North Atlantic

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The Northeast Utilities System

March 25, 2002

Docket No. 50-443
NYN-02035

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-001

Seabrook Station
Response to Request for Additional Information Regarding
License Amendment Request 01-07,
"Changes to Certain Technical Specifications
Associated with Response Time Testing"

North Atlantic Energy Service Corporation (North Atlantic), in response to questions from the Staff, has enclosed herein additional information regarding License Amendment Request (LAR) 01-07. As a result of a telephone conference conducted on February 27, 2002, the NRC requested North Atlantic to provide additional information to address specific questions on the proposed changes to the Technical Specifications (TS) associated with response time testing. Enclosure 1 contains the response to the Request for Additional Information. Enclosure 2 contains the revised LAR tables for enhanced clarity. Enclosure 3 contains the attachments of historical data. Enclosure 4 contains vendor technical literature for Rosemount Model 1153 and 1154 pressure transmitters. In addition, North Atlantic requests withdrawal of the associated TS Bases that was submitted as part of LAR 01-07 since NRC approval of TS Bases information is not a regulatory requirement.

This additional information does not change the conclusions of the original LAR 01-07 submittal, that the proposed change does not involve a significant hazard consideration pursuant to 10CFR50.92, and still meets the criteria of 10CFR51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement.

Should you have any questions regarding this letter, please contact Mr. James M. Peschel, Manager – Regulatory Programs, at (603) 773-7194.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

for

Ted C. Feigenbaum
Executive Vice President
and Chief Nuclear Officer

A001

*without Enclosure 4

cc: H. J. Miller, NRC Regional Administrator*
R.D. Starkey, NRC Project Manager, Project Directorate I-2
G. F. Dentel, NRC Senior Resident Inspector*

ENCLOSURE 1 TO NYN-02035

Response to Request for Additional Information Regarding License Amendment Request 01-07

The following provides North Atlantic Energy Service Corporation's (North Atlantic) response to the NRC Staff's request for additional information (RAI) regarding License Amendment Request (LAR) 01-07:

RAI 1: Were the Tobar 32DP2 (Reactor Coolant Flow Rate) and Tobar 32PA2 (Steam Line Pressure) sensors approved in the NRC SER for WCAP-13632-P-A? If not, was a Failure Modes and Effects (FMEA) analysis performed?

Response: Tobar 32DP2, Differential Pressure Transmitters, and 32PA2, Absolute Pressure Transmitters, were approved for elimination of response time testing (RTT) Technical Specifications (TS) requirements in the NRC SER for WCAP-13632-P-A. These particular instruments are identified on page 3 of section 1.0 "Introduction and Background" and on page 15 of section 3 "Evaluation". These transmitters are part of a subset of transmitters typically installed in Westinghouse plants and were evaluated by similarity analysis to compare their design to those evaluated using FMEA in the EPRI report.

The Tobar 32DP2 and 32PA2 transmitters are listed in Table 9-1 of WCAP 13632-P-A, Revision 2, with their applicable evaluated response times. The values and methodology of section 9.0 of WCAP-13632 are endorsed on page 18 of section 4.0 "Conclusion" in the NRC SER.

RAI 2: On Page 3 of the LAR North Atlantic identified that certain Rosemount transmitters were not evaluated in WCAP-13632-P-A. North Atlantic stated that it will use response times based on actual transmitter performance. For response time calculations, conservative values of 0.200 seconds for DB, GB and GP units and 0.600 seconds for DP units were applied. How do you know that the values are conservative? Please identify the basis for this information. What are the past values? What penalty factors were used? How were the conservative values obtained?

Response: Rosemount gage and differential pressure transmitter models 1153 and 1154 were evaluated by EPRI and are identified in section 4.4 of WCAP-13632-P-A and section 3.0 of the NRC SER. These transmitters are part of the entire set of transmitters identified where analysis has shown that changes in response time of the sensor will be accompanied by changes in performance characteristics which are detectable during routine periodic tests such as calibrations and channel checks. Typical response times for these transmitters are however, not identified in Table 9-1 of the WCAP. Guidance in WCAP-13632 and the NRC SER state that when response times for listed transmitters are not identified in Table 9-1 that neither the manufacturer nor Westinghouse currently provides this information. Applicable response times should therefore be obtained using conservative data from either previous plant insitu response time testing (historical records) or, if replacing the transmitter, the response time obtained through testing. This methodology is identified in section 9 of WCAP-13632, page 9 of section 2, "Discussion" of the NRC SER and endorsed on page 18 of section 4, "Conclusion" of the NRC SER.

Historical records from past performance at Seabrook Station were used in establishing the response times for Rosemount transmitters as identified in the LAR on page 3. The data for Rosemount GB9 and GP9 transmitters reflected response times of less than 0.200 seconds and for DP4 units all data recorded was less than or equal to 0.500 seconds. This plant data was further verified against Rosemount publications for consistency with the manufacturer's specifications and found to be in agreement with vendor specifications.

- Rosemount Publication 00813-0100-4302, R/AB, 1999, Model 1153DB5 & GB9, Specification Section: Response Time for Range Code 5 & 9 = 0.200 seconds.

- Rosemount Publication 00813-0100-4514, R/AA, 1999, Model 1154GP9 & DP9, Specification Section: Response Time for Range Code 9 = 0.200 seconds and for Range Code 4 = 0.500 seconds.

Based on the historical data (see Enclosure 3, Attachment A) and confirmation with Rosemount specifications, North Atlantic has chosen to apply 0.200 seconds for Rosemount GB9 and GP9 transmitters and 0.500 seconds[1] for DP4 transmitters. Since transmitter historical data never exceeded the response times specified the values specified were considered conservative.

RAI 3: On Page 4, North Atlantic stated that they may complete the following actions as an alternative to performing periodic drift monitoring of Rosemount transmitters as specified in Bulletin 90-01, Supplement 1. The NRC requested that North Atlantic either withdraw the option or commit to it.

Response: North Atlantic will not pursue the alternative action that was outlined in the LAR with respect to periodic drift monitoring for Rosemount pressure and differential pressure transmitters. As such, North Atlantic withdraws this information.

RAI 4: On Page 7 and 8 of the LAR North Atlantic provided two tables (Table I.B-1 and I.B-2). The NRC requested that North Atlantic consider combining both tables and make a stand alone table and that the table be changed to more clearly identify which sensor is being used. The table needs to correlate the brand and model of the individual sensors. Additionally note 4 needs clarification to identify the information pertaining to the function, the sensor, the applicable portions of the process cabinet, and the input of relay and logic information.

[1] The description of response times for the Rosemount DP transmitter on page 3 of the LAR and the attached table is in error. The correct response time is 0.500 seconds, as stated herein. The tables in Enclosure 2 have been corrected to reflect 0.500 seconds for the DP4 transmitter.

Response: LAR tables I.B-1 and I.B-2 are individually listed to separate Reactor Trip System and Engineered Safety Feature Actuation System Response Times. This is typical to Seabrook Station's Technical Specifications and Technical Requirements Manual. Transmitters applicable to each listed function are identified in section B of the LAR. For clarity, each table was revised to show the applicable transmitter model number associated with each protection function.

LAR page 5 states that North Atlantic will use allocations for system response times either from the bounding criteria in Reference 2 or from the summation of individual components within a specific channel. The response times listed in Tables I.B-1 and I.B-2 are generic bounding response times from WCAP-14036 Table 8-1 as endorsed in Table 1, page 12 of the NRC SER. For clarity the individual components (cards) within each specific channel have been added to the table. Reviewers should note that the summation of response times of the individual components would provide a response time much less than the generic value listed. North Atlantic is cognizant of this and prefers to use the longer generic times for the protection system functions.

Upon further review of the application of generic bounding response times associated with all the protection functions, it was noted that the Emergency Feedwater Flow channel does not appropriately fit the generic criteria. Therefore, North Atlantic will continue to response time test the EFW Flow channel, with exception of the transmitter since the transmitter is addressed in the WCAP and SER. Table I.B-2 has been revised accordingly.

Table I.B-1 and I.B-2 lists 7300 Process Cabinet string times based on generic bounding response times as outlined in Table 8-1 of WCAP-14036-P-A and Table 1 on page 12 of the NRC SER on this same WCAP. This same criterion applies to the rate trips of the Westinghouse Nuclear Instrumentation System and the table reflects a value of 0.200 seconds for the NIS PR High Negative Rate. In addition to the NIS PR High Negative Rate trip Seabrook Station also has a NIS High Positive Rate Trip. Although similar circuitry is used for these two rate trips they are in fact physically different. The difference is in the size of the input filter resistors on the applicable circuit cards. This difference has been previously identified at Seabrook Station and documented in its corrective action program as ACR 96-1265. The value listed in Table I.B-1 of 0.300 seconds has been established from historical data (see Enclosure 3, Attachment B), as referred to by Note 4 of Table I.B-1. The established value has never been exceeded in any documented RTT, is an appropriate value for the string response time and conforms to the overall response time required by Technical Specifications and Technical Requirements Manual.

