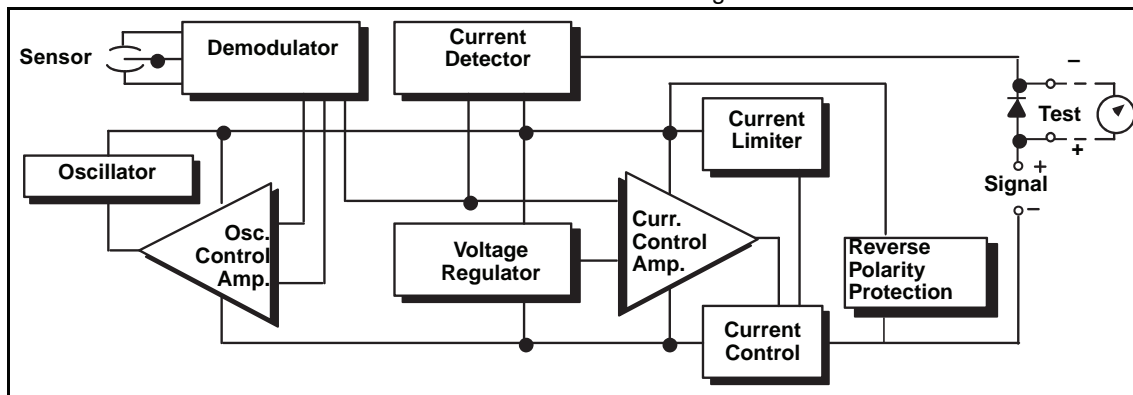
Range Codes 3–8

Overpressure limit is 2,000 psig (13.8 MPa).

Range Code 9

Overpressure limit is 4,500 psig (31.0 MPa).

FIGURE 6. Electrical Block Diagram



Physical Specifications

Materials of Construction

Isolating Diaphragms

316L SST.

Drain/Vent Valves

316 SST

Process Flanges

CF-8M (Cast version of 316 SST)

Process O-rings

316L SST.

Electronics Housing 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.

Mounting Bracket

Carbon steel AISI 1010 or 1020, with epoxy-polyester paint.

Mounting Bolts (bracket to transmitter)

SAE J429 carbon steel, Grade 2 or Grade 5.

Weight

13 lb (5.9 kg) including mounting bracket.

Electrical Connections

1/2–14 NPT conduit with screw terminals.

Process Connections

3/8 inch Swagelok compression fittings, 316 SST (1/4–18 NPT optional).

