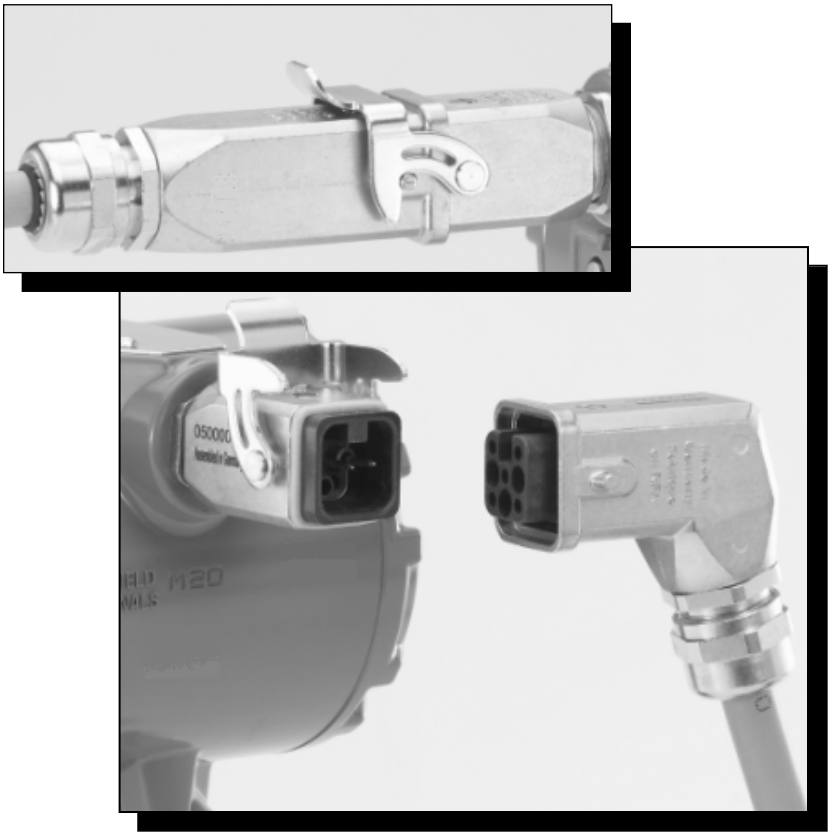
Rosemount 356 Nuclear Connector



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Rosemount 356 Nuclear Connector

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 at 1-952-949-5200.

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 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 prior to shipment. Contact Rosemount Nuclear (1-952-949-5200) 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
8200 Market Boulevard
Chanhassen, MN 55317
USA

IMPORTANT

Rosemount 356 Nuclear Connector has been tested for Nuclear Class 1E usage according to the standards shown below:

- KTA 3505-2005

Rosemount 356 Connectors are manufactured under a quality system that meets the requirements of ISO 9001, KTA 1401, KTA 3507 and the applicable portions of IAEA-50-C-Q. During qualification testing, interfaces were defined between transmitter/connector and the surrounding environment that are essential to meeting requirements of the qualification standards listed above.

In order to maintain the qualified status of the transmitter/connector system, the essential environmental interfaces must not be compromised. Performance of any operations on the connector 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 expressly disclaims all responsibility and liability for connectors for which the foregoing has not been complied with by the user.

Revision Status

Changes from March 2013 (Rev AD) to February 2020 (Rev AE)

Page (Rev AD)	Page (Rev AE)	Changes
Cover, throughout	Cover, throughout	Change revision date from March 2013 to February 2020; change revision from AD to AE.
Cover, throughout	Cover, throughout	Replace Emerson logo.
Throughout	Throughout	Replace Rosemount Nuclear Instruments, Inc. with Rosemount Nuclear per current practice.
Throughout	Throughout	Replace reference to Loctite PST 580 with Loctite® 580™.
TOC-2, 1-2, 2-8	TOC-2, 1-2, 2-8	Add "*This page intentionally left blank"* for clarity.
2-2	2-2	Add "as indicated in the 356 Product Data Sheet" for available options.
2-2	2-2	Remove reference to 4-wire configuration.
2-3	2-3	Replace figure 2-1 with better resolution for clarity.
2-3	2-3	Fix typos in "Customer Installed Instrument Side Connector".
2-4	2-4	Add figure 2-4a for current configuration with footnote of (As of February 2020) and amended figure 2-4 to be figure 2-4b, Former/Original Configuration with footnote (Up to February 2020).
2-5	2-5	Fix typo in 'TEST' terminal.
2-7	2-7	Add border to figure 2-7.
3-2	3-2	Update figures 3-2 and 3-3 description to remove material reference.
3-3	3-3	Add "Original" to figures 3-4 and 3-5 and footnote of (Up to February 2020).
A-2	A-2	Amend General Considerations.

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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SECTION 1: INTRODUCTION

USING THIS MANUAL

This manual is designed to assist in installing, operating and maintaining the Rosemount 356 Nuclear Connector. The manual is organized into the following sections:

Section 2: Installation of Instrument Side onto Device
Provides mechanical and electrical installation considerations of the Instrument Side portion of the connector.

Section 3: Installation of Field Side onto Instrument Side
Provides mechanical and electrical installation considerations of the Field Side portion of the connector.

Section 4: Maintenance
Provides basic hardware maintenance considerations for the 356 Connector.

Appendix A: Procedure for On-site Assembly of Field Side Connector
Provides instructions for assembling the field side portion of the connector on-site.

NOTE
Refer to Rosemount Qualification/Test Reports and Product Data Sheets for details on testing, performance specifications and dimensional drawings.

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SECTION 2: INSTALLATION OF INSTRUMENT SIDE ONTO DEVICE

OVERVIEW

This section contains the following installation considerations:

- General Considerations
- Electrical Considerations
  - Polarity
  - Factory Installed Instrument Side Connector
  - Customer Installed Instrument Side Connector
- Mechanical Considerations
- Installation Procedure
  - Preparation of the Instrument Side Connector
  - Installation of the Instrument Side onto 3152 Pressure Transmitter
  - Electrical Connection to 3152 Pressure Transmitter

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

Electrical shock can result in death or injury.

- Avoid contact with the connector leads and device terminals

⚠ WARNING

When installing the instrument side of the connector onto the housing of the device, take care to prevent the lead wires from becoming twisted or from being cut by any potential sharp edges inside the electronics housing. The same care must be taken when removing the connector from the device.

