

# Rosemount 2151N Analog Pressure Transmitter

## INDUSTRY LEADING PERFORMANCE

- Fully Analog Electrical Design
- Designed and Tested for Gamma Radiation and Seismic Vibration
- 200°F (93.3°C) Maximum Operating Temperature
- 0.25% Reference Accuracy



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## Results Driven by Proven Measurement

### Introduction

Rosemount 2151N Analog Pressure Transmitters provide precision pressure measurements in applications which require reliable performance and safety over an extended service life. The 2151N is designed for low-level gamma radiation exposure and seismic vibration. Stringent quality control during the manufacturing process includes traceability of pressure retaining parts and hydrostatic testing.

The Rosemount 2151N is not designated for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings. For information on Rosemount nuclear-qualified products, contact your local Emerson™ sales representative.

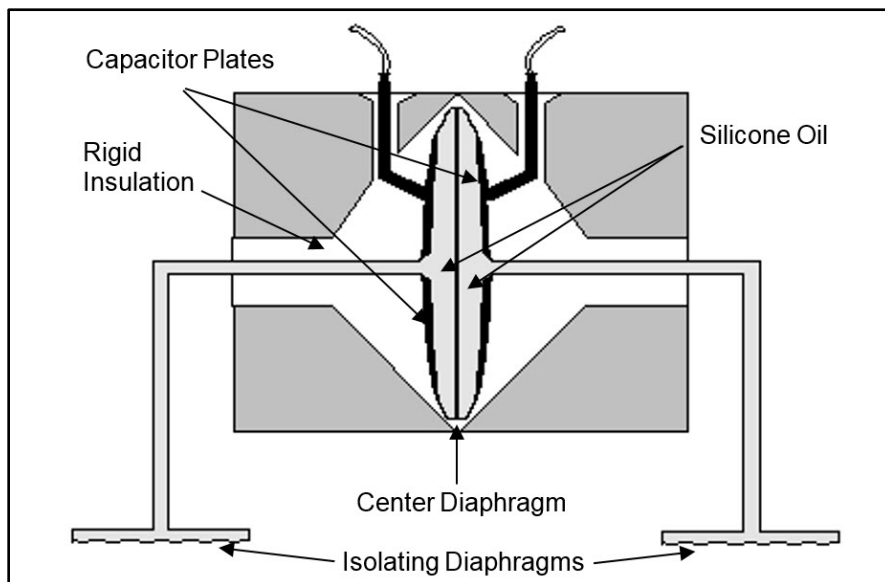
### Transmitter Description

Rosemount 2151N transmitters are similar in construction and performance to the proven Rosemount 3150 series pressure transmitters. Units are available in absolute (AP), gauge (GP), and differential (DP) configurations, with six pressure range options. Direct electronic sensing with the completely sealed coplanar capacitance sensing element (see **Figure 1**) eliminates mechanical force transfer and problems associated with vibration. Installation and commissioning are simplified by compact design, 2-wire system compatibility, and non-interacting external span and zero adjustments for typical calibrations.

### Operation

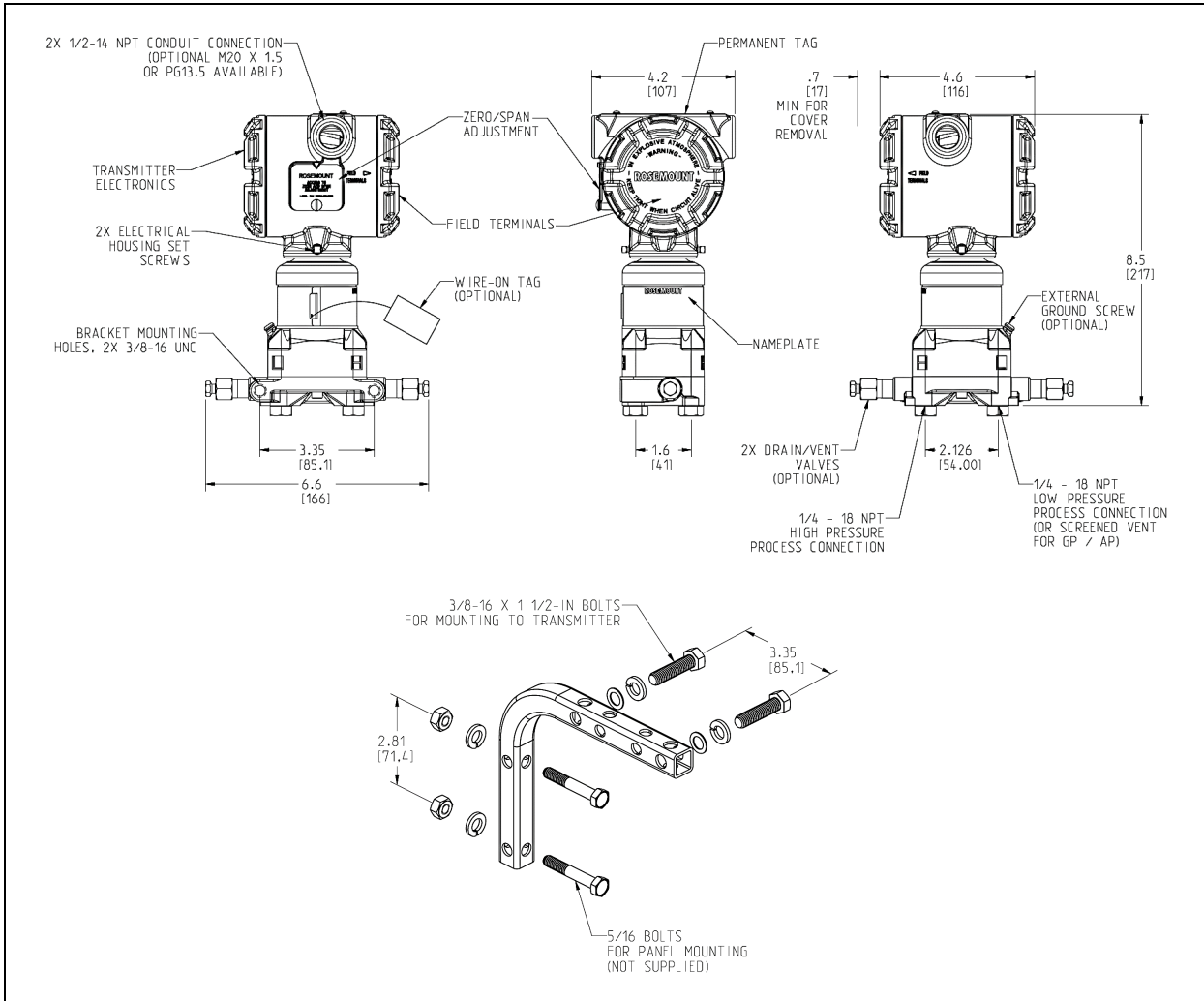
Process pressure is transmitted through an isolating diaphragm and silicone oil fill fluid to a sensing diaphragm in the center of the sensor cell. Process or reference pressure is transmitted in a like manner to the other side of the center sensing diaphragm. The capacitor plates on both sides of the sensing diaphragm detect the position of the sensing diaphragm.

