Reference Manual
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June 2015

Rosemount 3155 Nuclear Pressure Transmitter

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EMERSON Process Management

Rosemount 3155 Nuclear Pressure Transmitter

NOTICE
Read this manual before working with the product. For personal and system safety, and for optimum performance, make sure you thoroughly understand the contents of this manual before installing, using or maintaining this product. For Assistance: Within the United States, contact Rosemount Nuclear Instruments, Inc. at 1-952-949-5210. Outside the United States, contact the nearest Rosemount representative. Customer Feedback: Your feedback is important to us, please send comments or suggestions to: Chan.RNII-CustomerFeedback@emersonprocess.com

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

Rosemount Nuclear Instruments, Inc. Warranty and Limitations of Remedy

The warranty and limitations of remedy applicable to this Rosemount equipment are as stated on the reverse side of the current Rosemount quotation and customer acknowledgment forms.

RETURN OF MATERIAL

Authorization for return is required from Rosemount Nuclear Instruments, Inc. prior to shipment. Contact Rosemount Nuclear Instruments, Inc. (1-952-949-5210) for details on obtaining Return Material Authorization (RMA). **Rosemount Nuclear Instruments will not accept any returned material without a Return Material Authorization.** Material returned without authorization is subject to return to customer.

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Rosemount Nuclear Instruments, Inc.
8200 Market Boulevard
Chanhassen, MN 55317
USA

IMPORTANT

Rosemount 3155 Pressure Transmitters are designed for Nuclear Class 1E usage, and have been tested to the standards shown below:

- IEEE Std 323™-1974, -1983 and -2003
- IEEE Std 344™-1975, -1987 and -2004

These transmitters are manufactured under a quality system that meets the requirements of 10CFR50 Appendix B, 10CFR Part 21, ISO 9001, NQA-1, KTA 1401, KTA 3507, CSA N285.0, CSA Z299 and the applicable portions of IAEA-50-C-Q. During qualification testing, interfaces were defined between the transmitter and its environment that are essential to meeting requirements of the qualification standards listed above. Specifically, to ensure compliance with 10CFR Part 21, the transmitter must comply with the requirements herein and in the applicable Rosemount qualification report(s) throughout its installation, operation and maintenance. It is incumbent upon the user to ensure that the Rosemount Nuclear Instruments, Inc.'s component traceability program is continued throughout the life of the transmitter.

In order to maintain the qualified status of the transmitter, the essential environmental interfaces must not be compromised. Performance of any operations on the transmitter other than those specifically authorized in this manual has the potential for compromising an essential environmental interface. **Where the manual uses the terms requirement, mandatory, must or required, the instructions so referenced must be carefully followed.** Rosemount Nuclear Instruments, Inc. expressly disclaims all responsibility and liability for transmitters for which the foregoing has not been complied with by the user.

Revision Status

Original Release: June 2015

Page (Rev --)	Page (Rev --)	Changes

NOTE
The above Revision Status list summarizes the changes made. Please refer to both manuals for complete comparison details.

Table of Contents

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Operation

SECTION 5
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SECTION 1: INTRODUCTION

USING THIS MANUAL

This manual is designed to assist in installing, operating and maintaining the Rosemount 3155 Pressure Transmitter. This manual is organized into the following sections:

Section 2: Installation
Provides general, mechanical and electrical installation considerations.

Section 3: Calibration
Provides transmitter calibration procedures.

Section 4: Operation
Provides a description of how the transmitter operates.

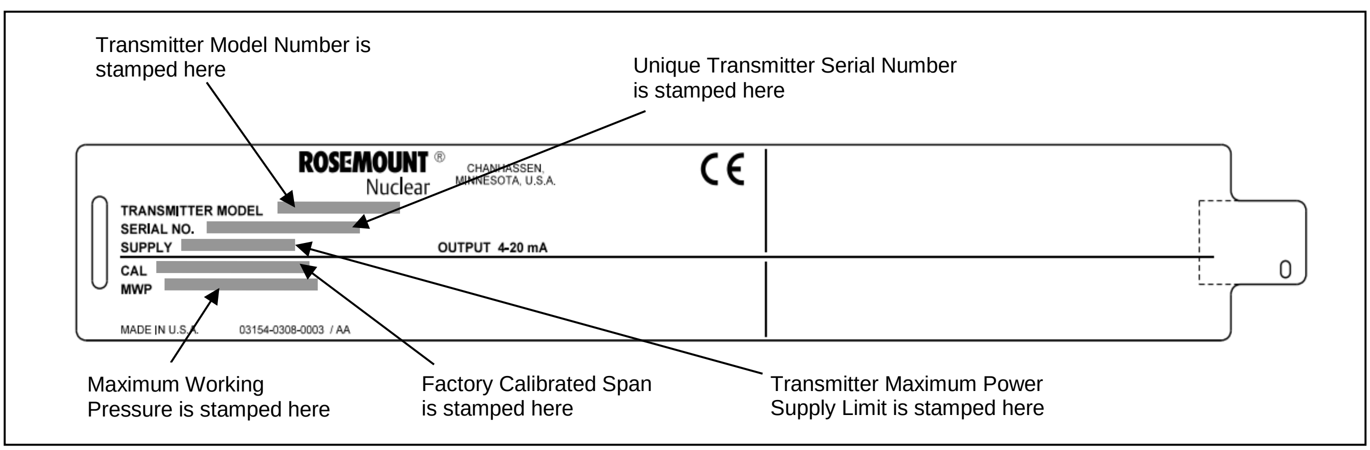
Section 5: Maintenance and Troubleshooting
Provides basic hardware troubleshooting considerations including disassembly and reassembly procedures and post assembly tests.

Section 6: Transmitter Spare Parts
Provides order information for transmitter spare parts.

NOTE
Refer to the applicable Rosemount Qualification/Test Reports, Product Data Sheets and/or Specification Drawings for details on testing, performance specifications and dimensional drawings for each model.

Figure 1-1 shows the standard transmitter nameplate and where transmitter information is stamped onto the nameplate. Nameplate material is stainless steel.

Figure 1-1 – Standard Transmitter Nameplate



SECTION 2: INSTALLATION

OVERVIEW

This section contains the following installation considerations:

- General Considerations
- Mechanical Considerations
  - Process Connections
  - Impulse Piping
  - Mounting Configurations
  - Conduit
  - Electrical Housing
- Electrical Considerations
- Installation Procedures
  - Mechanical

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Refer to the following safety messages before performing an operation preceded by this symbol ⚠.

Warnings

⚠ WARNING

Explosions can result in death or injury.

- Verify that the operating atmosphere of the transmitter is consistent with the appropriate qualification parameters.

WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

Replacement equipment or spare parts not approved by Rosemount Nuclear Instruments, Inc. for use could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous or adversely impact its qualified status.

- Use only components supplied with the Rosemount 3155 transmitter or designated by Rosemount Nuclear Instruments, Inc. as spare parts for the 3155.

Improper assembly of mounting bracket to traditional process flange can damage sensor module.

- For safe assembly of bracket to transmitter traditional process flange, bolts must break back plane of flange web (i.e. bolt hole), but must not contact module housing. Use only the Rosemount Nuclear Instruments Inc. approved bolts supplied with the bracket.

GENERAL CONSIDERATIONS

Measurement accuracy depends upon proper installation of the transmitter and its associated impulse piping and valves. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. For flow measurement, proper installation of the primary element is also critical to accuracy. Also, consider the need for easy access, personnel safety, practical field calibration and a suitable transmitter environment. Transmitter installation should minimize the effects of temperature gradients and fluctuations, and avoid vibration and shock during normal operation.

MECHANICAL CONSIDERATIONS

This section contains information you should consider when preparing to mount the transmitter. Read this section carefully before proceeding to the mechanical installation procedure. Proper installation is mandatory to assure seismic qualification.

WARNING

Do not attempt to loosen or remove flange bolts while the transmitter is in service.

NOTE

For steam service, do not blow down impulse piping through the transmitter. Flush the lines with the transmitter isolated and refill the lines with water before resuming measurement.

NOTE
When the transmitter is mounted on its side, position the traditional process flanges to ensure proper venting or draining. Keep drain/vent connections oriented on the bottom for gas service and on the top for liquid service.

Mount the Rosemount 3155 transmitter to a rigid support (i.e. one with a fundamental mechanical resonant frequency of 40 Hz or greater). A stainless steel panel bracket is provided with the 3155.

Refer to Figure 2-6 for qualified mounting configurations.

Orientation with respect to gravity is not critical to qualification. For maximum accuracy, zero the transmitter after installation to cancel any zero shift that may occur due to liquid head effect caused by mounting position. If ordered with Rosemount 3159 remote diaphragm seal, it is important to understand the final application installation and any potential liquid head effect due to height difference between the seal and the transmitter given the limited zero adjustment range of the Rosemount 3155 transmitter after manufacturing is complete. See Section 3 or contact Rosemount Nuclear Instruments, Inc. for more details.

NOTE
The transmitter is calibrated in an upright position at the factory. Mounting the transmitter in another position may cause the zero point to shift by an amount equivalent to the internal liquid head within the sensor module induced by the varied mounting position. For maximum accuracy, zero the transmitter to cancel this effect per **Section 3: Calibration**.

Mount the process flanges with sufficient clearance for process connections. For safety reasons, place the drain/vent valves so the process fluid is directed away from possible human contact when the vents are used. Also consider that access to the vent/drain valve(s) and process connection(s) may be required for plant specific operations (i.e. calibration, draining, etc.)

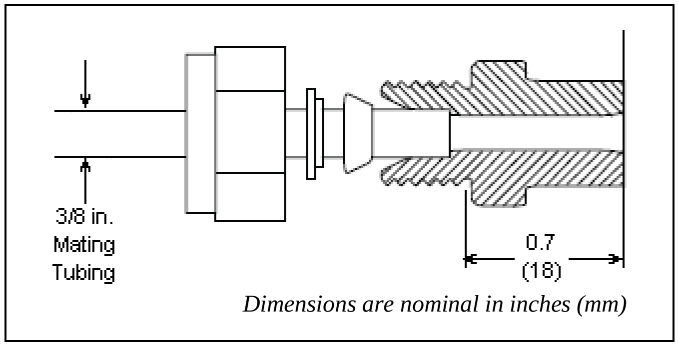
Process Connections and Interfaces

Process tubing must be installed to prevent any added mechanical stress on the transmitter under seismic conditions. Use stress-relief loops in the process tubing or separately support the process tubing close to the transmitter.

Typical connections on the transmitter flanges are ¼ - 18 NPT or 3/8 inch Swagelok ™. Use your plant-approved, qualified thread sealant when making threaded connections. The end-user is responsible for the qualification of the threaded seal interface on all ¼ - 18 NPT interfaces.

Transmitters with options including 3/8 inch Swagelok™ are shipped with front ferrule, rear ferrule and nut. Place these fittings on the tubing with the orientation and relative position shown in Figure 2-1. Use process tubing with 3/8 inch outside diameter and of suitable thickness for the pressure involved.

Figure 2-1 – Swagelok™ Compression Fitting Detail



The Swagelok™ tube fittings come completely assembled and are ready for immediate use. **Do not disassemble them before use** because dirt or foreign materials may get into the fitting and cause leaks. Insert the tubing into the Swagelok™ tube fitting, make sure the tubing rests firmly on the shoulder of the fitting and the nut is finger tight. Tighten the nut one-and-one-quarter turns. **Do not over-tighten.**

To reconnect, insert the tubing with pre-swaged ferrules into the fitting until the front ferrule sits in the fitting. Tighten the nut by hand, then rotate one-quarter turn more or to the original one-and-one-quarter tight position. Then snug it slightly with a wrench.

For more detailed information regarding the specifications and use of Swagelok™ tube fittings, refer to:

Fittings Catalog MS-01-140
"Gaugeable Tube Fittings and Adapter Fittings"
www.swagelok.com

If drain/vent valves are opened to bleed process lines, torque stems to the value in Table 5-2 in Section 5 Maintenance and Troubleshooting when closing.

