# Micro Motion® Model 3500 Transmitter (MVD) or Model 3300 Controller

## Installation manual for panel mount

**Micro Motion**®

**EMERSON**™
Process Management

## Safety and approval information

This Micro Motion product complies with all applicable European directives when properly installed in accordance with the instructions in this manual. Refer to the EC declaration of conformity for directives that apply to this product. The EC declaration of conformity, with all applicable European directives, and the complete ATEX Installation Drawings and Instructions are available on the internet at *www.micromotion.com* or through your local Micro Motion support center.

Information affixed to equipment that complies with the Pressure Equipment Directive can be found on the internet at *www.micromotion.com/documentation*.

For hazardous installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

## Other information

Full product specifications can be found in the product data sheet. Troubleshooting information can be found in the transmitter configuration manual. Product data sheets and manuals are available from the Micro Motion web site at *www.micromotion.com/documentation*.

## Return policy

Micro Motion procedures must be followed when returning equipment. These procedures ensure legal compliance with government transportation agencies and help provide a safe working environment for Micro Motion employees. Failure to follow Micro Motion procedures will result in your equipment being refused delivery.

Information on return procedures and forms are available on our web support system at *www.micromotion.com*, or by phoning the Micro Motion Customer Service department.

## Micro Motion customer service

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| | | Saudia Arabia | 800 844 9564 | | |
| | | UAE | 800 0444 0684 | | |

# Contents

# 1 Planning

This installation manual explains *basic installation guidelines* for installing the Micro Motion Model 3300 or Model 3500 MVD applications platform.

For information on I.S. applications, refer to Micro Motion approval documentation.

For complete instructions about configuration, maintenance, and service, refer to the instruction manual shipped with the transmitter.

⚠ **WARNING!**

**Improper installation in a hazardous area can cause an explosion.**
For information about hazardous applications, refer to the appropriate Micro Motion approval documentation, shipped with the meter or available from the Micro Motion web site.

⚠ **WARNING!**

**Hazardous voltage can cause severe injury or death.**
Install transmitter and complete all wiring before supplying power.

⚠ **CAUTION!**

**Improper installation can cause measurement error or meter failure. Follow all instructions.**

## 1.1 Installation kit

The installation kit includes a bezel, frame, two mounting brackets with screws, a power supply wiring connector, and a retaining clip assembly for power supply wiring. See *Figure 1-1*).

The applications platform fits through a 5 7/16-inch (138 mm) square cutout in a panel that is 5/64 inch (2 mm) to 1/2 inch (13 mm) thick. The bezel provides a IP65 watertight seal between the panel cutout and the applications platform housing. See *Figure 1-1*.

In addition, the installation kit includes either:

* A bracketed wiring connector for screw-type connectors. See *Figure 3-2*.
* I/O cables and connectors. See *Figure 3-3*.

**Figure 1-1: Panel-mount installation kit**
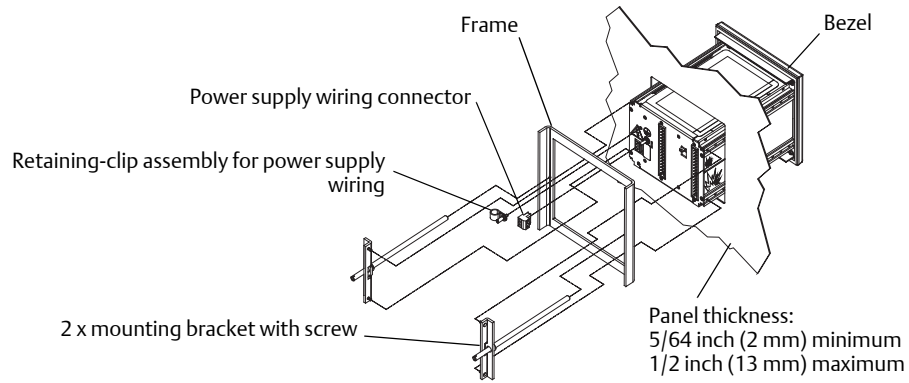


## 1.2 Choose a location

Choose a location for the transmitter based on the requirements described below.

### 1.2.1 Environmental requirements

Install the Model 3300 or Model 3500 where the ambient temperature is between –4 to +140 °F (–20 to +60 °C).

### 1.2.2 Dimensions

| Model type | Dimension drawing |
|---|---|
| Screw-type wiring connectors | *Figure 1-2* |
| I/O cables | *Figure 1-3* |