Figure 1 – The Sensor Cell



**Dimensional Drawings**

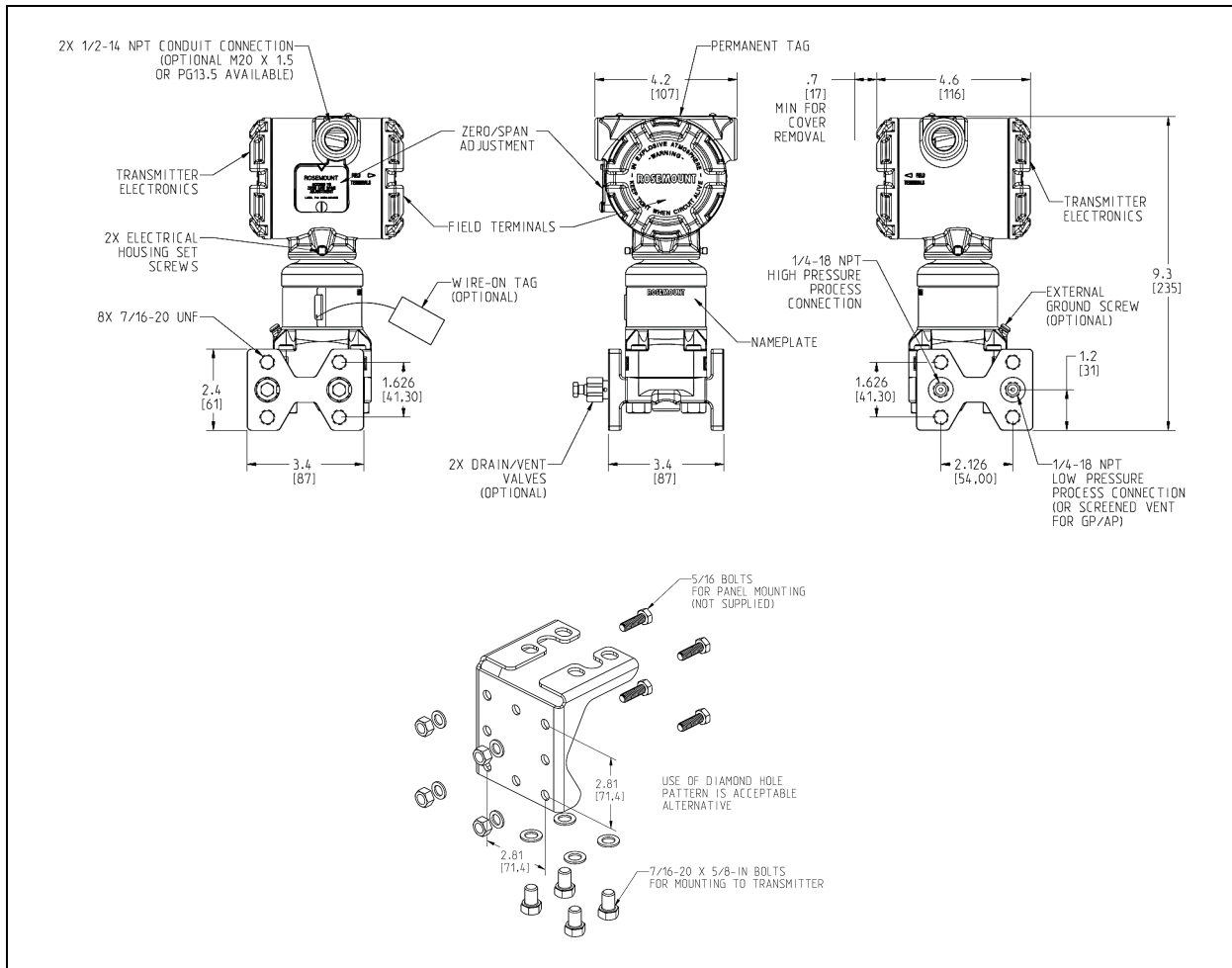
Figure 2a – Rosemount 2151N with Coplanar Flange (Option Code E12) Dimensional Drawing <sup>(1)</sup>