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer (such as obstruction), leaks, friction loss (particularly if purging is used), trapped gas in a liquid line or liquid in a gas line and density variations between the legs.

Impulse Piping

The best location for the transmitter in relation to the process pipe depends on the process itself. Use the following guidelines to determine transmitter location and placement of impulse piping:

- Keep impulse piping as short as possible
- For liquid service, slope the impulse piping at least 1 inch per foot (8 cm per m) upward from the transmitter toward the process connection
- For gas service, slope the impulse piping at least 1 inch per foot (8 cm per m) downward from the transmitter toward the process connection
- Avoid high points in liquid lines and low points in gas lines

- Make sure both impulse legs are the same temperature
- Use impulse piping of large enough diameter to avoid friction effects and blockage
- Vent all gas from liquid piping legs
- Vent all liquid from gas piping legs
- When using a sealing fluid, fill both piping legs to the same level
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe – avoid purging through the transmitter
- Keep corrosive or hot process material out of direct contact with the transmitter
- Prevent sediment deposits in the impulse piping
- Keep the liquid balanced on both legs of the impulse piping
- Avoid conditions that might allow process fluid to freeze within the process flange
- Make sure the impulse piping is of adequate strength to be compatible with anticipated pressure.

Mounting Configurations

Refer to Figure 2-2 for examples of the following mounting configurations:

Liquid Flow Measurement

- Place taps to the side of the line to prevent sediment deposits on the process isolators.
- Mount the transmitter beside or below the taps so gases vent into the process lines.

Gas Flow Measurement

- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps to drain liquid into the process line.

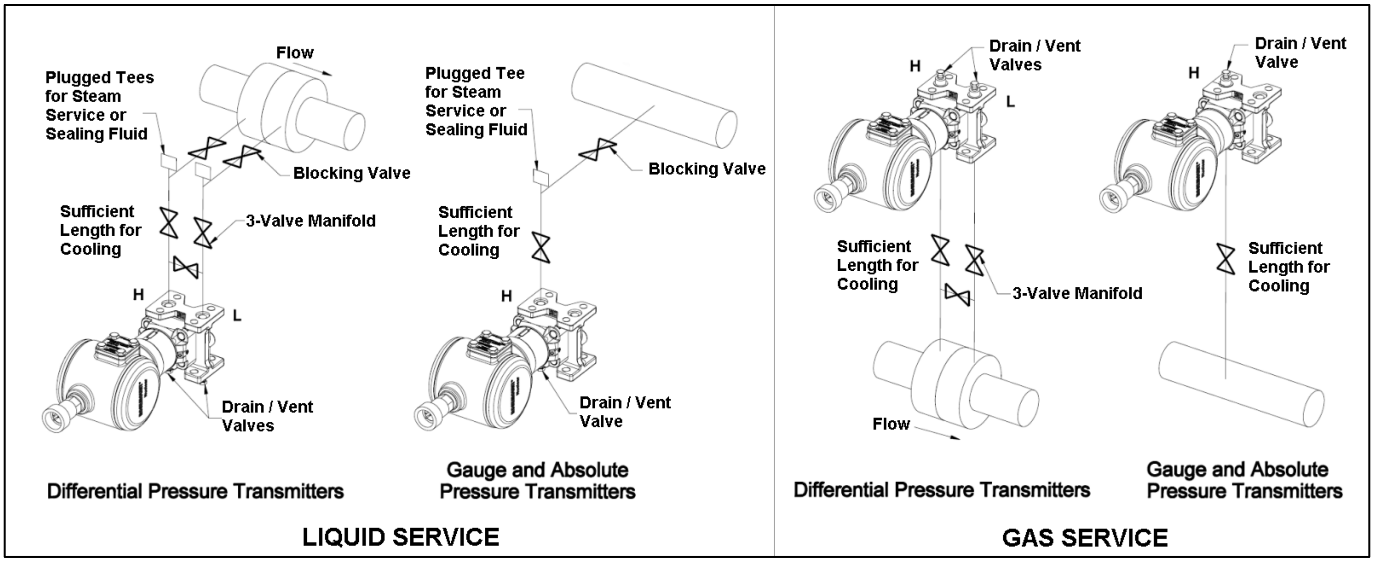
Steam Flow Measurement

- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that impulse piping will remain filled with condensate.
- Fill impulse lines with water to prevent steam from contacting the transmitter directly and to ensure accurate measurement start-up. Condensate chambers are not typically necessary since the volumetric displacement of the transmitter is negligible.

NOTE
The mounting configurations described above and depicted in Figure 2-2 are based on general industry “best practice” recommendations. Where applicable, specific plant approved installation practices should be used.

NOTE
In steam or other elevated temperature services, it is important that temperatures at the process flanges not exceed 250°F (121°C). In vacuum service, these limits are reduced to 220°F (104°C).

Figure 2-2 Transmitter Installation Examples (liquid, gas or steam)



Please note that transmitters depicted in Figure 2-2 are intended for reference only.

Conduit

Rosemount 3155 transmitters are provided with a welded integral electrical connector.

To prevent the conduit from adding mechanical stress to the transmitter during seismic disturbances, use flexible conduit or support the conduit near the transmitter. The instrument (pin) side of connector is factory installed by Rosemount Nuclear Instruments Inc. For the field (socket) side, install in accordance with the manufacturer's instructions or use the procedure in this section.

Electrical Housing

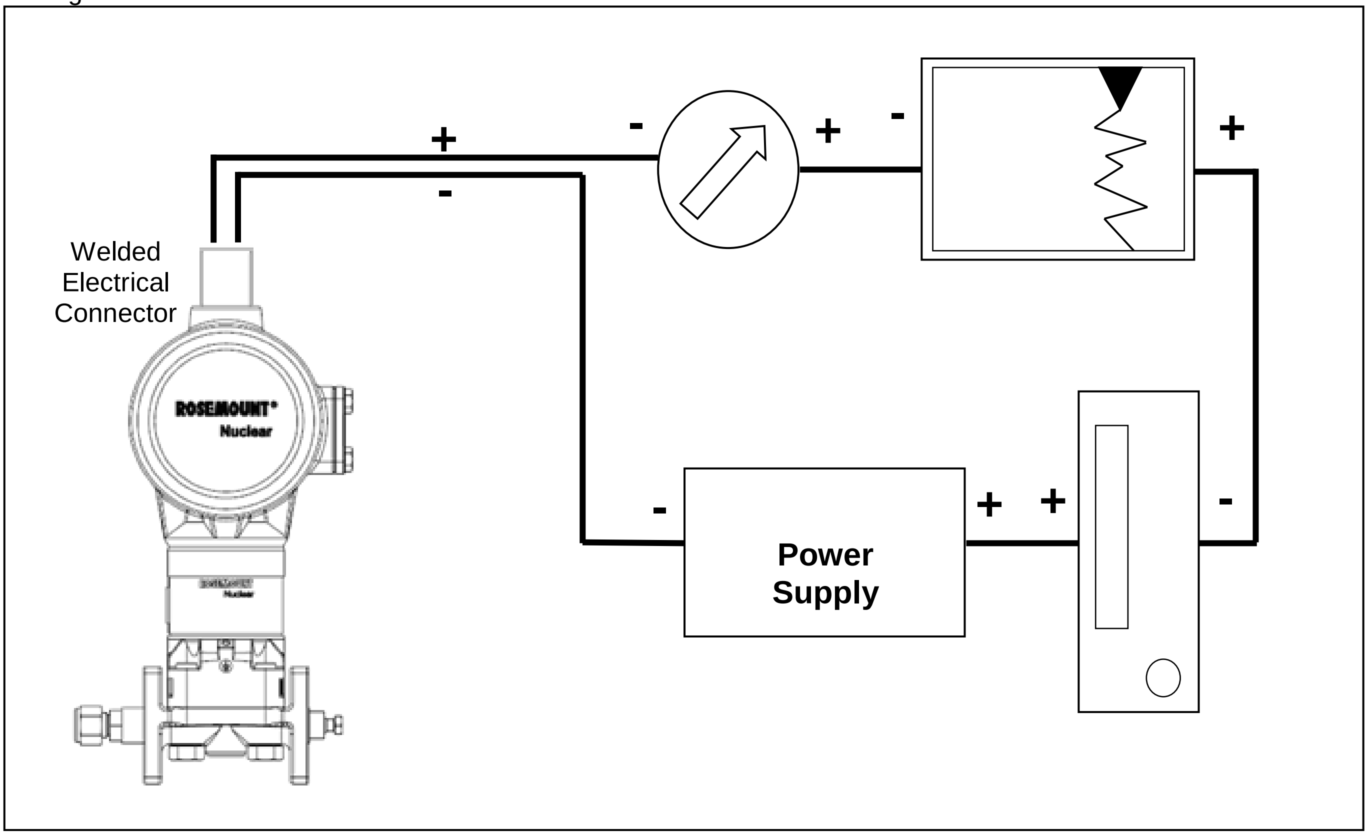
The standard transmitter orientation is shown in dimensional drawings found in this manual (see Figure 2-7). **The electronics housing cannot be rotated in the field.** For more information, please contact Rosemount Nuclear Instruments, Inc.

ELECTRICAL CONSIDERATIONS

This section contains information you should consider when preparing to make electrical connections to the transmitter. Read this section carefully before proceeding to the electrical installation procedure.

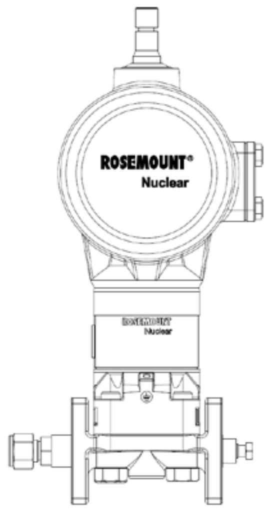
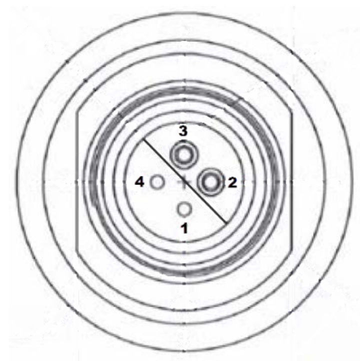
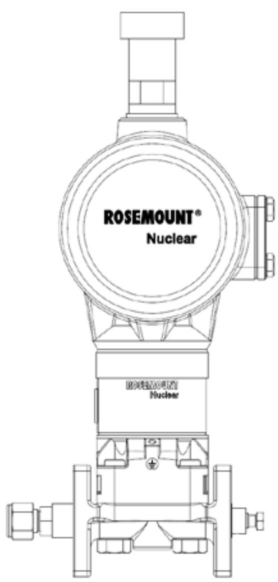
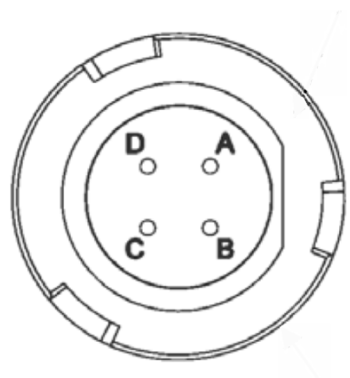
Rosemount 3155 transmitters provide a 4-20 mA signal when connected to a suitable dc power source. Figure 2-3 illustrates a typical signal loop consisting of a transmitter, power supply, and various receivers (controller, indicator, computer).

Figure 2-3 – Typical transmitter Wiring connection



The power supply must supply at least 13.5 volts to the transmitter terminals at 20 mA signal, or the maximum output current required for proper system operation. Any power supply ripple appears in the output load. The power supply versus load limitation relationship is shown in Figure 2-5. See qualification reports for additional details. The loop load is the sum of the resistance of the signal leads and the load resistance of the receivers.

