Section 3 Installation

OVERVIEW

This section is designed to guide you through a successful Rosemount 2088, 2090F, or 2090P Transmitter installation. Starting with an installation flowchart, this section contains information on installation considerations and transmitter options. Dimensional drawings are also included in this section.

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Explosions could result in death or serious injury:

- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

⚠WARNING

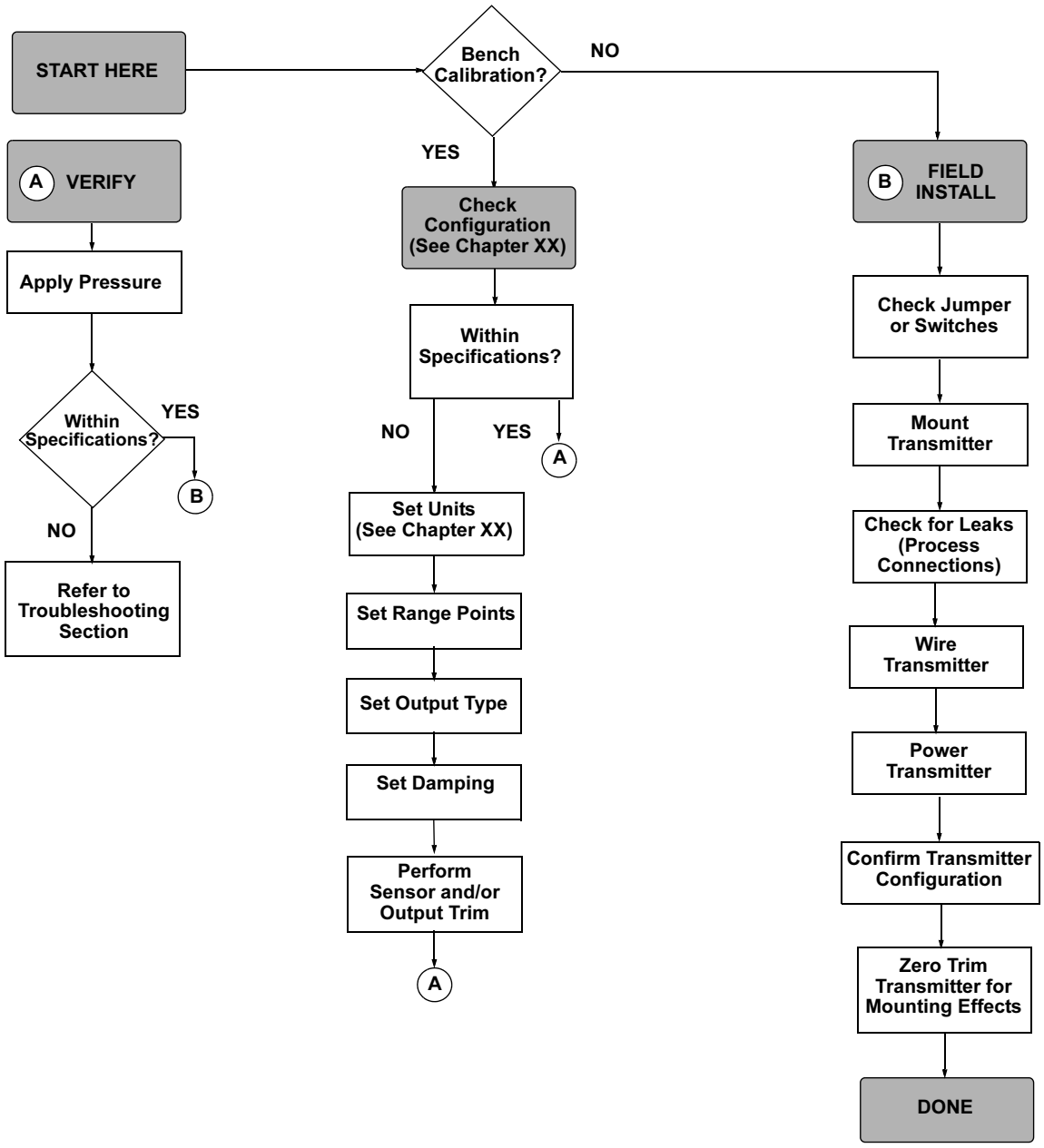
High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

⚠WARNING

Use appropriately rated sanitary clamps and gaskets during installation. The maximum working pressure of the clamp and gasket must be greater than or equal to the working pressure range of the transmitter. Failure to use proper clamps and gaskets can cause process leaks and can result in death or serious injury.

Figure 3-1. Installation Flowchart.

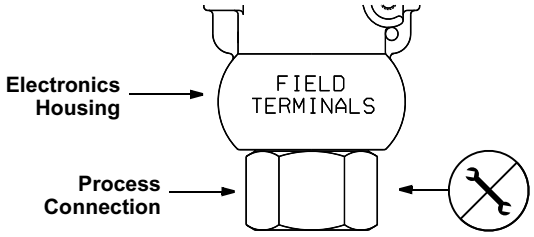


GENERAL CONSIDERATIONS

The accuracy of the pressure measurement depends on proper installation of the transmitter and impulse piping. The piping between the process and transmitter must accurately transmit pressure to the transmitter. Mount the transmitter close to the process and use a minimum of impulse piping to achieve the best accuracy. Keep in mind, however, the need for convenient access, safety of personnel, practical field calibration, and a suitable transmitter environment. In general, install the transmitter to minimize vibration, shock, and temperature fluctuations.

⚠CAUTION

Do not apply torque directly to the electronics housing. Rotation between the electronics housing and the process connection can damage the electronics. To avoid damage, apply torque only to the hex-shaped process connection. Use a backup wrench on Process Connection when installing an adapter.



ENVIRONMENTAL CONSIDERATIONS

Temperature

Mount the transmitter in a manner that minimizes variations in ambient temperature.

Moisture and Corrosives

The transmitter is designed to resist attack by moisture and corrosives. The electronics module is fully encapsulated and mounted in a compartment that is sealed from the power-side conduit entries. O-ring seals protect both compartments when the covers are installed.