**Notes:**

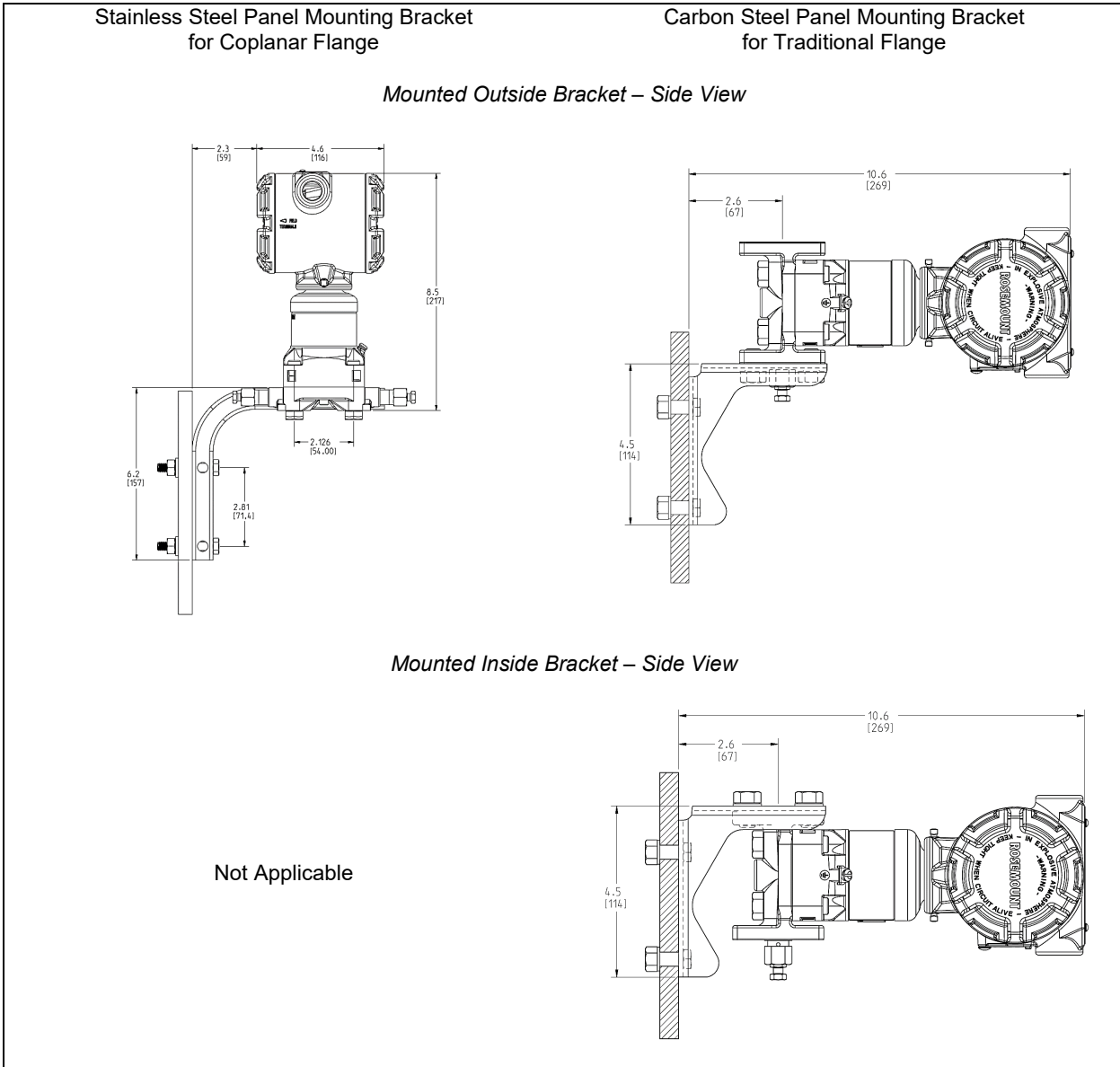
(1) All dimensions are nominal in inches [millimeters].

Figure 2b – Rosemount 2151N with Traditional Flange (Option Code F12) Dimensional Drawing <sup>(1)</sup>



Notes:  
 (1) All dimensions are nominal in inches [millimeters].

Figure 2c – Typical Mounting Configurations <sup>(1)</sup>



Notes:  
 (1) All dimensions are nominal in inches [millimeters].

### Application Specifications

#### Vibration

Exposed to 3g sine sweep from 5 Hz to 100 Hz.

#### Radiation

Designed and tested for low-level radiation exposure. Contact Rosemount Nuclear for additional details.

#### Nuclear Cleaning

Process wetted surfaces cleaned to less than 1 ppm chloride content when Option Code P3 is selected. See the **Ordering Information** table on page 13 for details.

#### Hydrostatic Testing

Hydrostatically tested at 150% of maximum working pressure for differential pressure transmitters.

Hydrostatically tested at the overpressure limit for gauge and absolute pressure transmitters.

All Range Code 1 transmitters tested to 2000 psi (13.79 MPa).

#### Traceability

Per ISO 9001; chemical and physical certification of pressure retaining parts.

### Performance Specifications

Based on zero-based calibration spans under reference conditions.

#### Accuracy

Range Code	Accuracy
All	±0.25% of calibrated span

*Includes the effects of linearity, hysteresis, and repeatability.*

#### Drift

Range Code	Drift Effect per 12 Months
All	±0.4% URL

#### Temperature Effect

Range Code	Temperature Effect (per 100°F (55.6°C) Temperature Shift)
1	±(1.0% URL + 1.0% Span)
2-6	±(0.5% URL + 0.5% Span)
AP Range 3	±(0.6% URL + 0.5% Span)

*The specification may be linearly interpolated down to a 50°F (27.8°C) temperature interval.*

#### Overpressure Effect

Based on full overpressure limits:

- Range 1: 2000 psig (13.79 MPa)
- Range 2-5: 3626 psig (25.00 MPa)
- Range 6: 6000 psig (41.37 MPa)

#### 2151ND:

Range Code	Overpressure Effect	
	One-Sided	Two-Sided Sequential
1-3	±0.25% URL	±0.5% URL
4, 5	±0.3% URL	±2.0% URL

#### 2151NG and 2151NA:

Range Code	One-Sided Overpressure Effect
1-3	±0.25% URL
4-6	±0.3% URL

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00813-0000-4851 Rev AF  
December 2023

# Rosemount 2151N

### High Static Line Pressure Zero Effect (2151ND Only)

The high static line pressure zero effect can be calibrated out by the customer (see 2151N Reference Manual 00809-0000-4851 for details). If it is not calibrated out, the error associated with the high static line pressure zero effect is as shown in the following tables.

