

Brooks® "Next Generation" QUANTIM® Ultra Low Flow Coriolis Precision Mass Flow QmBS Sensor / QTA Transmitters With MVD™ Technology



QmBS Sensor



*QTA Transmitter
Field Mount*



*QTA Transmitter
DIN Rail Mount*

Essential Instructions

Read this page before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Brooks Products.

- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED). The Directive is applicable within the European Economic Area (EU plus Norway, Iceland and Liechtenstein). Pressure equipment can be traded freely within this area once the PED has been complied with.

- Section 1 of this manual contains important safety and operating instructions related to the PED directive.
- Meters described in this manual are in compliance with EN directive 97/23/EC module H *Conformity Assessment*.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Meters larger than 25mm or 1" (inch) are in compliance with category I, II, III of PED.
- Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

ESD (Electrostatic Discharge)

CAUTION

This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of circuit boards or devices.

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

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1.1 Overview

This Section provides an orientation to the use of this manual. This manual describes the procedures required to install the following components:

- All QmBS sensors
- All QTA field-mount transmitters
- All QTA DIN rail mount transmitters

If you do not know what sensor or transmitter you have, see Section 1.6 for instructions on identifying the component type from the part number on the tag.

1.2 Safety

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

⚠ WARNING

Improper installation in a hazardous area can cause an explosion.

For information about hazardous applications, refer to Brooks approvals documentation, shipped with the transmitter.

⚠ WARNING

Hazardous voltage can cause severe injury or death.

Make sure power is disconnected before installing transmitter.

⚠ CAUTION

Improper installation could cause measurement error or flowsensor failure.

Follow all instructions to ensure transmitter will operate correctly.

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1.3 Flowsensor Components

The QmBS flowsensor may include at least one of the following components:

- One of the following QmBS sensors:
 - QmBS2
 - QmBS3
 - QmBS4
- and or one of the following QTA transmitters:
 - QTA field-mount transmitter with the 1 mA/1 FO outputs option board (flow-only)
 - QTA field-mount transmitter with the 1 mA/1 FO outputs option board (multivariable)
 - QTA field-mount transmitter with the 2 mA/1 FO outputs option board (multivariable, configurable)
 - QTA field-mount transmitter with the FOUNDATION™ fieldbus outputs option board
 - QTA field-mount transmitter with the Profibus-PA outputs option board
 - QTA DIN rail mount transmitter with the 1 mA/1 FO outputs option board (flow-only)
 - QTA DIN rail mount transmitter with the 2 mA/1 FO outputs option board (multivariable, configurable)

To identify your sensor and transmitter type, see Section 1.6.

1.4 Transmitter Codes Used in this Manual

In this manual, codes are used to identify specific QTA transmitter types. The codes are listed in Table 1-1.

Table 1-1 Transmitter Codes

Transmitter type	Code
QTA field-mount transmitter with the 1 mA/1 FO outputs option board (flow-only or multivariable)	FM AN
QTA field-mount transmitter with the 2 mA/1 FO outputs option board (multivariable, configurable)	FM CIO
QTA field-mount transmitter with the FOUNDATION fieldbus outputs option board	FM FB
QTA field-mount transmitter with the Profibus-PA outputs option board	FM PA
QTA DIN rail mount transmitter with the 1 mA/1 FO outputs option board (flow-only)	DIN AN
QTA DIN rail mount transmitter with the 2 mA/1 FO outputs option board (multivariable, configurable)	DIN CIO

1.5 Installation Procedures

To install the QmBS flowsensor, the following procedures are required:

- Install the sensor (all models) – see Section 2
- Install the transmitter
 - QTA field-mount transmitters – see Section 3
 - QTA DIN rail mount transmitters – see Section 4
- Wire the transmitter to the sensor – see Section 5
- Wire the transmitter outputs or connect the communication wires:
 - QTA FM AN transmitters – see Section 6
 - QTA FM CIO transmitters – see Section 7
 - QTA FM FB or PA transmitters – see Section 8
 - QTA DIN AN transmitters – see Section 9
 - QTA DIN CIO transmitters – see Section 10

1.6 QmBS Model Numbers

The QmBS sensor model number has the following form:

QmBSMxxxxxxxxxx

The first five characters identify the sensor model.

The QTA transmitter model number has the following form:

QTAxxxxxxxx

where the fourth character identifies the transmitter type:

- **1** and **3** = FM AN
- **2** = DIN AN
- **4** = FM CIO
- **5** = DIN CIO
- **6** = FM FB
- **7** = FM PA

1.7 Additional Documentation

For information on transmitter configuration and use, and flowsensor troubleshooting, (see *QTA Transmitters: Configuration and Use*, *QTA Transmitters with FOUNDATION Fieldbus: Configuration and Use*, or *QmBS Transmitters with Profibus-PA: Configuration and Use*.)

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2.1 Overview

This section describes how to install Brooks QmBS sensors. The following general steps are required:

- Determine the location of the sensor (see Section 2.3)
- Orient the sensor (see Section 2.4)
- Mount the sensor (see Section 2.5)
- Ground the sensor (see Section 2.6)

2.2 European Installations

This Brooks 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.BrooksInstrument.com** or through your local Brooks Support Center. See back cover for the nearest Brooks location.

2.3 Determining a Location

Choose a location for the sensor based on the requirements described in this section. The following general guidelines can help you select an appropriate location for the sensor.

- You should be able to stop flow through the sensor to facilitate the zeroing procedure.
- For optimal performance, the sensor should remain full of process fluid.
- The sensor must be installed in an area that is compatible with the classification specified on the approvals tag (see Table A-4).

2.3.1 Hazardous Area Installations

Make sure the hazardous area specified on the sensor approvals tag is suitable for the environment in which the sensor is installed (see Table A-5).

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2.3.2 Distance from Transmitter

The maximum cable length between the sensor and the transmitter is 1000 ft (300 m).

If you are installing the QmBS sensor for use in an MVD™ Direct Connect™ installation:

- The maximum cable length between the sensor and the direct host is 1000 ft (300 m).
- The maximum cable length between the sensor and the power supply depends on the wire size, as shown in Table 2-1. The wire must be sized to provide a minimum of 15 V at the sensor. See the discussion in Section 5.4.1.

Table 2-1 Power Supply Wire Size and Cable Length – MVD Direct Connect Installations

Wire size	Maximum length
22 AWG (0.35 mm ²)	300 ft (90 m)
20 AWG (0.5 mm ²)	500 ft (150 m)
18 AWG (0.8 mm ²)	500 ft (150 m)

Brooks supplies 4-wire cable to connect the sensor to the transmitter or remote host. The cable is fitted with a Eurofast® connector for connection to the sensor. Cable can be ordered in lengths ranging from 6.5 ft (2 m) to 500 ft (150 m). For longer cable lengths, contact the factory.

2.3.3 Pipe Run

Brooks sensors do not require a straight run of pipe upstream or downstream.

2.3.4 Shutoff Valve

After the sensor and transmitter have been installed, you must perform the zeroing procedure. During the zeroing procedure, flow through the sensor must be halted and the sensor tubes must be completely full of process fluid. A shutoff valve, downstream from the sensor, is recommended to halt flow during the zeroing procedure. For more information about zeroing, (refer to your specific transmitter instruction manual.)

2.4 Orienting the Sensor

The sensor will function properly in any orientation if the sensor tubes remain filled with process fluid.

2.4.1 Flow Direction Arrow

The sensor has a flow direction arrow to help you configure the transmitter for flow direction. Install the sensor so that the flow direction arrow matches actual process flow for best performance.

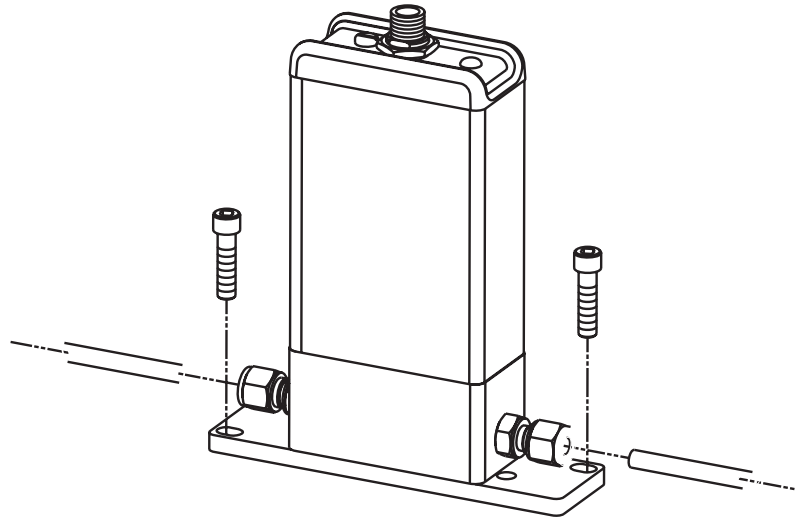
2.4.2 Vertical Pipeline

If the sensor is installed in a vertical pipeline, liquids and slurries should flow upward through the sensor. Gases may flow upward or downward.