See *Figure 3-1* and *Figure 3-3* for illustrations of screw-type connectors versus I/O cables.
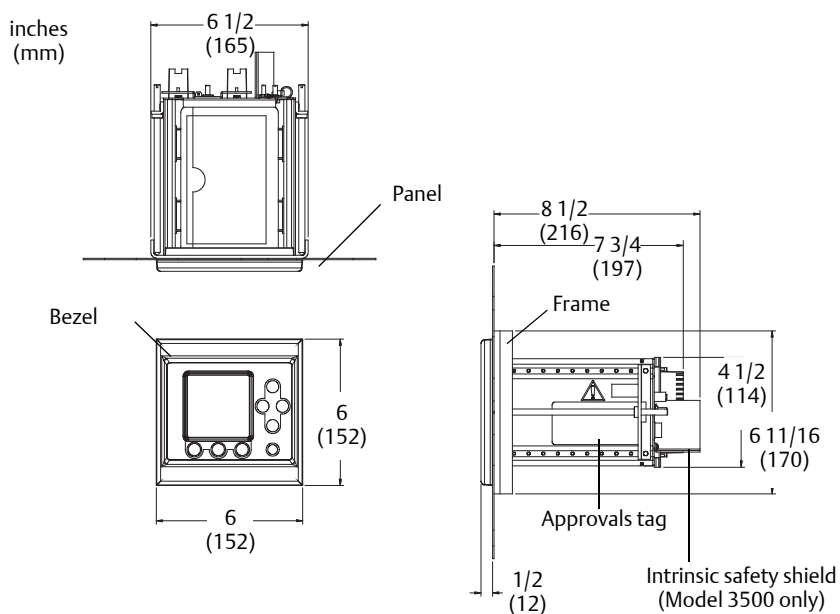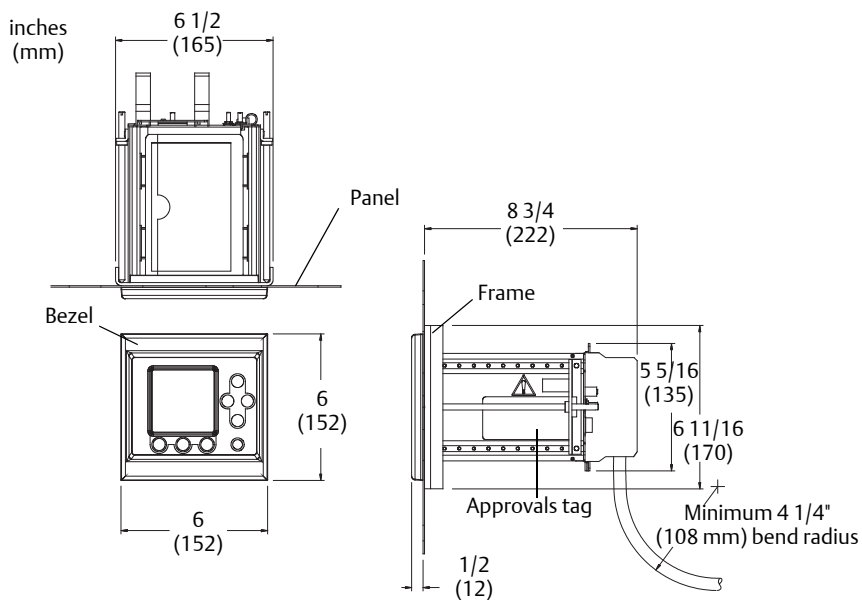
## Figure 1-2: Panel-mount screw-type dimensions

inches
(mm)

6 1/2
(165)

Panel

Bezel

6
(152)

6
(152)

8 1/2
(216)

7 3/4
(197)

Frame

4 1/2
(114)

6 11/16
(170)

Approvals tag

1/2
(12)

Intrinsic safety shield
(Model 3500 only)

## Figure 1-3: Panel-mount dimensions with I/O cables

inches
(mm)

6 1/2
(165)

Panel

Bezel

6
(152)

6
(152)

8 3/4
(222)

Frame

5 5/16
(135)

6 11/16
(170)

Approvals tag

Minimum 4 1/4"
(108 mm) bend radius

1/2
(12)

# 1.3 Cable lengths

Maximum cable length from the sensor to the Model 3500 transmitter depends on the installation type and cable type.

| Installation type | Maximum cable length |
|---|---|
| 4-wire remote transmitter | See *Figure 1-4*, and *Table 1-1* for maximum length of the 4-wire cable |
| Remote core processor with remote transmitter | See *Figure 1-5*, and *Table 1-1* for maximum length of the 4-wire cable and the 9-wire cable |

If you are installing the Model 3300 applications peripheral in combination with a transmitter, the maximum cable length between the transmitter frequency output and the Model 3300 frequency input is 500 feet (150 meters).
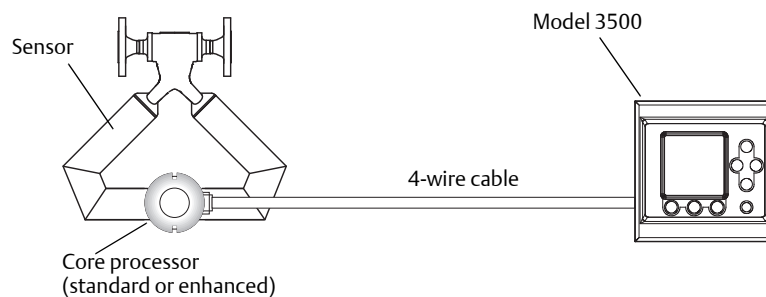
**Figure 1-4: 4-wire remote transmitter**
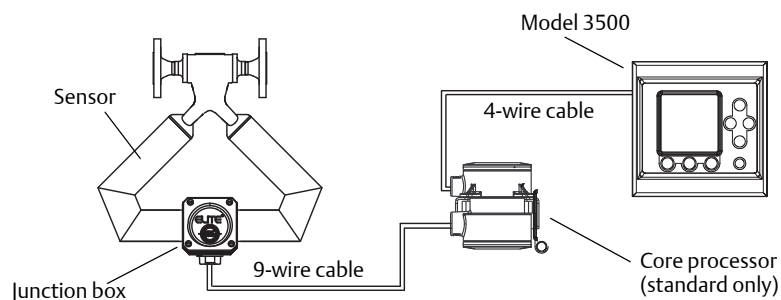


**Figure 1-5: Remote core processor with remote transmitter**

**Table 1-1: Maximum cable lengths between sensor and transmitter**

| Cable type | Wire gauge | Maximum length |
|---|---|---|
| Micro Motion 4-wire | Not applicable | • 1000 ft (300 m) without Ex-approval<br>• 500 ft (150 m) with IIC-rated sensors<br>• 1000 ft (300 m) with IIB-rated sensors |
| Micro Motion 9-wire | Not applicable | 60 ft (20 m) |
| User-supplied 4-wire | VDC 22 AWG (0.35 mm$^2$) | 300 ft (90 m) |
| | VDC 20 AWG (0.5 mm$^2$) | 500 ft (150 m) |
| | VDC 18 AWG (0.8 mm$^2$) | 1000 ft (300 m) |
| | RS-485 22 AWG (0.35 mm$^2$) or larger | 1000 ft (300 m) |

# 1.4 Install the Model 3300 or Model 3500 in the panel

Refer to *Figure 1-6* and follow these steps:

1. Insert the Model 3300 or Model 3500 through the cutout.
2. Slide the frame over the housing.
3. Insert the posts on the brackets into the rails on the housing.
4. Tighten the screws evenly to 10 to 14 inch-pounds (1,13 to 1,38 Nm) to ensure a watertight seal between the gasket and the panel.