For high static line pressure ( $P_s$ ) less than or equal to 2000 psi (13.79 MPa):

Range Code	High Static Line Pressure Zero Effect $P_s \leq 2000$ psi (13.79 MPa)
1	$\pm 0.25\%$ URL per 1000 psi (6.89 MPa)
2-5	$\pm 0.1\%$ URL per 1000 psi (6.89 MPa)

For high static line pressure ( $P_s$ ) greater than 2000 psi (13.79 MPa):

Range Code	High Static Line Pressure Zero Effect $P_s > 2000$ psi (13.79 MPa)
1	Not Applicable
2-5	$\pm(0.2 + (0.2(P_s - 2000)/1000))\%$ URL

### High Static Line Pressure Span Effect (2151ND Only)

2151ND Range Codes 1-3:

Range Code	High Static Line Pressure Span Effect
1	$\pm(0.4\% \text{ URL} + 0.4\% \text{ Span})$ per 1000 psi (6.89 MPa)
2, 3	$\pm(0.1\% \text{ URL} + 0.1\% \text{ Span})$ per 1000 psi (6.89 MPa)

2151ND Range Codes 4 and 5 experience a span shift when operated at high static line pressure. It is linear and correctable during calibration (see 2151N Reference Manual 00809-0000-4851 for details).

If the correction is not performed, the error associated with the high static line pressure span effect is as shown in the following table:

Range Code	High Static Line Pressure Span Effect
4	$-1.00\% \pm 0.4\%$ input reading per 1000 psi (6.89 MPa)
5	$-1.25\% \pm 0.4\%$ input reading per 1000 psi (6.89 MPa)

If the correction procedure as outlined in the 2151N Reference Manual is applied, an error associated with the correction uncertainty still exists as shown in the following table:

Range Code	High Static Line Pressure Span Correction Uncertainty
4, 5	$\pm 0.4\%$ input reading per 1000psi (6.89 MPa)

It is possible to improve the accuracy of the 2151ND at high static line pressure for applications requiring enhanced performance. Please contact Rosemount Nuclear for additional information.

### Power Supply Effect

Less than 0.005% of span / volt.

### Load Effect

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

### Electromagnetic Compatibility

Satisfies requirements defined in:

- EN 61326-1:2013
- EN 61326-2-3:2013

### Transient Protection (Option Code T1)

Designed in accordance with IEEE C62.41.2-2002; Location Category B:

- 6 kV crest (0.5 microseconds – 100 kHz)
- 3 kA crest (8 x 20 microseconds)
- 6 kV crest (1.2 x 50 microseconds)

### Mounting Position Effect

No span effect. Zero shift of up to 1.5 inH<sub>2</sub>O (0.37 kPa) which can be calibrated out.

## Functional Specifications

### Service

Liquid, gas, vapor.

### Output

4-20 mA.

### Power Supply

Maximum supply voltage is 55 VDC.

Maximum allowable supply voltage ripple is less than 1 volt peak-to-peak ripple for ripple frequency less than or equal to 120 Hz.

## Load Limits

See **Figure 3**.

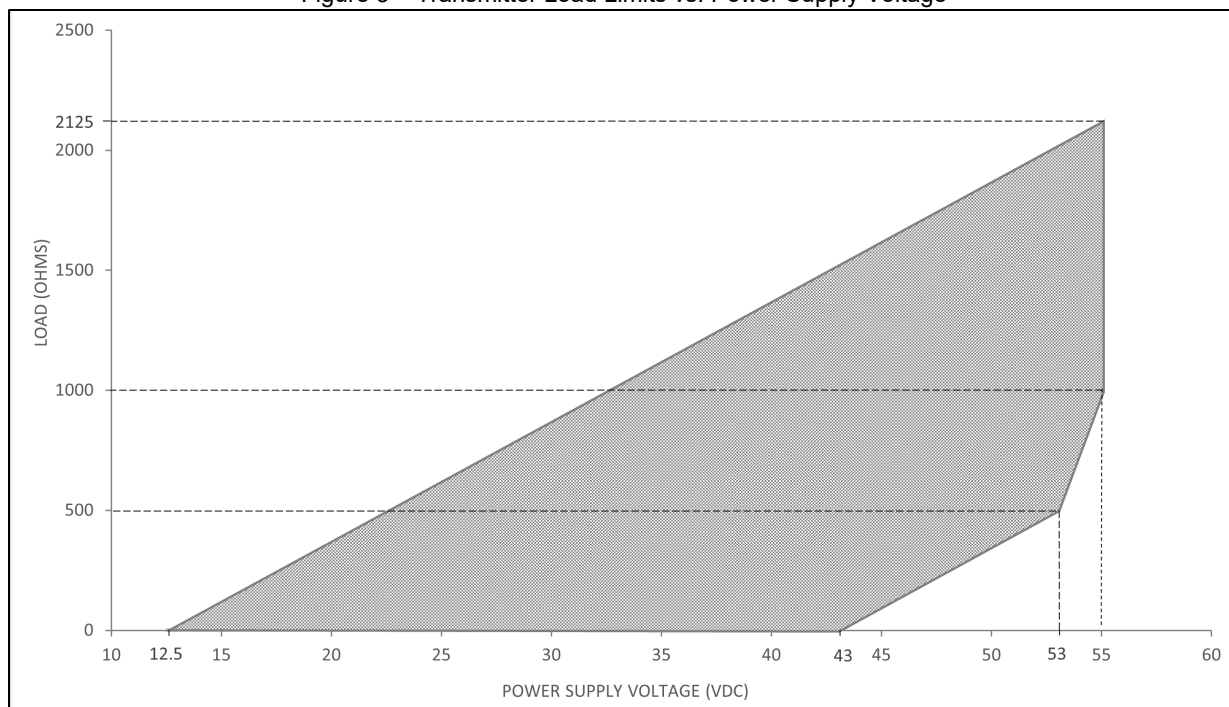
### Dielectric Withstand Test

707 VDC, 60 seconds, leakage less than 1 mA.

### Insulation Resistance Test

500 VDC, 60 seconds, IR greater than 100 MOhm.

Figure 3 – Transmitter Load Limits vs. Power Supply Voltage





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### Span and Zero Adjustments

Externally adjustable; non-interacting for typical calibrations.