Solid State Protection System input relays and logic card times are also listed on Table I.B-1 and I.B-2. These individual components are specifically credited in this LAR because the remainder of the SSPS circuitry is considered as part of the final actuated device and will continue to be regularly tested during other routine test procedures. The input relay logic times are different depending on if the relay is normally energized or normally de-energized. These relays were evaluated in the Westinghouse WCAP and a detail of their response times can be found on page 4-24 of WCAP-14036. The time response for the SSPS logic circuits was also evaluated in the Westinghouse WCAP and page 4-24 documents a response time of 0.000349 seconds. Current North Atlantic response time procedures use 0.01 seconds as an acceptance criterion for this position of the SSPS.

North Atlantic believes the 0.01 second to be a reasonable value for SSPS logic performance. This value envelopes the WCAP performance criteria and when summed with other protection channel response times yields total channel response times within the bounds of our accident analysis. Therefore, North Atlantic has listed 0.01 seconds for the response time of the SSPS logic circuits in Table I.B-1 and I.B-2 of the LAR.

ENCLOSURE 2 TO NYN-02035

TABLE I.B-1

Reactor Trip System (RTS) Response Time Allocations

RTS Function	Sensor		7300 Process Cabinet		SSPS Input Relay / Logic (Note 1)
	Type	(Sec.)	String	(Sec.)	(Sec.)
NIS PR High & Low SP	(Note 2)	(Note 2)	NIS cabinet	0.065 (Note 3)	0.020 / 0.01
NIS PR High Positive Rate	(Note 2)	(Note 2)	NIS cabinet	0.300 (Note 4)	0.020 / 0.01
NIS PR High Negative Rate	(Note 2)	(Note 2)	NIS cabinet	0.200 (Note 3)	0.020 / 0.01
OTΔT, OPΔT / T_{avg}	(Note 5)	(Note 5)	NRA+NSA+ NSA+NSA+ NAL	0.400	0.020 / 0.01
Pressurizer Pressure Low & High	Rosemount 1154 GP9	0.200	NLP+NAL	0.100	0.020 / 0.01
Reactor Coolant Flow Low	Westinghouse Veritrak 76 DP1 & Tobar 32 DP2	0.400	NLP+NAL	0.100	0.020 / 0.01
S/G Level Low-Low	Rosemount 1154 DP4	0.500	NLP+NAL	0.100	0.020 / 0.01
RCP Undervoltage	(Note 6)	(Note 6)	---		---
RCP Underfrequency	(Note 6)	(Note 6)	---		---

Notes:

1. For the Input Relays, the response time allocation is 0.020 sec. for normally energized relays.
2. Nuclear Instrumentation detectors are not response time tested.
3. Westinghouse Nuclear Instrumentation Cabinet time allocation from WCAP-14036-P-A, Revision 1 (Reference 2).
4. Westinghouse Nuclear Instrumentation Cabinet time allocation from Seabrook Station Plant Data.
5. Periodic response time testing of the Resistance Temperature Detectors (RTDs) will continue.
6. Periodic response time testing of these functions will continue.

TABLE I.B-2
Engineered Safety Features Actuation System (ESFAS) Response Time Allocations

ESFAS Function	Sensor		7300 Process Cabinet String	SSPS Input Relay / Logic (Note 1)
	Type	(Sec.)	(Sec.)	(Sec.)
Containment Pressure HI-1	Westinghouse Barton 752	0.400	NLP & NAL 0.100	0.020 / 0.01
Pressurizer Pressure Low	Rosemount 1154 GP9	0.200	NLP & NAL 0.100	0.020 / 0.01
Steam Pressure Low	Westinghouse Veritrak 76 PG1, Tobar 32 PA2, Rosemount 1153 GB9	0.200	NLP & NAL 0.100	0.020 / 0.01
Containment Pressure HI-3	Westinghouse Barton 752	0.400	NLP & NAL 0.100	0.026 / 0.01
Containment Pressure HI-2	Westinghouse Barton 752	0.400	NLP & NAL 0.100	0.020 / 0.01
Steam Line Hi Negative Rate	Westinghouse Veritrak 76 PG1	0.400	NLP & NAL 0.100	0.020 / 0.01
S/G Level HI-HI	Rosemount 1154 DP4	0.500	NLP & NAL 0.100	0.020 / 0.01
S/G Level Low-Low	Rosemount 1154 DP4	0.500	NLP & NAL 0.100	0.020 / 0.01
Emergency Feedwater Flow	Rosemount 1153 DB5	0.200	(Note 2)	---
RWST Level Low-Low	Westinghouse Veritrak 76 DP1	0.400	NLP & NAL 0.100	0.026 / 0.01
LOP Diesel Generator Start	(Note 2)	(Note 2)	---	---
CBA Actuation on Control Room HI Radiation	(Note 2)	(Note 2)	---	---

Notes:

1. For the Input Relays, the response time allocation is 0.020 sec. for normally energized relays, and 0.026 sec. for normally de-energized relays.

2. Periodic response time testing of these functions will continue.

ENCLOSURE 3 TO NYN-02035

Rosemount 1154DP4	
Year	**Response Time***
87	0.228 / 0.249
89	0.203 / 0.350
91	0.120 / 0.275
91	0.294 / 0.385
92	0.150 / 0.240
92	0.160 / 0.220
92	0.160 / 0.245
92	0.180 / 0.260
94	0.035 / 0.125
94	0.058 / 0.165
94	0.072 / 0.245
95	0.085 / 0.160
95	0.110 / 0.230
95	0.170 / 0.210
95	0.178 / 0.295
95	0.240 / 0.260
97	0.105 / 0.260
97	0.130 / 0.310
97	0.130 / 0.260
97	0.140 / 0.150
97	0.170 / 0.240
97	0.170 / 0.370
97	0.260 / 0.390
99	0.065 / 0.205
99	0.240 / 0.320
99	0.280 / 0.360
99	0.360 / 0.320
00	0.280 / 0.450
00	0.290 / 0.400
00	0.300 / 0.380
00	0.400 / 0.500
01	0.180 / 0.260

Rosemount 1154GP9	
Year	**Response Time***
91	0.015 / 0.020
92	0.030 / 0.030
94	0.070 / 0.088
95	0.080 / 0.113
95	0.120 / 0.120
96	0.013 / 0.018
97	0.008 / 0.010
97	0.050 / 0.100
99	0.003 / 0.013

Rosemount 1153DB5	
Year	**Response Time**
97	0.010
97	0.045
97	0.045
97	0.0525
98	0.035
98	0.0375
99	0.053
99	0.075
00	0.040
00	0.050

Rosemount 1153DB5	
Year	**Response Time**
97	0.040
97	0.040
97	0.047
97	0.050
98	0.035
98	0.040
99	0.055
99	0.070
00	0.045
00	0.050

Rosemount 1153GB9	
Year	**Response Time**
00	0.0125
01	0.010

* Double entries are based on increasing and decreasing process ramps.

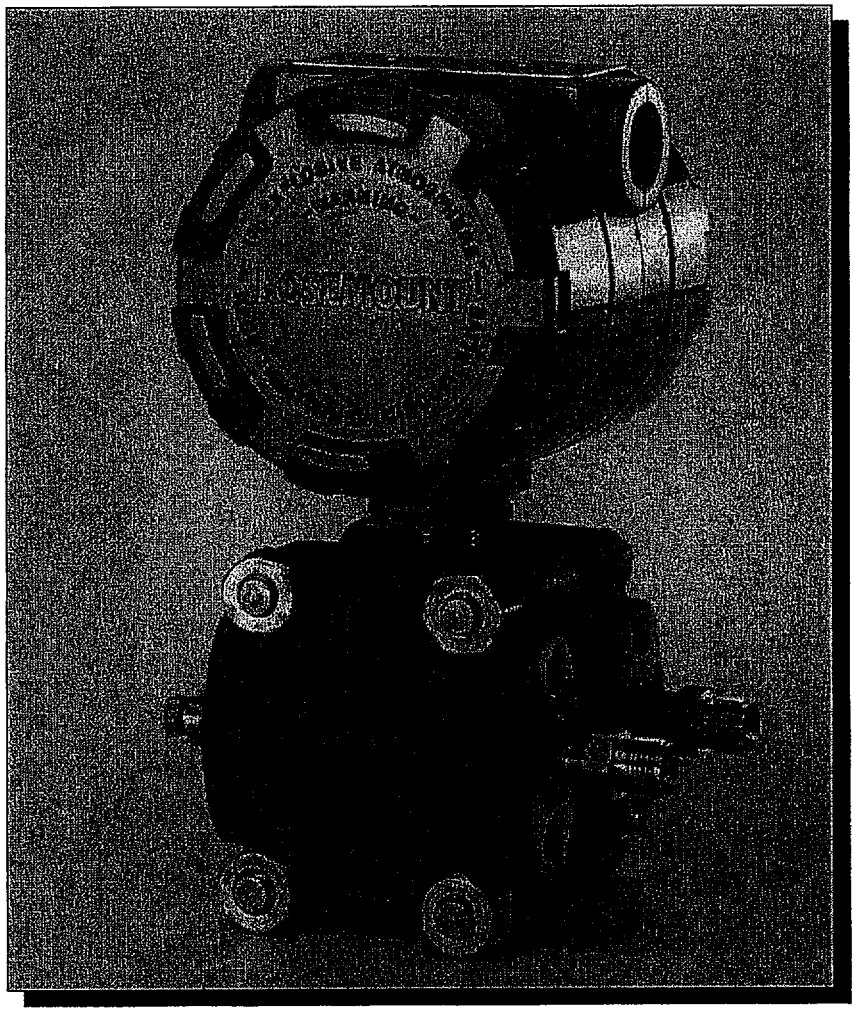
NIS POWER HIGH POSITIVE RATE TRIP	
Year	**Response Time***
97	0.236 / 0.236
97	0.237 / 0.236
97	0.250 / 0.245
97	0.257 / 0.260
97	0.262 / 0.265
98	0.275 / 0.277
99	0.217 / 0.220
00	0.223 / 0.222

* Double entries are based on increasing and decreasing process ramps.