FIGURE 7. Wiring Connections

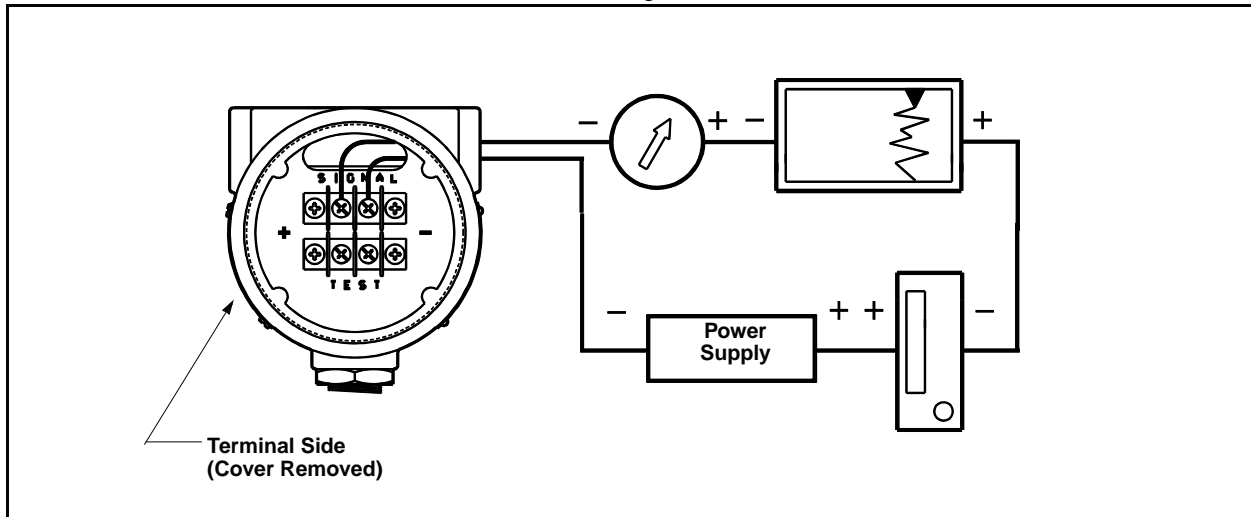


FIGURE 8. Typical Rosemount 1153 Series B