**Figure 1-6: Panel installation steps**
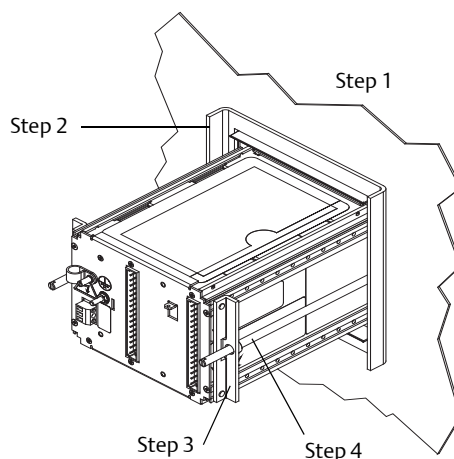
# 2    Mounting

## 2.1    Mount the core processor

Use this section only if you are installing a remote transmitter using a remote core processor or a remote enhanced core processor. See *Figure 1-5*. If you have a 4-wire remote installation, go to *Section 3.1*.

*Figure 2-1* shows both types of core processors and mounting bracket. Using the mounting bracket, mount the core processor in a location compatible with the cable length requirements discussed in *Section 1.2*.

**Figure 2-1:   Remote core processor and remote enhanced core processor components**



Core processor lid

Upper conduit ring

Core processor

Lower conduit ring

End-cap

Mounting bracket

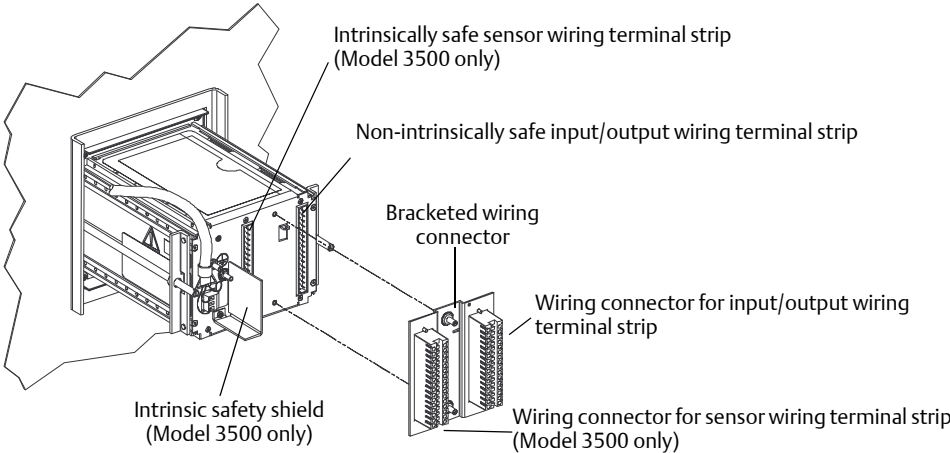Remote core processor

Remote enhanced core processor
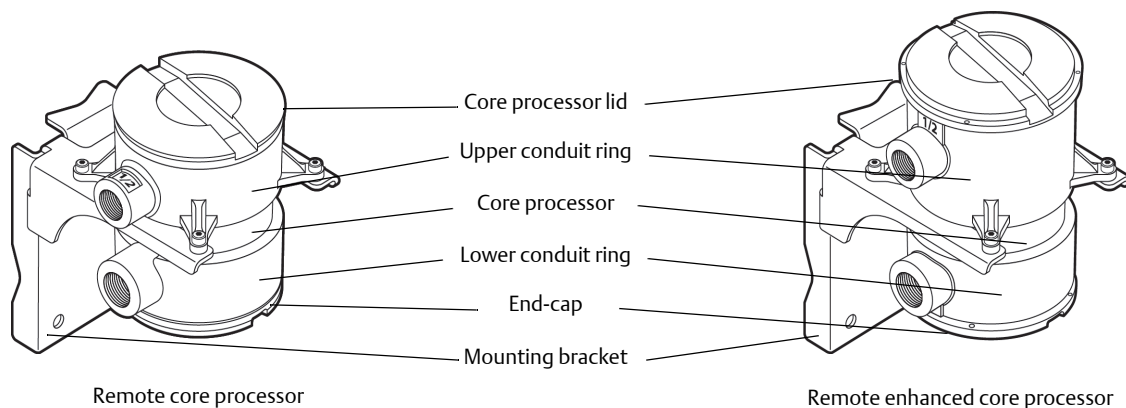
# 3 Wiring

## 3.1 Connect the input and output wiring

If the Model 3300 or Model 3500 has screw-type connectors:

1. Plug the bracketed wiring connectors onto the terminal strips on the back panel of the Model 3300 or Model 3500. See *Figure 3-1*. Tighten the captive screws to secure the bracket to the back panel.

**Figure 3-1: Wiring screw-type connectors and terminals**



Intrinsically safe sensor wiring terminal strip (Model 3500 only)

Non-intrinsically safe input/output wiring terminal strip

Bracketed wiring connector

Wiring connector for input/output wiring terminal strip

Intrinsic safety shield (Model 3500 only)

Wiring connector for sensor wiring terminal strip (Model 3500 only)

2. Connect input and output wiring to the appropriate terminals in the input/output wiring connector. Refer to the card that is inserted into the sleeve on the top panel (shown in *Figure 3-2*), and *Table 3-1*.

    • Use 24 to 16 AWG (0,25 to 1,5 mm$^2$) twisted-pair shielded wire.

    • Ground the shields at a single point only.