ENCLOSURE 4 to NYN-02035

00813-0100-4302
English
May 1999
Rev. AB

Model 1153 Series B Alphaline® Nuclear Pressure Transmitter



ROSEMOUNT NUCLEAR

FISHER ROSEMOUNT™ Managing The Process Better.™

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

INTRODUCTION

Model 1153 Series B Alphaline® Nuclear Pressure Transmitters are designed for precision pressure measurements in nuclear applications that require reliable performance and safety over a specified qualified life. The transmitters were qualified per IEEE Std 323-1974 and IEEE Std 344-1975 at radiation levels of 22 megarads TID gamma radiation, seismic levels of 4 g, 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

Model 1153 Transmitters are of a design unique to class 1E nuclear service while retaining the basic design of the Model 1151 Series that has become a standard of reliable service. Units are available in absolute (A), gage (G), differential (D), and high-line differential (H) configurations, with up to seven 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 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 of the Model 1153 Series B Nuclear 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). A reference pressure is transmitted in the same manner to the other side of the sensing diaphragm. 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 dc signal.

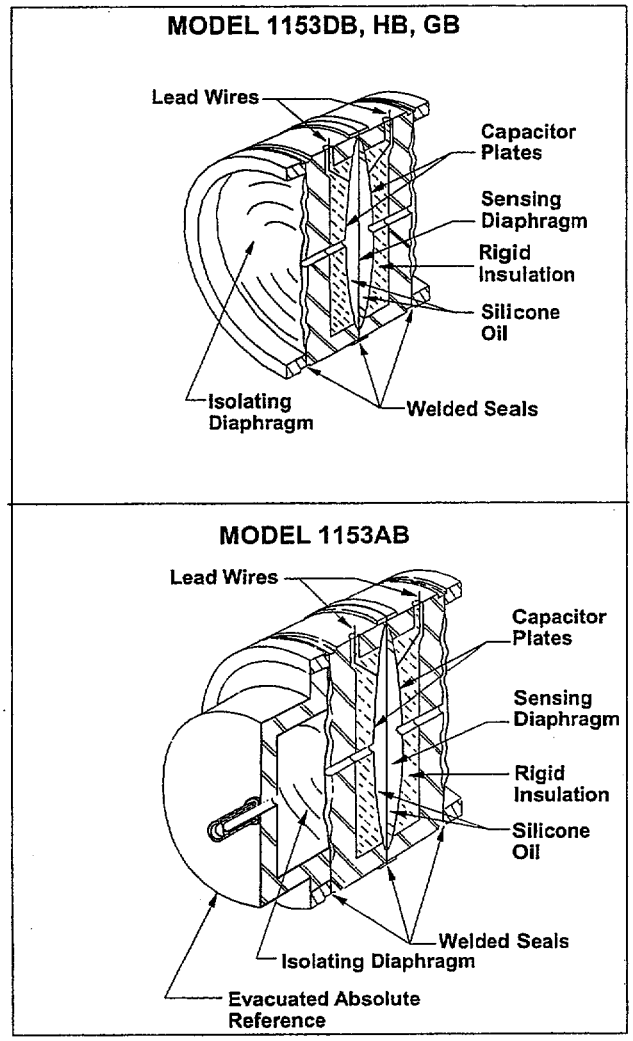


FIGURE 1.The δ-Cell.

Model 1153 Series B Alphaline Pressure Transmitters may be protected by one or more of the following U.S. Pat. Nos. 3,618,390; 3,646,538; 3,800,413; 3,975,719; and Re. 30,603. May depend on model. Other foreign patents issued and pending.

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

Rosemount, the Rosemount logotype, and Alphaline are registered trademarks and δ-Cell is a trademark of Rosemount Inc.
Swagelok is a registered trademark of Crawford Fitting Co.
Cover Photo: 1152-002AB

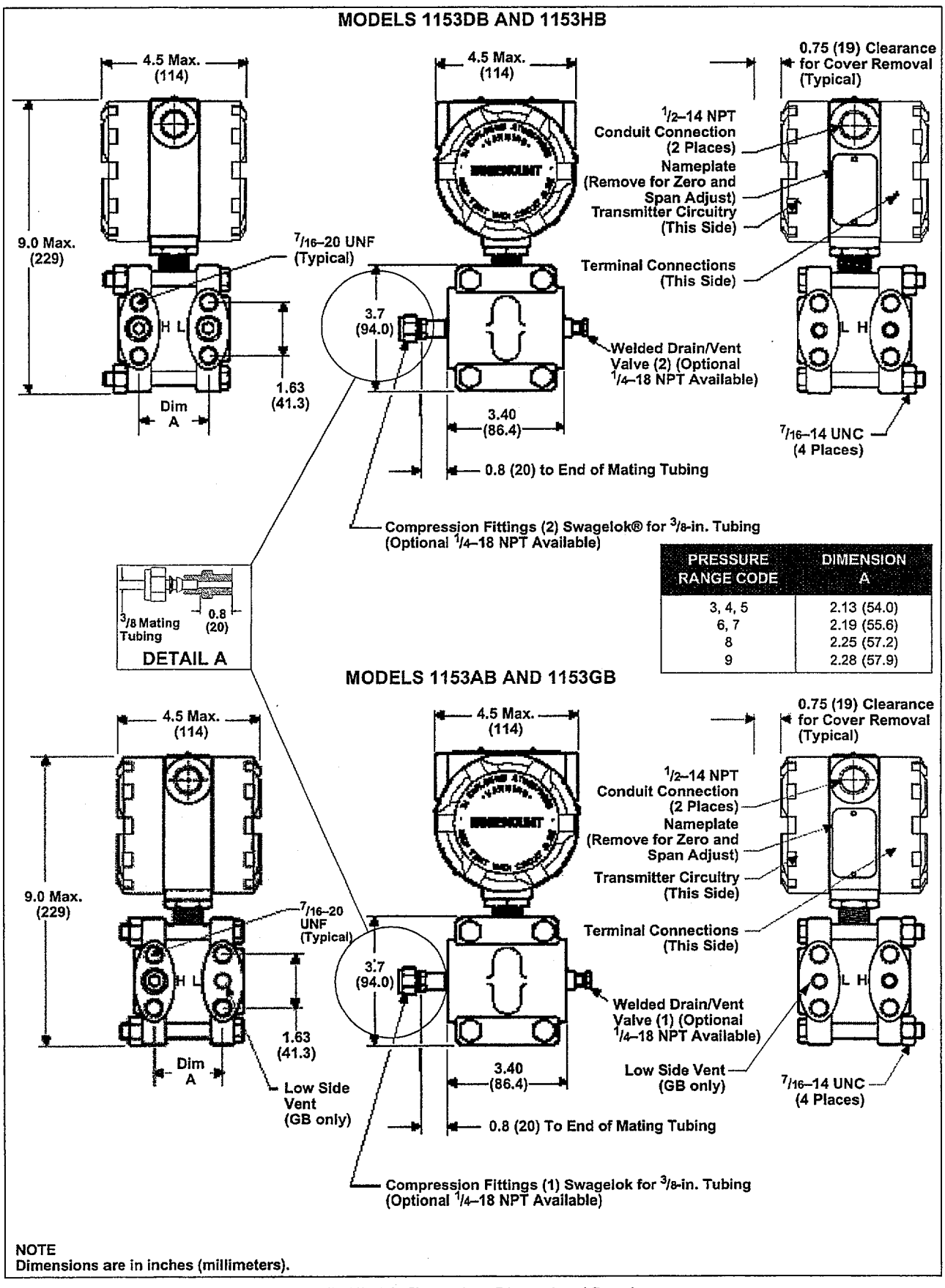


FIGURE 2. Transmitter Dimensional Drawings.

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 ±8.0% of upper range limit during and after exposure to 2.2 x 10^7 rads, total integrated dosage of gamma radiation

Seismic:

Accuracy within ±0.5% of upper range limit during and after a seismic disturbance defined by a required response spectrum with a ZPA of 4 g

Steam Pressure/Temperature:

Accuracy within ±(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 ±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 ±5% of upper range limit for one year following DBE

Output Code R

Radiation:

Accuracy within ±4.0% of upper range limit during and after exposure to 2.2 x 10^7 rads, total integrated dosage of gamma radiation

Seismic:

Accuracy within ±0.5% of upper range limit during and after a seismic disturbance defined by a required response spectrum with a ZPA of 4 g

Steam Pressure/Temperature:

Accuracy within ±(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 ±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 ±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

Nuclear Cleaning:

To 1 ppm maximum chloride content

Hydrostatic Testing:

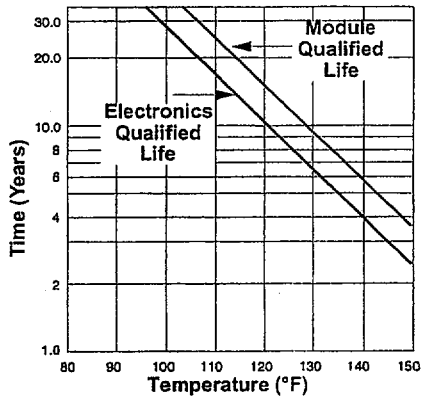
To 150% of maximum working pressure or 2,000 psi (13.8 MPa), whichever is greater

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)



1154-0293A

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

Model 1153DB:
Maximum zero shift after 2,000 psi (13.8 MPa) 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

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

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

Model 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

Model 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

Model 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 inH_2O (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 is available through special N option.