Pressure Transmitter Exploded View

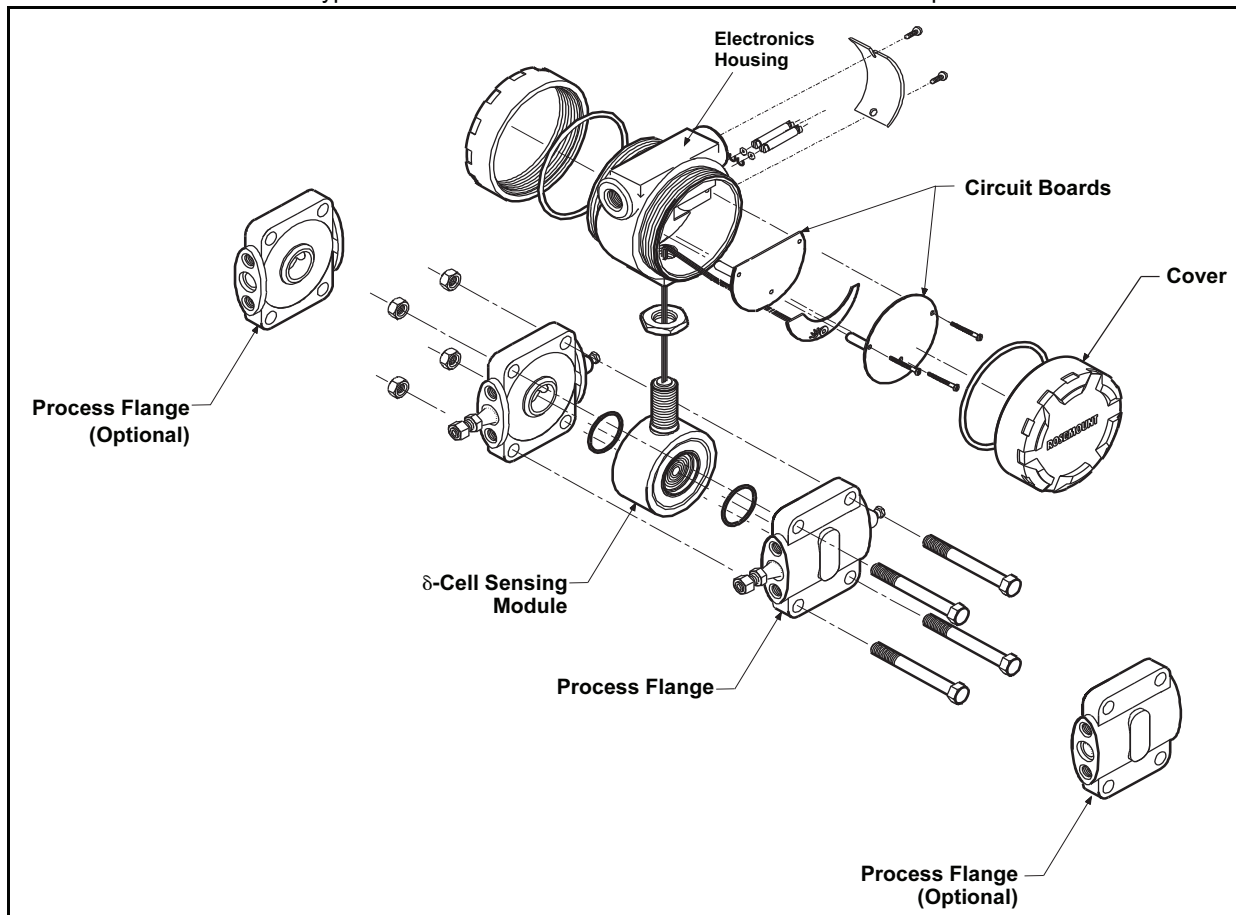
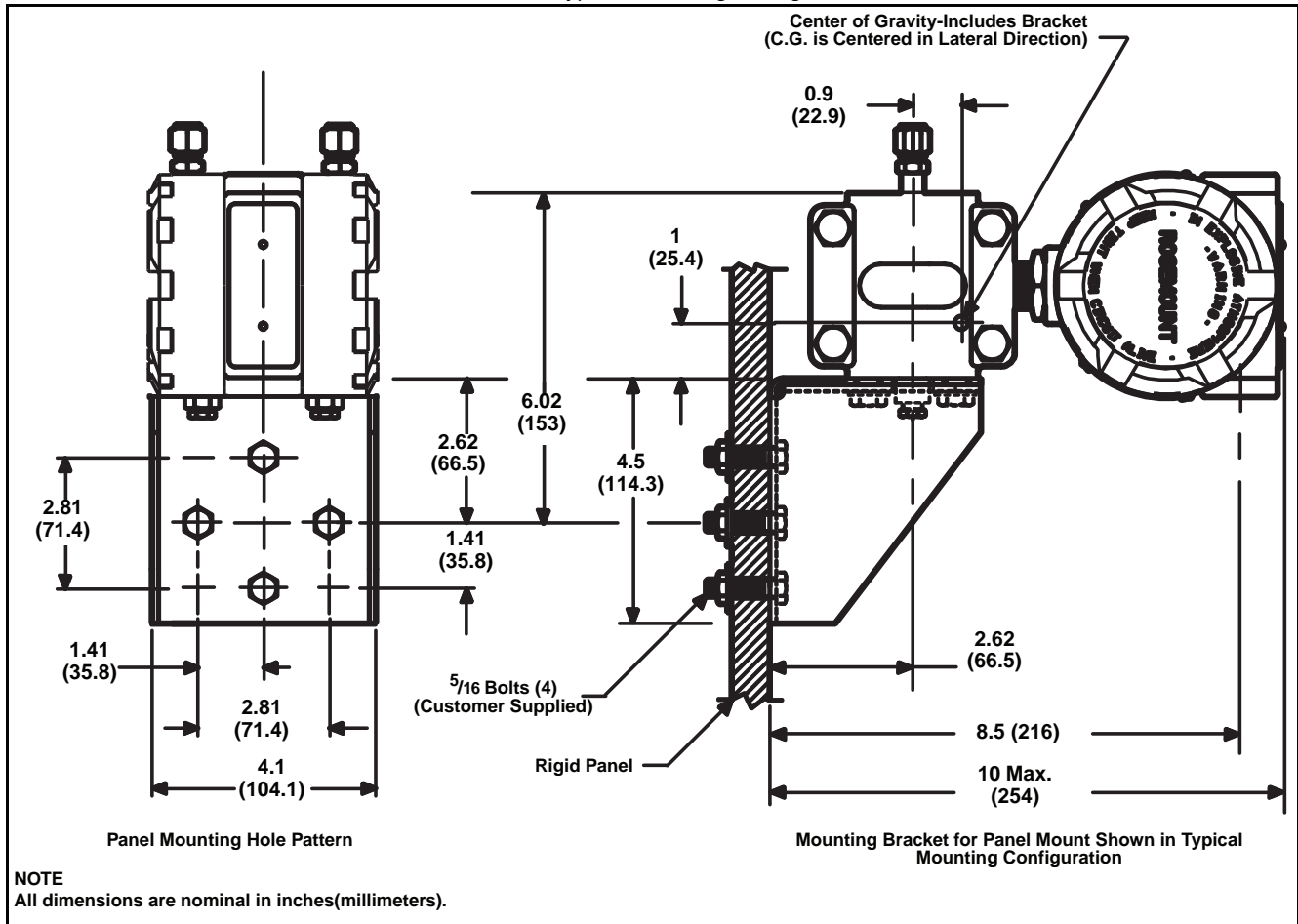