Figure 2-4 – Integrated Electrical Connector Pin Designation

Connector Style	Transmitter View	Connector Top View	Pin Contacts
Welded Mirion			1 - Positive 2 - Negative 3 – Ground (1) 4 – *Not Used*
Welded EGS QDC Gen 3X			A – Positive B – Ground (1) C – Negative D – *Not Used*

(1) Pin is connected to the transmitter's internal grounding point. Use of electrical connector grounding pin is not required for transmitter operation, but may be required by national or local electrical codes.

Figure 2-5 – Transmitter Supply Voltage vs. Load

Figure 2-5a – 3155N Qualified and Design Regions

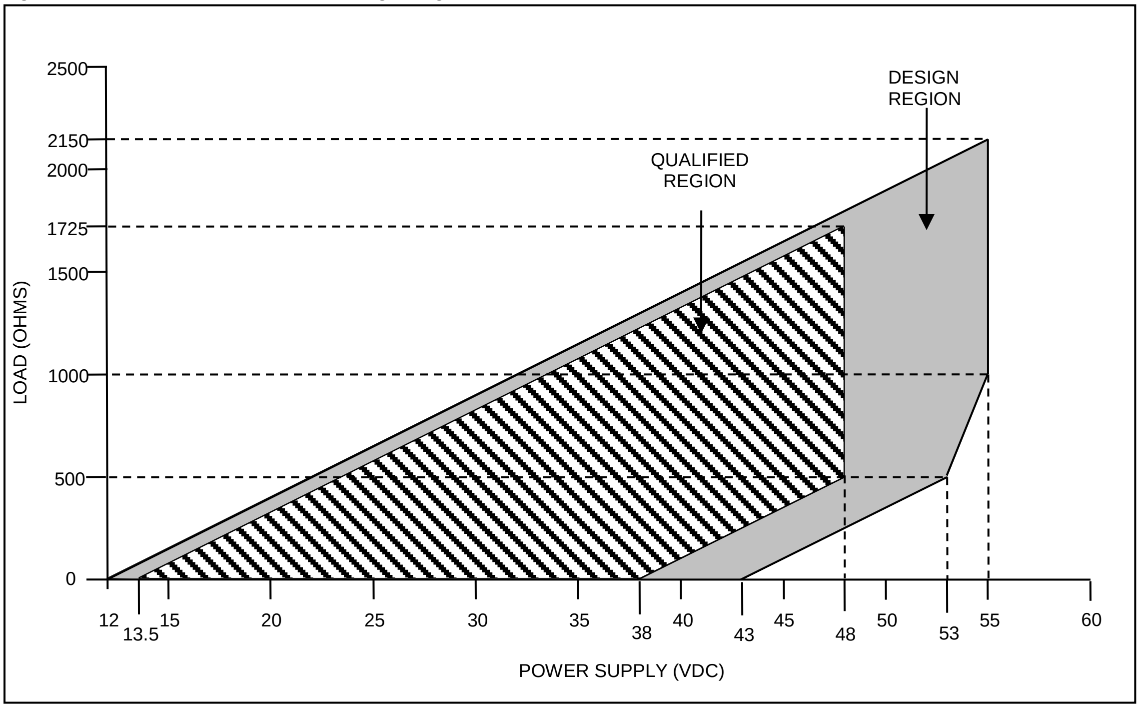
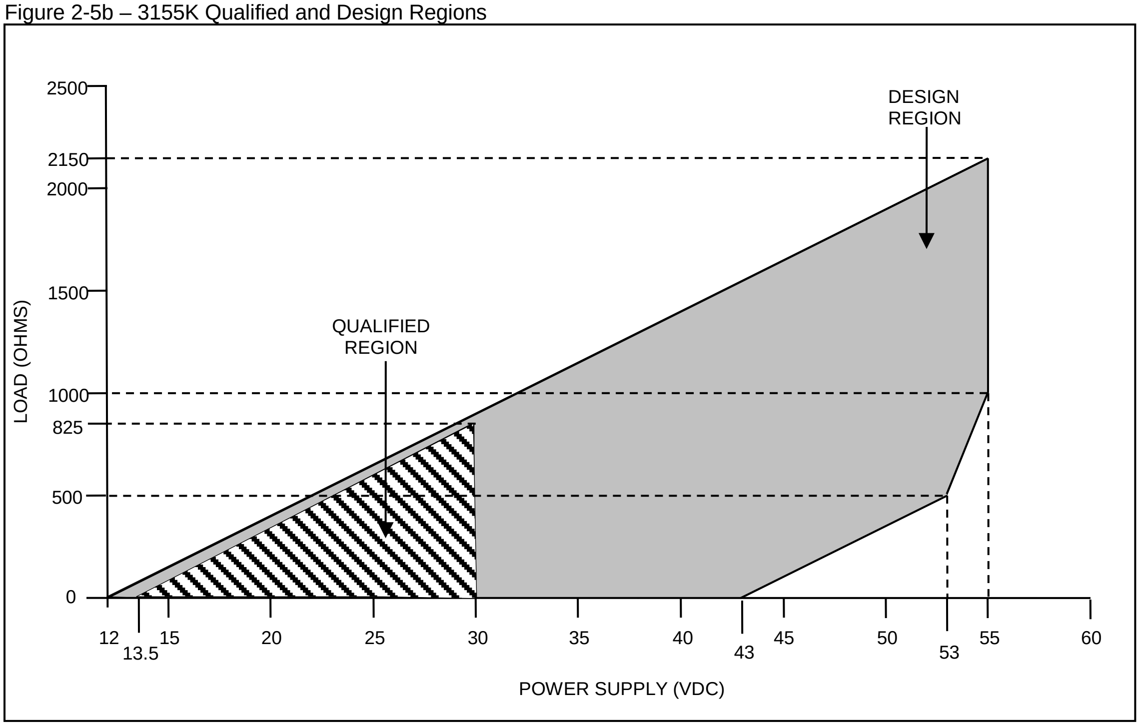


Figure 2-5b – 3155K Qualified and Design Regions



Shielded cable must be used to meet EMC qualification requirements. Do not run signal wiring in conduit or open trays with AC power wiring, or near heavy electrical equipment. Signal wiring may be ungrounded (floating) or grounded at any one point in the signal loop.

For installations with EMC performance requirements, consult the Rosemount Nuclear Instruments, Inc EMC test reports for additional details regarding recommended practices for electrical wiring per various national and international codes and regulations.

The transmitter case may be grounded or ungrounded. Grounding should be completed in accordance with national and local electrical codes. Transmitter case can be grounded using either the internal or external ground connection.

- **Internal Ground Connection:** Rosemount 3155 is provided with a welded integral electrical connector to the transmitter housing. This connector will be wired to the internal ground connection. See Figure 2-4 for grounding pin location.

- **External Ground Assembly:** The External Ground location is indicated by the ground symbol ⏚) on the module. An External Ground Assembly kit can be ordered as an option on the 3155 transmitter. This kit can also be ordered as a spare part. Please contact Rosemount Nuclear Instruments Inc. for ordering information.

The capacitance sensing element uses alternating current to generate a capacitance signal. This alternating current is developed in an oscillator circuit with a nominal frequency of 110 kHz +/- 11 kHz. This 110 kHz signal is capacitively-coupled to the transmitter case ground through the sensing element. Because of this coupling, a voltage may be imposed across the load, depending on choice of grounding.

This impressed voltage, which is seen as high frequency noise, has no effect on most instruments. Computers with short sampling times in a circuit where the negative transmitter terminal is grounded detect a significant noise signal. Filter this signal out by using a large capacitor (1 uf) or a 110 kHz LC filter across the load. Signal loops at any other point are negligibly affected by this noise and do not need filtering.

INSTALLATION PROCEDURES

Installation consists of mounting the transmitter and conduit and making electrical and process connections. The procedures for each operation follow.

Mechanical – Transmitter

WARNING
Improper assembly of mounting bracket to transmitter traditional process flange can damage sensor module. • For safe assembly of bracket to traditional flange, bolts must break back plane of flange web (i.e. bolt hole), but must not contact module housing. Use only the Rosemount Nuclear Instruments Inc. approved bolts supplied with the bracket.

1. Attach the panel mounting bracket to a panel or other flat surface (for illustration see Figure 2-6). Please note that the bolts required for this step are customer supplied hardware. Based on qualification tests performed by Rosemount, the bolts listed in Table 2-1 are recommended for the bracket-to-customer interface. Torque each bolt to value shown in Table 5-2 in **Section 5 Maintenance and Troubleshooting**.

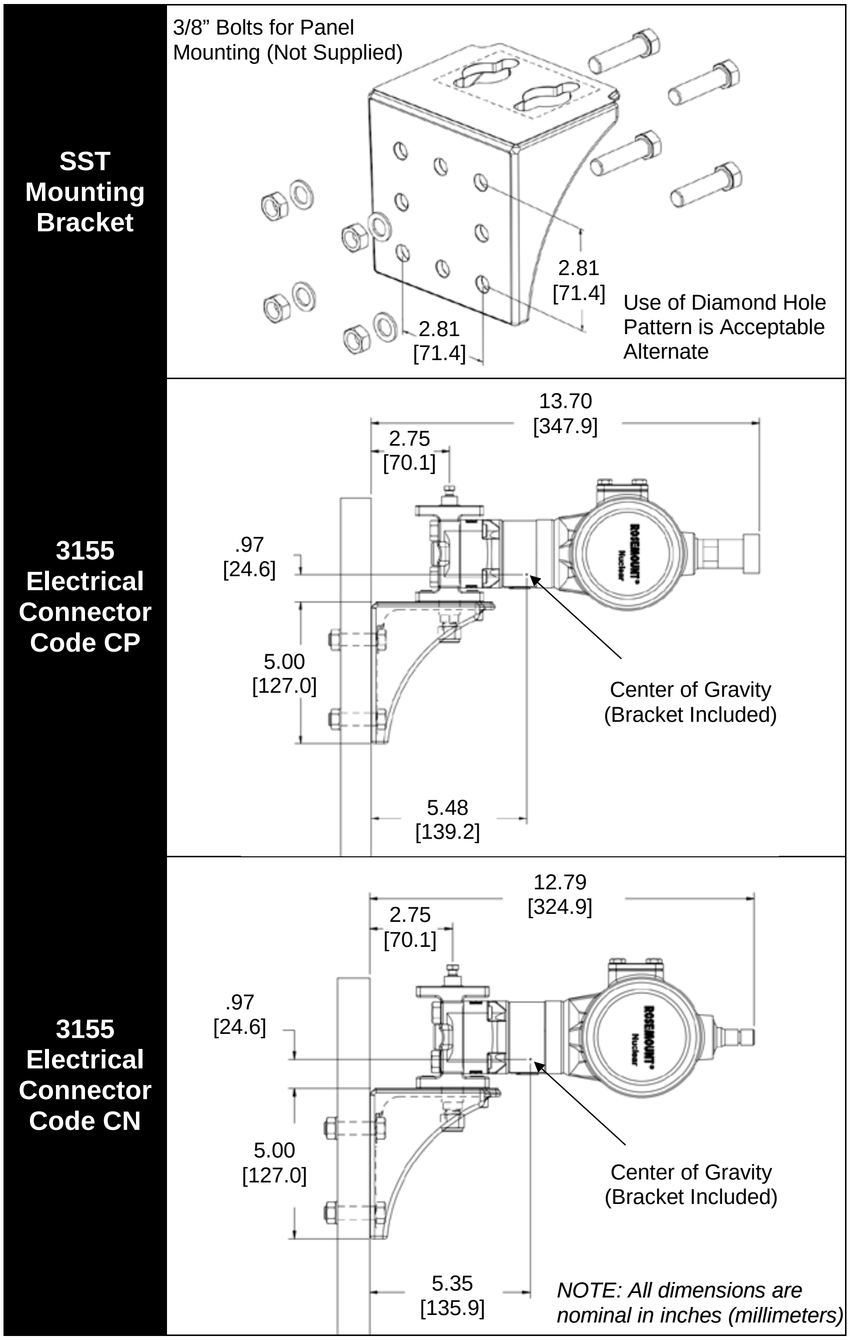
2. Attach the transmitter to the mounting bracket (for illustration see Figure 2-6). Use the four 7/16-20 x ¾ inch bolts with washers supplied with the transmitter. Torque each bolt to value shown in Table 5-2 in **Section 5 Maintenance and Troubleshooting**.