Functional Specifications

Service

Liquid, gas, or vapor

Output

4–20 mA dc

Power Supply

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

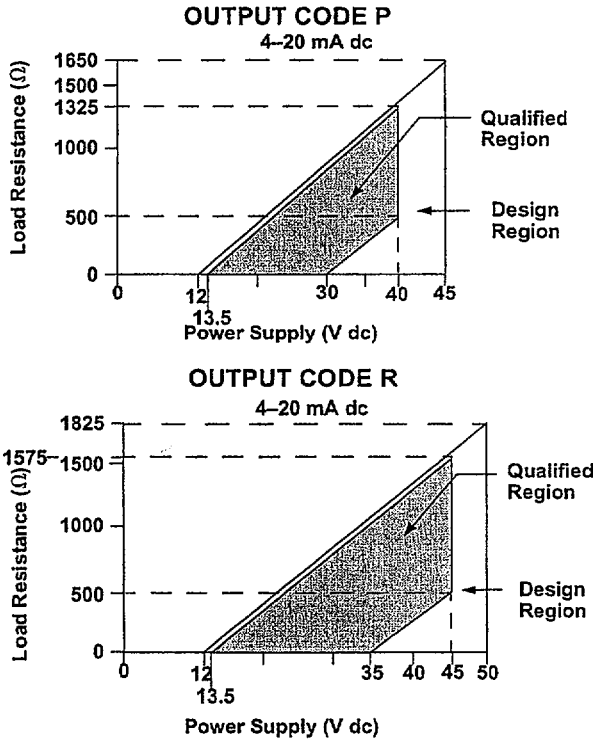


FIGURE 4. Transmitter Load Limits.

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 in^3 (0.16 cm^3)

Turn-on Time

2 seconds maximum. No warm-up required.

Pressure Ranges

Models 1153DB and 1153HB:

Range Code	Pressure Ranges
3	0–5 to 0–30 inH_2O (D units only) (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH_2O (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 (D units only) (0–1.17 to 0–6.89 MPa)

Model 1153GB and 1153AB:

Range Code	Pressure Ranges
3	0–5 to 0–30 inH_2O (G units only) (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH_2O (G units only) (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH_2O (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)
9	0–500 to 0–3,000 psi (G units only) (0–3.45 to 0–20.68 MPa)

Maximum Working Pressure

Model 1153DB and 1153HB:
Static pressure limit

Model 1153GB and 1153AB:
Upper range limit

Static Pressure and Overpressure Limits

Model 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

Model 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

Model 1153GB and 1153AB:
Operates within specifications from 0.5 psia (3.4 kPa abs) to upper range limit. Overpressure limits without damage to the 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)

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):
SAEJ429 carbon steel, Grade 2 or Grade 5

Process Connections

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

Electrical Connections

1/2–14 NPT conduit with screw terminals

Weight

13 lb (5.9 kg) including mounting bracket

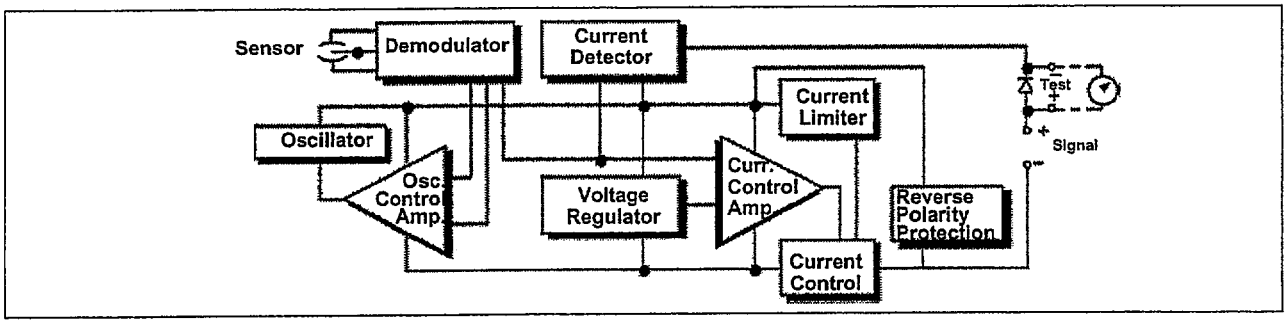


FIGURE 5. Electrical Block Diagram.

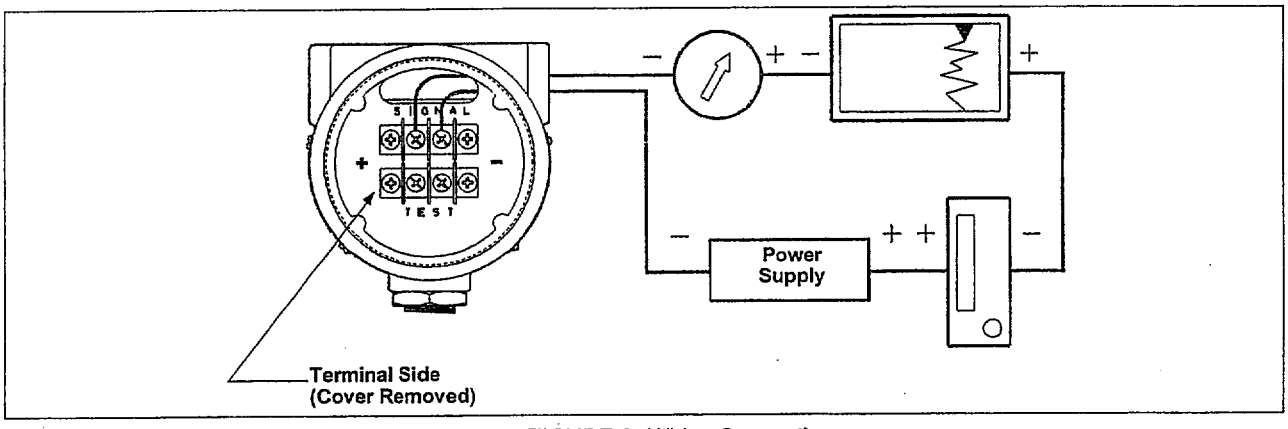


FIGURE 6. Wiring Connections.

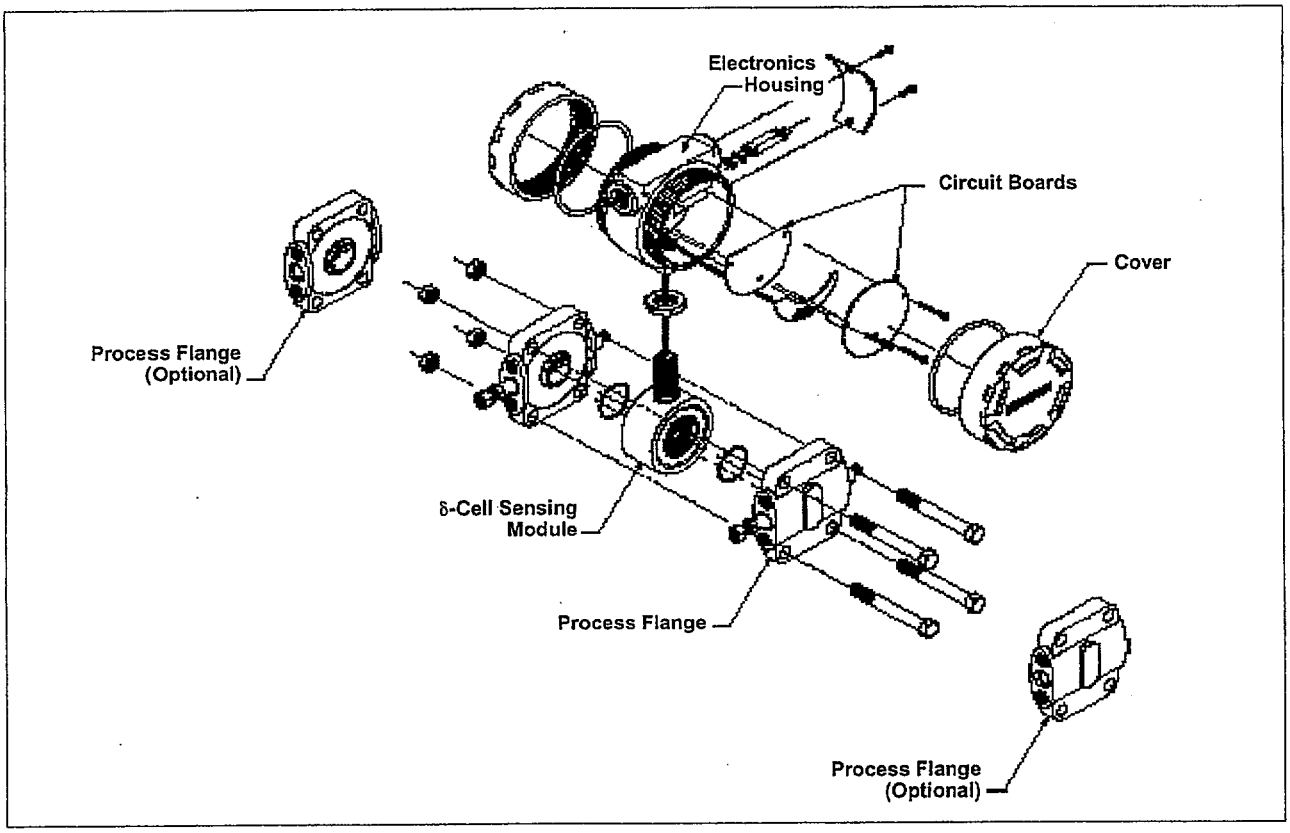


FIGURE 7. Typical Model 1153 Series B Pressure Transmitter, Exploded View.