**Figure 3-2: Input/output wiring terminal card for screw-type connectors**

**Table 3-1: Input/output wiring terminals for screw-type connectors**

| Terminal number | | Designation |
|---|---|---|
| c 2+ | a 2 – | Primary 4–20 mA output / HART |
| c 4 + | a 4 – | Secondary 4–20 mA output |
| c 6 + | a 6 – | Frequency input |
| c 8 + | a 8 – | Discrete input 1 |
| c 10 + | a 10 – | Discrete input 2 |
| c 12 + | a 12 – | Frequency output |
| c 14 + | a 14 – | Discrete output 1 |
| c 16 + | a 16 – | Discrete output 2 |
| c 18 + | a 18 – | Discrete output 3 |
| c 32 (B line | a 32 (A line) | RS-485 output |

3.  If the Model 3300 or the Model 3500 has I/O cables, plug the bracketed wiring connector onto the terminal strips on the back panel of the model. See *Figure 3-3*.

4.  Tighten the captive screws to secure the bracket to the back panel.

**Figure 3-3: Wiring connectors and terminals for I/O cables**
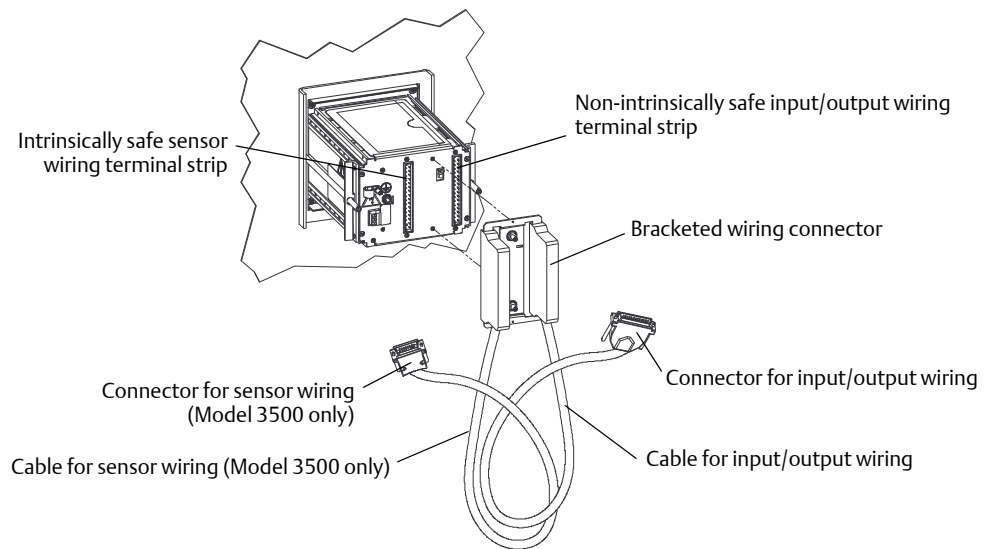


5.  Attach the supplied I/O terminal block to a DIN rail.
    The terminal block fits various rail types. See *Figure 3-4*.

6.  Plug the connector for input/output wiring onto the I/O terminal block.

7.  Tighten the captive screws to secure the connector to the I/O terminal block.

8.  Connect input and output wiring to the appropriate terminals on the I/O terminal block.

Refer to the label attached to the terminal block. See *Figure 3-5* and *Figure 3-2*.

- Use 24 to 16 AWG (0,25 to 1,5 mm$^2$) twisted-pair shielded wire
- Ground the shields at a single point only

The I/O terminal block ground is available for continuation of user cable shielding to I/O cable shielding. The cable connector does not connect the I/O cable shielding to the chassis ground.

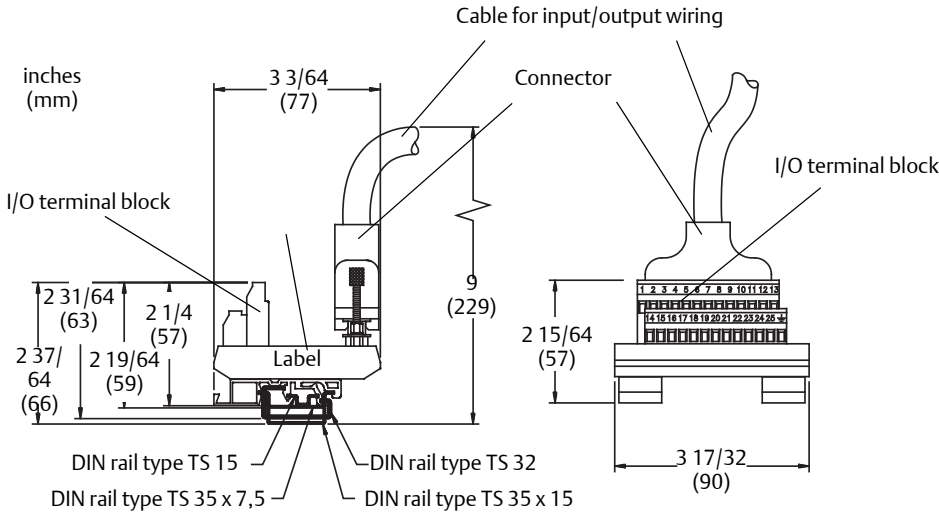**Figure 3-4: Terminal block installation steps for I/O wiring on a DIN rail**



**Figure 3-5: Input/output wiring terminal label for I/O cables**

**Table 3-2: Input/output wiring terminals for I/O cables**

| Terminal number | | Designation |
|---|---|---|
| 14 + | 15 – | Primary 4–20 mA output / HART |
| 1+ | 2 – | Secondary 4–20 mA output |
| 3 + | 4 – | Frequency input |
| 5 + | 6 – | Discrete input 1 |
| 7 + | 8 – | Discrete input 2 |
| 16 + | 17 – | Frequency output |
| 18 + | 19 – | Discrete output 1 |
| 20 + | 21 – | Discrete output 2 |
| 22 + | 23 – | Discrete output 3 |
| 24 (B line) | 25 (A line) | RS-485 output |

## 3.2 Connect the Model 3500 to the sensor

- If you are installing the Model 3300 applications peripheral, this step is not required. Go to *Section 3.4*.
- To connect the Model 3500 transmitter to a Micro Motion sensor, follow the instructions in this section.