Table 2-1 – Recommended bolts for bracket-to-customer interface

BRACKET CODE (1)	BRACKET TYPE	RECOMMENDED BOLT FOR BRACKET TO CUSTOMER INTERFACE
2	SST Panel Bracket	3/8-24 UNF 2A Grade 2

(1) The Bracket Code can be found in the 13th position of the 3155 model string

Figure 2-6 – Typical Transmitter Mounting Bracket Configuration, Traditional Flange, (1) (2)



(1) Transmitter and bracket orientation with respect to gravity will not impact qualification.

(2) Transmitters can alternatively be mounted inside bracket (as shown below) or with process connection positioned adjacent to bracket (not shown).

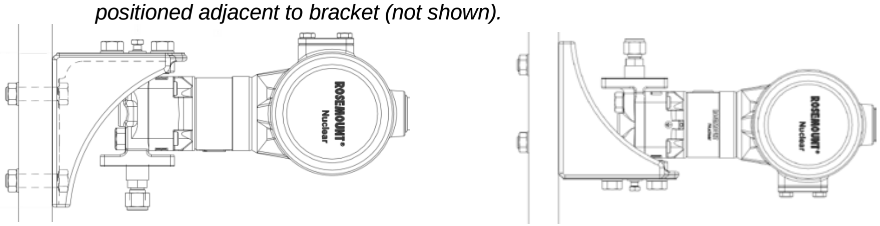


Figure 2-7a – Transmitter Dimensional Drawings, Shown with Mirion MIC Connector

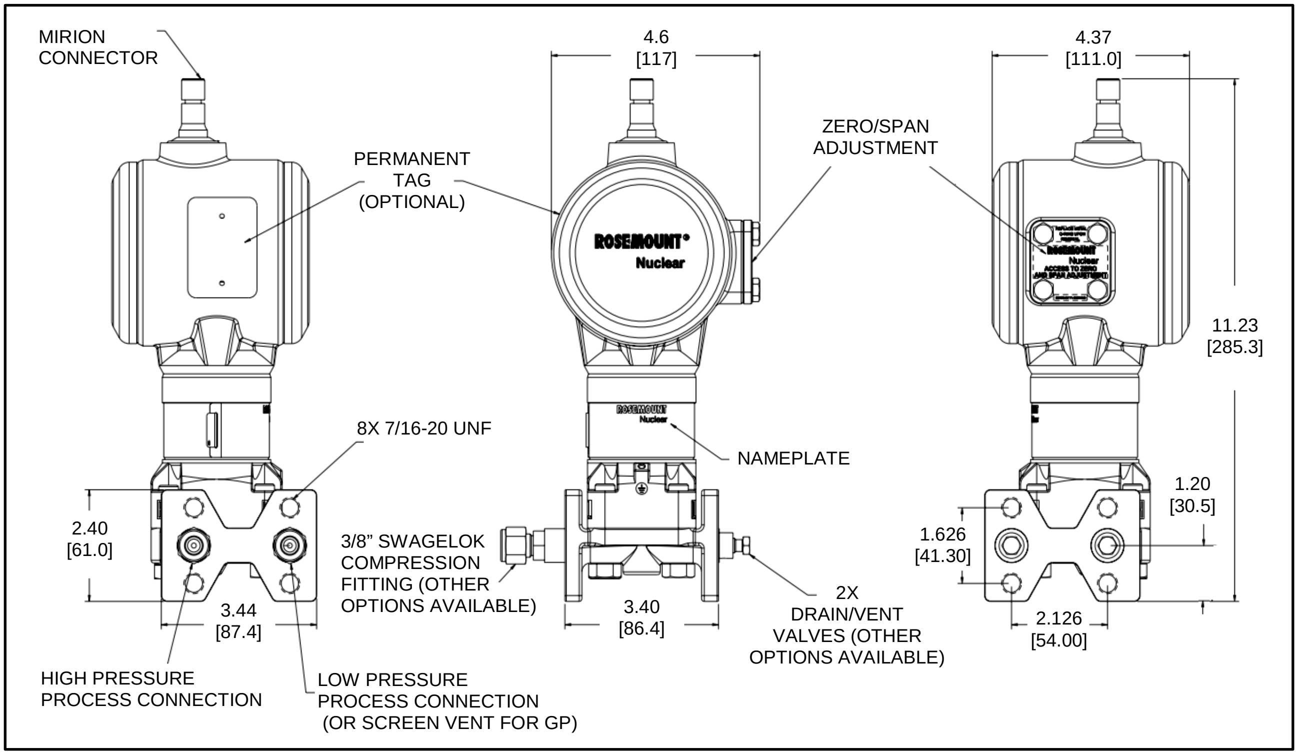
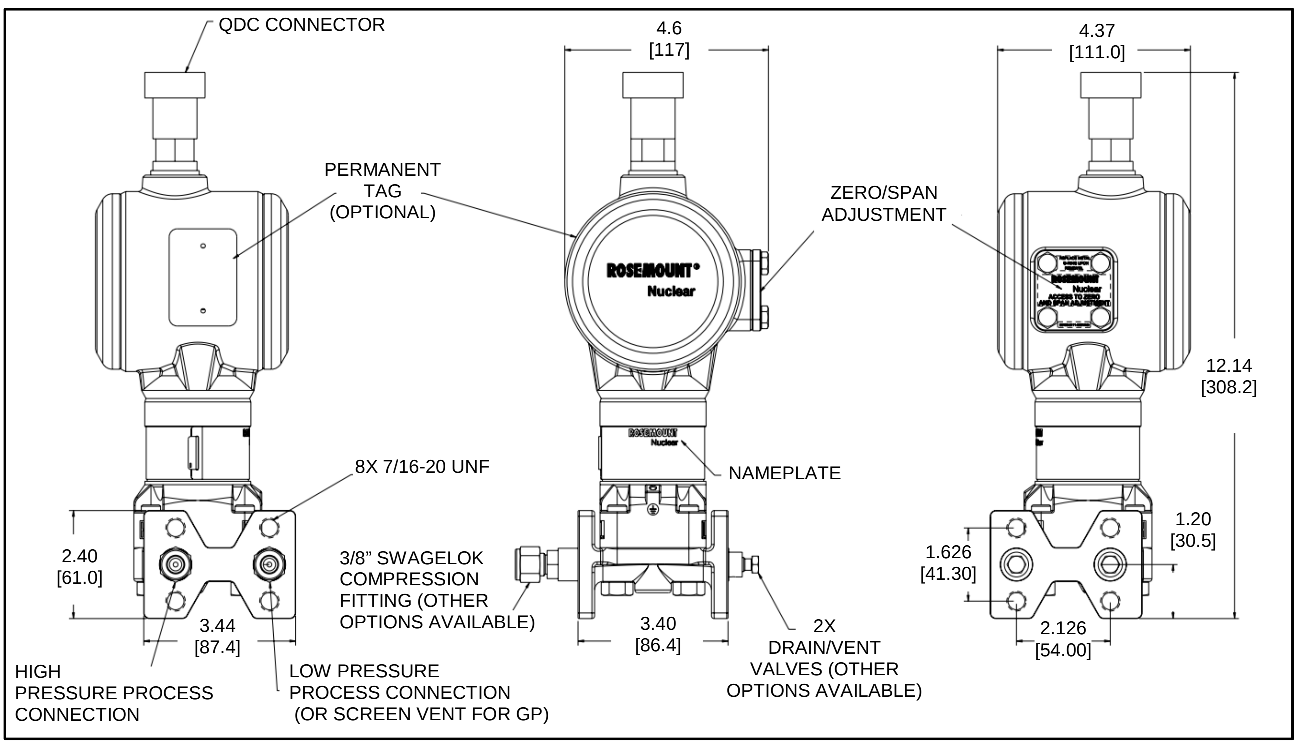


Figure 2-7b – Transmitter Dimensional Drawings, Shown with QualTech NP EGS QDC Gen 3X Connector



NOTE: All dimensions are nominal in inches (millimeters)

SECTION 3: CALIBRATION

OVERVIEW

This section contains the following transmitter calibration information:

- Calibration Overview
  - Calibration Considerations
  - Definitions
  - Zero and Span Adjustment Screw Access
  - Span Adjustment Range
  - Zero Adjustment Range
- Calibration Procedures
  - Span and Zero Adjustment
    - Calibration Procedure
  - Correction for High Static Line Pressure
    - High Static Pressure Span Effect on Range Codes 1, 2 and 3 DP Transmitters
    - High Static Pressure Span Correction for Range Code 4 and 5 DP Transmitters
    - High Static Line Pressure Zero Correction for DP Transmitters (All Ranges)
  - Linearity

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Refer to the following safety messages before performing an operation preceded by this symbol⚠.

⚠ WARNING

Explosions can result in death or injury.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate qualification parameters.

⚠ WARNING

Process leaks could result in death or serious injury.
- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

WARNING

Replacement equipment or spare parts not approved by Rosemount Nuclear Instruments, Inc. for use could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous or adversely impact its qualified status.

- Use only components supplied with the Rosemount 3155 transmitter or designated by Rosemount Nuclear Instruments, Inc. as spare parts for the 3155.

NOTE
The pressure unit "inches H_2O @ 68ºF (20ºC)" is used throughout this section. For ease of reading and to conserve space, this pressure unit will be abbreviated to "inH_2O".

CALIBRATION OVERVIEW

Calibration Considerations

Review this section to become familiar with the fundamentals of calibrating the Rosemount 3155 transmitter. Contact Rosemount Nuclear Instruments, Inc. with questions regarding calibrations that are not explained in this manual.

Rosemount 3155 transmitters are factory calibrated to the customer specified range which is shown on the nameplate (see Figure 1-1). The zero may be adjusted to elevated or suppressed configurations. Calibrations that have a lower range value below zero are termed zero elevated while calibrations that have a lower range value above zero are termed zero suppressed. At the factory, before the electronic housing covers are welded in place, this range may be changed within the full published limits of the transmitter. Once the electronic housing covers are welded in place, the adjustable range of the zero or the lower range value will be limited.

The zero and span are adjusted during calibration using zero and span adjustment screws. The adjustment screws are accessible externally and are located behind the access cover plate on the side of the electronics housing (see Figure 3-1). Transmitter output increases with clockwise rotation of the adjustment screws. For normal calibration adjustments, the zero adjustment screw has negligible effect on the span and the span adjustment has negligible effect on the zero.

Procedures for calibration are provided later in this section.

NOTE
Rosemount 3155 calibration range values must be set at the factory during manufacturing. The all-welded design does not allow for major zero elevation or suppression adjustments to transmitter calibration after manufacturing.

Definitions

The following definitions and descriptions are provided to aid in calibration:

DP
Differential pressure between the high pressure “H” and low pressure “L” process inputs, as marked on the transmitter module.

Upper Range Limit (URL)
The highest pressure the transmitter can be adjusted to measure, specified in the model ordering information by pressure range code.

Upper Range Value (URV)
The highest pressure the transmitter is adjusted to measure. This pressure corresponds to 20mA output point.

Lower Range Limit (LRL)
The lowest pressure the transmitter can be adjusted to measure, specified in the model ordering information by pressure range code.

Lower Range Value (LRV)
The lowest pressure the transmitter is adjusted to measure. This pressure corresponds to the 4mA output point.