EMERSON

GENERAL CONSIDERATIONS

Measurement accuracy of any type of instrument depends upon proper installation of the device and its associated piping, valves, and electrical connections. When installing the 356 Connector onto a device, consider the need for easy access, personnel safety and suitable connector/device environment.

The 356 Connector is available with M20x1.5 threads or PG13.5 threads as indicated in the 356 Product Data Sheet. Before installing the instrument side onto the intended device, ensure that the device housing includes compatible threads or that a qualified thread adaptor is available for use.

The instructions contained in this section apply only when the 356 Connector is ordered separately from the intended device. If the 356 is not factory-installed, qualification of the device/connector interface becomes the end user's responsibility.

The KTA qualification of the 356 was completed in conjunction with the Rosemount 3152 Pressure Transmitter. As such, most instructions in this section are focused on activities related to installation of the instrument side onto the 3152. However, it should be noted that the use of the 356 Connector is not limited to the 3152 or to Rosemount transmitters.

NOTE
If the 356 Connector is not factory-installed by RNII, qualification of the instrument/connector interface becomes the user's responsibility.

NOTE
When installing the 356 on other devices, consult the device manufacturer's documentation for specific instructions related to the device.

ELECTRICAL CONSIDERATIONS

This section contains information to be considered prior to preparing the instrument side connector for installation. Read this section carefully before proceeding to ensure the connector and device will function properly when installed.

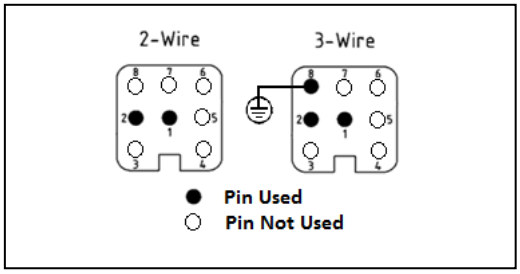
Polarity

Prior to installing a 356 instrument side connector, it is important to understand the polarity requirements and characteristics of the connector. Incorrect polarity can lead to non-functioning devices or, in some cases, a damaged device.

The 356 instrument side connector can be provided in 2- or 3-wire configurations. Figure 2-1 shows the wiring scheme for 2- and 3-wire configurations.

Pin #1 or pin #2 can be connected to positive (+) terminal of the intended device. Careful consideration must be given to ensure that the same pin is designated and identified as positive (+) on both instrument side and field side connectors.

Figure 2-1 – Instrument Side Wiring Scheme



Factory Installed Instrument Side Connector

If the 356 instrument side connector is factory installed to a 3152 pressure transmitter, the 5th character in the model string will define how the lead wires are installed on the transmitter.

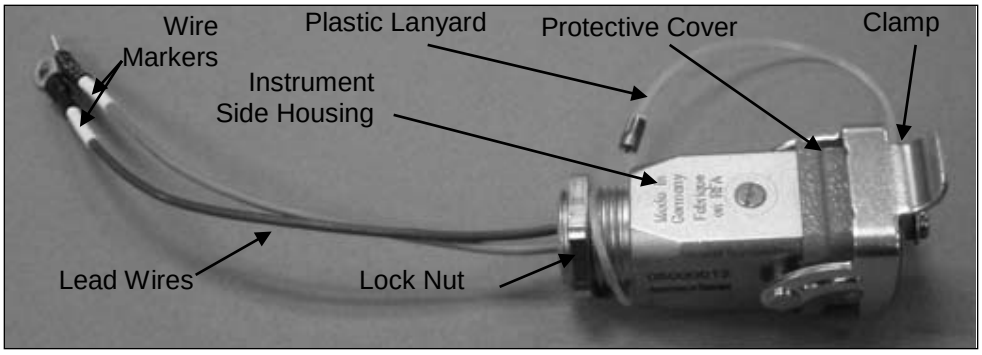
- "1" = Pin 1 is connected to the positive (+) terminal on the 3152 terminal block.
- "2" = Pin 2 is connected to the positive (+) terminal on the 3152 terminal block.

NOTE
Reference the Rosemount 356 Product Data Sheet (Rosemount document number 00813-0200-4856) for additional model string information.

Customer Installed Instrument Side Connector

The end user is responsible to determine whether pin #1 or pin #2 should be connected to positive (+) terminal of the device's terminal block.

Figure 2-2 – Instrument Side Connector Parts



MECHANICAL CONSIDERATIONS

This section contains information that should be considered when preparing to install the instrument side of the connector onto a Rosemount 3152 Pressure Transmitter. Read this section carefully before proceeding to installation procedure. Proper installation is mandatory to assure qualification.

Always use plant-approved sealant when installing the 356 Connector onto the 3152 housing. During qualification, Loctite® 580™ (RNII part number 01153-0329-0001) was used.

Ensure the attached protective cover remains in place throughout installation to provide protection from dust, moisture and other foreign materials (see Figure 2-2). Once the instrument side is connected to the field side of the connector, the cover may be discarded.

Care must be taken to prevent the lead wires from becoming twisted or cut during installation.

Figure 2-3 – Dimensional Drawing of Instrument Side, Zinc die cast

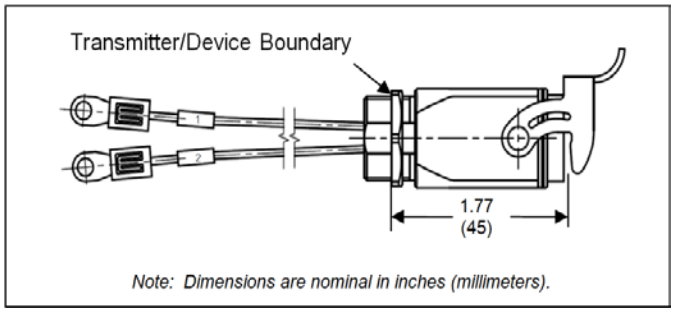


Figure 2-4 – Dimensional Drawing of Instrument Side, Stainless Steel

Figure 2-4a – Current Configuration (As of February 2020)