### Maximum Zero Elevation

Zero is adjustable to the Lower Range Limit (LRL).

### Maximum Zero Suppression

Zero is adjustable to 90% of the Upper Range Limit (URL) (80% for Range Code 1).

### Range Down

10:1 (5:1 for Range Code 1).

### Response Time

Time constant (63.2%) at 100°F (37.8°C):

Output Code A:

Range Code	Fixed Response Time (Max)	
	DP / GP	AP
1	0.4 sec	Not Applicable
2	0.2 sec	Not Applicable
3-6	0.2 sec	0.2 sec

Output Code B (Continuously Adjustable Damping):

Range Code	Minimum Time Response in the Max Damping Position
ALL	1.20 sec

Note: In the Minimum Damping Position, the values for Fixed Time Response apply

### Temperature Limits

Operating Limits:

40°F to 200°F (4.4°C to 93.3°C).

Storage Limits:

-40°F to 120°F (-40°C to 48.9°C).

### Humidity Limits

0 to 100% relative humidity

### Enclosure Rating

Enclosures meet NEMA® Type 4X & IP66.

### Volumetric Displacement

Less than 0.005 in<sup>3</sup> (0.082 cm<sup>3</sup>)

### Turn-On Time

2 seconds maximum.

### Maximum Working Pressure

Larger of Static Line Pressure Limit or Upper Range Limit (URL).

Flange code E12 is limited to 2,000 psi Maximum Working Pressure.

### Pressure Ranges

Adjustable within the range shown; Upper Range Limit (URL) is the highest pressure listed.

2151ND and 2151NG:

Range Code	Pressure Ranges
1	0-5 to 0-25 inH <sub>2</sub> O (0-1.25 kPa to 0-6.23 kPa)
2	0-25 to 0-250 inH <sub>2</sub> O (0-6.23 kPa to 0-62.3 kPa)
3	0-100 to 0-1000 inH <sub>2</sub> O (0-24.9 kPa to 0-249 kPa)
4	0-30 to 0-300 psig (0-206.8 kPa to 0-2068 kPa)
5	0-200 to 0-2000 psig (0-1379 kPa to 0-13.79 MPa)
6	0-400 to 0-4000 psig (0-2758 kPa to 0-27.58 MPa)

Range Code 6 is not available on 2151ND transmitters.

2151NA:

Range Code	Pressure Ranges
3	0-100 to 0-1000 inH <sub>2</sub> O (0-24.9 kPa to 0-249 kPa)
4	0-30 to 0-300 psia (0-206.8 kPa to 0-2068 kPa)
5	0-200 to 0-2000 psia (0-1379 kPa to 0-13.79 MPa)
6	0-400 to 0-4000 psia (0-2758 kPa to 0-27.58 MPa)

Extended operation below 0.5 psia (3.5 kPa abs) is not recommended.

### Static Pressure Limits (2151ND Only)

Range Code	Static Pressure Limit
1	0.5 psia to 2000 psig (3.45 kPa to 13.79 MPa)
2-5	0.5 psia to 3626 psig (3.45 kPa to 25.00 MPa)

### Overpressure Limits

Range Code	Overpressure Limit
1	2000 psig (13.79 MPa)
2-5	3626 psig (25.00 MPa)
6	6000 psig (41.37 MPa)

Flange code E12 is limited to 2,000 psi Maximum Working Pressure.

### Burst Pressure

Minimum Burst Pressure is 10,000 psig (68.95 MPa).

## Physical Specifications

### Materials of Construction

Numbers in parentheses indicate where the part is located in Figure 4.

#### Isolating Diaphragms (8)

316L SST.

#### Process Flange (10)

CF8M (cast version of 316 SST) for coplanar flange.

CF3M (cast version of 316L SST) for traditional flange.

#### Process Seal (9)

Ethylene Propylene O-rings for coplanar flange.

Silver-plated Inconel™ X-750 C-ring for traditional flange.

#### Electronics Housing O-rings (2)

Ethylene Propylene.

#### Fill Fluid (8)

Silicone Oil.

#### Sensor Module Housing (8)

CF3M (cast version of 316L SST).

#### Flange Bolts (11)

316 SST.

#### Electronics Housing (5)

Low copper aluminum with polyurethane paint.

#### Mounting Bracket (14)

AISI 1010 carbon steel with polyurethane paint for traditional bracket; 304 SST for coplanar bracket.

#### Mounting Bolts (Bracket-to-Transmitter) (14)

Carbon Steel (CS Panel).

316 SST (Coplanar Bracket).

#### Process Connections

1/4-18 NPT (per EN 61518 / IEC 61518).

#### Electrical Connections

1/2-14 NPT conduit with screw terminals; M20-1.5 and PG 13.5 threads are optional.