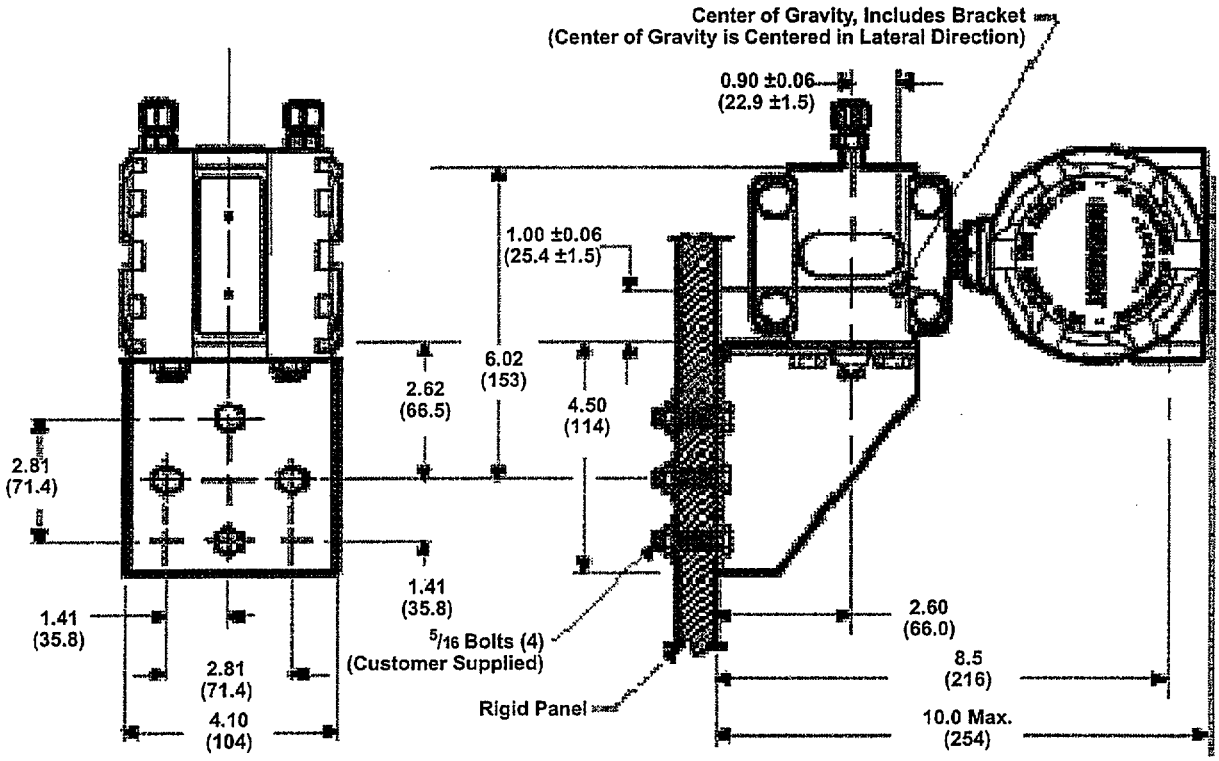


FIGURE 8. Typical Mounting Configuration.

ORDERING INFORMATION

Code	Transmitter Type			
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			
Code	**Pressure Ranges at 68 °F**			
	Model 1153DB (Differential)	**Model 1153HB (Differential)**	**Model 1153AB (Absolute)**	**Model 1153GB (Gage)**
3	0–5 to 0–30 inH_2O (0–1.24 to 0–7.46 kPa)	NA	NA	0–5 to 0–30 inH_2O (0–1.24 to 0–7.46 kPa)
4	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)	NA	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH_2O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH_2O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH_2O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH_2O (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)	NA	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	NA	NA	NA	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)	¼–18 NPT Process Connection and Welded Drain/Vent Valves			
C(2)	¼–18 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 ¼–18 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 D B 4 R A***			

*(1) The Model 1153 Series B with the R Output Code Electronics is also available with adjustable damping. This option is specified by adding "N0037" to the end of the complete model number. For example: 1153DB4RA**N0037**.*

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

Standard Accessories

All models are shipped with a mounting bracket. One instruction manual is included with each 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 height is 0.125 in. (3.18 mm). A wire-on tag is available on request.

Documentation

Certification is provided for each Model 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 Nuclear Instruments, Inc.
12001 Technology Drive
Eden Prairie, MN 55344
Tel (612) 828-8252
Telex 4310012
Fax (612) 828-8280

http://www.rosemount.com

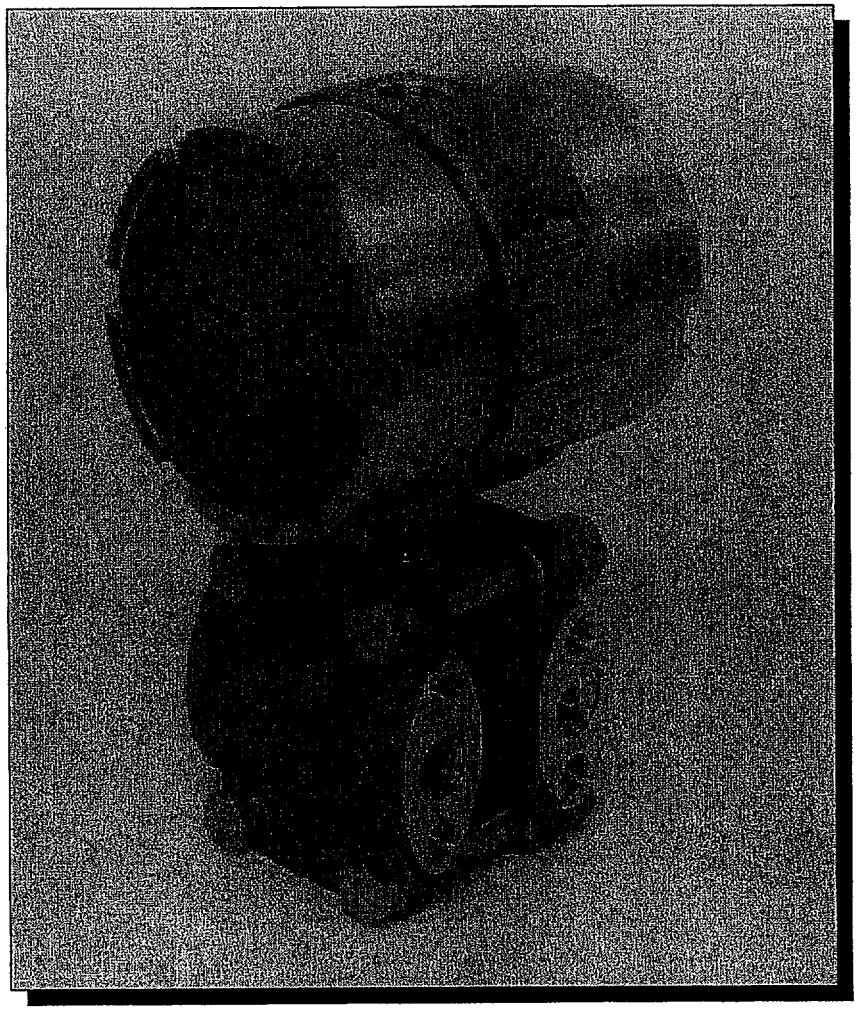
ROSEMOUNT NUCLEAR

FISHER-ROSEMOUNT Managing The Process Better.™

00813-0100-4302 Rev. AB

00813-0100-4514
English
June 1999
Rev. AA

Model 1154 Alphaline® Nuclear Pressure Transmitter



ROSEMOUNT® NUCLEAR

FISHER-ROSEMOUNT™ Managing The Process Better.™

- *Qualified per IEEE Std 323-1974 and IEEE Std 344-1975*
- *1.1 × 10^8 rads TID gamma radiation*
- *7 g ZPA seismic*
- *420 °F (215.6 °C) steam temperature*
- *0.25% accuracy*

INTRODUCTION

Model 1154 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 323-1974 and IEEE Std 344-1975 to radiation levels of 110 megarads TID gamma radiation, seismic levels of 7 g, and steam-pressure performance up to 420 °F (216 °C). Stringent quality control during the manufacturing process includes traceability of pressure-retaining parts, special nuclear cleaning, and hydrostatic testing.