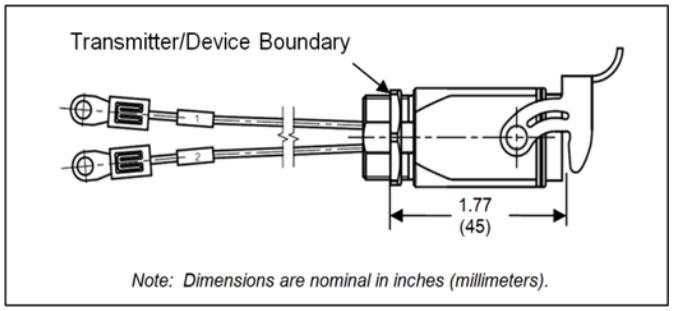
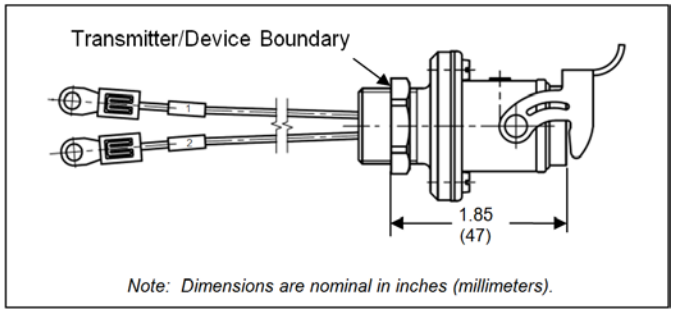


Figure 2-4b – Original Configuration (Up to February 2020)



INSTALLATION PROCEDURE

Installation consists of preparing the instrument side connector, installing the instrument side connector onto the transmitter and making the electrical connections. The procedures for these operations follow.

⚠ WARNING

Electrical shock can result in death or injury.

- Avoid contact with the connector leads and device terminals

⚠ WARNING

When installing the instrument side of the connector onto the housing of the device, take care to prevent the lead wires from becoming twisted or from being cut by any potential sharp edges inside the electronics housing. The same care must be taken when removing the connector from the device.

⚠ WARNING

Do not connect signal leads to the 'TEST' terminals on the 3152.

⚠ IMPORTANT

Ensure the provided cover remains in place throughout installation to provide protection from dust, moisture and other foreign materials.

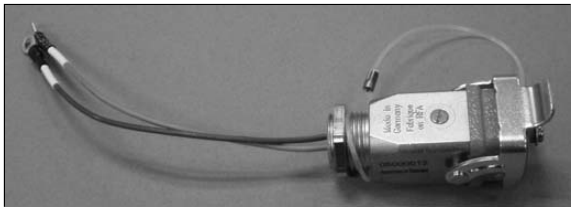
⚠ IMPORTANT

Ensure that lead wires are attached to positive (+) terminal and negative (-) terminal as intended, and that instrument and field sides are consistent.

Preparation of the Instrument Side Connector

The standard shipping configuration of the 356 instrument side connector from RNII is shown in Figure 2-5. If the cover has been removed during handling, reinstall now before installing connector onto transmitter.

Figure 2-5 – Properly installed cover and lanyard



Installation of Instrument Side onto 3152 Pressure Transmitter

1. Screw the lock nut fully onto the connector, taking care not to pinch the lanyard.
2. Apply plant approved sealant around the first 3 threads of the instrument side connector.

NOTE
Loctite® 580™ (RNII part number 01153-0329-0001) was used in KTA qualification.

3. Carefully feed the lead wires through the conduit opening of the electronics housing.
4. Screw the instrument side connector onto the housing five full turns. The final position of the notch in the crimp terminal must be on top (see Figure 2-6).

NOTE
A minimum of 5 threads must be engaged.

NOTE
Hold the 3152 electronics housing steady during instrument side connector installation to ensure that the module neck seal is not disrupted.

⚠ WARNING

When installing the instrument side of the connector onto the housing of the device, take care to prevent the lead wires from becoming twisted or from being cut by any potential sharp edges inside the electronics housing.

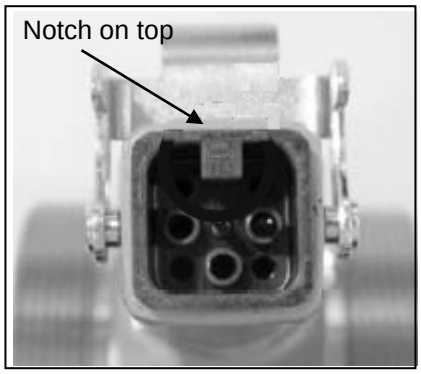


Figure 2-6 – Final position of instrument side connector

5. Torque the locknut against the 3152 housing to 221 in-lbs (25 N-m).
6. Wipe off any excess thread sealant from around the threads.
7. Allow the thread sealant to cure for 72 hours at room temperature to ensure seal integrity.

NOTE
Take care to ensure lanyard is not pinched and can move freely.

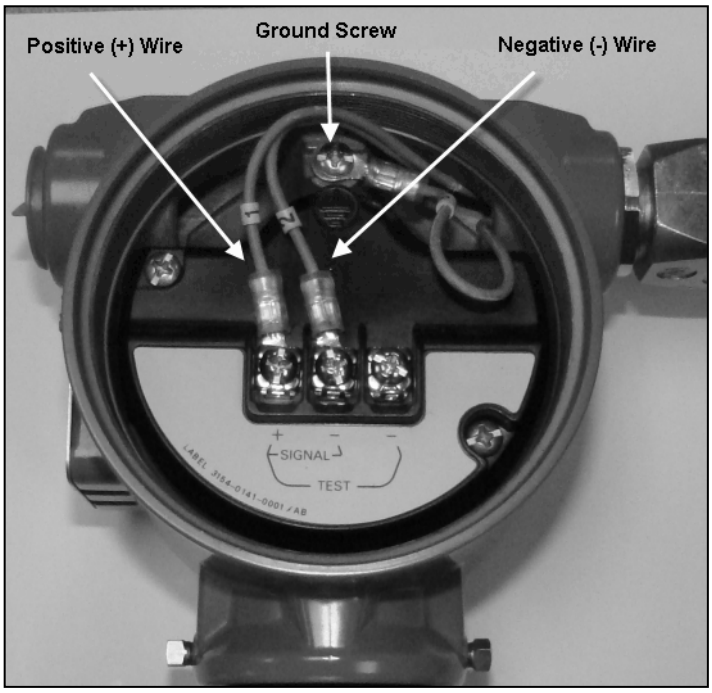
Electrical Connection to 3152 Pressure Transmitter

1. Attach the designated wire to the positive terminal on the 3152 (see Figure 2-7).
2. Attach the designated wire to the negative terminal on the 3152 (see Figure 2-7).
3. If a ground wire (optional) is present, attach it to the ground screw (see Figure 2-7).
4. Torque all screws (terminal and ground) to 7 in-lb (0.8 N-m).

NOTE
When installing onto 1150 Series pressure transmitters, terminal and ground screws should be torqued to 5 in-lb (0.6 N-m).