Span = |URV - LRV|

Zero Based Calibration
Calibration where the LRV is zero DP (see Figure 3-2)

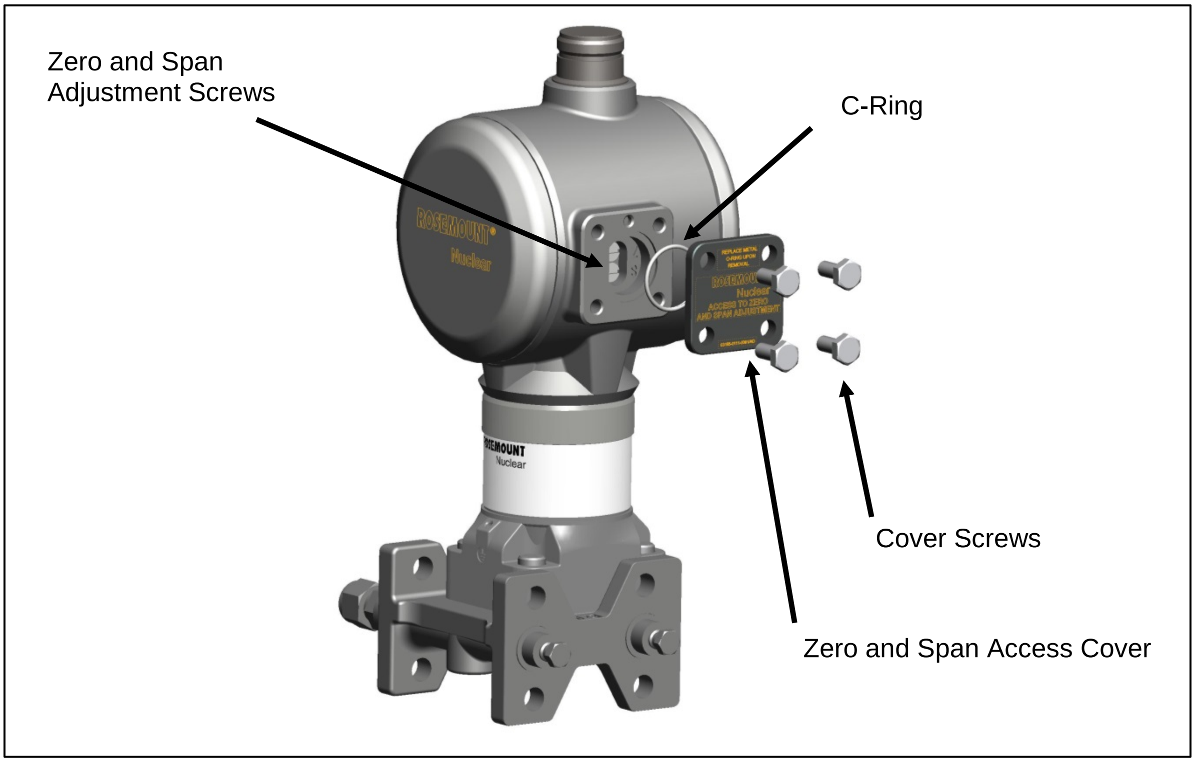
Elevated Zero Calibration
Calibration where the LRV is less than zero DP (i.e. the LRV is achieved when a positive pressure is applied to the low pressure side of the DP cell or a vacuum is applied to the high pressure side of the DP cell – see Figure 3-3).

Suppressed Zero Calibration
Calibration where the LRV is greater than zero DP (i.e. the LRV is achieved when a positive pressure is applied to the high pressure side of the DP cell or a vacuum is applied to the low pressure side of the DP cell – see Figure 3-3).

Sign Convention
Positive numbers indicate positive pressure is applied to the high pressure side of the DP cell or a vacuum is applied to the low pressure side of the DP cell. The high pressure side is indicated on the sensor module by an “H”.

Negative numbers indicate positive pressure is applied to the low pressure side of the DP cell or a vacuum is applied to the high pressure side of the DP cell. The low pressure side is indicated on the sensor module by an “L”.

Figure 3-1 – Zero and Span



WARNING

- After 3155 zero/span cover is removed, c-ring replacement is required to maintain qualification.
- See zero/span cover installation instructions in Section 5.
- Take care not to scratch the C-ring sealing surfaces in the radial direction.

Zero and Span Adjustment Screw Access

Zero and span adjustment screws are accessible externally and are located behind the access cover plate on the side of the electronics housing (see Figure 3-1). The metal zero/span C-ring shall be discarded every time the zero/span cover is removed and a new C-ring shall be installed. Zero/span C-ring and cover shall be installed as described in Section 5 of this manual.

Span Adjustment Range

For transmitter ranges 2 to 6, the span is continuously adjustable to allow calibration anywhere between the transmitter URL and 1/10 of URL. For example, the span on a Range 2 transmitter can be continuously adjusted between 25 and 250 inH_2O (6,22 kPa and 62,2 kPa).

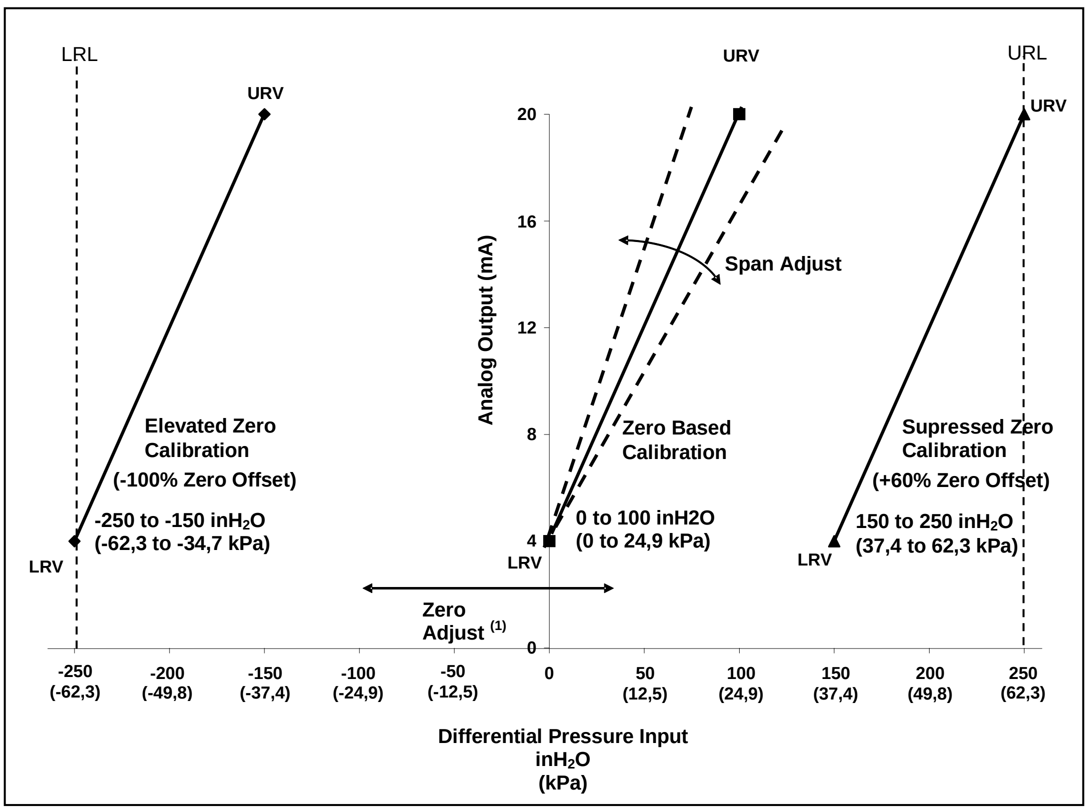
For Range 1 transmitters, the span is continuously adjustable to allow calibration anywhere between the transmitter URL and 1/5 of URL. For example, the span on a Range 1 transmitter can be continuously adjusted between 5 and 25 inH_2O (1,25 kPa and 6,23 kPa).

Zero Adjustment Range

Due to the welded design of the Rosemount 3155 transmitter, the zero adjustment range is limited once electronic housing covers are welded in place during manufacturing.

The LRV of transmitters with a zero based factory calibration is field adjustable to within ± 20% of the zero point. Transmitters with a zero elevated or suppressed based factory calibration can be adjusted, but the adjustment range is dependent on variables determined during manufacturing. Contact Rosemount Nuclear Instruments, Inc. for further details.

Figure 3-2 – Graphical Representation of Elevated Zero, Zero Based, and Suppressed Zero Calibrations for a Range 2 Transmitter



(1) Zero Adjustment range is limited after after housing covers are welded in place. Contact Rosemount Nuclear Instruments, Inc. for details regarding zero adjustment capabilities

CALIBRATION PROCEDURES

The following calibration procedures describe the recommended steps necessary to calibrate the Rosemount 3155 pressure transmitters.

Span and Zero Adjustment

NOTE
The pressure unit "inches H_2O @ 68ºF (20ºC)" is used throughout this section. For ease of reading and to conserve space, this pressure unit will be abbreviated to "inH_2O".

NOTE
3155 calibration must be set at the factory during manufacturing. The all welded design does not allow for major adjsutments to calibration after manufacturing.

The adjustment screws are accessible externally and are located behind the access cover plate on the side of the electronics housing (see Figure 3-1). The transmitter output increases with clockwise rotation of the adjustment screw.

1. Apply a pressure equivalent to the LRV to the high side pressure connection and turn Zero adjustment until output reads 4 mA.
2. Apply a pressure equivalent to the URV to the high side process connection and turn Span adjustment until output reads 20 mA.
3. Check to assure desired outputs are achieved and repeat steps 1 and 2 if necessary.
4. Replace zero and span access cover C-ring as outlined in Section 5 of this manual.

Correction for High Static Line Pressure

High Static Line Pressure Span Effect on Range Codes 1, 2 and 3 DP Transmitters

Rosemount 3155 Range 1, 2, and 3 differential pressure transmitters do not require correction for high static pressure span effect. The correction for these ranges occurs within the sensor.

High Static Line Pressure Span Correction for Range Code 4 and 5 DP Transmitters

Rosemount 3155 Range 4 and 5 pressure transmitters experience a systematic span shift when operated at high static line pressure. It is linear and correctable during calibration.

The correction factor for span shift caused by the application of static line pressure is shown in Table 3-1.

Table 3-1 – Range 4 and 5 Correction Factors

Range 4 and 5 Span Correction Factor % Input Reading Per 1000 psi (6,90 MPa)	
Range 4	1.00%(1)
Range 5	1.25%(1)

(1)Correction factors have an uncertainty of ±0.20% of input reading per 1000 psi (6,90 MPa)

The following illustrates two methods of correcting for the high static pressure span shift. Examples follow each method.

Method 1 for High Static Line Pressure, Ranges 4 and 5

Adjust transmitter output while leaving the input pressure at desired in service differential pressures. Use one of the following formula sets (depending on the pressure units being used to calibrate):

If using English Units (psi):
Corrected output reading (at LRV) =
4 mA + ((S X P/1000 X LRV)/Span) X 16 mA

Corrected output reading (at URV) =
20 mA + ((S X P/1000 X URV)/Span) X 16 mA

If using SI Units (MPa):
Corrected output reading (at LRV) =
4 mA + ((S X P/6,90 X LRV)/Span) X 16 mA

Corrected output reading (at URV) =
20 mA + ((S X P/6,90 X URV)/Span) X 16 mA

Where: S = value from Table 3-1 divided by 100
LRV = Lower range value
URV = Upper range value
P = static line pressure
Span = calibrated span

NOTE
For corrections where the calculated output adjustment exceeds the output high or low adjustment limits, the pressure input adjust procedure described in Method 2 in this section is recommended.

Figure 3-4 outlines examples of calculating a High Static Line Pressure Span Correction using Method 1. Figure 3-4a uses English units (psi) while Figure 3-4b uses SI units (MPa).

Figure 3-4a – Example for High Static Line Pressure, Span Correction using Method 1 (English Units)

Range 4; for a calibration of –10 to 45 psi corrected for 1,500 psi static line pressure:

1. Calculate the corrected output reading (at LRV)

= 4 mA + ((0.01 X 1500 psi/1000 psi X (-10 psi))/55 psi) X 16 mA
= 3.956 mA

2. Calculate the corrected output reading (at URV)
= 20 mA + ((0.01 X 1500 psi/1000 psi X 45 psi)/55 psi) X 16 mA
= 20.196 mA

3. At atmospheric static line pressure, apply 10 psi to the low side process connection (-10 psi), and adjust the zero until the transmitter output reads 3.956 mA.
4. Remaining at atmospheric static line pressure, apply 45 psi to the high side process connection and adjust the span until the transmitter output reads 20.196 mA.
5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 1,500 psi static line pressure, within specified uncertainties, the output will be 4 mA at -10 psi and 20 mA at 45 psi.