### 3.2.1 Installation options

The Model 3500 can be wired to the sensor in either of the following configurations:

- 4-wire remote transmitter (requires a 4-wire cable). See *Figure 1-4* and *Section 3.2.2*.
- Remote core processor with remote transmitter (requires both a 4-wire and a 9-wire cable). See *Figure 1-5* and *Section 3.2.3*.

### 3.2.2 Wiring instructions for 4-wire remote installations

1. Prepare the cable as described in the sensor documentation.
2. Connect the cable to the core processor as described in the sensor documentation.
3. To connect the cable to the transmitter:

   a. Identify the wires in the 4-wire cable.

   Use the 4-wire cable supplied by Micro Motion. This cable consists of one pair of 18 AWG (0,75 mm$^2$) wires (red and black) for the VDC connection, and one pair of 22 AWG (0,35 mm$^2$) wire (green and white) for the RS-485 connection.

   b. For transmitters with screw-type connectors, connect the four wires from the core processor to the appropriate terminals on the transmitter.

   See *Table 3-3* and *Figure 3-6* (standard core processor), or *Figure 3-7* (enhanced core processor).

      - Do not leave bare wires exposed.
      - Do not ground the shield, braid, or drain wires at the transmitter.

**Table 3-3:    Transmitter terminals for 4-wire cable**

| Connector type | | Wire color[1] | Function |
|---|---|---|---|
| **Terminal** | **I/O cable** | | |
| c 4 | 4 | Red | VDC+ |
| a 4 | 10 | Black | VDC− |
| c 6 | 7 | White | RS-485A |
| a 6 | 3 | Green | RS-485B |

*(1)   Wire colors apply to only 4-wire cable supplied by Micro Motion.*

**Figure 3-6: 4-wire cable to Model 3500 screw-type connectors for standard and remote core processors**
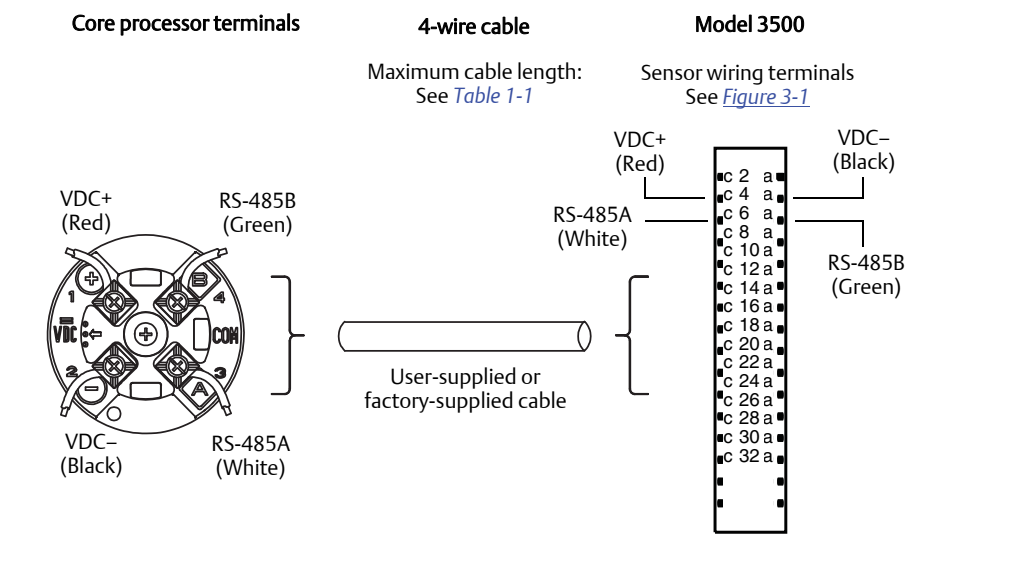
**Figure 3-7: 4-wire cable to Model 3500 screw-type connectors for enhanced and remote enhanced core processors**
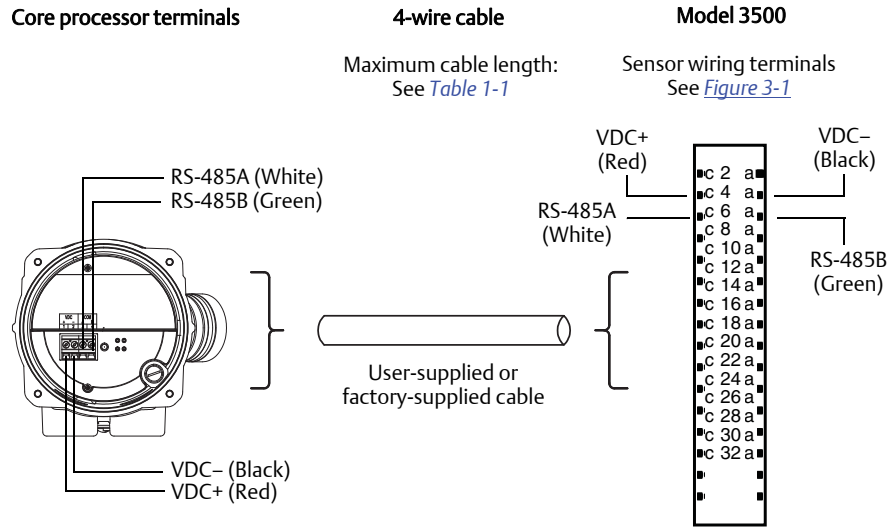


Core processor terminals     4-wire cable     Model 3500

Maximum cable length: See *Table 1-1*     Sensor wiring terminals See *Figure 3-1*

RS-485A (White)
RS-485B (Green)
User-supplied or factory-supplied cable
VDC– (Black)
VDC+ (Red)
VDC+ (Red)
VDC– (Black)
RS-485A (White)
RS-485B (Green)