In humid environments, it is possible for moisture to accumulate in the conduit lines and reach the terminal compartment of the transmitter housing. To prevent moisture from entering the terminal compartment, mount the transmitter at a high point in the conduit run, if possible. Also, remove the terminal compartment cover periodically and inspect the terminals for moisture and corrosion.

Hazardous Locations Installations

Rosemount 2088, 2090P, and 2090F transmitters are designed with explosion-proof electronics enclosures and circuitry that complies with intrinsic safety requirements and non-incendive operation. Individual transmitters are clearly tagged with approvals. Refer to Section 5: Specifications and Reference Data for a complete list of available approvals. To maintain certified ratings for installed transmitters, install with applicable installation codes and approval drawings.

NOTE
Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

MECHANICAL CONSIDERATIONS

Mounting

Rosemount 2088

The Rosemount 2088 Smart Transmitter weighs approximately 2.44 lb. (1,11 kg). The 2088 Analog Transmitter weighs approximately 1.9 lb. (0,86 kg). In many cases, its compact size and light weight makes it possible to mount the 2088 directly to the impulse line without using an additional mounting bracket. When this is not desirable, mount directly to a wall, panel, or two-inch pipe using the optional mounting bracket (see Figure 3-3).

The 2088 also offers several process connections. Use your plant-approved thread sealant to ensure a leak-proof connection.

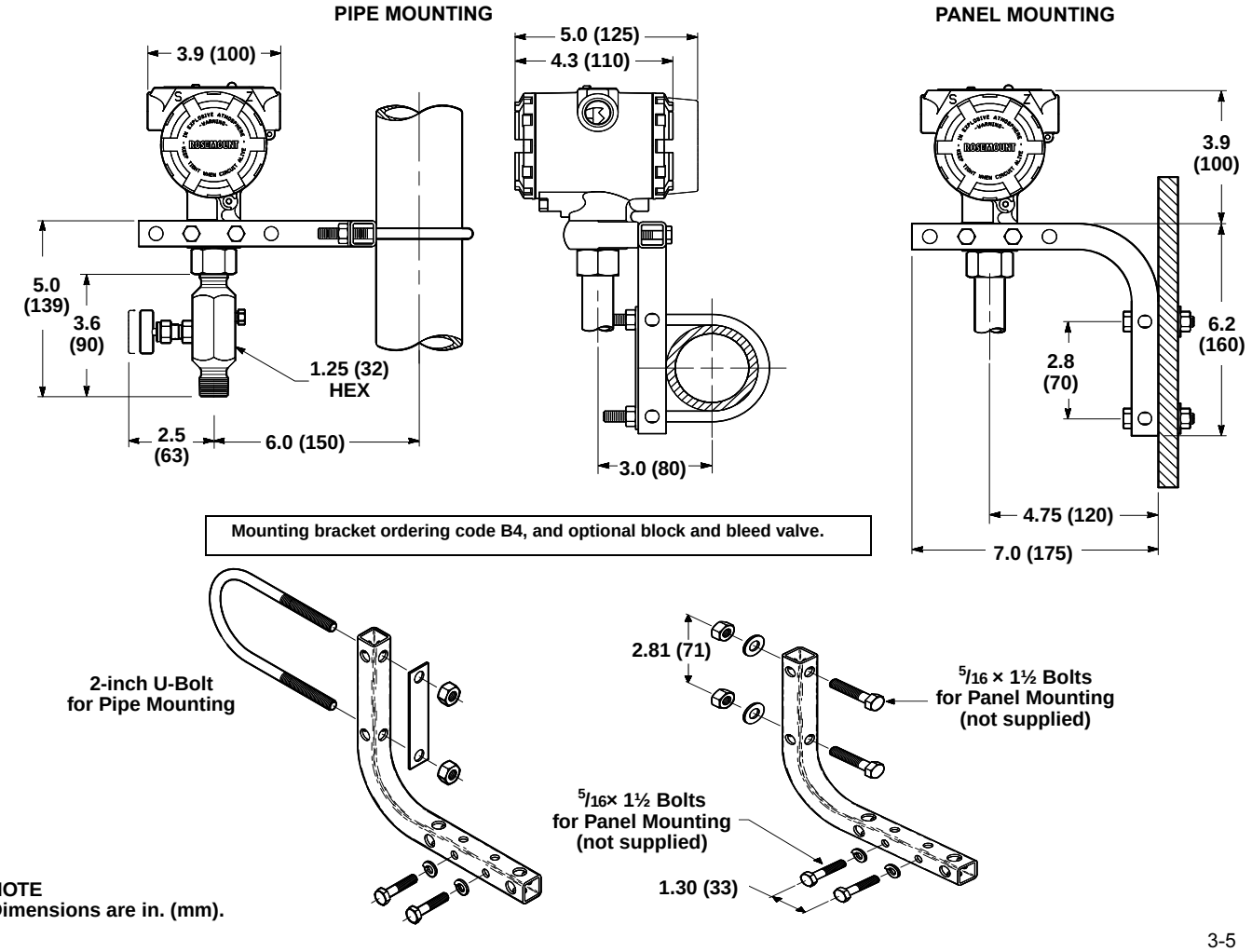
Rosemount 2090P

The Rosemount 2090P is designed to be mounted directly to the process pipe using a weld spud (see Figure 3-7). Mount the transmitter using an existing weld spud, or install a new one using the instructions on page -9.

Rosemount 2090F

The Rosemount 2090F is designed to be mounted directly to the process pipe using a standard sanitary fitting (see Figure 3-8). The transmitter is available with either a 1.5- or 2-inch Tri-Clamp® connection.

Figure 3-2. Transmitter Mounting Configurations with Optional Bracket.



Impulse Piping

Impulse piping configurations depend on specific measurement conditions. Use the following information and Figure 3-3 as a guideline when installing impulse piping.