2.5 Mounting the Sensor


Use your common practices to minimize torque and bending load on process connections. Figure 2-1 illustrates how to mount the sensor. Refer to page A-3 for the QmBS sensor dimensions

Figure 2-1 Mounting an QmBS sensor



2.6 Grounding the Sensor

The sensor's mounting plate must be grounded to earth.

 CAUTION
<p>Improper grounding could cause measurement error.</p> <p>To reduce the risk of measurement error:</p> <ul style="list-style-type: none"> • Ground the Flowsensor to earth, or follow ground network requirements for the facility. • For hazardous area installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

If national standards are not in effect, follow these grounding guidelines:

Use copper wire, 14 AWG (2.5 mm²) or larger wire size, for grounding.

Keep all ground leads as short as possible, less than 1 ΩOhm impedance.

Connect ground leads directly to earth, or follow plant standards.

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3.1 Overview

This section describes how to install Brooks QTA field-mount transmitters. The following general steps are required:

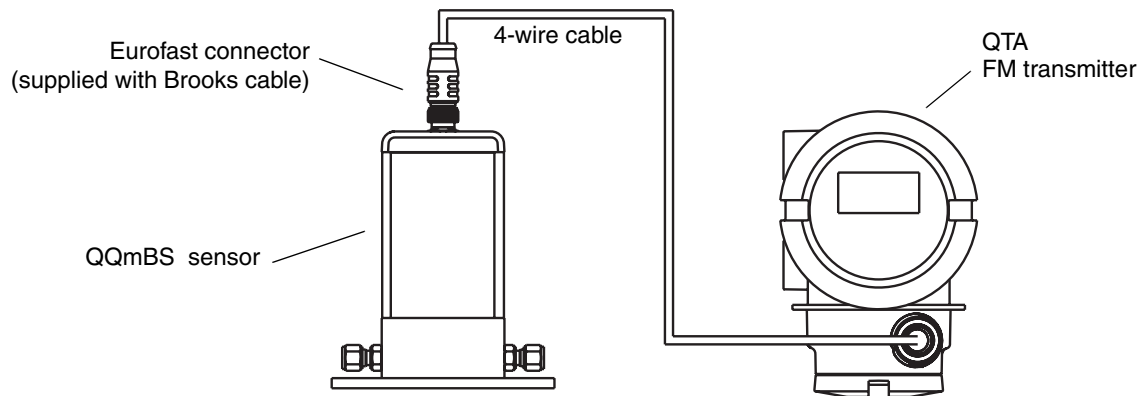
- Determine the location of the transmitter and other flowsensor components (see Section 3.2)
- Mount the transmitter (see Section 3.3)
- Ground the transmitter (see Section 3.4)
- Supply power to the flowsensor (see Section 3.5)
- Rotate the display, if desired and if the transmitter has a display (see Section 3.6)

3.2 Determining an Appropriate Location

To determine an appropriate location for the transmitter, you must consider the environmental requirements of the transmitter, hazardous area classification, location of power source, cable lengths, accessibility for maintenance, and visibility of the display (if transmitter is equipped with display).

The field-mount installation architecture is shown in Figure 3-1.

Figure 3-1 Installation Architecture



QmBS Sensor / QTA Transmitters

3.2.1 Environmental Requirements

The transmitter's environmental requirements include temperature, humidity, and vibration.

Temperature limits

Install the transmitter in an environment where ambient temperature is between -40 and $+140$ °F (-40 and $+60$ °C). If possible, install the transmitter in a location that will prevent direct exposure to sunlight.

Different ambient temperature requirements may apply, depending on your installation. Refer to the approvals documentation included on the CD shipped with the transmitter.

Humidity limits

Install the transmitter in an environment where relative humidity is between 5 and 95%, non-condensing at 140 °F (60 °C).

Vibration limits

The transmitter meets IEC 68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g.

3.2.2 Hazardous Area Classifications

If you plan to mount the transmitter in a hazardous area, verify that the transmitter has the appropriate hazardous area approval. Each transmitter has a hazardous area approvals tag attached to the transmitter housing.

For more information about hazardous area classifications and requirements, see Section A.3.2, Table A-13.

3.2.3 Power Source

The transmitter must be connected to an AC or DC voltage source. The transmitter automatically recognizes the source voltage.

AC power requirements

If you are using AC power, the following requirements apply:

- 85–265 VAC
- 50/60 Hz
- 6 watts typical, 11 watts maximum

DC power requirements

Note: These requirements assume a single transmitter per cable. Connecting multiple transmitters to a single cable should generally be avoided.

If you are using DC power, the following requirements apply:

- 18–100 VDC
- 6 watts typical, 11 watts maximum
- At startup, the transmitter power source must provide a minimum of 1.5 amps of short-term current per transmitter.
- Length and conductor diameter of the power cable must be sized to provide 18 VDC minimum at the power terminals, at a load current of 0.5 amps. To size the cable, refer to Table 3-1 and use the following formula as a guideline:

$$\text{Minimum Supply Voltage} = 18\text{V} + (\text{Cable Resistance} \times \text{Cable Length} \times 0.5\text{A})$$

Table 3-1 Typical Power Cable Resistances at 68 °F (20 °C)

Gauge	Resistance^a
14 AWG	0.0050 Ω/foot
16 AWG	0.0080 Ω/foot
18 AWG	0.0128 Ω/foot
20 AWG	0.0204 Ω/foot
2.5 mm ²	0,0136 Ω/meter
1.5 mm ²	0.0228 Ω/meter
1 mm ²	0.0340 Ω/meter
0.75 mm ²	0.0460 Ω/meter
0.5 mm ²	0.0680 Ω/meter

a. These values include the resistance of both high and low conductors in a cable.

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Example

The transmitter is mounted 350 feet from a DC power supply. If you want to use 16 AWG cable, calculate the required voltage at the DC power supply as follows:

$$\text{Minimum Supply Voltage} = 18V = (\text{Cable Resistance} \times \text{Cable Length} \times 0.5A)$$

$$\text{Minimum Supply Voltage} = 18V + (0.0080 \text{ ohms/ft} \times 350 \text{ ft} \times 0.5A)$$

$$\text{Minimum Supply Voltage} = 19.4V$$

3.2.4 Distance from Sensor

The maximum cable length between the sensor and the transmitter is 1000 ft (300 m).

Brooks supplies 4-wire cable to connect the sensor to the transmitter. The cable is fitted with a Eurofast connector for connection to the sensor. Cable can be ordered in lengths ranging from 6.5 ft (2 m) to 500 ft (150 m). For longer cable lengths, contact the factory.

3.2.5 Accessibility for Maintenance

Ensure that the transmitter is mounted in a location and orientation that will allow easy access to the terminals and to the display (if your transmitter has a display).

3.3 Mounting the Transmitter

You can mount the transmitter in any orientation as long as the conduit and wiring openings do *not* point upward. For transmitter dimensions, see Figures A-1, A-2 and A-3.

⚠ CAUTION

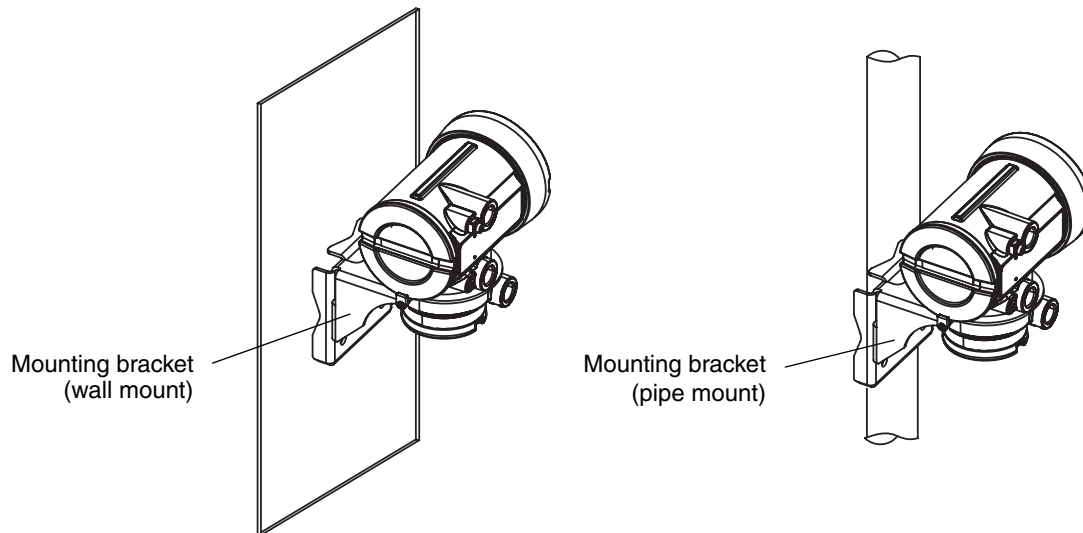
Condensation or excessive moisture entering the transmitter could damage the transmitter and result in measurement error or flowsensor failure.