NOTE
When using the 356 Connector with devices other than Rosemount transmitters, a fourth wire may be present. In these cases, attach the wire and torque all screws in accordance with the device product manual.

Figure 2-7 – 356 wired to 3152 Terminal Block



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SECTION 3: INSTALLATION OF FIELD SIDE ONTO INSTRUMENT SIDE

OVERVIEW

This section contains the following installation considerations:

- General Considerations
- Mechanical Considerations
- Installation Procedure

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

Electrical shock can result in death or injury.

- Avoid contact with the connector leads and device terminals

⚠ WARNING

Field Side Instrumentation cable should be supported within approximately 1 foot of the device/connector to prevent undue strain on field side connector.

GENERAL CONSIDERATIONS

The Rosemount 356 uses a simple clamp-style disconnect mechanism between the instrument and field sides of the connector. While the general use of this type of connection is simple, this section should be read carefully before installation to ensure the qualified configuration requirements are met.

MECHANICAL CONSIDERATIONS

This section contains information you should consider when preparing to install the field side of the connector onto the instrument side. Read this section carefully before proceeding to installation procedure. Proper installation is mandatory to assure qualification.

Ensure the provided protective covers remain in place throughout installation to provide protection from dust, moisture and other foreign materials (see Figure 3-1). Once the field side is connected to the instrument side, the covers may be discarded.

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The field side of the Rosemount 356 connector is available in two configurations: Top Entry (see Figures 3-2 and 3-4) and Side Entry (see Figures 3-3 and 3-5).

Figure 3-1 – Field Side

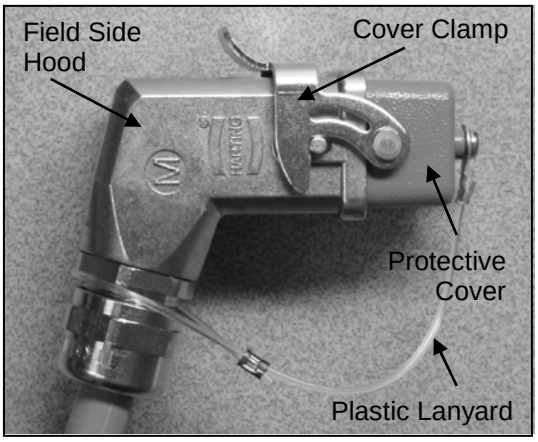


Figure 3-2 – Dimensional Drawing of Coupled Connector – Top Entry Hood

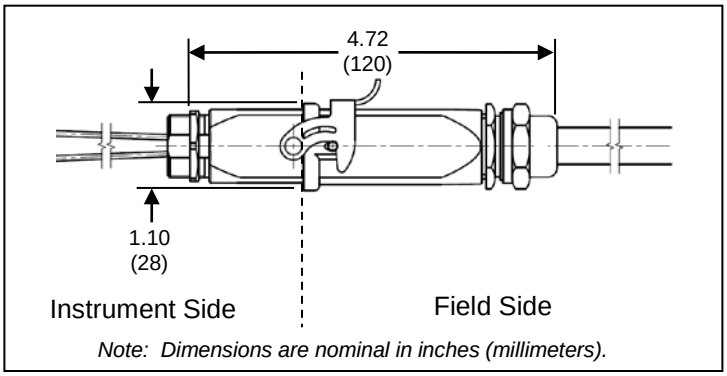


Figure 3-3 – Dimensional Drawing of Coupled Connector – Side Entry Hood

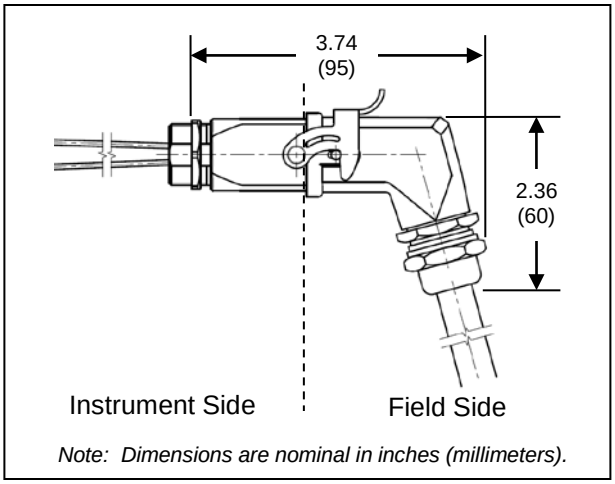
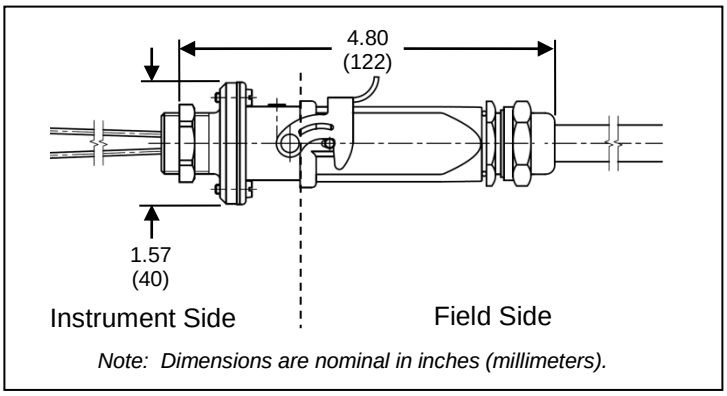
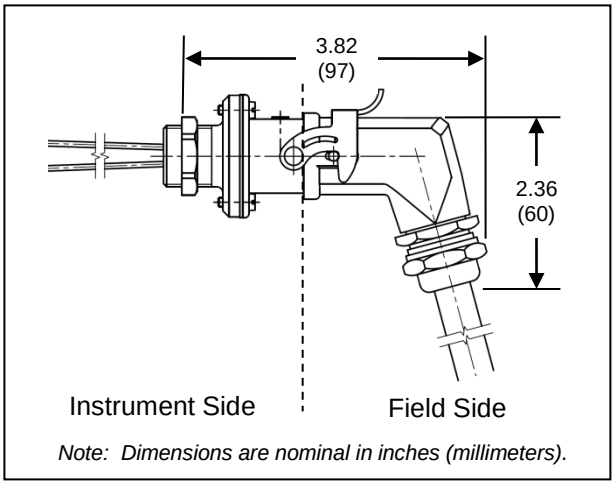


Figure 3-4 – Dimensional Drawing of Coupled Connector – Top Entry Hood Original Stainless Steel (Up to February 2020)



Note: Dimensions are nominal in inches (millimeters).