#### Weight

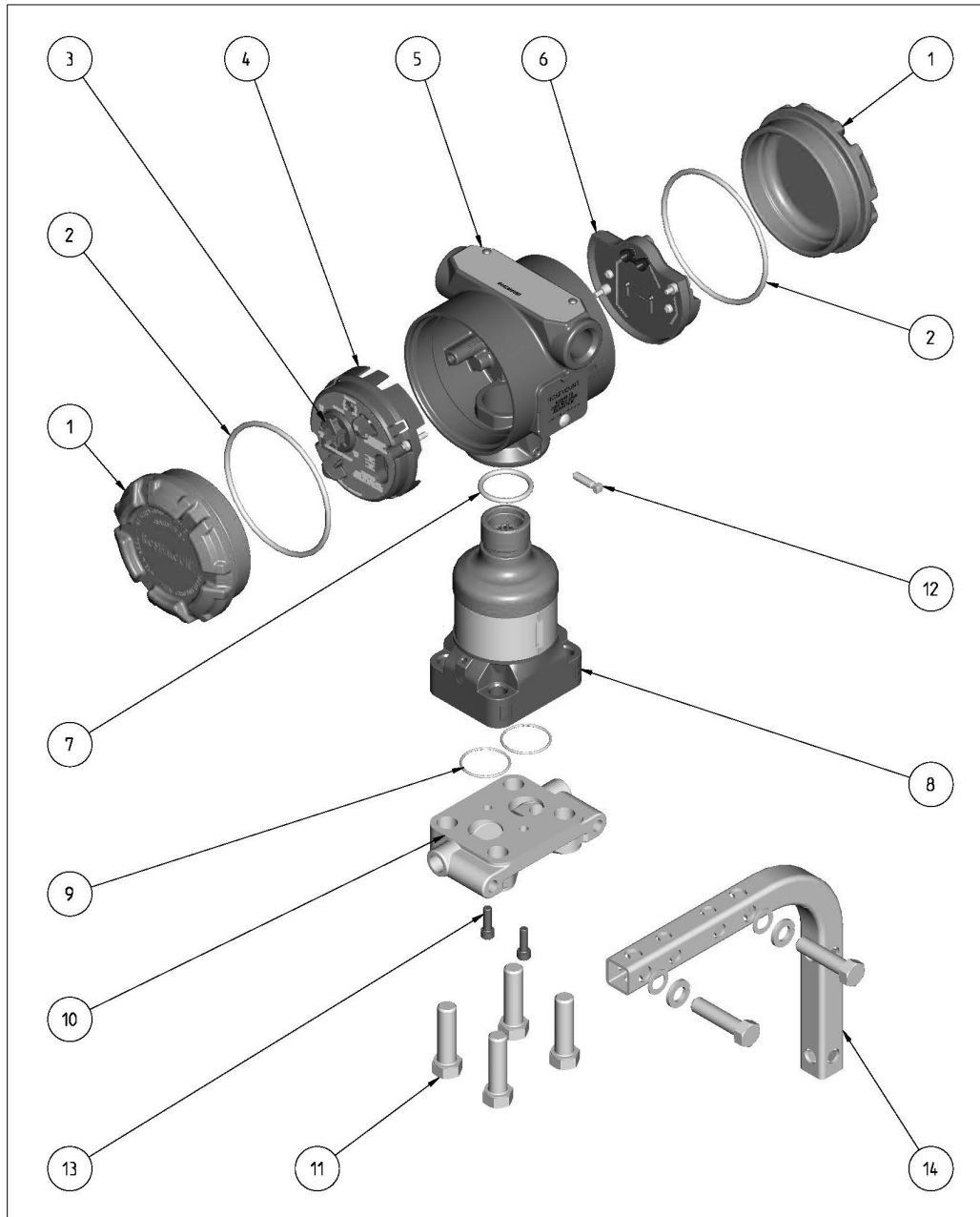
2151N with Traditional Flange:

- 8.8 lbs (4.0 kg) excluding mounting bracket.
- 11.2 lbs (5.0 kg) including mounting bracket.

2151N with Coplanar Flange:

- 7.5 lbs (3.4 kg) excluding mounting bracket.
- 8.5 lbs (3.9 kg) including mounting bracket.

Figure 4 – Parts Drawing and Table, Exploded View (Rosemount 2151N with Coplanar Flange Shown)



Item No.	Description	Item No.	Description
1	Electronics Cover	8	Sensor Module
2	Cover O-ring	9	Process Seals
3	Coarse Zero Select Jumper	10	Process Flange
4	Electronics Assembly	11	Flange Bolts
5	Electronics Housing Assembly	12	Electronics Housing Set Screws
6	Terminal Block Assembly	13	Flange Cap Screws
7	Header O-ring	14	Mounting Bracket and Hardware (Optional)