To reduce the risk of measurement error or flowmeter failure:

- Ensure the integrity of gaskets and O-rings.
- Grease the O-rings every time the transmitter housing is opened and closed.
- Do not mount the transmitter with the conduit openings pointing upward.
- Install drip legs on conduit or cable.
- Seal the conduit openings.
- Fully tighten the transmitter cover.

See Figure 3-2 for a diagram of the mounting bracket supplied with the transmitter. Both pipe mounting and wall mounting are shown. Ensure that the transmitter is mounted and oriented in a way that will allow easy access to the terminals and to the display (if your transmitter has a display).

Figure 3-2 4-Wire Remote – Wall Mount or Pipe Mount

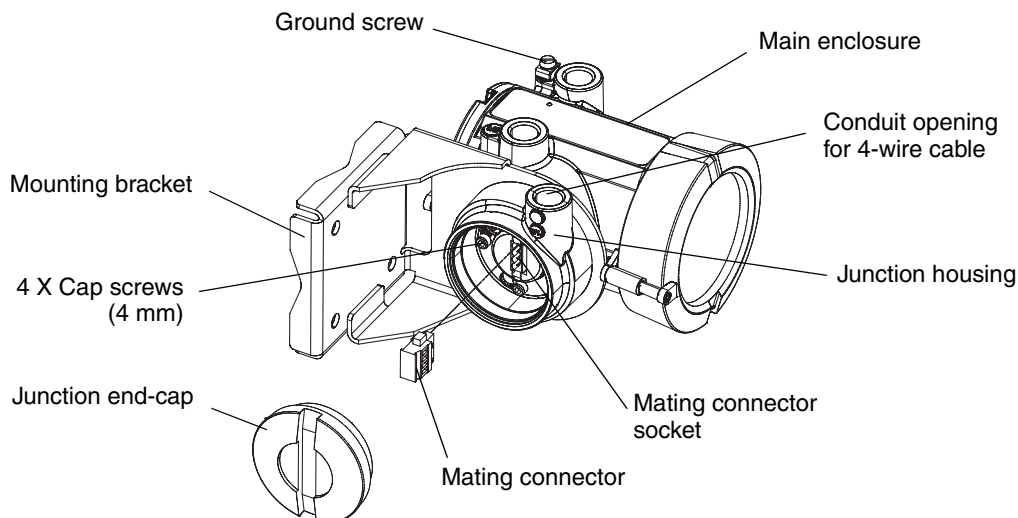


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To mount the transmitter:

1. Identify the components shown in Figure 3-3. For dimensions, see Appendix A.
2. If desired, re-orient the transmitter on the bracket.
 - a. Remove the junction end-cap from the junction housing.
 - b. Loosen each of the four cap screws (4 mm) inside the junction housing.
 - c. Rotate the bracket so that the transmitter is oriented as desired.
 - d. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).
 - e. Replace the junction end-cap.
3. Attach the mounting bracket to an instrument pole or wall. For pipe mount, two user-supplied U-bolts are required. Contact Brooks to obtain a pipe-mount installation kit if required.

Figure 3-3 Transmitter Components – Field-mount Transmitters



3.4 Grounding the Transmitter

⚠ CAUTION

Improper grounding could cause measurement error.

To reduce the risk of measurement error:

- Ground the transmitter to earth, or follow ground network requirements for the facility.
- For hazardous area installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

If national standards are not in effect, follow these transmitter grounding guidelines:

- Use copper wire, 14 AWG (2,5 mm²) or larger wire size, for grounding.
- Keep all ground leads as short as possible, less than 1 ΩOhm impedance.
- Connect ground leads directly to earth, or follow plant standards.

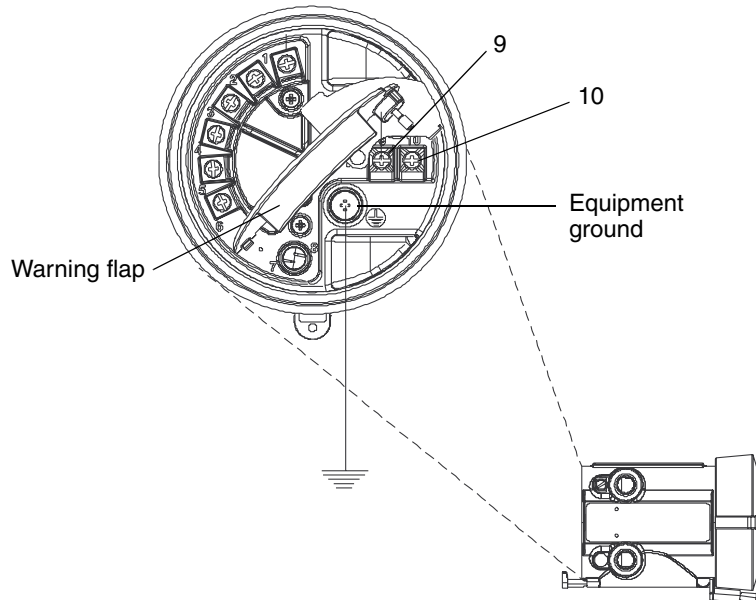
The transmitter has both an internal and an external grounding screw (see Figures 3-3 and 3-4). Ground the transmitter according to applicable local standards.

3.5 Supplying Power

In all installations, power must be provided to the transmitter. Refer to Section 3.2.3 for information on the transmitter's power supply requirements.

1. Connect the power supply to terminals 9 and 10, under the Warning flap (see Figure 3-4). Terminate the positive (line) wire on terminal 10 and the return (neutral) wire on terminal 9.
2. Ground the power supply using the equipment ground, also under the Warning flap.
3. A user-supplied switch may be installed in the power supply line. For compliance with low-voltage directive 73/23/EEC (European installations), a switch in close proximity to the transmitter is required.

Figure 3-4 Wiring the Transmitter Power Supply



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3.6 Rotating the Display

If your transmitter has a display, you can rotate the display on the transmitter up to 360° in 90° increments.

⚠ WARNING

Removing the display cover in explosive atmospheres while the power is on can cause an explosion.

To reduce the risk of an explosion, before removing the display cover in explosive atmospheres, be sure to shut off the power and wait five minutes.