Figure 3-5 – Dimensional Drawing of Coupled Connector – Side Entry Hood Original Stainless Steel (Up to February 2020)



Note: Dimensions are nominal in inches (millimeters).

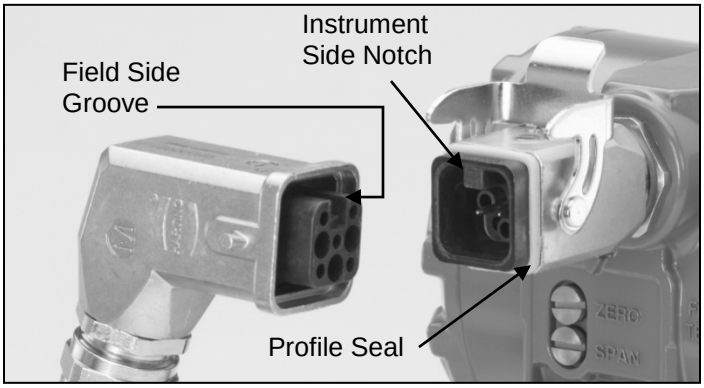
INSTALLATION PROCEDURE

1. Remove and discard the protective covers from both the instrument side and field side of the connector.
2. Ensure grey profile seal is present on the instrument side of the connector (see Figure 3-6). If it is missing or damaged, replace the profile seal before proceeding to step 3.

NOTE
An extra profile seal is shipped with every 356 Instrument Side Connector. Please contact Rosemount Nuclear for ordering information if additional profile seals are required.

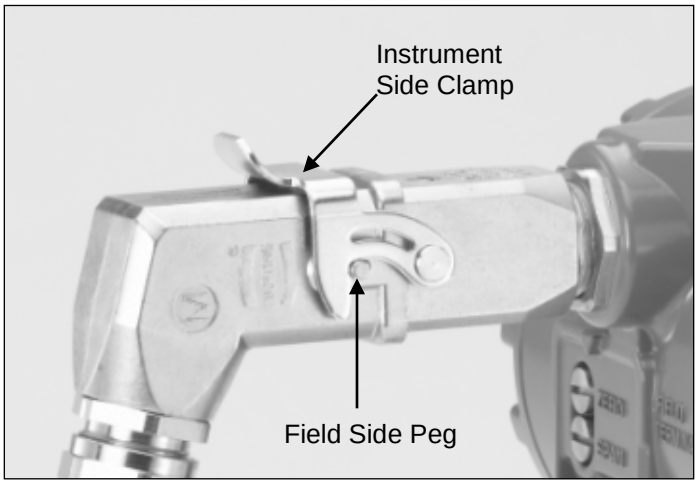
3. Line up the groove on the field side with the notch on the instrument side (see Figure 3-6) and push the two together firmly.

Figure 3-6 – Lining up Instrument Side and Field Side



4. Secure the field and instrument sides together by pushing the instrument side clamp down over the pegs on the field side (see Figure 3-7).

Figure 3-7 – Correctly Coupled 356 Connector



SECTION 4: MAINTENANCE

OVERVIEW

This section contains the following maintenance considerations:

- General Considerations
- Maintenance

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

Electrical shock can result in death or injury.

- Avoid contact with the connector leads and device terminals

⚠ WARNING

Replacement equipment or spare parts not approved by Rosemount Nuclear for use could reduce the performance capabilities of the connector and may render the instrument dangerous or adversely impact its qualified status.

- Use only components supplied with the 356 Connector or designated by Rosemount Nuclear as spare parts for the 356.

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

Once installed, the Rosemount 356 Connector is generally considered to be a maintenance-free component. In cases where maintenance is required, this section provides guidance.

EMERSON

MAINTENANCE

Routine maintenance on the 356 Connector is not required. The following parts can be purchased as spare parts and replaced by the user on-site:

Instrument Side:

- Profile Seal
- Loctite® 580™ Thread Sealant

Field Side:

- Cable Gland
- Sealing Screw with Gasket

Please contact Rosemount Nuclear for spare parts ordering and technical assistance for on-site procedures.

Appendix A PROCEDURE FOR ON-SITE ASSEMBLY OF FIELD SIDE

OVERVIEW

This section contains the following topics:

- General Considerations
- Field Side Kit Contents
- Required Tools for Assembly
- Assembly Procedures
  - Prepare Cable and Attach Crimp Contacts
  - Install Cable Gland
  - Assemble Field Side of Connector
- 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. Refer to the following safety messages before performing an operation preceded by this symbol. ⚠

Warnings

⚠ WARNING

Electrical shock can result in death or injury.

- Avoid contact with the connector leads and device terminals

⚠ IMPORTANT

Field Side Connectors should be assembled by trained/qualified technicians.

EMERSON

GENERAL CONSIDERATIONS

Unassembled field side kits are available for on-site assembly using customer-provided instrumentation cable.

The procedure outlined in this appendix demonstrates the proper way to assemble the 356 field side connector.

Please contact Rosemount Nuclear for technical assistance.

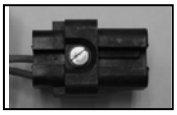
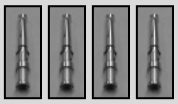
IMPORTANT

When the Field Side Connector is assembled by the customer on-site, the customer is responsible for ensuring that the assembly is performed according to approved instructions and for ensuring a qualified configuration is achieved.

FIELD SIDE KIT CONTENTS

The basic 356 Field Side Kit contents are listed in Table A-1.

Table A-1: Field Side Kit Contents

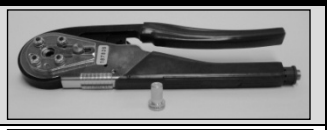
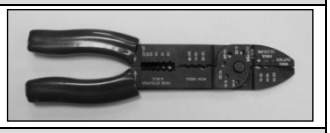
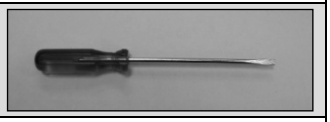
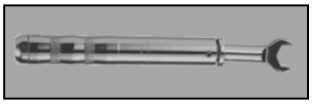
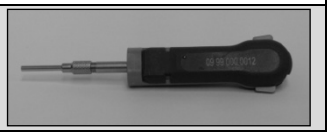
Description	Quantity	Photo
Field Side Hood (1)	1	
Crimp Terminal, Female Insert	1	
Crimp Contacts, Female, Gold-plated	4	
Sealing Screw, With Gasket, M3 IP65	1	
Cable Gland (1)	1	
Protective Cover with Lanyard	1	

(1) The description and appearance of the Field Side Hood and Cable Gland will vary depending on the type of kit ordered (i.e. Top Entry Hood vs. Side Entry Hood.) Components shown in photos are the Side Entry Hood and Perfect Cable Gland.