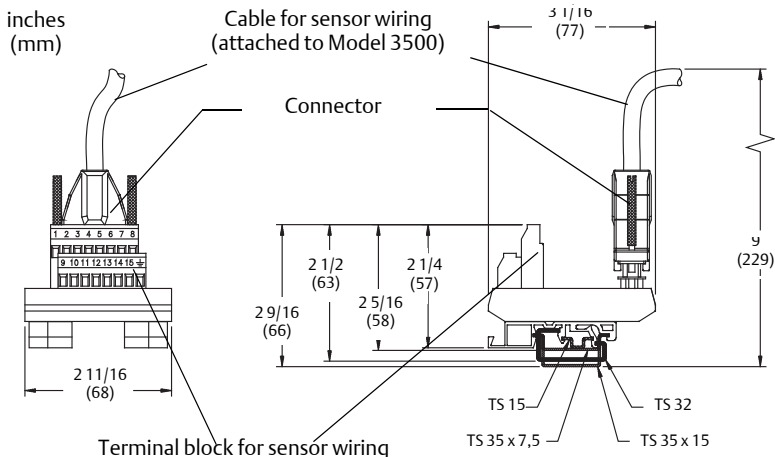**Figure 3-8: Terminal block for sensor wiring on the DIN rail**



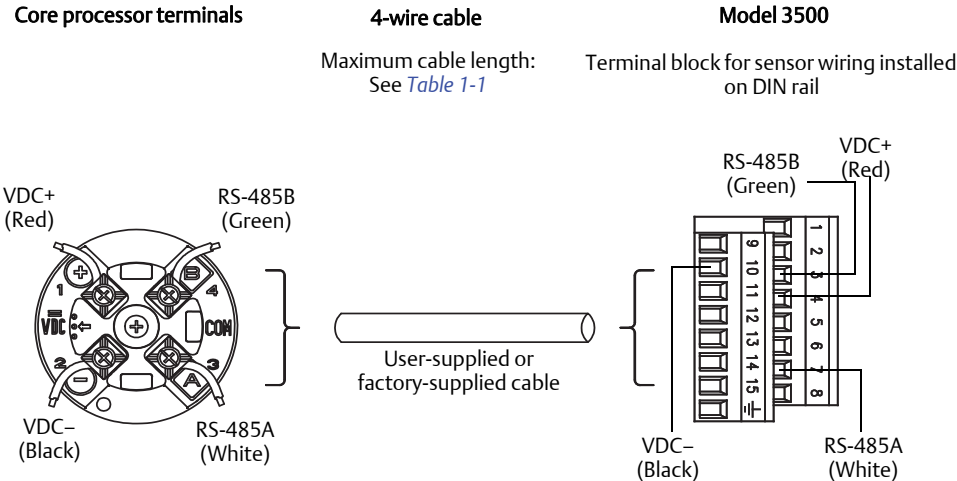**Figure 3-9: 4-wire cable to Model 3500 with I/O cables for standard and remote core processors**
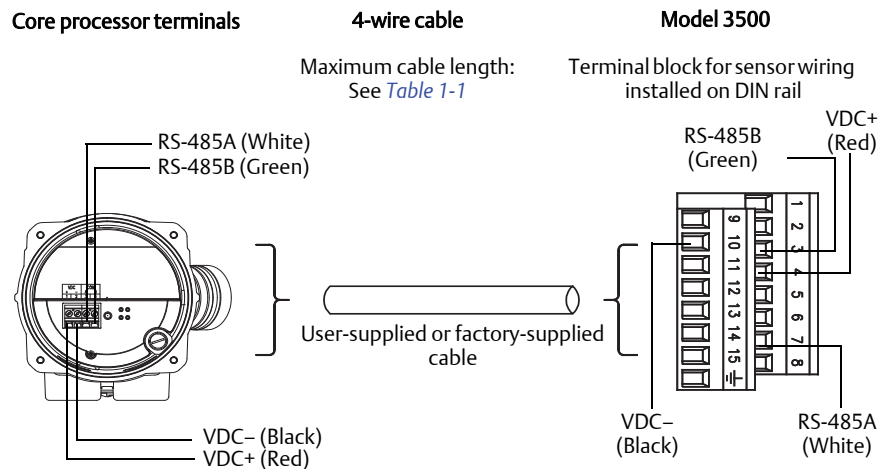
**Figure 3-10: 4-wire cable to Model 3500 with I/O cables for enhanced and remote enhanced core processors**



## 3.2.3 Wiring instructions for remote core processor with remote transmitter installations

There are two phases to this procedure:

- Wiring the remote core processor to the transmitter
- Wiring the sensor to the remote core processor

To wire the remote core processor to the transmitter:

1.  Use one of the following methods to shield the wiring:

| Installation method | Procedure |
|---|---|
| Unshielded wiring in continuous metallic conduit that provides 360° termination shielding for the enclosed wiring | Go to Step 8 |
| User-supplied cable gland with shielded cable or armored cable, terminate the shields in the cable gland. Terminate both the armored braid and the shield drain wires in the cable gland | Go to Step 8 |
| A Micro Motion-supplied cable gland at the core processor housing | Go to Step 2 |

2.  Do one of the following:

    - If you are using shielded cable, prepare the cable and apply shielded heat shrink as described in Step 6. The shielded heat shrink provides a shield termination

suitable for use in the gland when using cable whose shield consists of foil and not a braid. Go to Step 3.

- If you are using armored cable, prepare the cable as described in Step 6, but do not apply heat shrink – omit Step 6d, e, f, and g. Go to Step 3.