⚠ WARNING

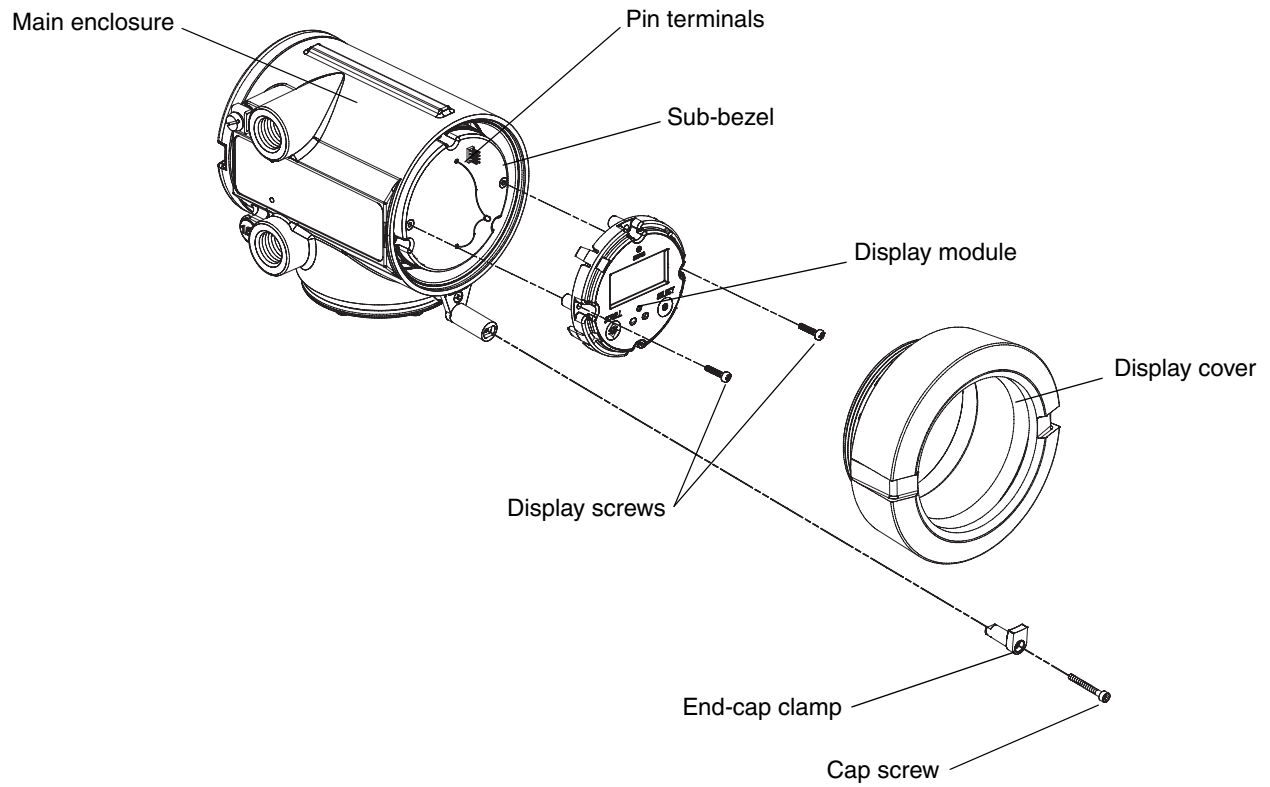
Using a dry cloth to clean the display cover can cause static discharge, which could result in an explosion in an explosive atmosphere.

To reduce the risk of an explosion, always use a damp cloth to clean the display cover in an explosive atmosphere.

To rotate the display, follow the instructions below:

1. Power down the transmitter.
2. Remove the end-cap clamp by removing the cap screw. See Figure 3-5.
3. Turn the display cover counterclockwise to remove it from the main enclosure.
4. Carefully loosen (and remove if necessary) the semicaptive display screws while holding the display module in place.
5. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.
6. Rotate the display module to the desired position.
7. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.
8. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.
9. Place the display cover onto the main enclosure. Turn the display cover clockwise until it is snug.
10. Replace the end-cap clamp by reinserting and tightening the cap screw.
11. Restore power to the transmitter.

Figure 3-5 Display Components



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4.1 Overview

This section describes how to install QTA DIN rail mount transmitters. The following general steps are required:

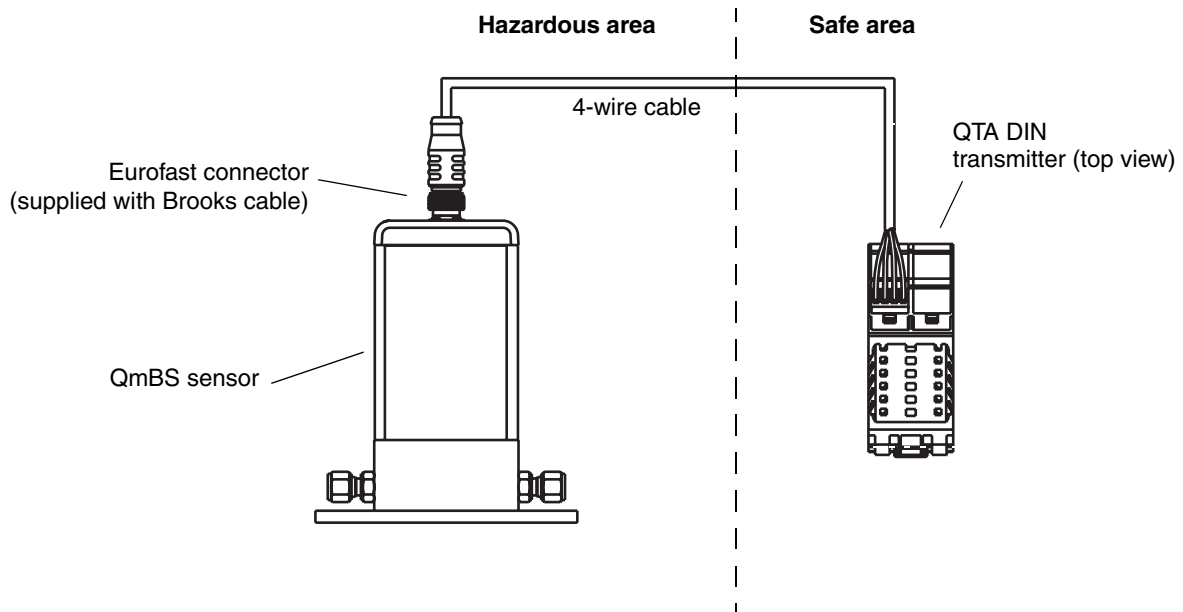
- Determine the location of the transmitter and other flowsensor components (see Section 4.2)
- Mount the transmitter (see Section 4.3)
- Ground the transmitter (see Section 4.4)
- Supply power to the flowsensor (see Section 4.5)

4.2 Determining an Appropriate Location

See Figure 4.2.5 for the DIN rail mount installation architecture.

To determine an appropriate location for the transmitter, you must consider the temperature requirements of the transmitter, hazardous area issues, location of power source, cable lengths, and accessibility for maintenance.

Figure 4-1 Installation Architecture



4.2.1 Temperature Requirements

Install the transmitter in an environment where ambient temperature is between -40 and +131 °F (-40 and +55 °C).

Different ambient temperature requirements may apply, depending on your installation. Refer to the approvals documentation included on the CD shipped with the transmitter.

4.2.2 Hazardous Area Classifications

The QTA DIN rail mount transmitter is designed for installation in a safe area. It can be connected to a sensor located in a hazardous area.

For more information about hazardous area classifications, see Appendix A.

4.2.3 Power Source

The transmitter must be connected to a DC voltage source. Do not use an AC power supply.

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⚠ CAUTION

Applying AC voltage to the transmitter will damage the device.

To avoid damaging the transmitter, do not connect it to an AC power supply.

The following requirements apply:

- 19.2 to 28.8 VDC at the power terminals, at a load current of 330 mA
- 6.3 watts maximum
- At startup, the transmitter power source must provide a minimum of 1.0 amp of short-term current per transmitter

To size the cable, refer to Table and use the following formula as a guideline:

$$\text{Minimum Supply Voltage} = 19.2\text{V} + (\text{Cable Resistance} \times \text{Cable length} \times 0.33 \text{ A})$$

Table 4-1 Typical Power Cable Resistances at 68 °F (20 °C)

Gauge	Resistance ^a
14 AWG	0.0050 Ω/foot
16 AWG	0.0080 Ω/foot
18 AWG	0.0128 Ω/foot
20 AWG	0.0204 Ω/foot
2.5 mm ²	0.0136 Ω/meter
1.5 mm ²	0.0228 Ω/meter
1 mm ²	0.0340 Ω/meter
0.75 mm ²	0.0460 Ω/meter
0.5 mm ²	0.0680 Ω/meter

a. These values are based on copper wire, and include the resistance of both wires in a cable. If you are using a material other than copper, refer to the resistivity specifications for your wire type.

Example

The transmitter is mounted 350 feet from a DC power supply. If you want to use 16 AWG cable, calculate the required voltage at the DC power supply as follows:

$$\text{Minimum Supply Voltage} = 19.2V + (\text{Cable Resistance} \times \text{Cable Length} \times 0.33A)$$

$$\text{Minimum Supply Voltage} = 19.2V + (0.0080 \text{ ohms/ft} \times 350 \text{ ft} \times 0.33A)$$

$$\text{Minimum Supply Voltage} = 20.1V$$

4.2.4 Distance from Sensor

The maximum cable length between the sensor and the transmitter is 1000 ft (300 m).

Brooks supplies 4-wire cable to connect the sensor to the transmitter. The cable is fitted with a Eurofast[®] connector for connection to the sensor. Cable can be ordered in lengths ranging from 6.5 ft (2 m) to 500 ft (150 m). For longer cable lengths, contact the factory.