REQUIRED TOOLS FOR ASSEMBLY

Tools required for assembly of the 356 Field Side connector are listed in Table A-2. If a Rosemount part number is not specified, any general brand tool that meets the specifications can be used. Please contact Rosemount Nuclear with any questions regarding the required tools.

Table A-2 – Tools Required for Assembly of the Field Side

Description	Rosemount Part Number	Photo
Crimping tool with locator	00356-0504-0001	
Wire Stripper	Customer Supplied	
Small Flat-head Screwdriver (3.5mm-5mm)	Customer Supplied	
22mm Open-end Wrench (Quantity of 2 required)	Customer Supplied	
25mm Open-end Wrench	Customer Supplied	
22mm Open-end Torque Wrench (30 N-m / 22 ft-lb)	Customer Supplied	
Crimp contact removal tool (recommended)	00356-0505-0001	

ASSEMBLY PROCEDURES

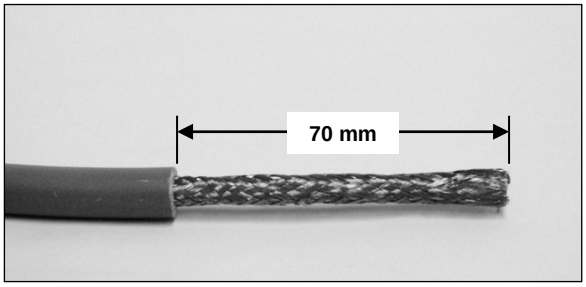
The following procedures describe the proper steps to follow to assemble the field side connector in the qualified configuration.

NOTES

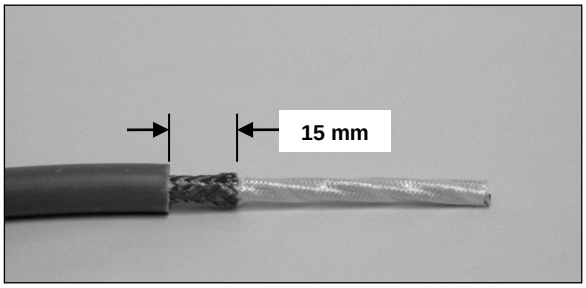
- Some instructions may require modification depending on instrumentation cable and number of wires. Please contact Rosemount Nuclear for technical assistance.
- The following procedures and photos demonstrate the assembly process using the Side Entry Hood (see Figures 3-3 and 3-5). The Top Entry Hood (see Figures 3-2 and 3-4) is assembled in an identical manner.
- Each step in the following procedures is accompanied by a photo directly below the instructions demonstrating the associated activity.
- Use crimp tool as specified to ensure strength of crimped connection meets requirements specified by IEC 60352-2 Table 1.

Prepare Cable and Attach Crimp Contacts

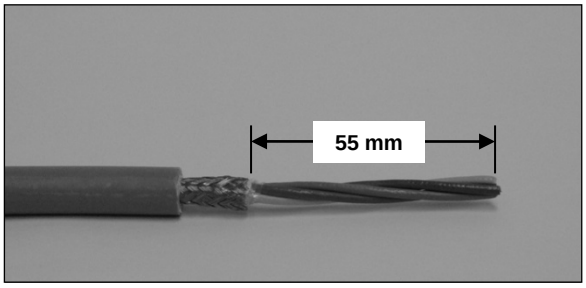
1. Remove approximately 70 mm of the outer sheath of the cable, taking care not to damage the metal braiding.



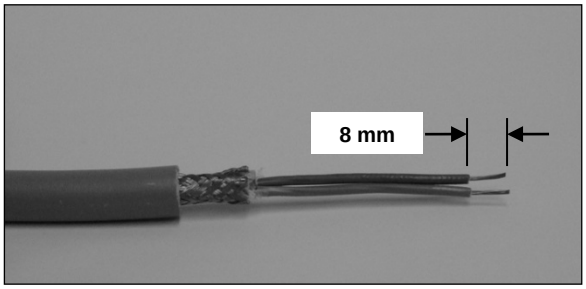
2. Cut and remove the metal braiding so that there is a minimum of 15 mm remaining.



3. Cut and remove the inner sheath to expose approximately 55 mm of the conductor wires.

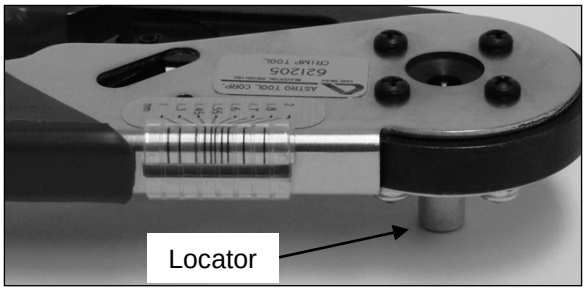


4. Cut any unused conductor wires flush with inner sheath. Strip 8 mm of insulation from the remaining wires, taking care not to cut or damage individual strands. Gently re-twist the stranded conductors if necessary.

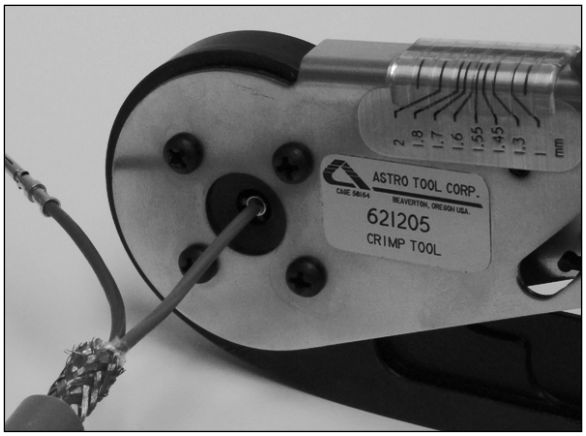


5. Install locator and adjust the crimp tool according to the following table:

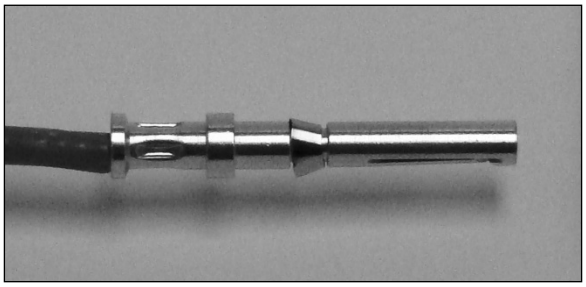
Conductor size (mm^2)	Crimp Setting (mm)
0.50	1.55
1.00	1.55



6. Insert the stranded wire into the crimp contact and then fully insert the crimp contact into the locator. Cycle the tool to create the crimp. Repeat this step for the remaining conductor wire(s).