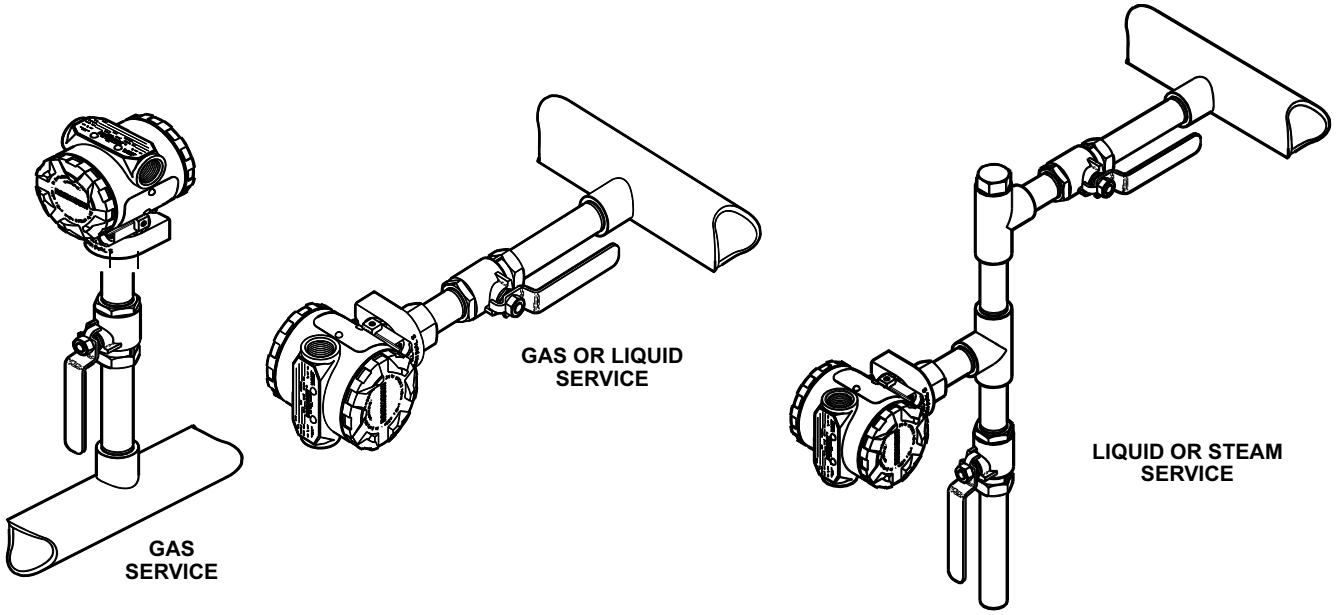
Liquids: Make the line tap on the side of the pipe to prevent sediment deposits from plugging the impulse line or transmitter. Mount the transmitter level with or below the tap so gases vent into the process line.

Gases: Make line taps on either the top or the side of the process line. Mount the transmitter level with or above the line tap so liquids drain into the process line.

Steam: Make line taps in the side of the process line. Mount the transmitter below the line tap to ensure that the impulse line remains filled with condensate.

NOTE
Installing a “T”-connection with a shut-off valve in the impulse line between the transmitter and the valve to the process line will allow you to vent the transmitter to atmosphere, thereby enabling calibration without removing the transmitter.

Figure 3-3. Transmitter Mounting Configurations for Liquids, Gases, and Steam



NOTE
In steam or other high-temperature services, the temperature at the process connection must not exceed the process temperature limit of the transmitter, which is 250 °F (121 °C).

In steam service above 250 °F (121 °C), fill impulse lines with water to prevent steam from contacting the transmitter. Condensate chambers are not necessary since the volumetric displacement of the Rosemount 2088 is negligible.

Access Requirements

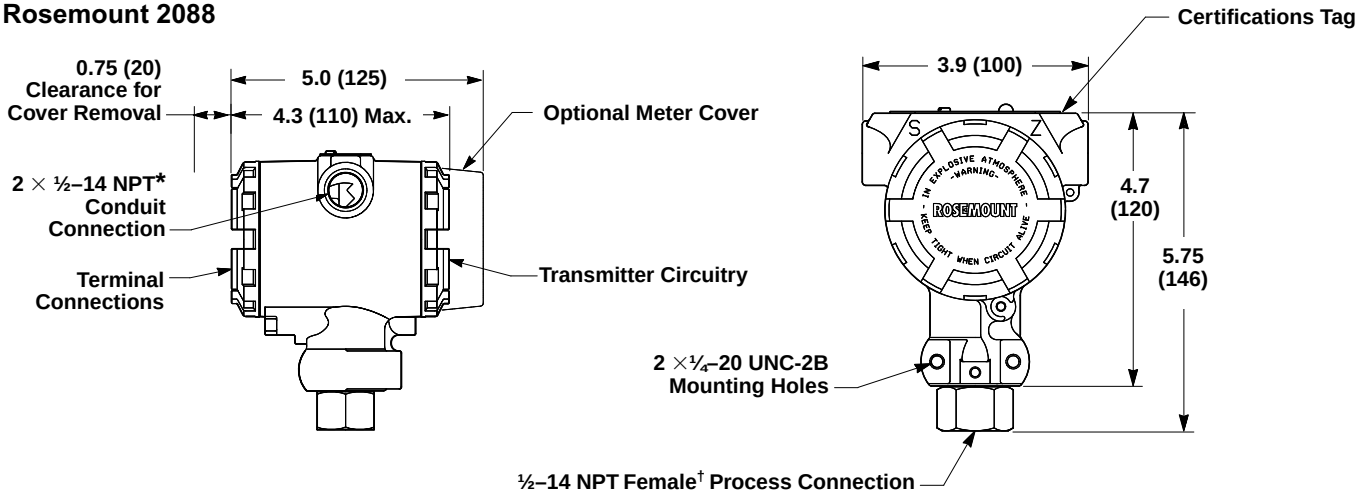
When choosing a mounting location and position, take into account the need for access to the transmitter.

Make wiring terminations through the conduit openings at the top of the electronics housing. The field terminal side of the transmitter is clearly marked on the transmitter neck. Test terminals are incorporated on the terminal block; you do not need access to the electronics compartment to perform calibration procedures.