Figure 3-4b – Example for High Static Line Pressure, Span Correction using Method 1 (SI Units)

Range 4; for a calibration of –0,07 to 0,31 MPa corrected for 10,34 MPa static line pressure:

1. Calculate the corrected output reading (at LRV)

= 4 mA + ((0,01 X 10,34 MPa/6,90 MPa X (-0,07 MPa))/0,38 MPa) X 16 mA
= 3,956 mA

2. Calculate the corrected output reading (at URV)
= 20 mA + ((0,01 X 10,34 MPa/6,90 MPa X 0,31 MPa)/0,38 MPa) X 16 mA
= 20,196 mA

3. At atmospheric static line pressure, apply 0,07 MPa to the low side process connection (-0,07MPa), and adjust the zero until the transmitter output reads 3,956 mA.
4. Remaining at atmospheric static line pressure, apply 0,31 MPa to the high side process connection and adjust the span until the transmitter output reads 20,196 mA.
5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 10,34 MPa static line pressure, within specified uncertainties, the output will be 4 mA at -0,07 MPa and 20 mA at 0,31 MPa.

High Static Line Pressure Span Correction for Range Code 4 and 5 DP Transmitters (continued)

Method 2 for High Static Line Pressure, Ranges 4 and 5

Adjust transmitter pressure input while leaving the output at 4 mA and 20 mA. Use one of the following formula sets (depending on the pressure units being used to calibrate):

If using English Units (psi):
Corrected LRV pressure input =
Desired LRV - ((S X LRV) X (P/1000))

Corrected URV pressure input =
Desired URV - ((S X URV) X (P/1000))

If using SI Units (MPa):
Corrected LRV pressure input =
Desired LRV - ((S X LRV) X (P/6,90))

Corrected URV pressure input =
Desired URV - ((S X URV) X (P/6,90))

Where: S = Value from Table 3-1, divided by 100
LRV = lower range value
URV = upper range value
P = static line pressure

Figures 3-5 and 3-6 outline two examples of calculating a High Static Line Pressure Span Correction using Method 2.

“Example 1” in Figure 3-5 contains a calculation for a Zero Based Calibration Range. Figure 3-5a uses English units (psi) for the calculation while Figure 3-5b uses SI units (MPa)

“Example 2” in Figure 3-6 demonstrates the calculation for a Zero Elevated Calibration Range. “Example 2” can also be followed for Zero Suppressed Calibration Ranges. Figure 3-6a uses English units (psi) while Figure 3-6b uses SI units (MPa).

Figure 3-5a – Example 1 for High Static Line Pressure, Span Correction using Method 2 (English Units)

Range 4 for a calibration of 0 to 45 psi corrected for 1,500 psi static line pressure

1. In this example LRV is 0 psid. Zero differential pressure points require no span correction.

2. Calculate the corrected URV pressure input
= 45 psi - (0.01 X 45psi) X (1500 psi/1000 psi))
= 44.325 psi

3. At atmospheric static line pressure, with zero differential pressure applied, adjust the zero until the transmitter output reads 4 mA.

4. Remaining at atmospheric static line pressure, apply 44.325 psi to the high side process connection and adjust the span until the transmitter output reads 20 mA.

5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 1,500 psi static line pressure, within specified uncertainties, the output will be 4 mA at 0 psi and 20 mA at 45 psi.

Figure 3-5b – Example 1 for High Static Line Pressure, Span Correction using Method 2 (SI Units)

Range 4 for a calibration of 0 to 0,31 MPa corrected for 10,34 MPa static line pressure

1. In this example LRV is 0 MPa. Zero differential pressure points require no span correction.

2. Calculate the corrected URV pressure input
= 0,31 MPa - (0,01 X 0,31 MPa) X (10,34 MPa / 6,90 MPa))
= 0,305 MPa

3. At atmospheric static line pressure, with zero differential pressure applied, adjust the zero until the transmitter output reads 4 mA.

4. Remaining at atmospheric static line pressure, apply 0,305 MPa to the high side process connection and adjust the span until the transmitter output reads 20 mA.

5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 10,34 MPa static line pressure, within specified uncertainties, the output will be 4 mA at 0 MPa and 20 mA at 0,305 MPa.

Figure 3-6a – Example 2 for High Static Line Pressure, Span Correction using Method 2 (English Units)

Range 5 for a calibration of –250 to 750 psi corrected for 1,500 psi static line pressure

1. Calculate the corrected LRV pressure input
= -250 psi – (0.0125 X -250 psi) X (1500 psi/1000 psi)
= -245.31 psi

2. Calculate the corrected URV pressure input
= 750 psi – (0.0125 X 750 psi) X (1500 psi/1000 psi)
= 735.94 psi

3. At atmospheric static line pressure, apply 245.31 psi to the low side process connection (-245.31 psi) and adjust the zero until the transmitter output reads 4 mA.

4. Remaining at atmospheric static line pressure, apply 735.94 psi to the high side process connection and adjust the span until the transmitter output reads 20 mA.

5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 1,500 psi static line pressure, within specified uncertainties, the output will be 4 mA at -250 psi and 20 mA at 750 psi.

Figure 3-6b – Example 2 for High Static Line Pressure, Span Correction using Method 2 (SI Units)

Range 5 for a calibration of –1,72 to 5,17 MPa corrected for 10,34 MPa static line pressure

1. Calculate the corrected LRV pressure input
= -1,72 MPa – (0,0125 X -1,72 MPa) X (10,34 MPa/6,90 MPa)
= -1,69 MPa

2. Calculate the corrected URV pressure input
= 5,17MPa – (0,0125 X 5,17 MPa) X (10,34 MPa/6,90 MPa)
= 5,07 MPa

3. At atmospheric static line pressure, apply 1,69 MPa to the low side process connection (-1,69 MPa) and adjust the zero until the transmitter output reads 4 mA.

4. Remaining at atmospheric static line pressure, apply 5,07 MPa to the high side process connection and adjust the span until the transmitter output reads 20 mA.

5. Check to assure desired outputs are achieved and repeat steps 3 and 4 if necessary.

When the transmitter is exposed to 10,34 MPa static line pressure, within specified uncertainties, the output will be 4 mA at -1,72 MPa and 20 mA at 5,17 MPa.

High Static Line Pressure Zero Correction for Differential Pressure Transmitters (All Ranges)

Zero shift with static pressure is not systematic. However, the effect can typically be eliminated during calibration. To trim out the zero error at high static line pressure, perform the following:

1. If the calibrated range (i.e. LRV to URV) contains zero differential pressure:

   a. Calibrate the pressure transmitter according to the preceding sections.
   b. Apply atmospheric line pressure with zero differential pressure.
   c. Record the output reading.
   d. Apply the intended line pressure at zero differential pressure.
   e. Adjust the zero to match the reading obtained in step c.

2. If the calibrated range (i.e. LRV to URV) does not contain zero differential pressure:

   a. Depending on the factory transmitter calibration, it may be possible to eliminate the zero error. Please contact Rosemount Nuclear Instruments Inc. for more details.

Linearity

Linearity is factory optimized and cannot be field adjusted.

SECTION 4: OPERATION

OVERVIEW

This section provides a brief description of basic 3155 pressure transmitter operations in the following order:

- Transmitter Theory of Operation
- The Sensor Cell
- Demodulator
- Oscillator
- Voltage Regulator
- Current Control
- Current Limit
- Reverse Polarity Protection

TRANSMITTER THEORY OF OPERATION

The block diagram in Figure 4-1 illustrates the operation of the 3155 pressure transmitter.

The 3155 pressure transmitters have a variable capacitance sensor (see Figure 4-2). Differential capacitance between the sensing diaphragm and the capacitor plates is converted electronically to a 2 wire, 4-20mA dc signal based on the following formulas:

$$P = k_1\left(\frac{C_2 - C_1}{C_1 + C_2}\right)$$

Where:

P is the process pressure.
k_1 is a constant.
C_1 is the capacitance between the high-pressure side and the sensing diaphragm.
C_2 is the capacitance between the low-pressure side and the sensing diaphragm

$$fV_{p-p} = \frac{I_{ref}}{C_1 + C_2}$$

Where:

I_{ref} is the reference current.
V_{p-p} is the peak to peak oscillation voltage.
f is the oscillation frequency.

$$I_{diff} = fV_{p-p}\left(C_2 - C_1\right)$$

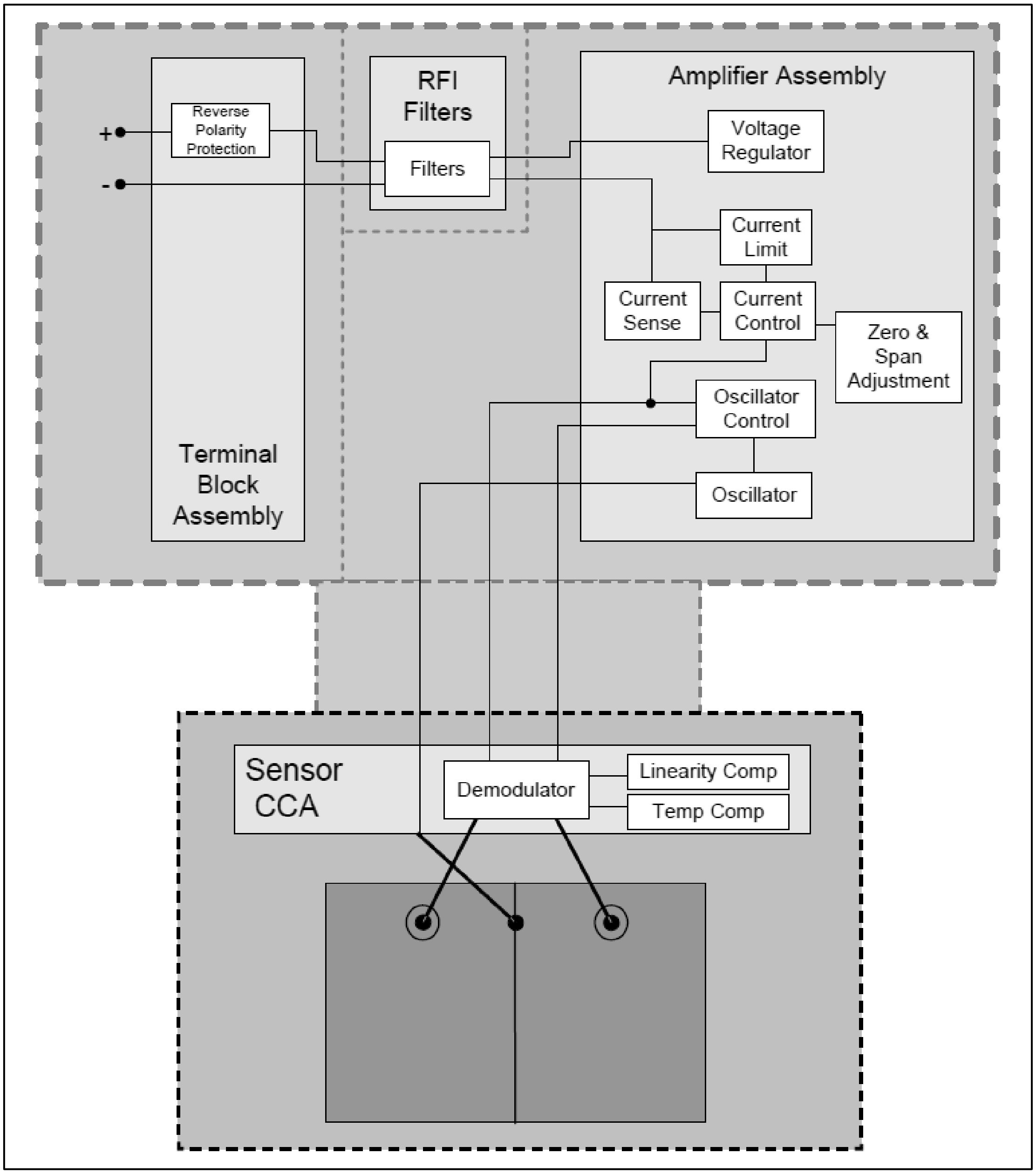
Where:

I_{diff} is the difference in current between C_1 and C_2.