Figure 5 – Electrical Block Diagram

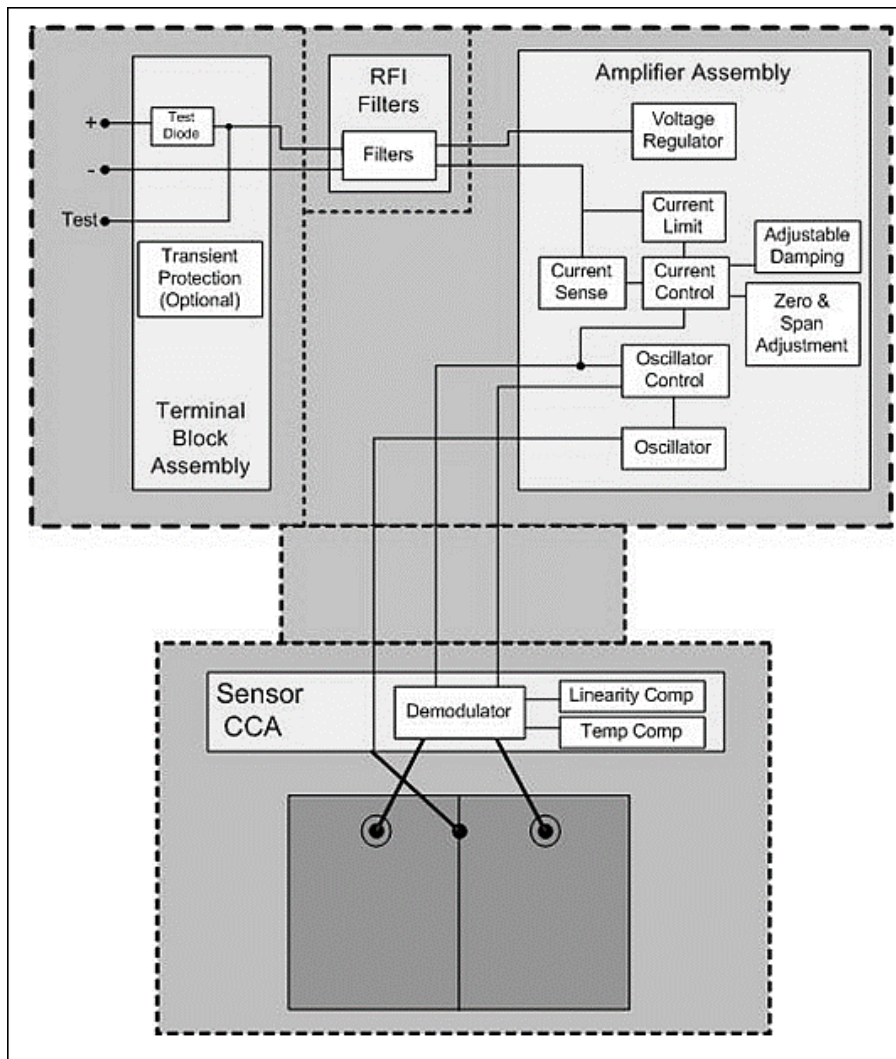
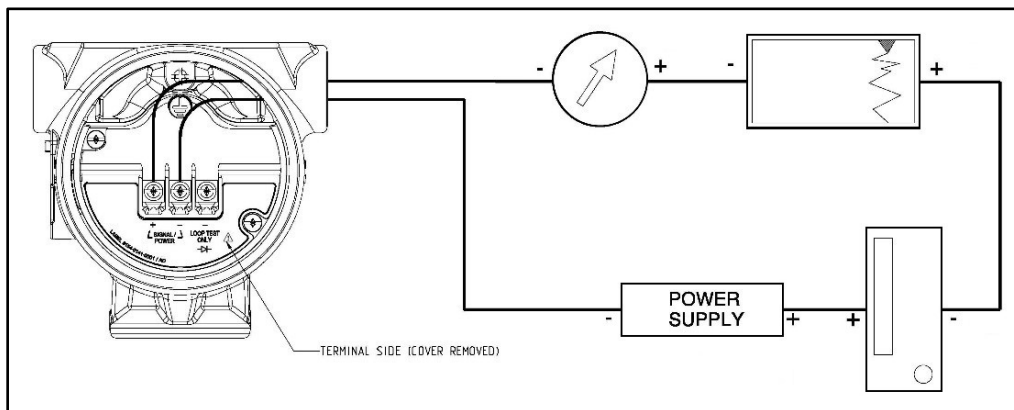


Figure 6 – Typical Transmitter Wiring Connection



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# Rosemount 2151N

## Ordering Information

Model	Description		
2151	Analog Pressure Transmitter		
Code	Pressure Measurement		
ND	Differential Pressure	Range Code 1	2000 psig (13.79 MPa) Static Pressure Limit
		Range Codes 2-5	3626 psig (25.00 MPa) Static Pressure Limit
NG	Gauge Pressure		
NA	Absolute Pressure		
Pressure Ranges <sup>(1)</sup>			
Code	Lower Range Limit (LRL) to Upper Range Limit (URL) / Minimum Span <sup>(2)</sup>		
	Differential	Gauge <sup>(3)</sup>	Absolute <sup>(4)</sup>
1	-25 to 25 inH <sub>2</sub> O / 5 inH <sub>2</sub> O (-6.23 to 6.23 kPa / 1.25 kPa)	-25 to 25 inH <sub>2</sub> O / 5 inH <sub>2</sub> O (-6.23 to 6.23 kPa / 1.25 kPa)	Not Applicable
2	-250 to 250 inH <sub>2</sub> O / 25 inH <sub>2</sub> O (-62.3 to 62.3 kPa / 6.23 kPa)	-250 to 250 inH <sub>2</sub> O / 25 inH <sub>2</sub> O (-62.3 to 62.3 kPa / 6.23 kPa)	Not Applicable
3	-1000 to 1000 inH <sub>2</sub> O / 100 inH <sub>2</sub> O (-249 to 249 kPa / 24.9 kPa)	-393 to 1000 inH <sub>2</sub> O / 100 inH <sub>2</sub> O (-97.9 to 249 kPa / 24.9 kPa)	0 to 1000 inH <sub>2</sub> O abs / 100 inH <sub>2</sub> O abs (0 to 249 kPa abs / 24.9 kPa abs)
4	-300 to 300 psi / 30 psi (-2068 to 2068 kPa / 206.8 kPa)	-14.2 to 300 psig / 30 psi (-97.9 kPa to 2068 kPa / 206.8 kPa)	0 to 300 psia / 30 psia (0 to 2068 kPa abs / 206.8 kPa abs)
5	-2000 to 2000 psi / 200 psi (-13.79 to 13.79 MPa / 1379 kPa)	-14.2 to 2000 psig / 200 psig (-97.9 kPa to 13.79 MPa / 1379 kPa)	0 to 2000 psia / 200 psia (0 to 13.79 MPa abs / 1379 kPa abs)
6	Not Applicable	-14.2 to 4000 psig / 400 psig (-97.9 kPa to 27.58 MPa / 2758 kPa)	0 to 4000 psia / 400 psia (0 to 27.58 MPa abs / 2758kPa abs)
Code	Transmitter Output		
A	4-20 mA Analog		
B	4-20 mA Analog with Adjustable Damping		
L	10-50 mA Analog with Adjustable Damping <sup>(13)</sup>		
Code	Isolating Diaphragm		
2	316L SST		
Code	Process Flange Type, Material	Process Connection	Drain / Vent
E12 <sup>(11)</sup>	Coplanar, SST (Meets EN 61518 / IEC 61518)	1/4 – 18 NPT <sup>(6)</sup>	1/4 – 18 NPT Drain Hole <sup>(6)</sup>
F12 <sup>(5)</sup>	Traditional, SST (Meets EN 61518 / IEC 61518)	1/4 – 18 NPT <sup>(6)</sup>	1/4 – 18 NPT Drain Hole <sup>(6)</sup>
FS1 <sup>(12)</sup>	Remote Seal, One Sided	Defined by remote seal model	Defined by remote seal model
FS2 <sup>(12)</sup>	Remote Seal, Two Sided	Defined by remote seal model	Defined by remote seal model
Code	Electronics Housing Material, Conduit Connection		
A	Aluminum, 1/2 – 14 NPT		
B	Aluminum, M20 x 1.5		
C	Aluminum, PG13.5		
Code	Mounting Bracket <sup>(7)</sup>		
0	No Mounting Bracket		
1	SST Mounting Bracket for Coplanar Flange, SST Mounting Hardware		
2	Painted CS Mounting Bracket for Traditional Flange, Carbon Steel Mounting Hardware		
Code	Standard Options		
PT	Temperature Effects Test		
P3	Process wetted surfaces cleaned to less than 1 ppm chloride content		
P4	Calibration at Line Pressure <sup>(8)</sup>		
P5	Process Seal Helium Leak Test <sup>(9)</sup>		
P8	Time Response Test <sup>(8)</sup>		
Q4	Calibration Certificate		
Q8	Material Certification for Process Wetted and Pressure Retaining Parts		