The transmitter electronics compartment contains the electronics module with failure mode and security jumpers, and the optional LCD meter. Consider the need for access to both compartments when installing the transmitter. Refer to Figure 3-5 for transmitter dimensional drawings.

Figure 3-4. Smart Transmitter Dimensional Drawings.

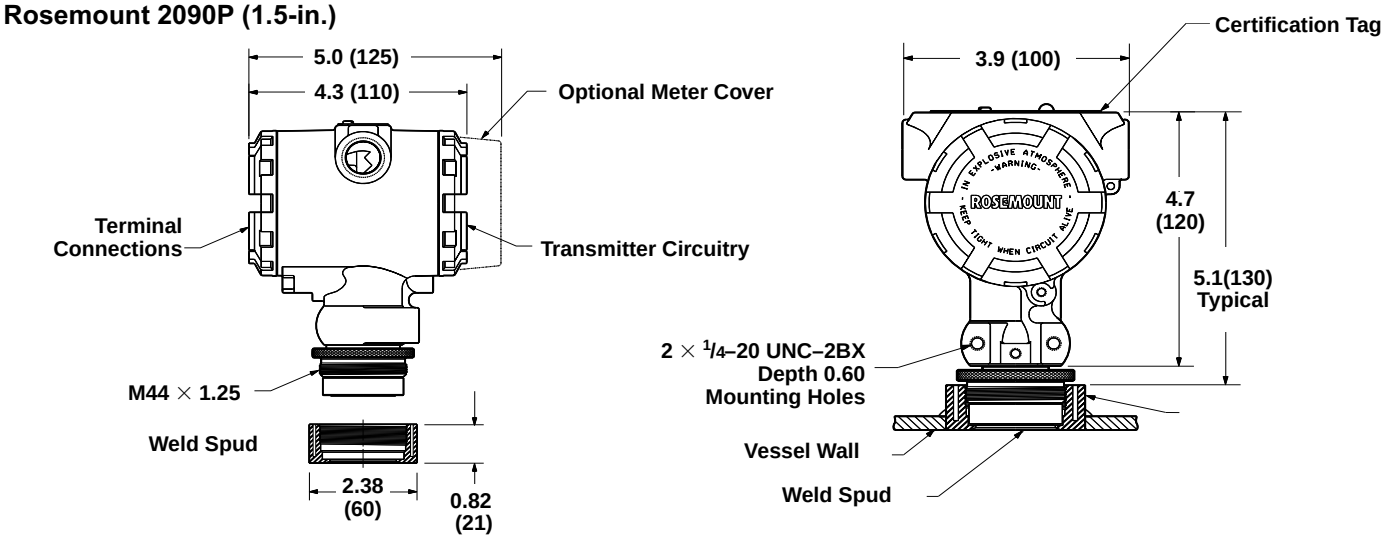
Rosemount 2088



* *M20 × 1.5 Female (CM20), PG 13.5, and G 1/2 Female (PF 1/2) also available as options.*

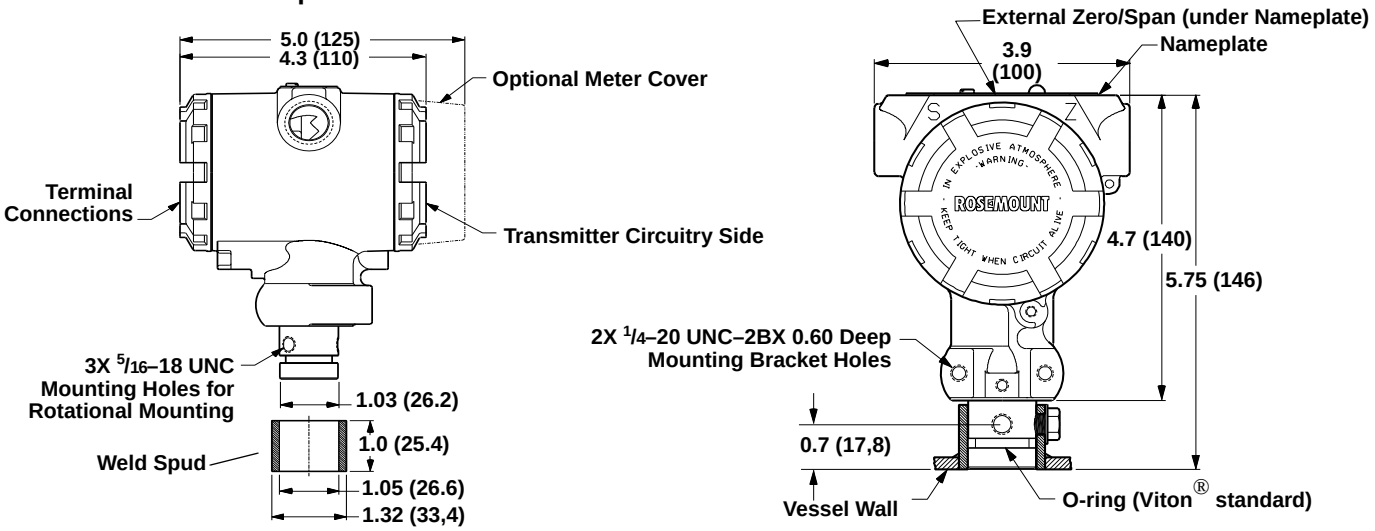
† *DIN 16288 G 1/2 Male, RC 1/2 Female (PT 1/2), and M20 × 1.5 Male (CM20) also available.*

Rosemount 2090P (1.5-in.)