3. Identify the components shown in *Figure 2-1*.

4. Remove the core processor lid.

5. Slide the gland nut and the clamping insert over the cable. See *Figure 3-11*.
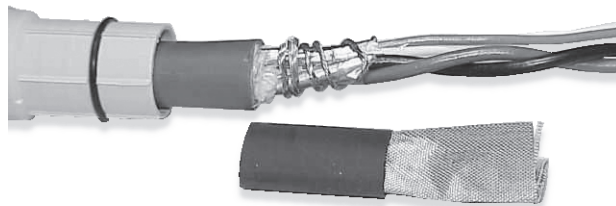
**Figure 3-11: Gland nut and clamping insert**
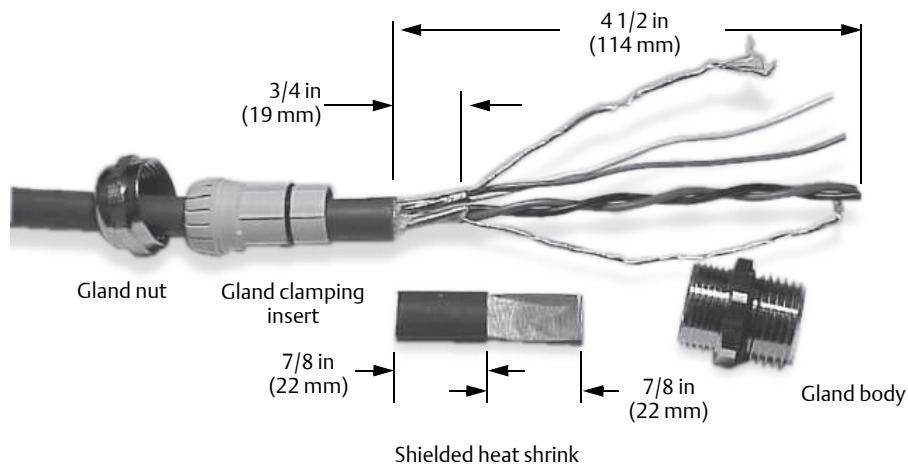


6. For connection at the core processor housing, prepare shielded cable as follows (for armored cable, omit steps d, e, f, and g):

   a. Strip 4 1/2 inches (114 mm) of cable jacket.

   b. Remove the clear wrap that is inside the cable jacket, and remove the filler material between the wires.

   c. Remove the foil shield that is around the insulated wires, leaving 3/4 inch (19 mm) of foil or braid and drain wires exposed, and separate the wires.

   d. Wrap the shield drain wires around the exposed foil twice. See *Figure 3-12*. Cut off the excess wire.

**Figure 3-12: Shield drain wires wrapped twice around exposed shield foil**
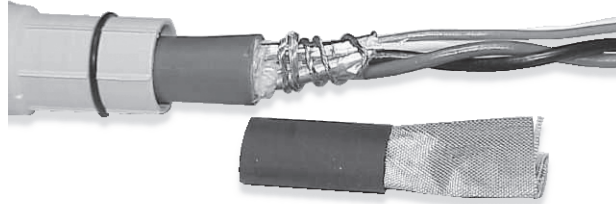


e.  Place the shielded heat shrink over the exposed shield drain wires. The tubing should completely cover the drain wires.

f.  Without burning the cable, apply heat (250 °F or 120 °C) to shrink the tubing. See *Figure 3-13*.

**Figure 3-13: Shielded heat shrink covering exposed drain wires**



g.  Position the gland clamping insert so that the interior end is flush with the heat shrink.

h.  Fold the cloth shield or braid and drain wires over the clamping insert and approximately 1/8 inch (3 mm) past the O-ring. See *Figure 3-14*.
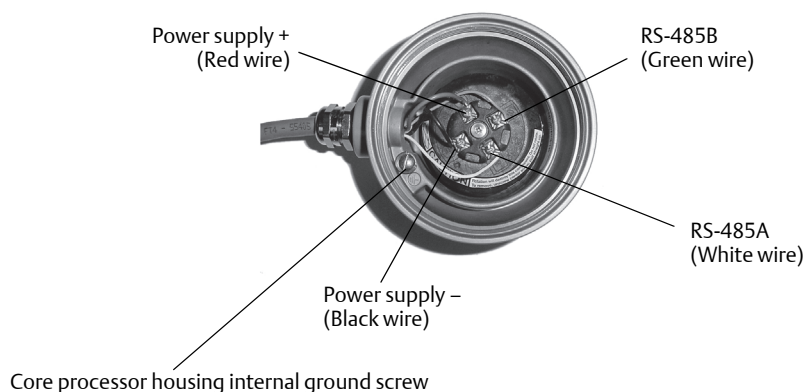
**Figure 3-14: Folded cloth**
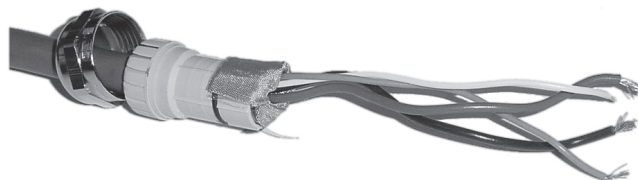


i.  Install the gland body into the core processor housing conduit opening. See *Figure 3-15*.

**Figure 3-15: Installing the gland body**



7. Insert the wires through the gland body and assemble the gland by tightening the gland nut.
8. Identify the wires in the 4-wire cable.

   The 4-wire cable supplied by Micro Motion consists of one pair of 18 AWG (0,75 mm$^2$) wires (red and black) for the VDC connection, and one pair of 22 AWG (0,35 mm$^2$) wire (green and white) for the RS-485 connection.
9. Connect the four wires to the numbered slots on the core processor. See *Figure 3-16*.

**Figure 3-16: Connect the four wires to the numbered slots**



Power supply +
(Red wire)

RS-485B
(Green wire)

RS-485A
(White wire)

Power supply –
(Black wire)

Core processor housing internal ground screw

10. Connect the core processor housing internal ground screw if earth ground is required.

    Earth ground is required if the core processor cannot be grounded via sensor piping, and local codes require internal ground connections.

    Do not connect shield drain wires to this terminal.
11. Reinstall and tighten the core processor lid.