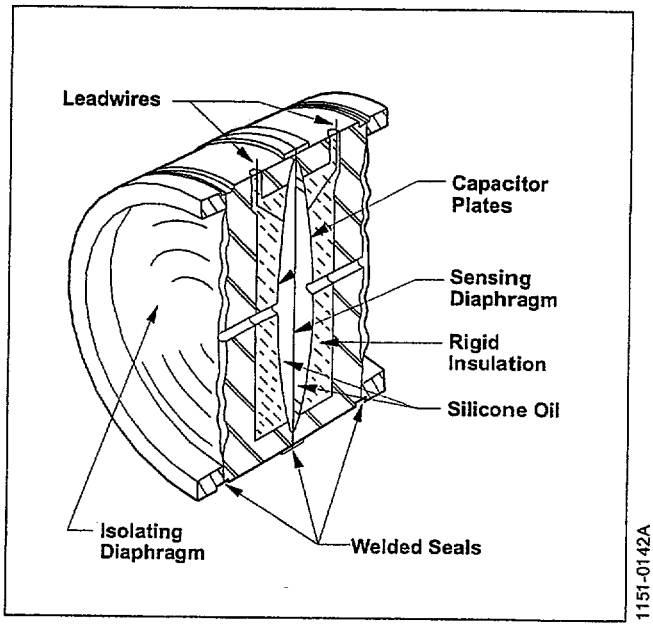


FIGURE 1.The δ-Cell.

TRANSMITTER DESCRIPTION

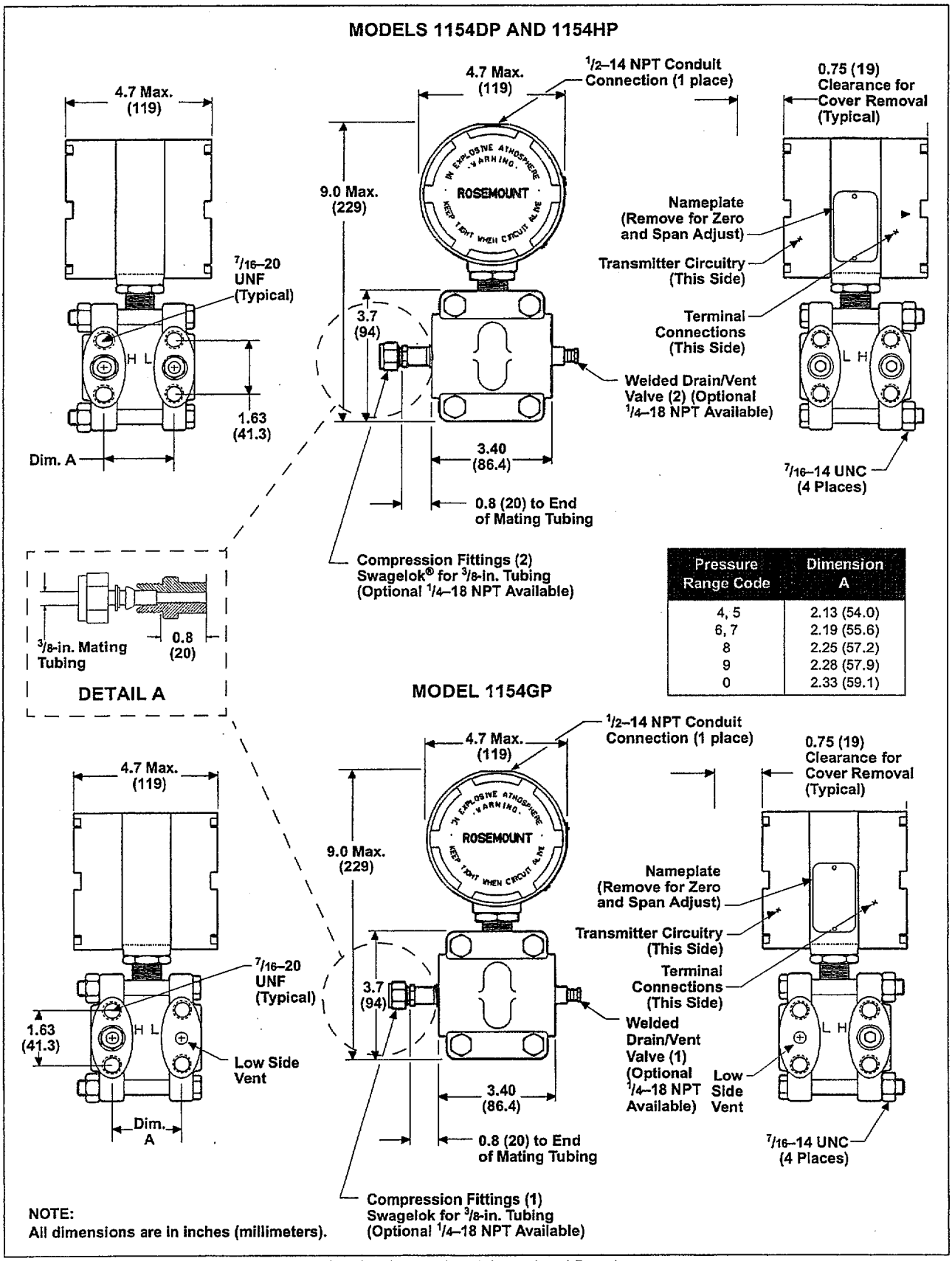
Model 1154 Alphaline Nuclear Pressure Transmitters are uniquely built for Class 1E nuclear service while retaining the basic design parameters of the Model 1151 Series that has become a standard for reliable service. Units are available in gage (G), differential (D), and high-line differential (H) configurations, with up to seven 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 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 of the Model 1154 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). A reference pressure is transmitted in the same manner to the other side of the sensing diaphragm. 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 dc signal.

Cover Photo: 1152-001AB



Pressure Range Code	Dimension A
4, 5	2.13 (54.0)
6, 7	2.19 (55.6)
8	2.25 (57.2)
9	2.28 (57.9)
0	2.33 (59.1)

1154-1154A05A, 1154B05A, 1154C05A, 0296A

1154-1154D05A, 1154B05A, 1154F05A

FIGURE 2. Transmitter Dimensional Drawing.

SPECIFICATIONS

Nuclear Specifications

Qualified per IEEE Std 323-1974 and IEEE Std 344-1975, as stated in Rosemount Report D8400102

Radiation

Accuracy within ±(1.5% of upper range limit + 1.0% of span) during and after exposure to 55 megarads TID gamma radiation at the centerline at the following dose rate: 2 megarads/hr for 2 hr, 1.5 megarad/hr for 4 hr, 1 megarad/hr up to 55 megarads TID and an additional 55 megarads TID at a rate of 1 megarad/hr during post-accident operation

Range Code 0: ±(2.25% of upper range limit + 1.0% of span)

Seismic

Accuracy within ±0.5% of upper range limit after a seismic disturbance defined by a required response spectrum with a ZPA of 7 g

Range Code 0: ±0.75% of upper range limit

Steam Pressure/Temperature

Accuracy within ±(2.5% upper range limit + 0.5% of span) during and after sequential exposure to steam at the following temperatures and pressures, concurrent with chemical spray for the first 24 hr:

420 °F (215.6 °C), 50 psig for 3 minutes
350 °F (176.6 °C), 110 psig for 7 minutes
320 °F (160.0 °C), 75 psig for 8 hours
265 °F (129.4 °C), 24 psig for 56 hours

Range Code 0: ±(3.75% of upper range limit + 0.5% of span)

Chemical Spray

Composition is 0.28 molar boric acid, 0.064 molar sodium thiosulfate, and sodium hydroxide to make an initial pH of 11.0 and a subsequent pH ranging from 8.5 to 11.0. Chemical spray is sprayed at a rate of 0.25 gal/min/ft^2.

Post DBE Operation

Accuracy at reference conditions shall be within ±2.5% of upper range limit (±3.75% for Range Code 0) for one year following DBE.

Quality Assurance Program

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

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, 10CFR50 Appendix B; chemical and physical material certification of pressure retaining parts

Qualified Life

The transmitter qualified life is dependent on continuous ambient temperature at the installation site (see Figure 3). Replacement of amplifier and calibration circuit boards at the end of their qualified life permits extension of the transmitter qualified life to the module qualified life. See Rosemount Report D8400102 for details.

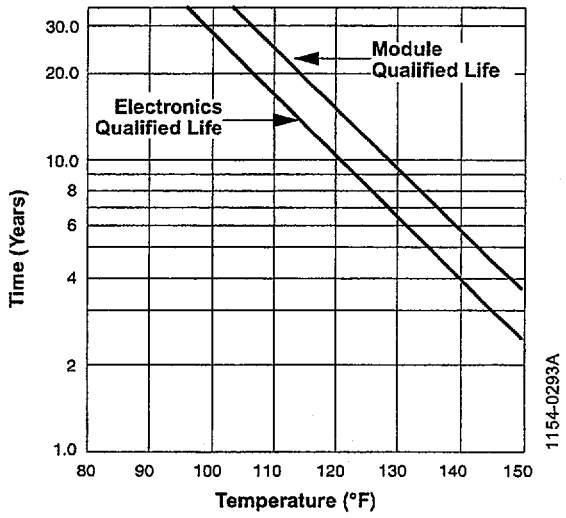


FIGURE 3. Qualified Life vs. Ambient Temperature.