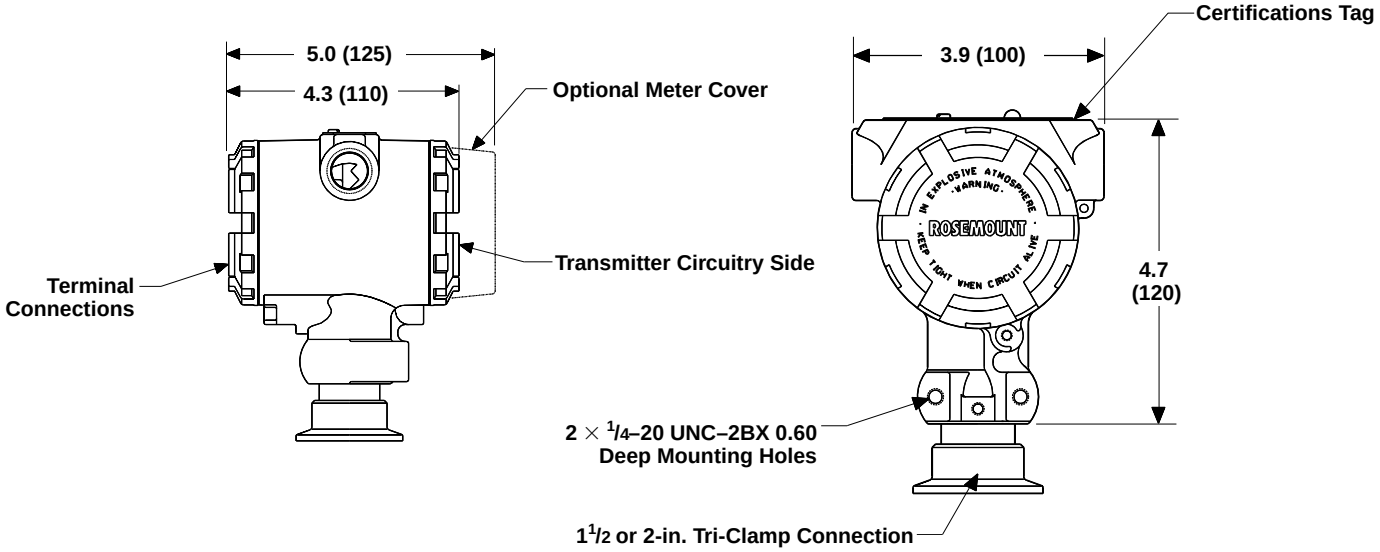


NOTE: Dimensions are in. (mm).

Rosemount 2090P Compatible with 1-in. PMC® Process Connection



Rosemount 2090F



* *M20 × 1.5 Female (M20) and PG 13.5 also available.*

NOTE: Dimensions are in inches (millimeters).

Rosemount 2090P

Installing the Rosemount 2090P transmitter involves attaching a weld spud to the tapped process vessel, attaching the transmitter to the weld spud, and making electrical connections. If you intend to use an existing weld spud, proceed to the transmitter section of this installation procedure.

NOTE
The Rosemount 2090P Isolating Diaphragm can be mounted flush with the inside diameter of any vessel larger than three inches in diameter.

⚠CAUTION

Installation of the weld spud should be performed by a skilled welder using a TIG welder. Improper installation may result in weld spud distortion.

Weld Spud

1. Using the appropriate size hole saw, cut a hole in the process vessel to accept the weld spud. The diameter for a weld spud with heat isolator groove is 2.37 inch (60 mm); when compatible with 1-in. PMC® process connection style spud, diameter is 1.32 in. (33,4 mm). The hole should produce a tight, uniform fit when coupled with the weld spud.
2. Bevel the edge of the vessel hole to accept filler material (see Figure 3-5).
3. Remove the weld spud from the transmitter and remove the Teflon® gasket from the weld spud.

⚠CAUTION

Excessive heat will distort the weld spud. Weld in sections, as shown in Figure 3-5, cooling each section with a wet cloth. Allow adequate cooling between passes.

To reduce the chances of distorting the weld spud (for 1.5-in. connection), use a heat sink—Rosemount Part Number 02088-0196-0001.

4. Position the weld spud in the vessel hole, place heat sink and tack spud in place using the welding sequence shown in Figure 3-5. Cool each section with a wet cloth before proceeding to the next section.
5. Weld the spud in place using 0.030 to 0.045 in. (0,762 to 1,143 mm) stainless steel rod as filler in the bevelled area. Using between 100 and 125 amps., adjust the amperage for 0.080 in. (2,032 mm) penetration.

Transmitter

1. After the weld spud has cooled, remove the heat sink and install the Teflon gasket into the weld spud. Ensure that the gasket is properly positioned within the weld spud; improper placement could cause a process leak (see Figure 3-6).
2. Position the transmitter into the spud and begin to engage the threads. Rotate the transmitter prior to seating the threads completely to enable access to the housing compartments, the conduit entry, and the local indicator.

3. Hand tighten the transmitter using the knurled retaining ring, then snug an additional 1/8 turn with adjustable pliers.

IMPORTANT
Do not over-tighten the retaining ring. A spanner wrench (P/N 02088-0193-0001) hole is located on the knurled portion of the retaining ring to assist in transmitter removal if it is over-tightened.

Figure 3-5. Installing the Weld Spud.

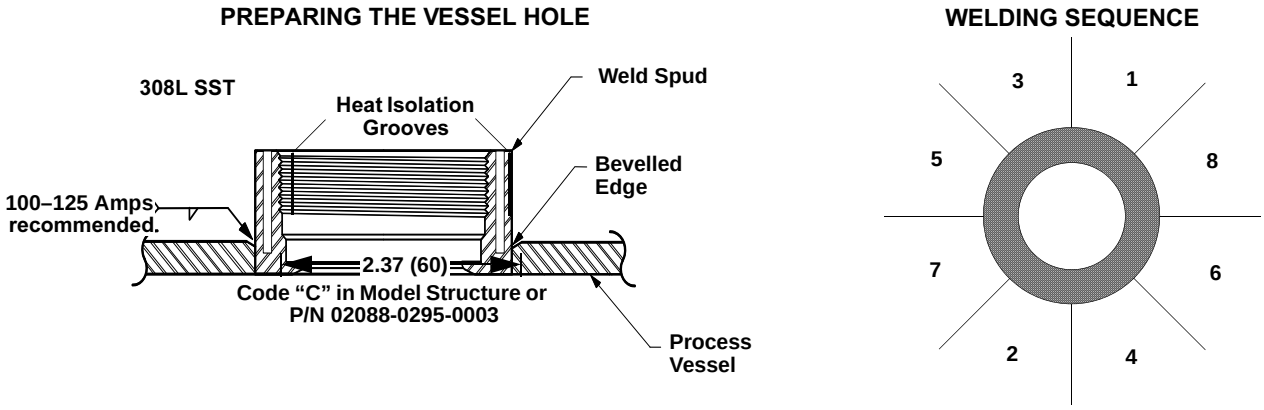


Figure 3-6. Teflon Gasket Placement.