⚠ **WARNING!**

**Do not twist the core processor, as this will damage the sensor.**
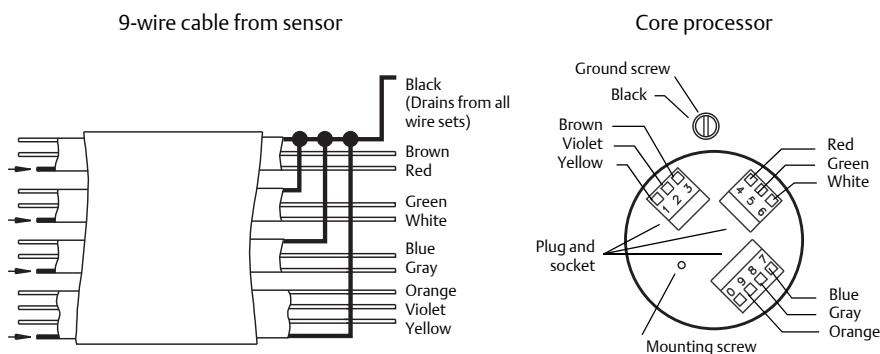
12. Connect the cable to the transmitter.

| Connection type | Procedure |
|---|---|
| Screw-type connectors | Connect the four wires from the core processor to the appropriate terminals on the transmitter. See *Table 3-3* and *Figure 3-6*.<br><br>• Do not expose bare wires.<br>• Do not ground the shield, braid, or drain wires at the transmitter. |
| I/O cables | 1. Attach the supplied terminal block to a DIN rail. The terminal block accommodates various rail types. See *Figure 3-8*.<br><br>2. Plug the I/O cable connector onto the terminal block. Tighten the captive screws to secure the connector to the terminal block.<br><br>3. Connect the four wires from the core processor to the appropriate terminals on the terminal block. See *Table 3-3* and *Figure 3-9*. No bare wires should remain exposed. Do not ground the shield, braid, or drain wire(s) at the transmitter. |

## 3.3      Wire the sensor to the remote core processor

⚠ **CAUTION!**

**Do not allow the shield drain wires to contact the sensor junction box, as this can cause meter errors.**

1. Refer to Micro Motion's *9-Wire Flowmeter Cable Preparation and Installation Guide* and follow the instructions on cable shielding and preparation.
   - At the sensor end, follow the instructions for your cable type.
   - At the core processor end, follow the instructions for your cable type with an MVD transmitter.
2. To connect the wires, refer to Micro Motion's *9-Wire Flowmeter Cable Preparation and Installation Guide* and follow the instructions for your sensor with an MVD transmitter. Additional information for connecting the wires at the core processor is provided below:

   a. Identify the components shown in *Figure 2-1*.

   b. Remove the core processor's end-cap.

   c. Insert the 9-wire cable through the conduit opening.

   d. Connect the wires to the plugs supplied with the core processor.

   e. Insert the plugs into the sockets inside the lower conduit ring. See *Figure 3-17*.

**Figure 3-17: 9-wire cable to core processor**

9-wire cable from sensor                                    Core processor



3.    Ground the cable.

| Cable type | Procedure |
|---|---|
| Jacketed cable | Ground the shield drain wires (the black wire) only on the core processor end, by connecting it to the ground screw inside the lower conduit ring. Do not ground to the core processor's mounting screw. Do not ground the cable at the sensor junction box. |
| Shielded or armored cable | Ground the shield drain wires (the black wire) only on the core processor end, by connecting it to the ground screw inside the lower conduit ring. Do not ground to the core processor's mounting screw. Do not ground the cable at the sensor junction box.<br><br>Ground the cable braid on both ends, by terminating it inside the cable glands. |

4.    Ensure the integrity of the gaskets, grease all O-rings, then close the junction box housing and core processor end-cap, and tighten all screws.

⚠ **CAUTION!**

Make sure that the wires are not caught or pinched when you close the housing to reduce the risk of measurement error or meter failure.

## 3.4        Connect the power supply wiring

⚠ **CAUTION!**

• **Do not install power supply wiring in the same cable tray or conduit as the input/output wiring to avoid device failure or measurement error.**

• **Shut off the power supply before installing the applications platform.**

• **Make sure the power supply voltage matches the voltage that is indicated on the power supply wiring terminals. See** *Figure 3-18***.**

Connect the Model 3300 or Model 3500 to a power supply using the following steps:

1. Connect 18 to 14 AWG (0,75 to 2,5 mm$^2$) wiring to the power supply wiring connector. See *Figure 1-1*.
2. Ground the transmitter as follows:
   a. Connect the ground wire to the green power supply ground screw. See *Figure 3-1*.
   b. Connect the power supply ground wire directly to earth ground.
   c. Keep all ground leads as short as possible.
   d. Ensure that all ground wiring has less than 1 ohm impedance.
3. Plug the power supply wiring connector into the power supply wiring terminals. See *Figure 3-18*.
4. Slide the retaining clip over the wiring, then tighten the screw to hold the clip in place. See *Figure 1-1*.
5. (Optional). Install a user-supplied switch in the power supply line.
   In Europe, install the switch close to the Model 3300 or Model 3500 in order to comply with low-voltage directive 2006/95/EC. For details, see standard EN 61010-1:2010 clause 5.4.3.d.

**Figure 3-18: Power supply wiring terminals**
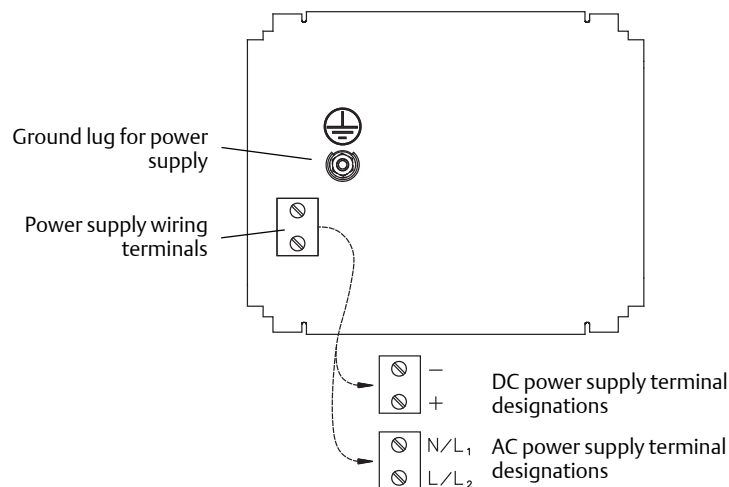
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