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 30 months

Range Code 0: ±(0.3% of upper range limit)

Temperature Effect

Range Codes 4–9:
±(0.75% upper range limit +0.5% span) with an ambient temperature change of 100 °F (55.6 °C)

Range Code 0:
±(1.13% upper range limit +0.5% span) with an ambient temperature change of 100 °F (55.6 °C)

Overpressure Effect

Model 1154DP:
Maximum zero shift after 2,000 psi (13.8 MPa) overpressure:

Range Code	Overpressure Effect
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

Model 1154HP:
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

Model 1154GP:
Maximum zero shift after 2,000 psi (13.8 MPa) overpressure:

Range Code	Overpressure Effect
4	±0.25% of upper range limit
5–8	±1.0% of upper range limit

After 4,500 psi (31.0 MPa) overpressure:

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

After 6,000 psi (41.37 MPa) overpressure:

Range Code	Overpressure Effect
0	±0.25% of upper range limit

Static Pressure Zero Effect

Model 1154DP:
Per 1,000 psi (6.89 MPa):

Range Code	Static Pressure Zero Effect
4, 5	±0.2% of upper range limit
6–8	±0.5% of upper range limit

Model 1154HP:
Per 1,000 psi (6.89 MPa):

Range Code	Static Pressure Zero Effect
All Ranges	±0.66% 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 ±0.5% of input reading/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 inH_2O (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
4	0.5 seconds or less
all others	0.2 seconds or less

Adjustable damping is available through a special N option.

Functional Specifications

Service

Liquid, gas, or vapor

Output

4–20 mA dc

Power Supply

Design limits are as shown in Figure 4. See qualification report D8400102 for additional detail.

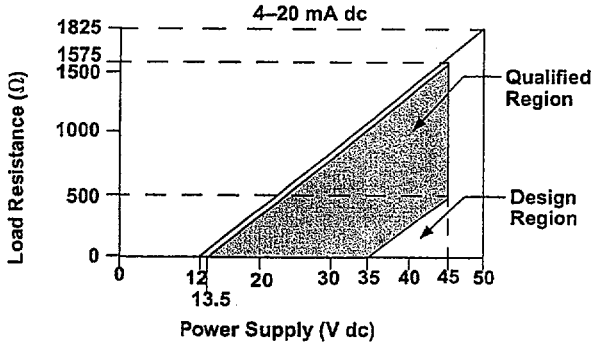


FIGURE 4. Transmitter Load Limits.

Span and Zero

Continuously adjustable externally

Zero Elevation and Suppression

Maximum zero elevation: 600% of calibrated span (400% of calibrated span for Range Code 0)

Maximum zero suppression: 500% of calibrated span (300% of calibrated span for Range Code 0)

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 (–40.0 to 48.9 °C)

Humidity Limits
0–100% relative humidity (NEMA 4X)

Volumetric Displacement
Less than 0.01 in^3 (0.16 cm^3)

Turn-on Time
2 seconds maximum. No warm-up required

Pressure Ranges
Model 1154DP and 1154HP:

Range Code	Pressure Ranges
4	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH_2O (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)

Model 1154GP:

Range Code	Pressure Ranges
4–8	as listed for Model 1154DP
9	0–500 to 0–3,000 psi (0–3.45 to 0–20.68 MPa)
0	0–1,000 to 0–4,000 psi (0–6.89 to 0–27.56 MPa)

Maximum Working Pressure
Model 1154DP and 1154HP:
Static pressure limit

Model 1154GP:
Upper range limit

Static Pressure and Overpressure Limits
Model 1154DP:
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.

Model 1154HP:
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
Model 1154GP:
Operates within specifications from 0.5 psia (3.4 kPa abs) to upper range limit. Overpressure limits without damage to the transmitter:

Range Code	Overpressure Limit
4–8	2,000 psig (13.8 MPa)
9	4,500 psig (31.0 MPa)
0	6,000 psig (41.34 MPa)

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

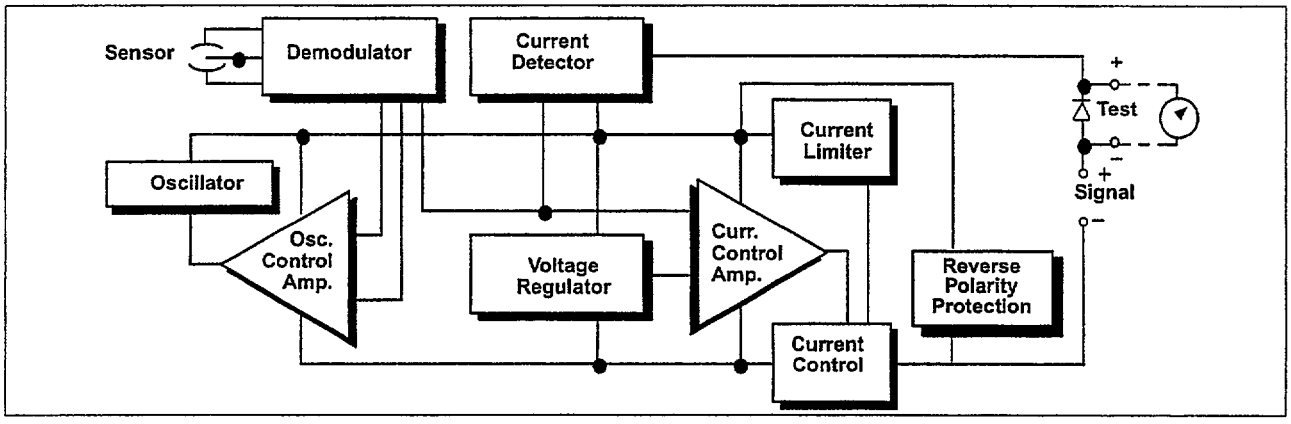


FIGURE 5. Electrical Block Diagram.

Fill Fluid:
Silicone oil

Flange Bolts and Nuts:
Plated alloy steel, as specified in ASTM A540

Electronics Housing:
316 SST

Mounting Bracket:
316L SST

Mounting Bolts (Bracket to Transmitter):
SAE J429 carbon steel, Grade 2 or Grade 5.

Electrical Connections
½–14 NPT conduit with screw terminals

Process Connections
⅜-in. Swagelok compression fitting, 316 SST (¼–18 NPT optional)

Weight
24 lb (10.9 kg) including mounting bracket

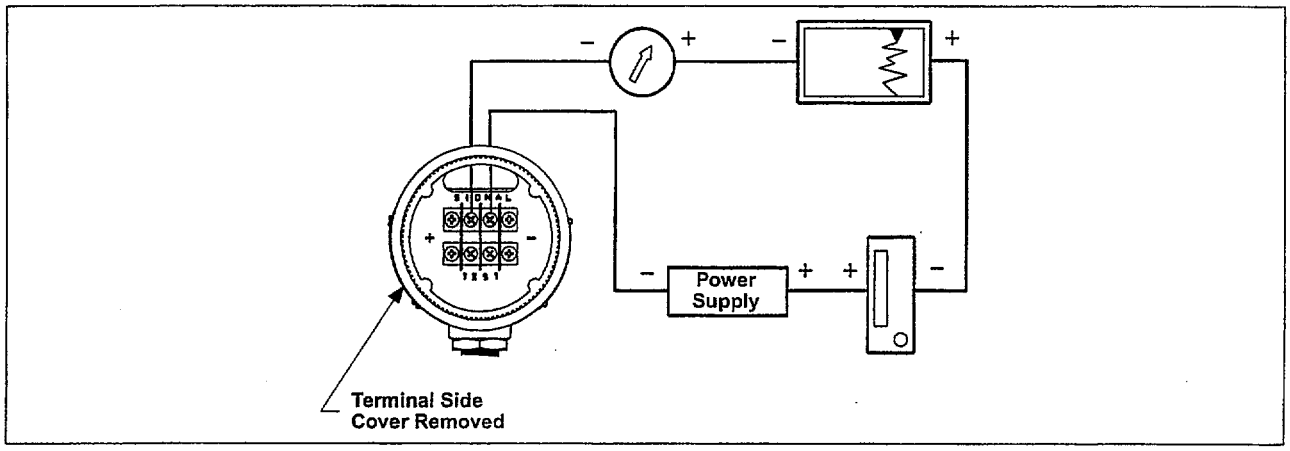


FIGURE 6. Wiring Connections.