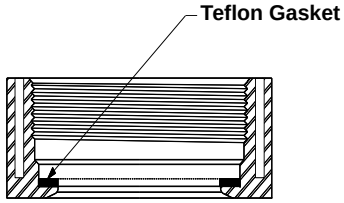
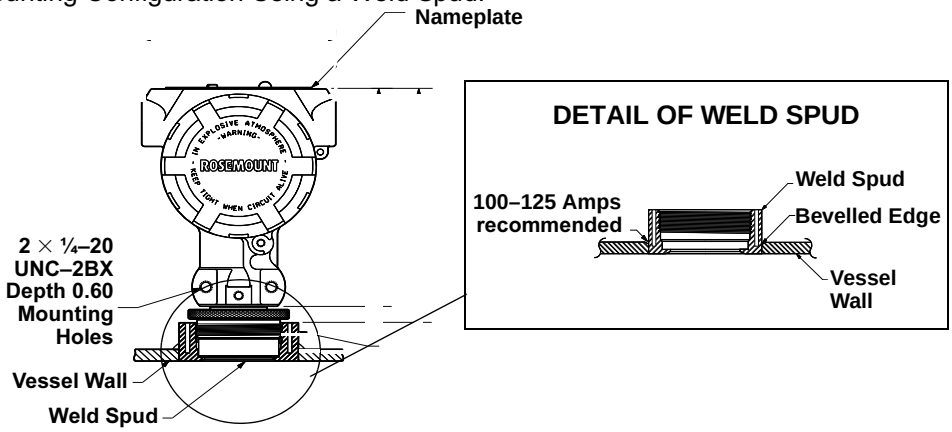


Figure 3-7. Rosemount 2090P Mounting Configuration Using a Weld Spud.

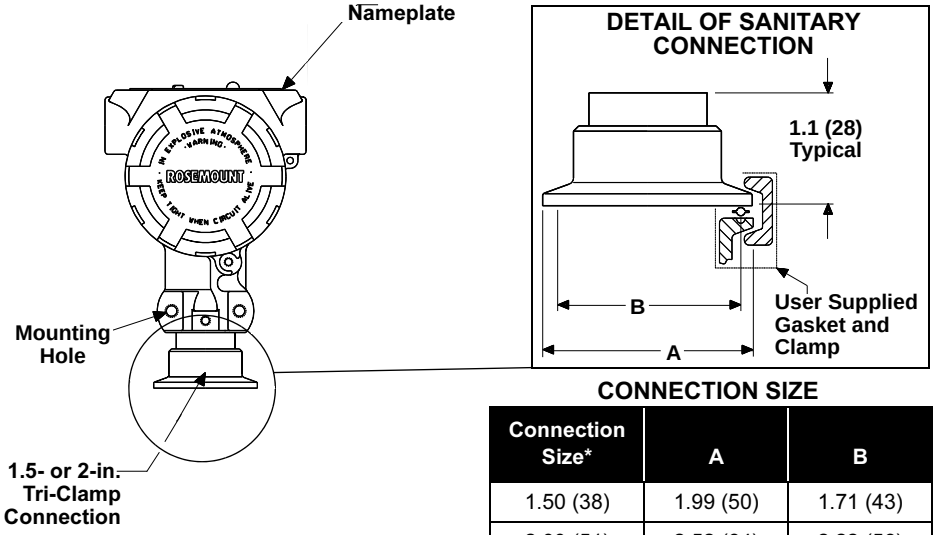


Rosemount 2090F

⚠ The Rosemount 2090F sanitary pressure transmitter is designed to be installed directly to a sanitary fitting. The transmitter is available with either a 1.5- or 2-inch clamp connection.

When installing the transmitter to the sanitary fitting it is important to use the proper sanitary clamp and gasket (user-supplied). Check the clamp and gasket specifications before installing. Refer to *Standard Sanitary Clamp Models* in Figure 3-8 for a list of standard sanitary clamps, their respective maximum pressure ranges, and the recommended torque to be applied when mounting.

Figure 3-8. Rosemount 2090F Mounting Configuration Using a Sanitary Fitting.



CONNECTION SIZE

Connection Size*	A	B
1.50 (38)	1.99 (50)	1.71 (43)
2.00 (51)	2.52 (64)	2.22 (56)

** Dimensions are in inches (millimeters)*

STANDARD SANITARY CLAMP MODELS

Clamp Model	psi @ 70 °F (kPa @ 21 °C)	psi @ 250 °F (kPa @ 121 °C)	Recommended Torque
13 MHHM 1.5-inch 13 MHHM 2-inch	450 (3 103) 500 (3 448)	250 (1 724) 250 (1 724)	25 in-lb (2.8 N•m)
13 MHHS 1.5-inch 13 MHHS 2-inch	600 (4 138) 550 (3 793)	300 (2 069) 275 (1 896)	25 in-lb (2.8 N•m)
13 MHP 1.5-inch 13 MHP 2-inch	1500 (10 345) 1000 (6 896)	1200 (8 276) 800 (5 517)	20 ft-lb (27 N•m)