Continued on the next page

Code	Standard Options
T1	Transient Protection
V4	Threaded Drain / Vent Valve(s) (1/4 – 18 NPT, SST) – Unassembled, Provided Separately in Package <sup>(6) (10)</sup>
V5	External Ground Screw Kit
W1	Additional Customer Tagging Information, Permanent Tag Attached to Electronics Housing
W2	Additional Customer Tagging Information, Wire-on Tag Attached to Nameplate
<b>Typical Model Number: 2151ND 2 A 2 E12 A 1 V4</b>	

**Notes:**

- (1) 2151N transmitter calibrations which include a Lower Range Value (LRV), Upper Range Value (URV), or span that are within ±5% of the published limits are acceptable.
- (2) Maximum span is equal to the Upper Range Limit (URL); i.e. the maximum span of a 2151ND range code 2 transmitter is 250 inH2O (62.3 kPa).
- (3) 2151NG Lower Range Limit (LRL) varies with atmospheric pressure.
- (4) Extended operation below 0.5 psia (3.5 kPa abs) is not recommended.
- (5) Process flange code F12 is required for 2151NA transmitters.
- (6) Customer assumes responsibility for interfaces on these options.
- (7) Mounting bracket must correspond with process flange; i.e. if process flange E12 is selected, mounting bracket codes 0 or 1 are required.
- (8) Requires Configuration Data Sheet. Contact Rosemount Nuclear for details.
- (9) Wire-on tag stating, "HELIUM LEAK TESTED – DO NOT DISASSEMBLE" attached to nameplate.
- (10) Quantity is two for DP type transmitters and one for GP/AP type transmitters.
- (11) Flange code E12 is limited to 2,000 psi Maximum Working Pressure. Not available on range code 6.
- (12) Rosemount 1199 remote seals are available with the Rosemount 2151N pressure transmitter. Please contact Rosemount Nuclear for more information regarding available configurations. 2151ND transmitters with FS1 code will have 1/4-18 NPT process connection and drain/vent opposite of remote seal on transmitter process flange.
- (13) 10-50 mA output is subject to a separate specification, contact Rosemount Nuclear for details.

### Standard Accessories

One reference manual per shipment; one conduit plug and two electronics housing O-rings per transmitter are included.

### Calibration

Transmitters are factory calibrated at ambient temperature and pressure to the customer's specified range. If calibration is not specified, transmitters are calibrated 0 to Upper Range Limit (URL).

### Damping

If output code with Adjustable Damping is selected, factory default is MIN damping. In addition, if Time Response Testing (Option Code P8) is selected and a time response value is not specified, damping is set to factory default (MIN).

### Additional Customer Tagging Information

Tagging is optional and will be provided when either option code W1 and/or W2 is included in the model number. All tags are SST. The transmitter will be tagged in accordance with customer requirements considering the space limitations defined below:

Description	Permanent Tag (W1)	Wire-on Tag (W2)
Nominal Character Height	0.10 in (2.54 mm)	0.188 in (4.76 mm)
Maximum Number of Lines	4	4
Maximum Characters per Line	24	20

### Special Options

Please contact Rosemount Nuclear for special transmitter needs.

### Spare Parts

Please contact Rosemount Nuclear for spare parts needs.

### Certification

Certification will be provided for each 2151N pressure transmitter for quality system, hydrostatic testing, traceability, and special testing if applicable. Chemical and physical reports and identification of pressure retaining parts will be on file at Rosemount Nuclear.

Calibration Certificate is available when Q4 is specified in the model code.

**Revision History**

**Changes from May 2021 (Rev AE) to December 2023 (Rev AF)**

<b>Page (Old)</b>	<b>Page (New)</b>	<b>Description of Changes</b>
Cover, throughout	Cover, throughout	Document revision changed from May 2021 to December 2023, Rev AE to Rev AF.
3	3	Update Figure 2a.
4	4	Update Figure 2b.
4	4	Update Figure 2c.
7	7	Update Electromagnetic Compatibility specification year.
8	8	Update Figure 3 and maximum supply voltage.
9	9	Add damping specification for output codes, add enclosure rating.
13	13	Update ordering information table with output code and remote seal options
14	14	Add footnotes to ordering information table regarding remote seals and 10-50mA output. Add Damping information.

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