Therefore:

$$P = \text{constant} \times I_{diff} = I_{ref}\,\frac{C_2 - C_1}{C_2 + C_1}$$

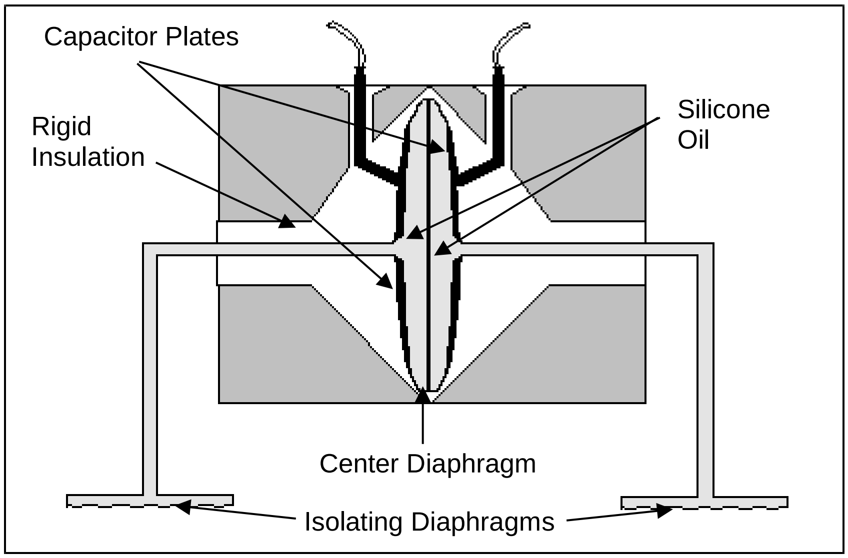
Figure 4-1 Block Diagram



THE SENSOR CELL

Process pressure is transmitted through an isolating diaphragm and silicon oil fill fluid to a sensing diaphragm in the center of the Sensor. The reference pressure is transmitted in a like manner to the other side of the sensing diaphragm. The capacitance plates on both sides of the sensing diaphragm detect the position of the sensing diaphragm. The capacitance between the sensing diaphragm and either capacitor plate ranges from 40pf to 80pf depending on input pressure. An oscillator drives the sensor through the transformer windings at roughly 110 kHz and 20 $V_{p\text{-}p}$.

Figure 4-2 – The Sensor Cell



DEMODULATOR

The demodulator consists of a diode bridge that rectifies the ac signal from the sensor cell to a dc signal. The oscillator driving current, I_{ref} (the sum of the dc currents through two transformer windings), is kept a constant by an integrated circuit operational amplifier (op amp). The output of the demodulator is a current directly proportional to pressure, ie,

$$I_{diff} = fV_{p-p}\left(C_2 - C_1\right)$$

The diode bridge and temperature compensation circuits are located inside the sensor module.

OSCILLATOR

The oscillator frequency is determined by the capacitance of the sensing element and the inductance of the transformer windings. The sensing element capacitance is variable. Therefore, the frequency is variable about a nominal value of 110kHz. An operational amplifier acts as a feedback control circuit and controls the oscillator drive voltage such that:

$$fV_{p-p} = \frac{I_{ref}}{C_1 + C_2}$$

VOLTAGE REGULATOR

The transmitter uses a zener diode, transistors, associated resistors and capacitors to provide a constant reference voltage of 3.2 Vdc and a regulated voltage of 7.4 Vdc for the oscillator and amplifiers.

CURRENT CONTROL

The current control amplifier consists of two operational amplifiers, two transistors, and associated components. The first amplifier provides an adjustable gain output proportional to the sum of the differential sensor current and a zero adjustment current. This output is supplied to the second amplifier, which controls the current in the 4-20mA loop proportionally.

CURRENT LIMIT

The current limiter prevents output current from exceeding 30mA nominal in an overpressure condition. Conversely, minimum output is limited to 3 mA nominal. Both the minimum and maximum current limits may vary slightly depending upon sensor pressure range code and associated calibration.

REVERSE POLARITY PROTECTION

A diode provides reverse polarity protection.

SECTION 5: MAINTENANCE & TROUBLESHOOTING

OVERVIEW

This section outlines techniques for checking out the components, a method for disassembly and reassembly, and a troubleshooting guide.

- General Considerations
- Disassembly Procedure
  - Process Flange Removal
- Reassembly Procedure
  - Process Flange Reassembly
- Post Assembly Tests

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation(s). Refer to the following safety messages before performing an operation preceded by this symbol ⚠.

⚠ WARNING

Explosions can result in death or injury.

- Verify that the operating atmosphere of the transmitter is consistent with the appropriate qualification parameters.

⚠ WARNING

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

⚠ WARNING

Residual process fluid may remain after disassembly of process flanges. If this fluid is potentially contaminated, take appropriate safety measures.

⚠ WARNING

Replacement equipment or spare parts not approved by Rosemount Nuclear Instruments, Inc. for use could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous or adversely impact its qualified status.

- Use only components supplied with the 3155 transmitter or designated by Rosemount Nuclear Instruments, Inc. as spare parts for the 3155.

NOTE

Maintenance of traceability of any replacement parts is the responsibility of the user (see Important **Notice** at the beginning of this manual preceding Section 1).

GENERAL CONSIDERATIONS

The Rosemount 3155 Series transmitters have no moving parts and require a minimum of scheduled maintenance. Calibration procedures for range adjustments are outlined in **Section 3 Calibration**. A calibration check should be conducted after inadvertent exposure to overpressure, unless your plant considers this factor separately in the plant error analysis.

An exploded view drawing of the transmitter is provided in Figure 5-1. In the following procedures, numbers in parentheses refer to item numbers in the exploded view.

Figure 5-1 – Parts Drawing, Exploded View

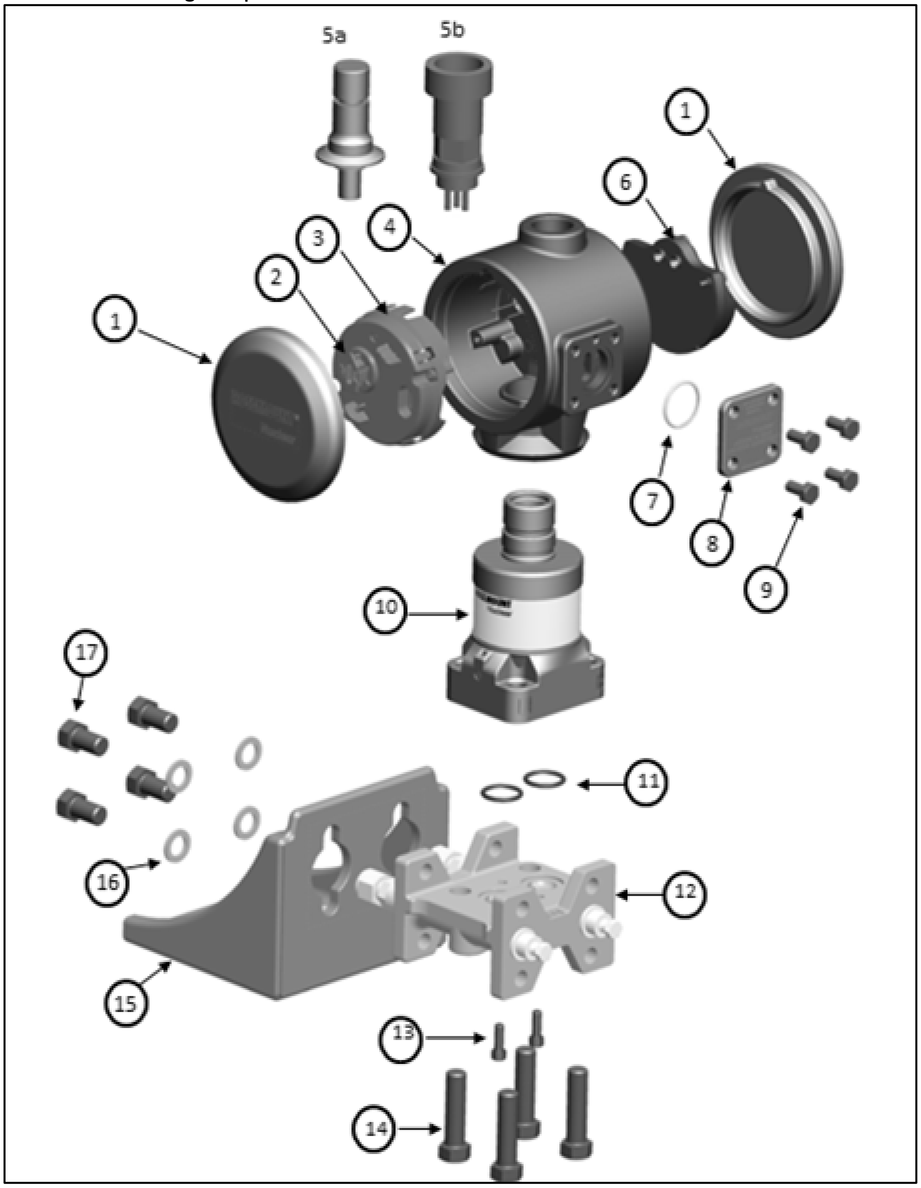


Table 5-1 – 3155 Transmitter Exploded view (For Reference Only.)

ITEM #	DESCRIPTION	ITEM #	DESCRIPTION
1	Electronics Cover	9	Zero/Span Bolts
2	Coarse Zero Select Jumper	10	Sensor Module
3	Electronics Assembly	11	C-rings for Process Flange
4	Electronics Housing Assembly (includes set screws)	12	Process Flange
5a	Mirion MIC Connector	13	Flange Cap Screws
5b	QualTech NP EGS QDC Gen 3X	14	Bolts for Process Flange
6	Terminal Block Assembly	15	Mounting Bracket
7	Zero/Span C-ring	16	Washers
8	Zero/Span Cover	17	Bolt for Mounting Bracket

DISASSEMBLY PROCEDURE

NOTE
Before removing the transmitter from service:

- Follow all plant safety rules and procedures.
- Isolate and vent the process from the transmitter before removing the transmitter from service.
- Remove all electrical leads and conduit.

WARNING

Residual process fluid may remain after disassembly of process flanges. If this fluid is potentially contaminated, take appropriate safety measures.

NOTE
Numbers in parentheses refer to item numbers in Figure 5-1.

NOTE
Special testing and part replacement are required for reassembly. Read the **Process Flange Reassembly Procedure** section before attempting disassembly.

Process Flange Removal

1. Remove the transmitter from service before disassembling flanges.
2. Remove the two flange cap screws (13).
3. Detach process flange (12) by removing the four large bolts (14). **Take care not to scratch or puncture the isolating diaphragms.** Identify the orientation of flange with respect to sensing module for reassembly.
4. Carefully remove the C-rings (11). **Do not reuse C-rings. Take care not to scratch the sealing surfaces on the process flange and sensor module.**

Zero Span Cover Removal

1. Detach Cover (8) by removing the four bolts (9).
2. Carefully remove the C-ring (7) and discard. **Do not reuse C-rings. Take care not to scratch the sealing surfaces on the cover and housing.**

REASSEMBLY PROCEDURE

NOTE
Numbers in parentheses refer to item numbers in Figure 5-1.