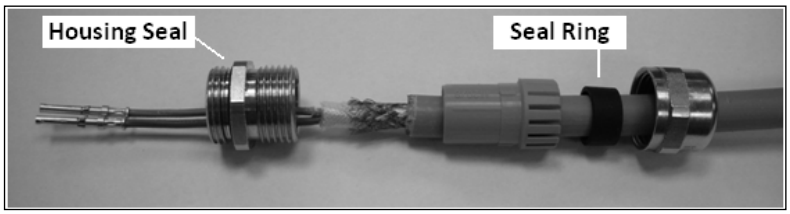


7. Properly installed crimp contact is shown in the following photo.

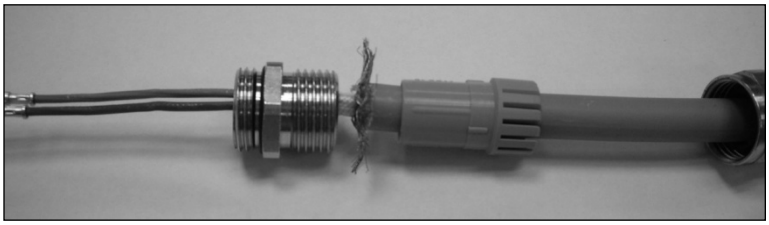


Install Cable Gland

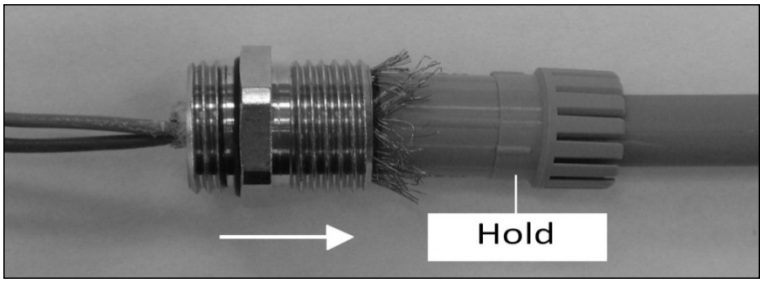
1. Thread the cable through the loop of the plastic lanyard on the protective cover (not shown in photo below). Place cable gland components onto the cable as shown below. The Perfect EMC cable gland includes a supplementary reducing ring for cables having an outer diameter smaller than 9 mm. Remove the reducing ring as appropriate.



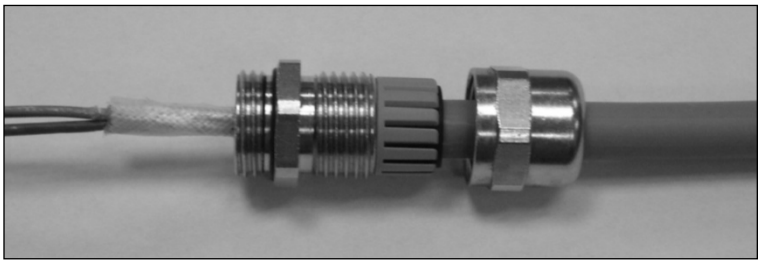
2. With the cable gland parts positioned as shown, fold back and spread the metal braiding.



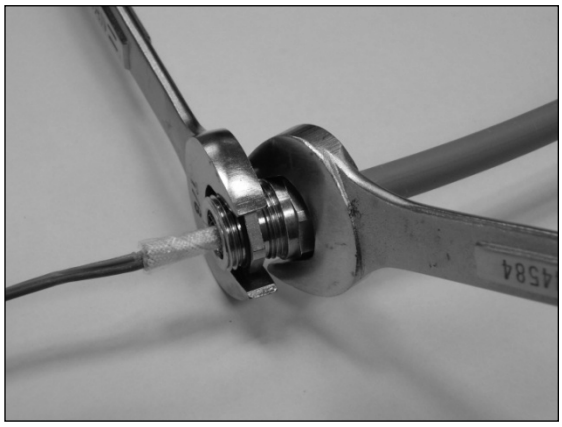
3. Hold the lamellar insert against the metal braiding as shown below, then slide the metal base over the insert so that the metal braiding folds back and becomes firmly trapped between the two pieces.



4. Continue to press the metal base onto the lamellar insert until it stops at the end position. Push the sealing ring into the lamellar insert as shown.

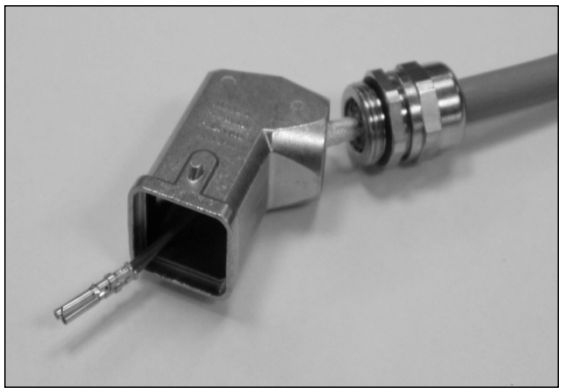


5. While using one of the 22 mm open-end wrenches to keep the metal base steady, screw the dome nut onto the metal base until finger tight. Then use the second 22 mm open-end wrench to tighten the dome nut an additional half turn. **Ensure that the metal base is held steady during this entire step to prevent damage to the metal braiding on the cable.**

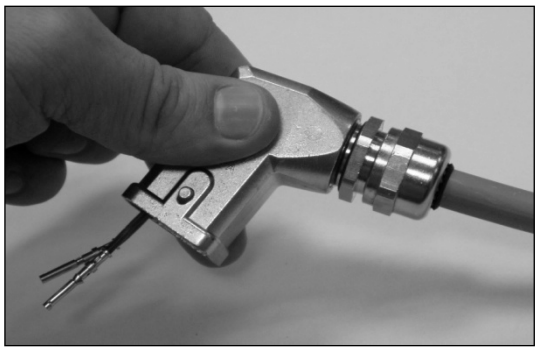


Assemble Field Side Of Connector

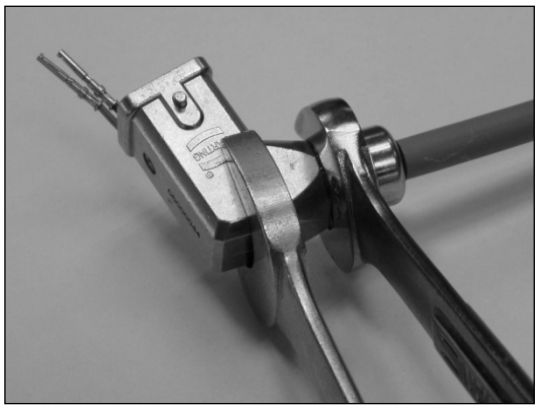
1. Guide the lead wires through the back of the connector hood.