FIGURE 9. Typical Mounting Configuration



Rosemount 1153 Series B

ORDERING INFORMATION

Model	Description			
1153	Alphaline Pressure Transmitters for Nuclear Applications			
Code	Pressure Measurement			
D	Differential Pressure, 2,000 psig (13.8 MPa) Static Pressure Rating			
H	Differential Pressure, 3,000 psig (20.68 MPa) Static Pressure Rating			
A	Absolute Pressure			
G	Gage Pressure			
Code	Series			
B	Painted Aluminum Housing; qualified per IEEE Std 323 -1974 and IEEE Std 344 -1975			
PRESSURE RANGES at 68 °F				
Code	Rosemount 1153DB (Differential)	Rosemount 1153HB (Differential)	Rosemount 1153AB (Absolute)	Rosemount 1153GP (Gage)
3	0–5 to 0–30 inH ₂ O (0–1.24 to 0–7.46 kPa)	N/A	N/A	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)	N/A	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 psi (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 psi (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)	N/A	0–170 to 0–1,000 psi (0–1.17 to 0–6.89 MPa)	0–170 to 0–1,000 psi (0–1.17 to 0–6.89 MPa)
9	N/A	N/A	N/A	0–500 to 0–3,000 psi (0–3.45 to 0–20.68 MPa)
Code	Output			
P	Standard 4–20 mA			
R ⁽¹⁾	Improved Radiation Performance, 4–20 mA			
Code	Flange Option			
A	Welded ³ / ₈ in. Swagelok Compression Fitting Process Connection and Welded Drain/Vent Valve			
B ⁽²⁾	¹ / ₄ –18 NPT Process Connection and Welded Drain/Vent Valve			
C ⁽²⁾	¹ / ₄ –18 NPT Process Connection and Drain Hole (Drain/Vent Valve not supplied)			
D	One Flange Code Option A and One Remote Seal			
E ⁽²⁾	One Flange Code Option B and One Remote Seal			
F ⁽²⁾	One Flange Code Option C and One Remote Seal			
G	Two Remote Seals			
H	Welded ³ / ₈ in. Swagelok Compression Fittings on Both Process Connection and Drain/Vent Connection			
J ⁽²⁾	Welded ³ / ₈ in. Swagelok Compression Fitting Process Connection and ¹ / ₄ –18 NPT Drain Hole			
L	One Flange Code Option H and One Remote Seal			
M ⁽²⁾	One Flange Code Option J and One Remote Seal			
Typical Model Number: 1153 DB 4 R A				

(1) The Rosemount 1153 Series B with Output Code R Electronics is also available with adjustable damping. This option is specified by adding "N0037" to the end of the complete model number, for example, 1153DB4RAN0037.

(2) Note: Customer assumes responsibility for qualifying interfaces on these options. Contact Rosemount Nuclear Instruments, Inc. for details.

Product Data Sheet

00813-0100-4302, Rev BA

January 2008

Rosemount 1153 Series B

Standard Accessories

All models are shipped with a mounting bracket. One instruction manual is included per shipment.

Calibration

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

Options

Consult N-Options Product Data Sheet (PDS 00813-0100-2655), or contact Rosemount Nuclear Instruments, Inc. for special transmitter needs.

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 is 0.125 in. (3.18mm). A wire-on tag is available on request.

Documentation

Certification is provided for each Rosemount 1153 Series B transmitter for accuracy, special cleaning, hydrostatic testing, and traceability. Chemical and physical reports and identification of pressure-retaining parts are on file at Rosemount Nuclear Instruments, Inc.

Rosemount 1153 Series B

Product Data Sheet
00813-0100-4302, Rev BA
January 2008

IMPORTANT NOTICE -- ERRATA

Model 1153 Series B Product Data Sheet 00813-0100-4302 Rev BA (January 2008)

No.	Affected Pages	Description of Change	Effect. Date
1	7	Process Flange – <i>CF3M</i> (Cast version of <i>316L SST</i>) Drain/Vent Valves – <i>316L SST</i> Process Connections – 3/8-inch Swagelok compression fitting, <i>316L SST</i> (1/4-18 NPT optional)	10/21/09
2	7	Electronics Housing – Low-copper aluminum with <i>polyurethane</i> paint	1/24/11
3	7	Mounting Bracket – Carbon steel AISI 1010 or 1020, with <i>urethane or polyurethane</i> paint	1/24/11

The Emerson logo is a trade mark and service mark of Emerson Electric Co.

*Rosemount, the Rosemount logotype, and Alphasine are registered trademarks of Rosemount, Inc.
δ-Cell is a trademarks of Rosemount, Inc.*

Swagelok is a registered trademark of Swagelok Co.

Emerson Process Management

Rosemount Nuclear Instruments, Inc.
8200 Market Boulevard
Chanhassen, MN 55317
Tel (952) 949-5210
Fax (952) 949-5201

Copyright 2008 Rosemount Nuclear Instruments, Inc.
<http://www.rosemountnuclear.com>



Rosemount Nuclear Instruments, Inc. satisfies all obligations coming from legislation to harmonize product requirements in the European Union.



00813-0100-4302, Rev BA

ROSEMOUNT
Nuclear



www.rosemountnuclear.com



EMERSON
Process Management