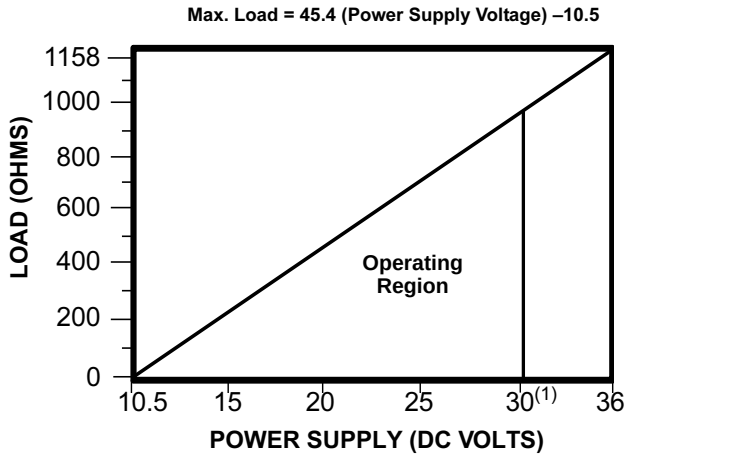
ELECTRICAL CONSIDERATIONS

The wiring terminations on the Rosemount 2088, 2090P, and 2090F are located in the side of the transmitter housing marked “FIELD TERMINALS.” Access to these terminations is required during installation and may be necessary during periodic calibration of the transmitter.

Power Supply

The dc power supply should provide power to the transmitter with less than one percent ripple. The total loop resistance load is the sum of the resistance of the signal wires and the resistance load of the controller, indicator, and other pieces of equipment in the loop. Note that the resistance of intrinsic safety barriers, if used, must be included. Figure 3-9 shows the transmitter power supply load limitations.

Figure 3-9. Transmitter Load Limitations



(1) For CENLEC EX ia Approval, power supply must not exceed 30 volts.

NOTE
Minimum load impedance for Output Code N is 100 kilohms.

Field Wiring

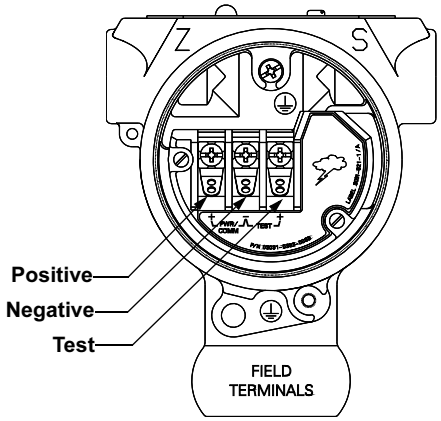
⚠ All power to the transmitter is supplied over the signal wiring. Signal wiring need not be shielded, but use twisted pairs for best results. Do not run unshielded signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. For high EMI/RFI environments, shielded twisted pair cable should be used. To power the transmitter, connect the positive power lead to the terminal marked “PWR/COMM+” and the negative power lead to the terminal marked “–” (see Figure 3-10). Tighten the terminal screws to ensure that proper contact is made. Avoid contact with the leads and the terminals. No additional power wiring is required for transmitters with 4-20 mA output. For low power transmitters, connect positive signal lead to “test +” and negative signal lead to terminal marked “-.”

⚠ To connect test equipment for monitoring the output of the Rosemount 2088 Smart during maintenance procedures, connect one lead to the terminal labeled “TEST+” and the other lead to the terminal labeled “–” (see Figure 3-10). Avoid contact with the leads and the terminals.

Signal wiring may be grounded at any one point on the measurement loop, or it may be left ungrounded. The negative side of the power supply is a recommended grounding point. The transmitter case may be grounded or left ungrounded.

Conduit connections at the transmitter should be sealed to prevent moisture accumulating in the field terminal side of the transmitter housing. Also, install wiring with a drip loop with the bottom of the drip loop lower than the conduit connection of the transmitter housing.

Figure 3-10. Rosemount 2088 Smart Signal Wiring Terminals.



FAILURE MODE AND SECURITY JUMPERS

Failure Mode

As part of normal operation, the Rosemount 2088/2090 Smart Pressure Transmitter continuously monitors its own operation. This automatic diagnostic routine is a timed series of checks repeated continuously. If the diagnostic routine detects a failure in the transmitter, the transmitter drives its output either below or above specific values depending on the position of the failure mode jumper or switch.

The values to which 4–20 mA transmitters drive their output in failure mode depend on whether they are factory-configured to *standard* or *NAMUR-compliant* operation. The values for each are as follows:

Standard Operation
Linear output: $3.9 \leq I \leq 20.8$ mA
Fail low: $I \leq 3.75$ mA
Fail high: $I \geq 21.75$ mA

NAMUR-Compliant Operation (Option Code C4)
Linear output: $3.8 \leq I \leq 20.8$ mA
Fail low: $I \leq 3.6$ mA
Fail high: $21.0 \leq I \leq 23.0$ mA

To determine the failure mode configuration of your transmitter, review the failure mode options using a 275 HART Communicator.

NOTE
The failure mode configuration, whether standard or NAMUR-compliant, is configured at the factory and can not be changed in the field.

Jumper Locations

Without a meter installed

⚠ The failure mode alarm jumper is located on the front side of the electronics module just inside the electronics housing cover and is labeled ALARM (See Figure 3-11). Do not remove the transmitter cover in explosive atmospheres when the circuit is alive. Both covers must be fully engaged to meet explosion-proof requirements.

With a meter installed

⚠ The failure mode alarm jumper is located on the LCD faceplate in the electronics module side of the transmitter housing and is labeled ALARM (See Figure 3-11). Do not remove the transmitter cover in explosive atmospheres when the circuit is alive. Both covers must be fully engaged to meet explosion proof requirements.