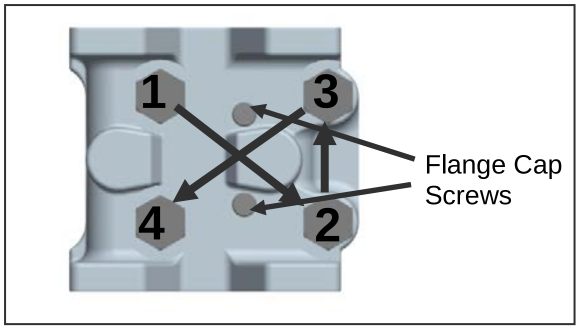
Process Flange Reassembly

1. Replace the process c-rings (11) with new c-rings if the flanges were removed. Carefully place one c-ring (11) in each of the two weld rings located on the isolating diaphragms of the sensor module (10) as shown in Figure 5-2.
2. Carefully place the process flange (12) on the sensor module. Take care not to disturb the c-rings or damage the isolating diaphragms.

Figure 5-2 – Process C-ring location

3. With the process flange sitting secure on the sensor module, install two flange cap screws (13) into the flange location shown in Figure 5-3. Tighten the cap screws approximately two or three rotations only.
4. Place the four bolts (14) through the process flange and screw them on finger-tight.
5. Using a hand torque wrench, evenly seat the flange onto the sensor module by following steps 6 through 9 (see Figure 5-3 to identify the bolts).
6. Alternately tighten the four bolts in the sequence shown in Figure 5-11 to 150 in-lbs ±15 in-lbs (16.9 N-m ± 1.7 N-m)
7. Repeat step 6.
8. Repeat step 6 at 300 in-lbs ± 25 in-lbs (33.9 N-m ± 2.8 N-m)
9. Repeat step 8.
10. Torque the two cap screws in the flange to 33 in-lbs ± 1.7 in-lbs (3.7 N-m ± 0.2 N-m). NOTE: Cap screws must be torqued after bolts, or they will loosen.

Figure 5-3 – Flange Bolt Torqueing Sequence



Zero Span Cover Plate Reassembly

1. Replace the C-ring (7) with new C-ring every time the zero span cover is removed.
2. Clean C-ring sealing surfaces as necessary to remove contamination (cotton swab / isopropyl alcohol)
3. Carefully place the C-ring (7) and cover (8) over the zero span screws; install bolts finger tight. Take care not to disturb the c-rings or damage the sealing surface.
4. Tighten bolts(9) in two steps following the pattern shown in Figure 5-4:
   first to 72 in-lb ±5 in-lb (8.1 N-m ±0.5 N-m),
   then to 108 in-lb ±5 in-lb (12.2 N-m +0.5 N-m).

Figure 5-4 – Zero/Span Cover Plate Torqueing Sequence

POST-ASSEMBLY TESTS

1. Conduct hydrostatic testing to 150% of maximum working pressure or 2,000 psi (13.79 MPa), whichever is greater. Conduct the testing for a duration of ten minutes minimum, and visually verify that there is no water leakage from the transmitter, including the flange/process connection interface and the flange/ sensor module interface.
2. Calibrate the transmitter per **Section 3 Calibration** in this manual.
3. Clean the “wetted parts” to < 1 ppm chloride content.

Table 5-2 – Torque References

ITEM(S) TO BE TORQUED	3155 TORQUE VALUE	TOLERANCE
Traditional Flange Panel Bracket to Mounting Surface Bolts	19 ft-lb (26 N-m)	±1 ft-lb (1.4 N-m)
Traditional Flange Transmitter to Bracket Bolts	21 ft-lb (29 N-m)	±1 ft-lb (1.4 N-m)
Flange Bolts	*See* ***Process Flange Reassembly*** section	*See* ***Process Flange Reassembly*** section
Drain/Vent Valves	7.5 ft-lb (10 N-m)	±0.5 ft-lb (0.7 N-m)
Valve Seats or Plugs	200 in-lbs (22.6 N-m)	± 1 ft-lbs (1.4 N-m)
Swagelok™ Process Fitting	*See installation instructions*	-
Zero Span Cover Bolts	*See* ***Zero Span Cover Reassembly*** *Section*	*See* ***Zero Span Cover Reassembly*** *Section*

Table 5-3 – Troubleshooting

Symptom	Potential Source	Corrective Action
High Output	Primary Element	Check for restrictions at primary element, improper installation or poor condition. Note any changes in process fluid properties that may affect output.
	Impulse Piping	Check for leaks or blockage. Ensure blocking locking valves are fully open. Check for entrapped gas in liquid lines, or liquid in dry lines. Ensure that density of fluid in impulse line is unchanged. Check for sediment in transmitter process flanges.
Low Output or No Output	Primary Element	Check the insulation and condition of primary element. Note any changes in process fluid properties that may affect output.
	Loop Wiring	**CAUTION** Do not use more than 55 volts to check the loop, or damage to the transmitter electronics may result. Check for adequate voltage to the transmitter. Check the milliamp rating of the power supply against the total current being drawn for all transmitters being powered. Check for shorts and multiple grounds. Check for proper polarity at the signal terminal. Check loop impedance. Check wire insulation to detect possible shorts to ground.
	Impulse Piping	Ensure that the pressure connection is correct. Check for leaks or blockage. Check for entrapped gas in liquid lines, or liquid in dry lines. Check for sediment in transmitter process flanges. Ensure that blocking valves are fully open and that bypass valves are tightly closed. Ensure that density of fluid in the impulse line is unchanged.
	Power Supply	Check the power supply output voltage at the transmitter.
Erratic Output	Loop Wiring	**CAUTION** Do not use more than 55 volts to check the loop, or damage to the transmitter electronics may result. Check for inadequate voltage to the transmitter. Check for intermittent shorts, open circuits, or multiple grounds.
	Impulse Piping and Process Connections	Check for entrapped gas in liquid lines, or liquid in dry lines.
	Power Supply	Check power supply output voltage.

SECTION 6: Transmitter Spare Parts

For Rosemount 3155 Pressure transmitter

OVERVIEW

This section provides information pertaining to the spare part kits offering for Rosemount model 3155 pressure transmitter. Techniques for transmitter troubleshooting and methods for disassembly and reassembly are provided in Section 5.

- General Considerations
- Spare Parts Shelf Life
- Impact on Transmitter Qualified Life
- Spare Parts List

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation(s). Refer to the following safety messages before performing an operation preceded by this symbol ⚠.

⚠ WARNING

Explosions can result in death or injury.

- Verify that the operating atmosphere of the transmitter is consistent with the appropriate qualification parameters.

⚠ WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals when the circuit is live.

WARNING

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

WARNING

Residual process fluid may remain after disassembly of process flanges. If this fluid is potentially contaminated, take appropriate safety measures.

WARNING

Replacement equipment or spare parts not approved by Rosemount Nuclear Instruments, Inc. for use could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous or adversely impact its qualified status.

- Use only components supplied with the 3155 transmitter or designated by Rosemount Nuclear Instruments, Inc. as spare parts for the 3155.

NOTE

Maintenance of traceability for any replacement part is the responsibility of the user (see Important **Notice** at the beginning of this manual preceding Section 1).

NOTE

In the event a spare part kit is needed for on-site transmitter maintenance that is not represented within Table 6-1, please contact Rosemount Nuclear Instruments, Inc.

GENERAL CONSIDERATIONS

Because of the nuclear use intended for these parts, certain factors must be considered regarding maintenance of product qualification and component traceability during on-site instrument repair. Rosemount Nuclear Instruments, Inc. rigidly controls the manufacture of each instrument to ensure that published performance specifications are met and qualified configurations are maintained. For parts installed outside of this controlled environment, Rosemount Nuclear Instruments, Inc. is unable to ensure that the specifications are being satisfied. This responsibility is shifted to the end user. The integrity of the instrument as originally assembled is modified.

Replacement of parts has ramifications under 10CFR21, for which the user is responsible. These same regulations also mandate a component traceability program, which the user must undertake for the replacement parts. In view of this, and in order to maintain the qualification of the product, the user must ensure that all replacement parts are installed in accordance with the Rosemount Nuclear Instruments, Inc. approved installation and calibration procedures herein.

NOTE
Spare parts for the Rosemount 3155 model are not hydrostatically tested or nuclear cleaned.

NOTE
The part numbers shown are current at the time of printing of this manual, but may be revised in the future. Parts provided are compatible and interchangeable with those listed on your order as to the form, fit, and function of the part required.

SPARE PARTS SHELF LIFE

Store all spare transmitters and spare component parts in accordance with ANSI N45.2.2 level B.

Lubricants and sealant: The date of the end of shelf life (use by date) is provided with the lubricants and/or sealant, at the time of shipment. The product has a minimum of six months shelf life at the time of shipment.

All other parts: Shelf life is not applicable.

IMPACT ON TRANSMITTER QUALIFIED LIFE

Transmitters were qualified based on an installed life of 10 years at an ambient temperature of 120°F (48.8°C).

The use or installation of spare parts has no effect on overall transmitter qualified life as established in the baseline qualification.

TRANSMITTER SPARE PARTS LIST

Table 6-1 – Rosemount 3155 Spare Parts

Part Description	Item Number [3]	Quantity Required [2]	Spare Parts Category [1]	Rosemount Order Number
Electronics Housing Accessories				-
Calibration Access Metal Seal (Qty=1)	7	1		03155-5001-0005
Calibration Access Metal Seal (Qty=5)	7			03155-5001-0006
Process Flange Accessories				
3150 Drain/Vent Valves (Qty=2 each)		2		03154-5015-0001
Drain/Vent Valve Stem		2	A	03154-5015-0002
Metal C-Ring (Qty=1)	11			03154-5016-0001
Process Connection Plug, 1/4" NPT, SST (Qty=1)				03154-5017-0001
Process Connection Plug, 1/4" NPT, SST (Qty=2)				03154-5017-0002
Screen Plug (Qty=1)				03154-5018-0001
Flange Bolt Kit, Standard	13,14	1		03154-5019-0001
Flange Bolt Kit, P9 Option	13,14	1		03154-5019-0002
Process Flange Kits for DP Transmitters [4]				-
Flange Assembly, w/Qty (2) C-rings; Flange Code F0	11,12	1		03154-5022-1001
Flange Assembly, w/Qty (2) C-rings; Flange Code F1	11,12	1		03154-5022-2200
Flange Assembly, w/Qty (2) C-rings; Flange Code F2	11,12	1		03154-5022-0011
Flange Assembly, w/Qty (2) C-rings; Flange Code F3	11,12	1		03154-5022-2211
Flange Assembly, w/Qty (2) C-rings; Flange Code F4	11,12	1		03154-5022-1111
Flange Assembly, w/Qty (2) C-rings; Flange Code F5	11,12	1		03154-5022-0022
Process Flange Kits for GP Transmitters [4]				-
Flange Assembly, w/Qty (2) C-rings; Flange Code F0	11,12	1		03154-5032-1001
Flange Assembly, w/Qty (2) C-rings; Flange Code F1	11,12	1		03154-5032-0200
Flange Assembly, w/Qty (2) C-rings; Flange Code F2	11,12	1		03154-5032-0001
Flange Assembly, w/Qty (2) C-rings; Flange Code F3	11,12	1		03154-5032-0201
Flange Assembly, w/Qty (2) C-rings; Flange Code F4	11,12	1		03154-5032-0101
Flange Assembly, w/Qty (2) C-rings; Flange Code F5	11,12	1		03154-5032-0002
Mounting Bracket Kits				-
Panel Mount Bracket Kit, SST, Transmitter to Bracket SST Mounting Hardware Included, All Models	15-17	1		03154-5112-0003
3150 Transmitter to Bracket Mounting Bolts & Washers, SST	16,17	1		03154-5115-0002

(1) *Rosemount recommends one spare or kit for every 25 transmitters in Category "A", one spare part or kit for every 50 transmitters in Category "B", and one spare part or kit for every 5 transmitters in Category "C".*
(2) *The quantity stated is sufficient to service one transmitter.*
(3) *The item number corresponds with Figure 5-1 in Section 5 of this reference manual.*
(4) *See Transmitter Product Data Sheet for information regarding process flange configuration.*

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