4.2.5 Accessibility for Maintenance

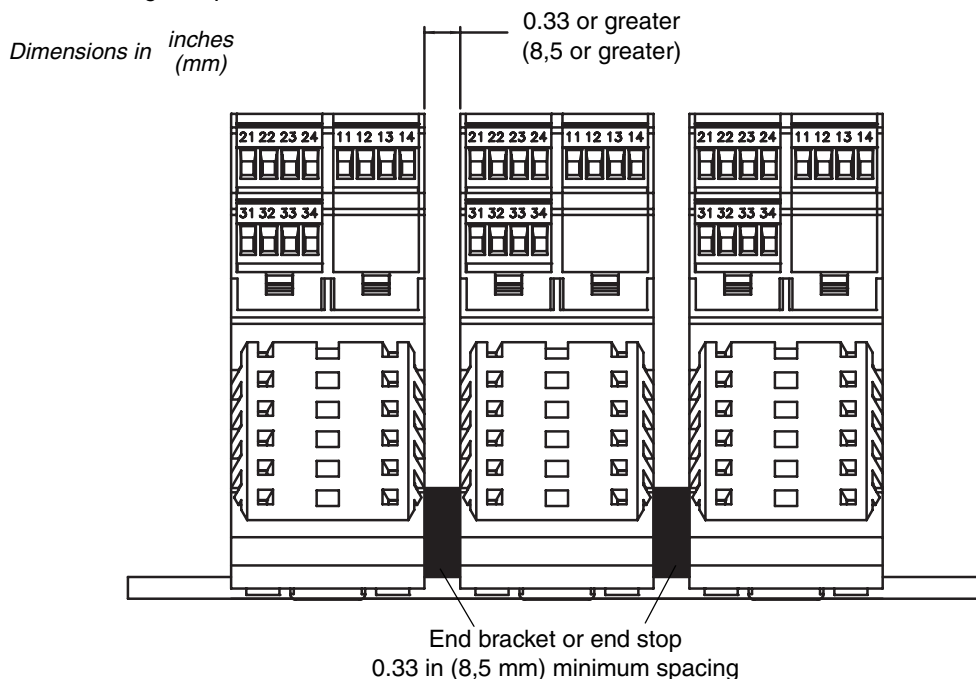
Ensure that the transmitter is mounted in a location that will allow easy access to the terminals and the front panel.

4.3 Mounting and Removing the Transmitter

The transmitter is designed to be mounted on a 35 mm rail. The DIN rail must be grounded. See Figure A-3 for dimensions.

If the temperature is above 113 °F (45 °C) and you are mounting multiple transmitters, they must be mounted at least 0.33 in (8,5 mm) apart. Use an end bracket or end stop to space the transmitters. See Figure 4-2.

Figure 4-2 Mounting Multiple Transmitters

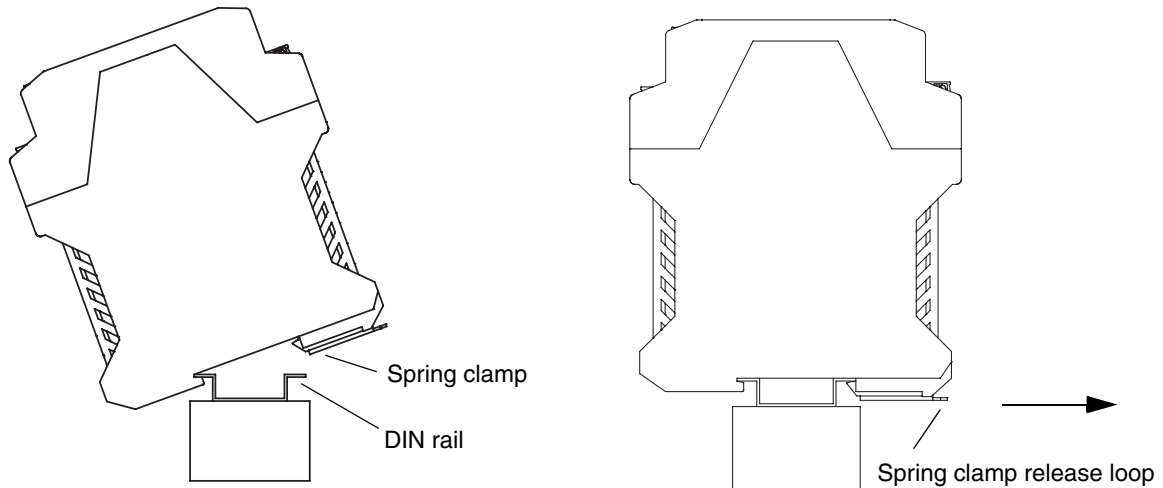


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To mount the transmitter:

1. Locate the transmitter in the desired position on the DIN rail.
2. Place the slot on back of the transmitter against the rail (see Figure 4-3).
3. Apply pressure to the transmitter until the spring clamp snaps onto the rail.

Figure 4-3 Mounting and Removing the Transmitter



To remove the transmitter:

1. Slide a screwdriver into the spring clamp release loop (see Figure 4-3).
2. Pull the spring clamp away from the transmitter.
3. Lift the transmitter from the rail.

4.4 Grounding the Transmitter

⚠ CAUTION

Improper grounding could cause measurement error.

To reduce the risk of measurement error:

- Ground the transmitter to earth, or follow ground network requirements for the facility.
- For hazardous area installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

If national standards are not in effect, follow these transmitter grounding guidelines:

- Use copper wire, 14 AWG (2,5 mm²) or larger wire size, for grounding.
- Keep all ground leads as short as possible, less than 1 ΩOhm impedance.
- Connect ground leads directly to earth, or follow plant standards.

To ground the transmitter, ground the DIN rail. A rail clip in the base of the transmitter housing grounds the transmitter to the DIN rail.

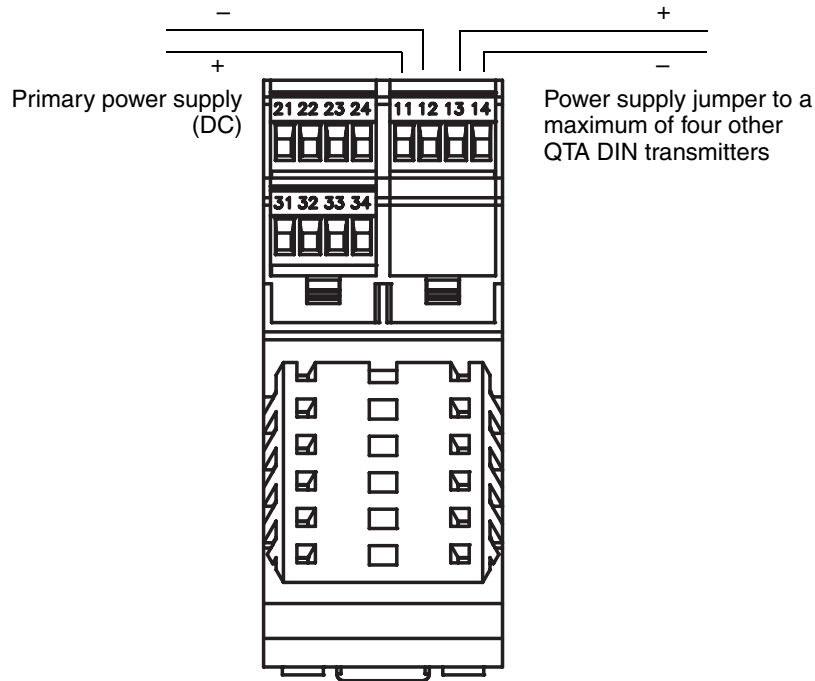
4.5 Supplying Power

In all installations, power must be provided to the transmitter. Refer to Section 4.2.3 for information on the transmitter's power supply requirements.

Connect the power supply to terminals 11 and 12. Terminate the positive wire on terminal 11 and the negative wire on terminal 12. See Figure 4-4.

Terminals 13 and 14 are used to jumper power to another QTA DIN transmitter. A maximum of five transmitters can be jumpered together.

Figure 4-4 Wiring the Transmitter Power Supply



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5.1 Overview

This section describes how to connect Brooks QmBS sensors to QTA transmitters. This section also describes how to connect the QTA sensor to a remote host, for use in MVD Direct Connect installations.

CAUTION

Large electromagnetic fields can interfere with flowsensor communication signals.

Improper installation of cable or conduit can cause measurement error or flowsensor failure. To reduce the risk of measurement error or flowsensor failure, keep cable or conduit away from devices such as transformers, motors, and power lines which produce large electromagnetic fields.

5.2 Cable Types

Brooks offers 4-wire cable with a factory-installed Eurofast connector.

5.3 Wiring to FM or DIN Transmitters

To connect the cable, follow the steps below.