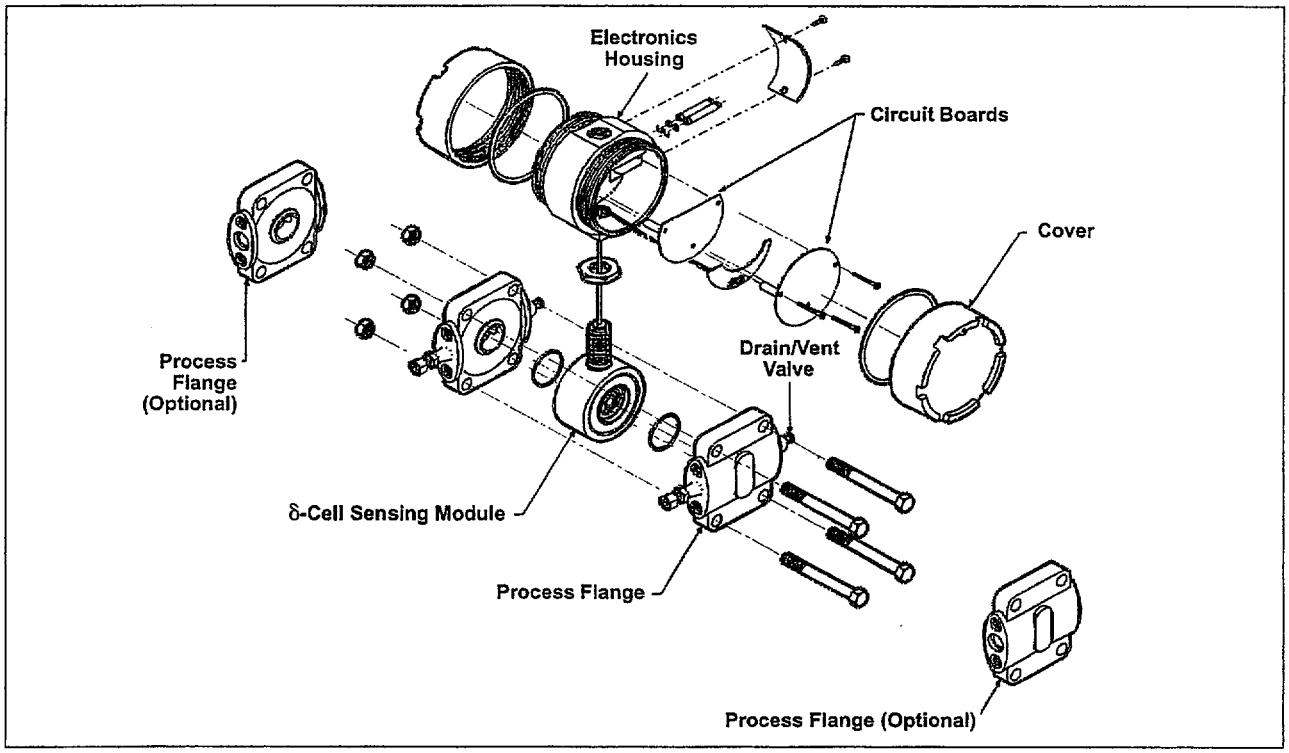
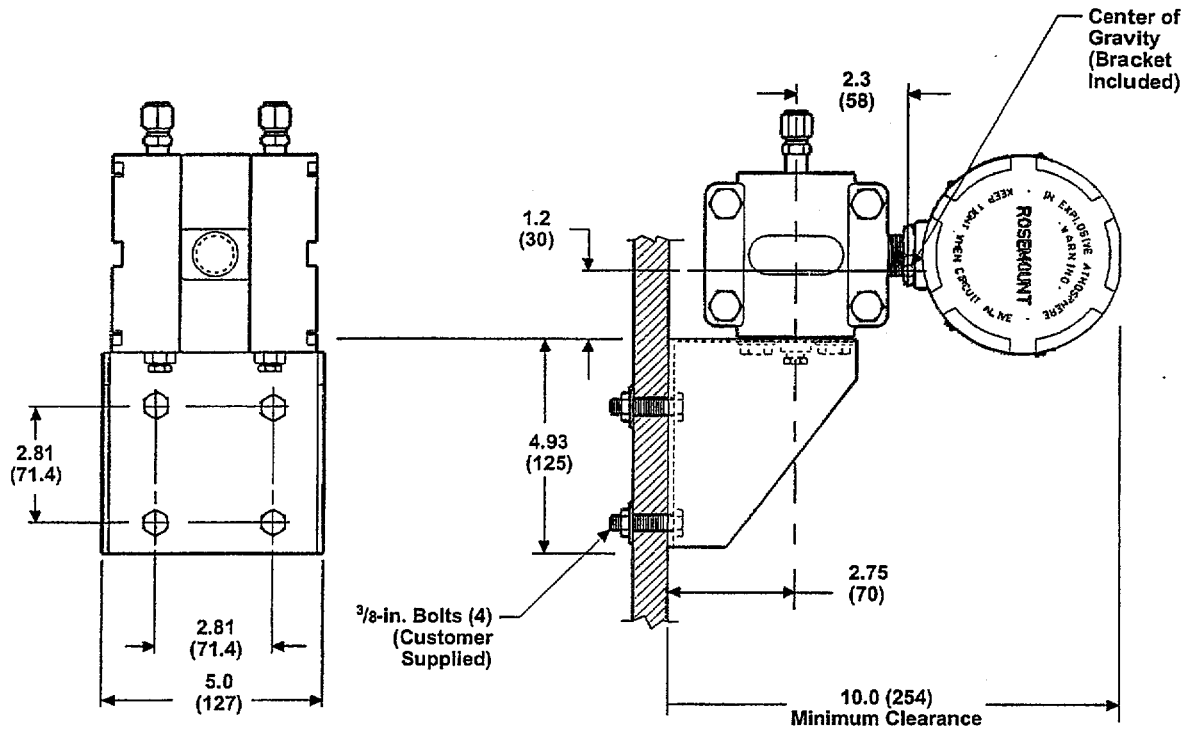
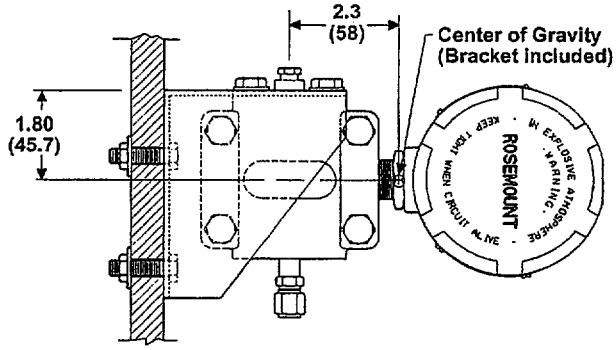


FIGURE 7. Typical Model 1154 Transmitter Exploded View.



PANEL MOUNTING HOLE PATTERN (Back Side)

MOUNTING BRACKET FOR PANEL MOUNT SHOWN IN TYPICAL MOUNTING CONFIGURATION



ACCEPTABLE ALTERNATE MOUNTING

NOTE:
All dimensions are in inches (millimeters).

1154-1154a99c, 1154d99a

FIGURE 8. Model 1154 Typical Mounting Configuration.

ORDERING INFORMATION

Model	Description		
1154	*Alphaline* Pressure Transmitters for Nuclear Applications (Qualified per IEEE Std 323-1974 and Std 344-1975)		
Code	**Pressure Measurement**		
DP	Differential Pressure, 2,000 psig (13.8 MPa) Static Pressure Rating		
HP	Differential Pressure, 3,000 psig (20.68 MPa) Static Pressure Rating		
GP	Gage Pressure		
Code	**PRESSURE RANGES at 68°F**		
	Model 1154DP (Differential)	**Model 1154HP (Differential)**	**Model 1154GP (Gage)**
4	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)	0–25 to 0–150 inH_2O (0–6.22 to 0–37.3 kPa)
5	0–125 to 0–750 inH_2O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH_2O (0–31.08 to 0–186.4 kPa)	0–125 to 0–750 inH_2O (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)
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)
8	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	—	—	0–500 to 0–3,000 psi (0–3.45 to 0–20.68 MPa)
0	—	—	0–1,000 to 0–4,000 psi (0–6.89 to 0–27.56 MPa)
Code	**Output**		
R(1)	Standard 4–20 mA		
Code	**Flange Option**		
A	Welded 3/8-in. *Swagelok* Compression Fitting Process Connection and Welded Drain/Vent Valve		
B(2)	¼–18 NPT Process Connection and Welded Drain/Vent Valve		
C(2)	¼–18 NPT Process Connection and Drain Hole (Drain/Vent Valve not supplied)		
D	One Flange Option Code A and one Remote Seal		
E(2)	One Flange Option Code B and one Remote Seal		
F(2)	One Flange Option Code 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 ¼–18 NPT Drain Hole		
L	One Flange Option Code H and one Remote Seal		
M(2)	One Flange Option Code J and one Remote Seal		
Typical Model Number:	**1154 DP 4 R A**		

*(1) The Model 1154 with Output Code R Electronics is also available with adjustable damping. Specify adjustable damping by adding "N0037" to the end of the complete model number, for example: 1154DP4RA**N0037**.*

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

Standard Accessories

All models are shipped with a mounting bracket. One instruction manual is included per 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 reference conditions (ambient temperature and pressure).

Options

Consult the N Options Product Data Sheet 00813-0100-2655 or call 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 height is 0.125 in. (3.18 mm). A wire-on tag is available on request.

Documentation

Certification of compliance is provided for each Model 1154 Pressure 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.

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