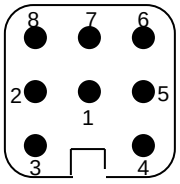
2. Making sure that the lead wires do not hang up on anything, screw the connector hood onto the cable gland as shown. Do not allow the conductor wires to become twisted.



3. Using a 25 mm open-end wrench on the connector housing and a 22 mm open-end wrench on the cable gland, tighten the two pieces together. Then use an open-end torque wrench to tighten the cable gland to 22 ft-lb (30 N-m).



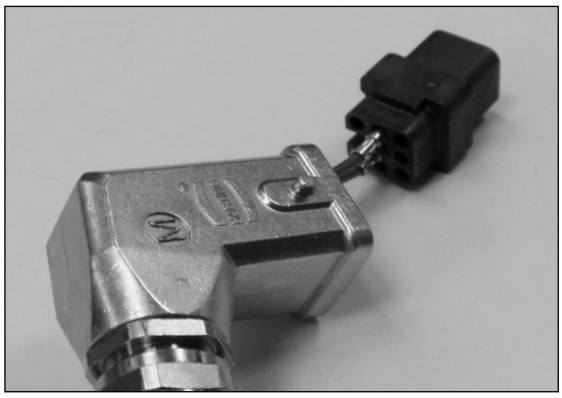
4. Check the instrument side connector to determine which pin (#1 or #2) is designated as the positive (+) pin. Insert the positive (+) field side contact into the correct pin location of the crimp terminal. Follow the same procedure for the negative (-) wire and the ground wire (if applicable). Consult the factory regarding 4-wire configurations.



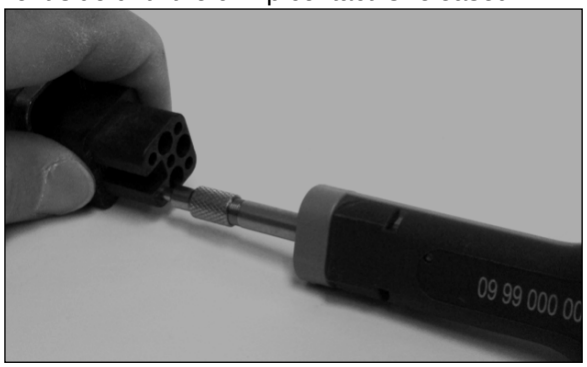
IMPORTANT

Ensure the positive (+) and negative (-) cable wires are installed on the correct pins on the field side connector to match the polarity configuration of the instrument side connector.

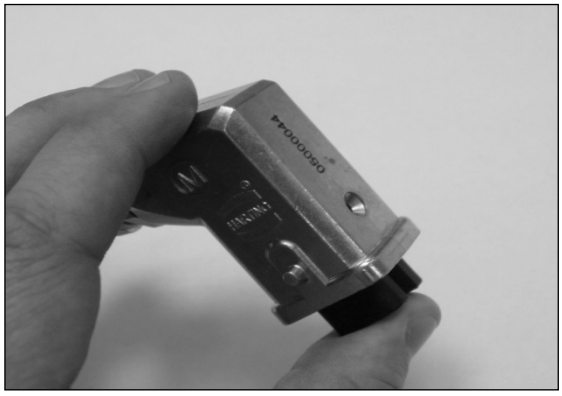
5. Firmly push the contacts into the crimp terminal until a small snap is heard and the contact is locked in place. Gently pull each wire to confirm it is locked into the crimp terminal.



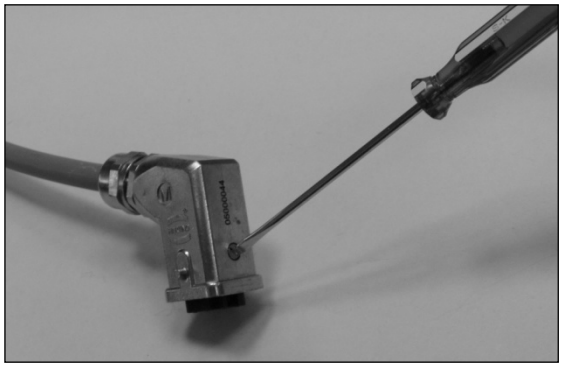
Note: If the contacts should be installed incorrectly, use the contact removal tool to safely remove them. Push the tool into the front side until the crimp contact is released.



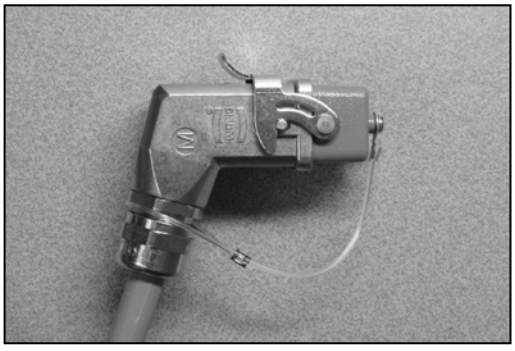
6. Guide the crimp terminal into the connector hood, taking care that the insulated wires do not get pinched in the process.



7. Double-check that the sealing screw includes a clear gasket under the head. Using a small flat-head screwdriver, tighten the sealing screw as shown.



8. If the connector will not to be installed right away, attach the protective cap onto the connector hood.



POST ASSEMBLY TESTS

1. Perform a continuity check to ensure the positive and negative wires have been installed in the correct positions.
2. Check Insulation Resistance for 10 seconds at 500 Vdc. IR for each of the following configurations must be greater than 1 GOhm:
    a. Negative pin to connector housing
    b. Positive pin to connector housing
    c. Negative pin to positive pin
3. After installation, a continuity check between the connector housing and cable shield at junction box/electrical panel is recommended.

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