1. To connect the cable to the sensor, plug the Eurofast connector onto the top of the sensor connection. **Attention!** The connector is keyed for appropriate orientation.
2. Identify the wires in the 4-wire cable. The 4-wire cable supplied by Brooks consists of one pair of 18 AWG (0.75 mm²) wires (brown and black), which should be used for the VDC connection, and one pair of 22 AWG (0.35 mm²) wires (blue and white), which should be used for the RS-485 connection.
3. To connect:
 - To a field-mount transmitter, connect the four wires from the sensor to terminals 1–4 on the mating connector of the transmitter. See Figure 5-1. Do not ground the shield, braid, or drain wire(s) at the transmitter.
 - To a DIN rail mount transmitter, connect the four wires from the sensor to terminals 1–4 on the transmitter. See Figure 5-2. Do not ground the shield, braid, or drain wire(s) at the transmitter.

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Figure 5-1 4-Wire Cable Between Sensor and FM Transmitter

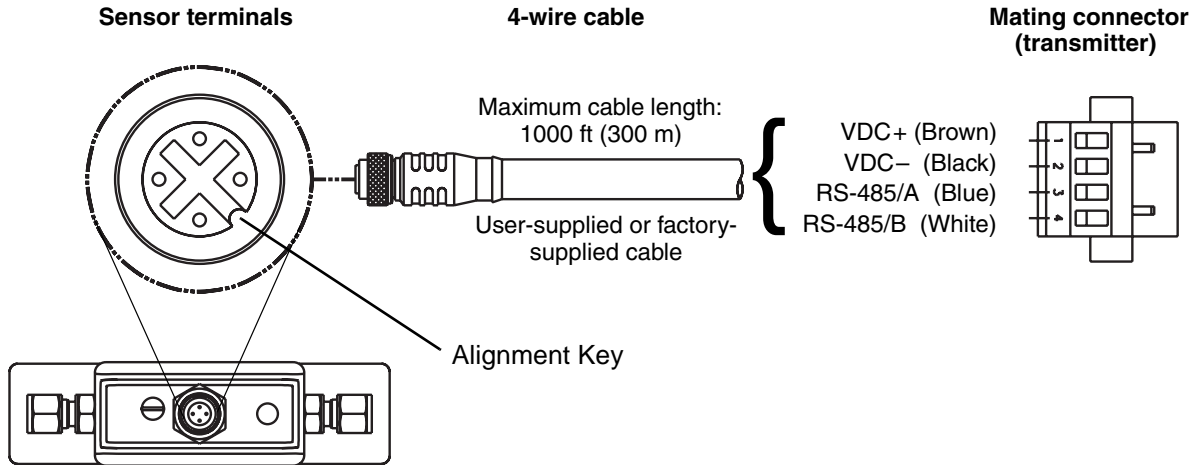
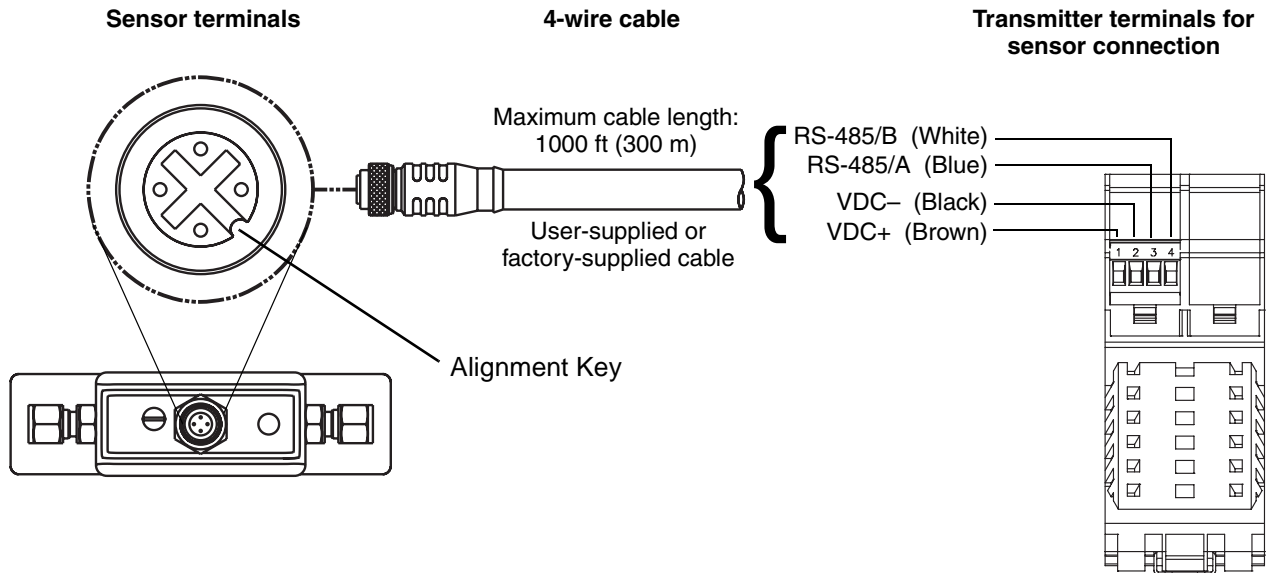


Figure 5-2 4-Wire Cable Between Sensor and DIN Transmitter



5.4 MVD Direct Connect Wiring

Note: This section applies only to QTA sensors used in MVD Direct Connect installations.


Note: MVD Direct Connect installations based on the QTA sensor cannot include the MVD Direct Connect I.S. barrier.

In MVD Direct Connect installations, you must connect the sensor to a remote host and to a power supply.

5.4.1 Power Supply Requirements

The power supply must meet the following requirements:

- Power must be supplied from a common floating regulated power supply with the correct voltage.
- The voltage requirement for a single sensor is 15–26 VDC. The maximum power consumption of a single sensor is approximately 3 W.
- The power supply may be used to power any number of sensors, but must not be used to power other devices.
- Use shielded wiring.
- The power supply must not allow power surges or conducted radio frequency interference (RFI) to propagate through to its output.
- The power supply must not be grounded.
-

 CAUTION
<p>Grounding the power supply to the sensor can cause damage to the sensor or the remote host.</p> <p>To avoid damaging the sensor or the remote host, ensure that the power supply to the sensor is not grounded.</p>

- In EU countries, the power supply must meet the requirements of the EMC directive.
- The power supply cable must comply with the size and length requirements listed in Table 2-1. A minimum DC input of 15 V is required for each sensor. At startup, the power source must provide a minimum of 0.2 A of short-term current per sensor. The maximum steady state current is 0.15 A. For assistance in sizing the power supply cable, refer to Table 5-1 and use the equation below:

$$\text{Minimum Supply Voltage} = 15V + (\text{Cable Resistance} \times \text{Cable Length} \times 0.15A)$$

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Table 5-1 Typical Power Cable Resistances at 68 °F (20 °C)

Gauge	Resistance ^a
14 AWG	0.0050 Ω/foot
16 AWG	0.0080 Ω/foot
18 AWG	0.0128 Ω/foot
20 AWG	0.0204 Ω/foot
22 AWG	0.0328 Ω/foot
2.5 mm ²	0.0136 Ω/meter
1.5 mm ²	0.0228 Ω/meter
1 mm ²	0.0340 Ω/meter
0.75 mm ²	0.0460 Ω/meter
0.5 mm ²	0.0680 Ω/meter

a. These values include the resistance of both high and low conductors in a cable.

Example

The sensor is mounted 350 feet from a DC power supply. If you want to use 18 AWG cable, calculate the required voltage at the DC power supply as follows:

$$\text{Minimum Supply Voltage} = 15V + (\text{Cable Resistance} \times \text{Cable length} \times 0.15A)$$

$$\text{Minimum Supply Voltage} = 15V + (0.0128 \text{ ohms/ft} \times 350 \text{ ft} \times 0.15A)$$

$$\text{Minimum Supply Voltage} = 15.7V$$

5.4.2 Wiring

To connect the cable, follow the steps below.

1. To connect the cable to the sensor, plug the Eurofast connector onto the top of the sensor connection. The connector is keyed for appropriate orientation.
2. At the remote host:
 - a. Open the wiring compartment and identify the RS-485 terminals. Refer to the vendor documentation if required.
 - b. Connect the RS-485 wires from the sensor to the RS-485 terminals at the remote host. The blue wire is RS-485/A; the white wire is RS-485/B.
 - c. Do not terminate the shield, braid, or drain wire(s) at the remote host.
 - d. Do not terminate the RS-485 lines using the standard 60-ohm termination resistor. If possible, do not terminate the RS-485 lines at all. If the RS-485 cable is 1000 feet (300 meters) long or longer, and termination is required, the total termination must be 175 ohm or above.
 - e. Close the wiring compartment.
3. At the power supply, connect the power supply wires from the sensor to the power supply, matching positive and negative (+ and -). The brown wire is VDC+; the black wire is VDC-.