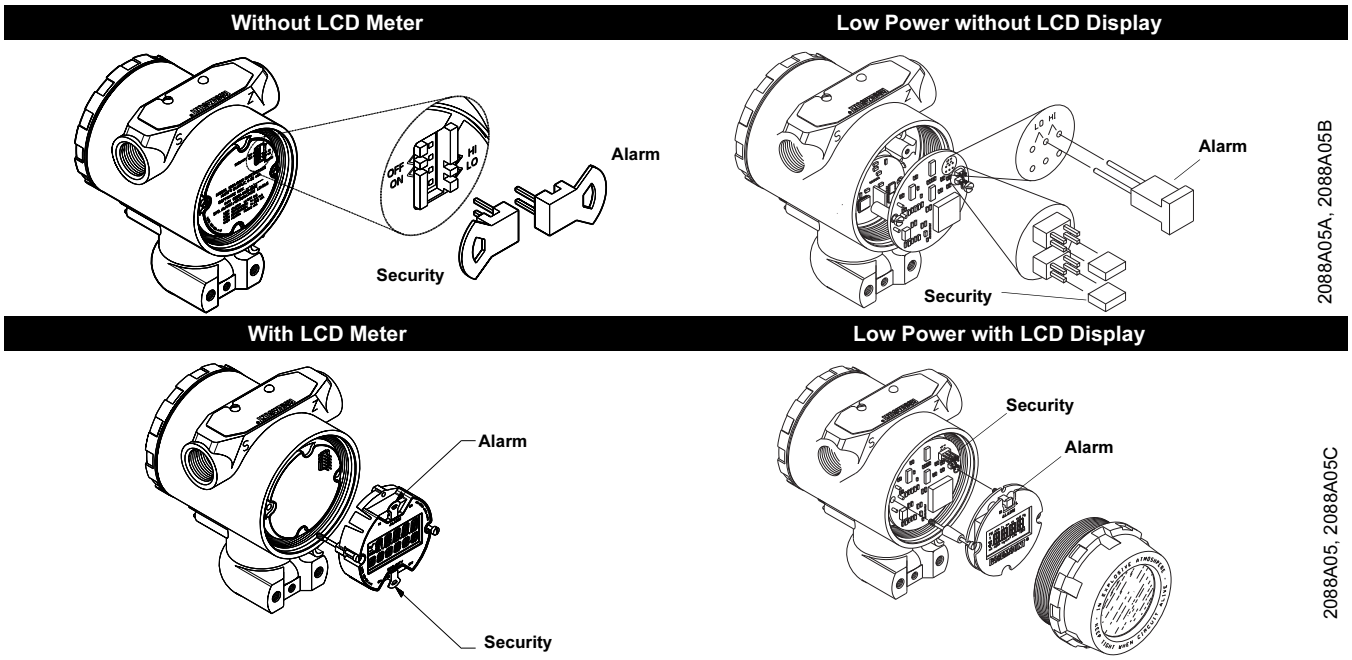
Transmitter Security

After commissioning the transmitter, you may wish to protect the configuration data from unwarranted changes. The transmitter is equipped with a security jumper that can be positioned to prevent changes to the configuration data (see Figure 3-11). The circuit board is electrostatically sensitive. Observe handling precautions for static-sensitive components to avoid circuit board damage.

When the transmitter security jumper is in the “ON” position, the transmitter will not accept any “writes” to its memory. This means that configuration changes (such as digital trim and reranging) cannot take place when the transmitter security is on. To reposition the jumper, use the following procedure.

1. If the transmitter is installed, secure the loop, and remove power.
2. ⚠ Remove the housing cover opposite the field terminal side. Do not remove the instrument cover in explosive atmospheres when the circuit is alive.
3. Reposition the jumper. Avoid contact with the leads and the terminals. Refer to Figure 3-11 for the location of the jumper and the ON and OFF positions.
4. ⚠ Reattach the transmitter cover. The cover must be fully engaged to comply with explosion-proof requirements.

Figure 3-11. Transmitter Alarm and Security Jumper Locations



NOTE
If either the alarm or security jumper is dislodged or removed from its position the transmitter reverts to default alarm or security settings of: Alarm: Output high; Security: Off

ZERO AND SPAN ADJUSTMENTS

The smart Rosemount 2088 is equipped with local zero and span adjustment buttons. The buttons are located on the top of the transmitter beneath the certifications label. Use the zero and span adjustments to set the 4 and 20 mA output points.

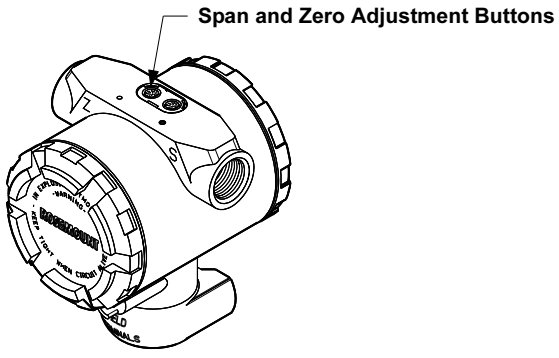
Rerange Procedure

To rerange the transmitter using the span and zero buttons, perform the following procedure.

1. Loosen the screw holding the nameplate on top of the transmitter housing and rotate the nameplate to expose the zero and span buttons (see Figure 3-12).
2. Using a pressure source with an accuracy three to ten times the desired calibrated accuracy, apply a pressure equivalent to the lower range value.
3. To set the 4 mA point, press and hold the zero button for at least two seconds, then verify that the output is 4 mA. If a meter is installed, it will display ZERO PASS.
4. Apply a pressure equivalent to the upper range value.
5. To set the 20 mA point, press and hold the span button for at least two seconds, then verify that the output is 20 mA. If a meter is installed, it will display SPAN PASS.

NOTE
If the transmitter security jumper is in the “ON” position, or if the local zero and span adjustments are disabled through the software, you will not be able to make adjustments to the zero and span using the local buttons. Refer to Figure 3-11 on page -14 for the proper placement of the transmitter security jumper.

Figure 3-12. Local Zero and Span Adjustments



Disabling the Zero and Span Adjustments

After you rerange the transmitter using the span and zero adjustments, you may wish to disable the adjustments to prevent further reranging. To disable the span and zero adjustments, activate the transmitter security jumper (see “Transmitter Security” on page -14).

NOTE
The transmitter security jumper prevents any changes to the transmitter configuration data. The software lockout sequence only disables the local span and zero adjustment buttons.