6.1 Overview

This section explains how to wire outputs for QTA field-mount AN transmitters. If you don't know your transmitter type, see Section 6.1.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

6.2 Output Terminals and Output Types

Table 6-1 describes the outputs and communication protocols available for the QTA field-mount AN transmitter.

Table 5-1 Terminals and Output Types

Terminals	Output type	Communication
1 & 2	Milliamp/Bell 202 ^a	HART
3 & 4	Frequency	None
5 & 6	RS-485	• Modbus (default) • HART

a. The Bell 202 signal is superimposed on the mA output.

6.3 Output Wiring

Output wiring requirements depend on how you will use the analog functionality and the HART or Modbus protocol. This section describes several possible configurations:

- Figure 6-1 shows the wiring requirements for the mA output (terminals 1 and 2) and the frequency output (terminals 3 and 4).
- Figure 6-2 shows the wiring requirements for the mA output (terminals 1 and 2) if it will be used for HART communications in addition to the mA signal.
- Figure 6-3 shows the wiring requirements for RS-485 communications using the RS-485 output (terminals 5 and 6).
- Figure 6-4 shows the wiring requirements for connecting the transmitter to a HART multidrop network.

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Figure 6-1 Basic Analog Wiring

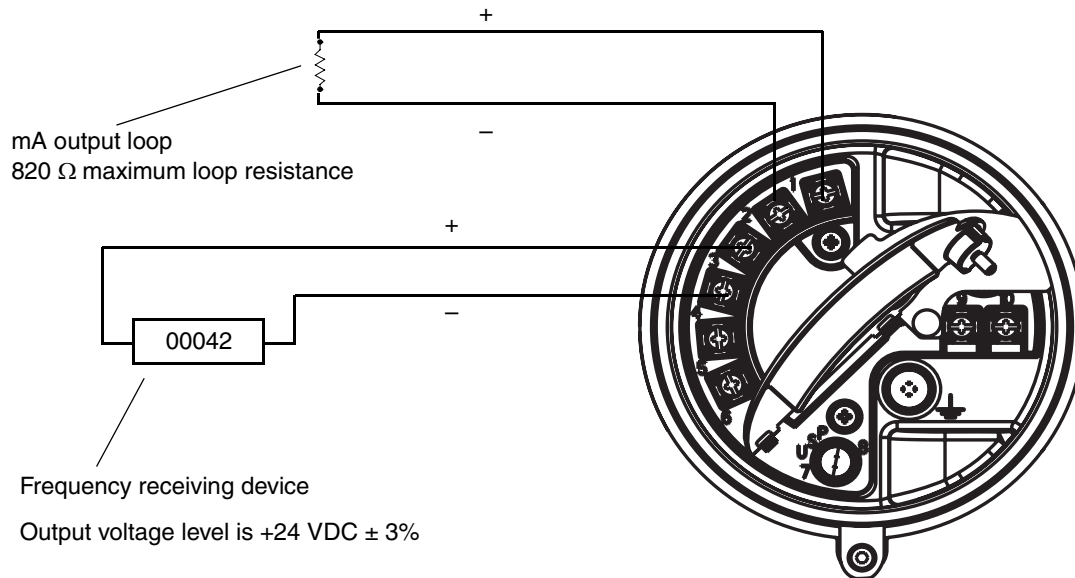


Figure 6-2 HART/Analog Single-Loop Wiring

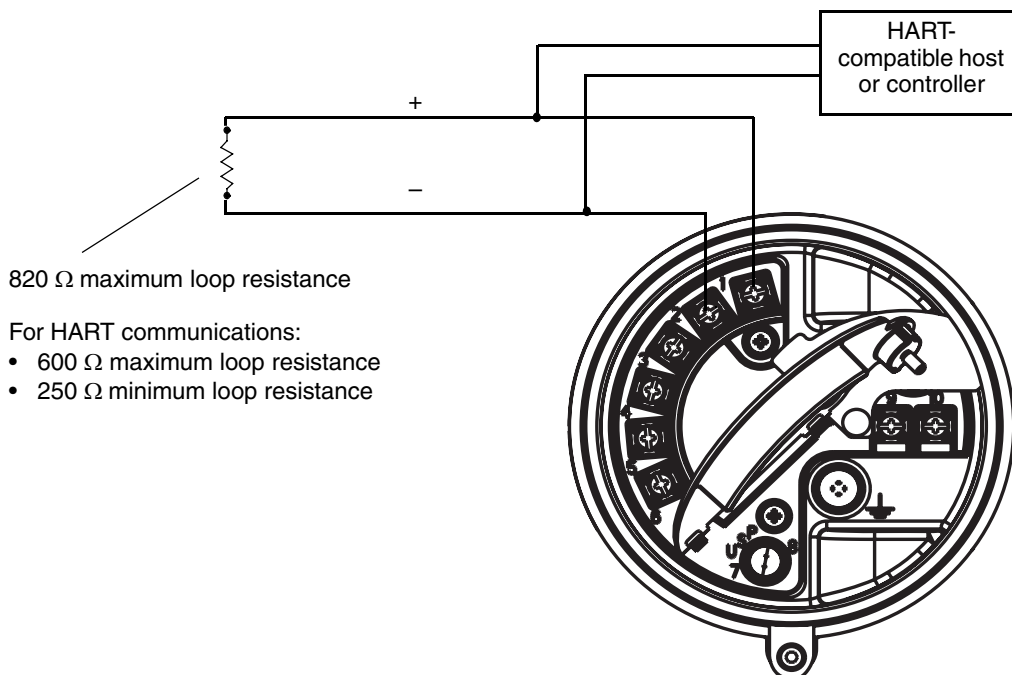
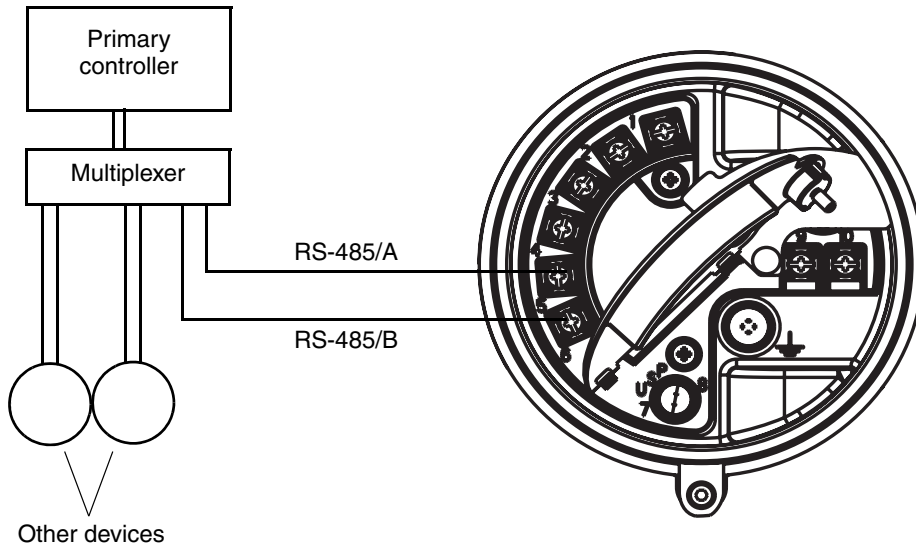
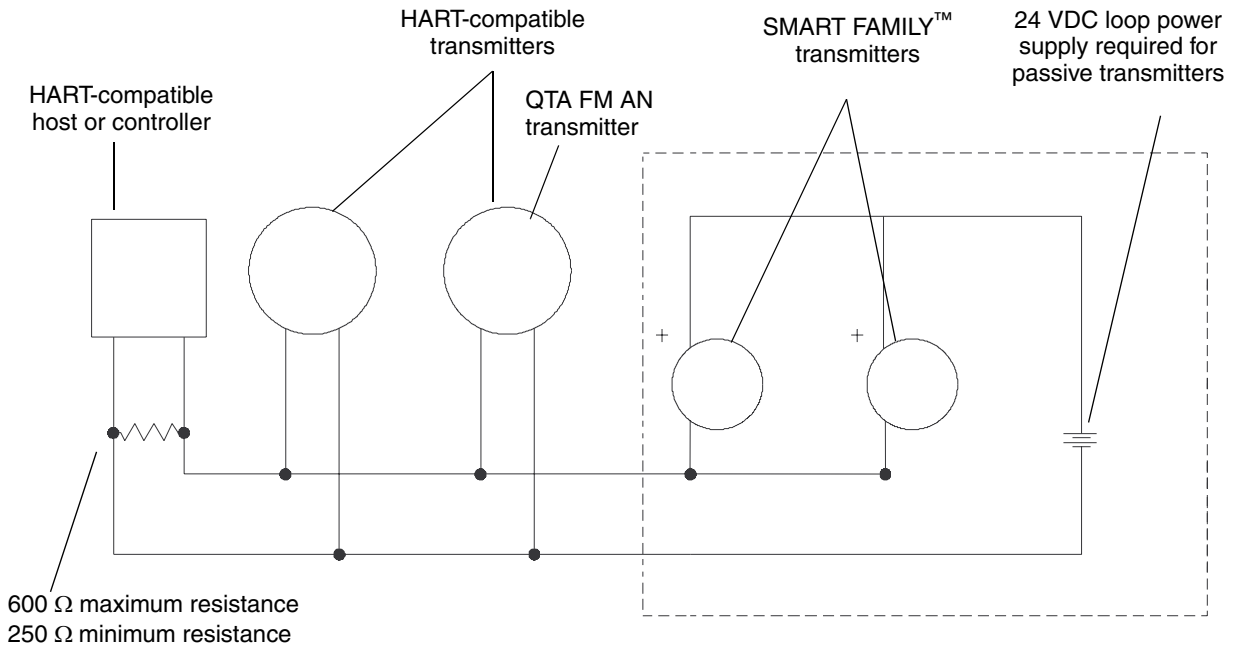


Figure 6-3 RS-485 Point-to-Point Wiring



Note: The RS-485 communication wires must be shielded.

Figure 6-4 HART Multidrop Wiring with SMART FAMILY™ Transmitters and a Configuration Tool



Note: For optimum HART communication, make sure the output loop is single-point-grounded to an instrument-grade ground.

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7.1 Overview

This section explains how to wire outputs for QTA field-mount CIO transmitters. If you don't know your transmitter type, see Section 1.6.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

7.2 Channel Configuration

The six output terminals are divided into three pairs. The pairs are called Channels A, B, and C. Channel A is terminals 1 and 2; Channel B is terminals 3 and 4; and Channel C is terminals 5 and 6. Variable assignments are governed by channel configuration.

Output wiring requirements depend on how you will configure the transmitter channels. The configuration options are shown in Table 7-1 and Figure 7-1. You can use a HART Communicator or ProLink II software to configure channels. See the transmitter configuration manual for more information.

If Channel B is configured as a frequency output or discrete output, it can also be configured to use either internal or external power. Channel C can be configured to use either internal or external power, independent of its output configuration.

- "Internal power" means that the terminals are powered automatically by the transmitter. The output wiring instructions do not include power setup and power wiring.
- "External power" means that the terminals must be connected to an independent power supply. The output wiring instructions include power setup and power wiring.

Note: The terms "active" and "passive" are sometimes used to describe internally and externally powered outputs.

Note: You cannot configure the following combination: Channel B = discrete output, Channel C = frequency output. If you need both a frequency output and a discrete output, use the following: Channel B = frequency output, Channel C = discrete output. For more information, see the transmitter configuration manual.

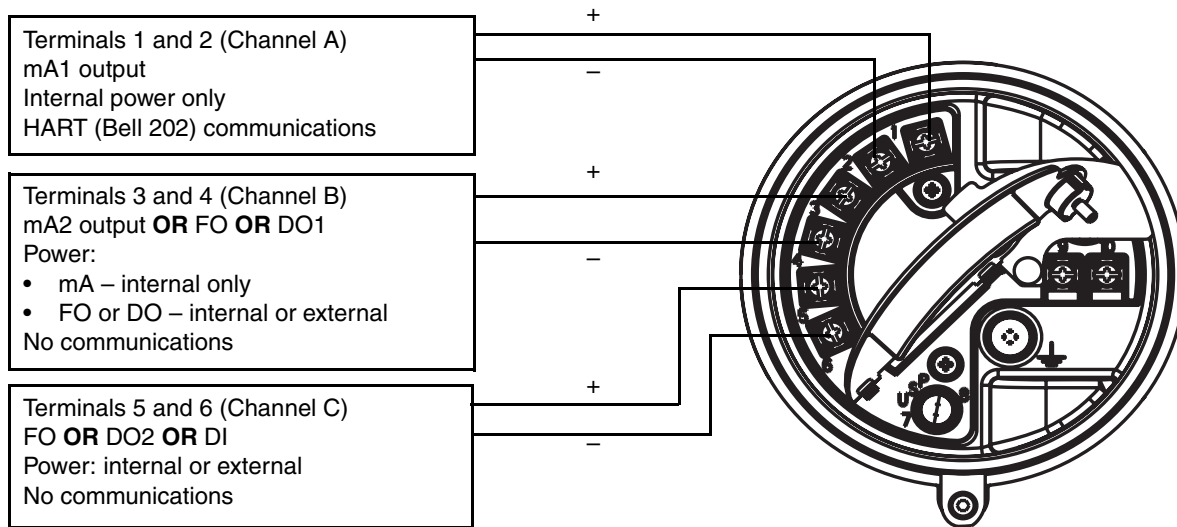
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Table 7-1 Channel Configuration

Channel	Terminals	Configuration options	Power
A	1 & 2	mA output with HART/Bell 202 ^a	Internal
B	3 & 4	• mA output (default)	Internal
		• Frequency output	Internal or external ^b
		• Discrete output	Internal or external
C	5 & 6	• Frequency output (default) ^c	Internal or external
		• Discrete output	Internal or external
		• Discrete input	Internal or external

- a. The Bell 202 signal is superimposed on the mA output.
- b. You must provide power to the outputs when a channel is set to external power.
- c. When configured for two frequency outputs (dual pulse), frequency output 2 is generated from the same signal that is sent to the first frequency output. Frequency output 2 is electrically isolated but not independent.

Figure 7-1 Configuration of Configurable I/O Terminals



mA = milliamp
 FO = frequency output
 DO = discrete output
 DI = discrete input

7.3 mA Output Wiring

The following 4–20 mA wiring diagrams are examples of proper basic wiring for the QTA FM CIO transmitter’s primary and secondary mA outputs. The following options are shown:

- Basic mA wiring (Figure 7-2)
- HART/analog single-loop wiring (Figure 7-3)
- HART multidrop wiring (Figure 7-4)

Figure 7-2 Basic mA Wiring

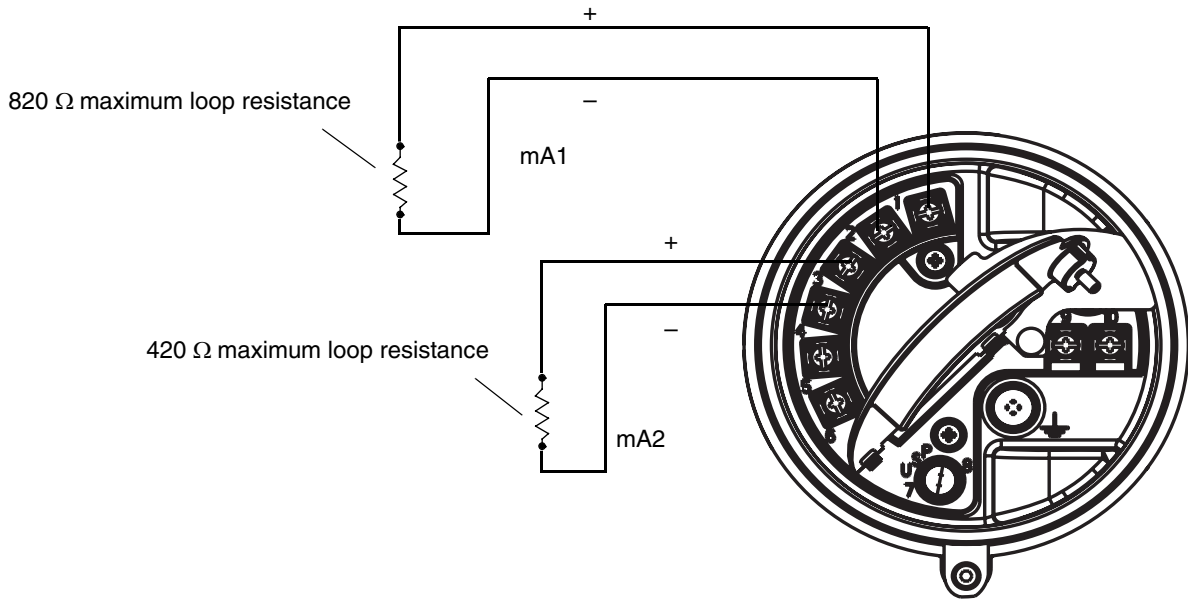
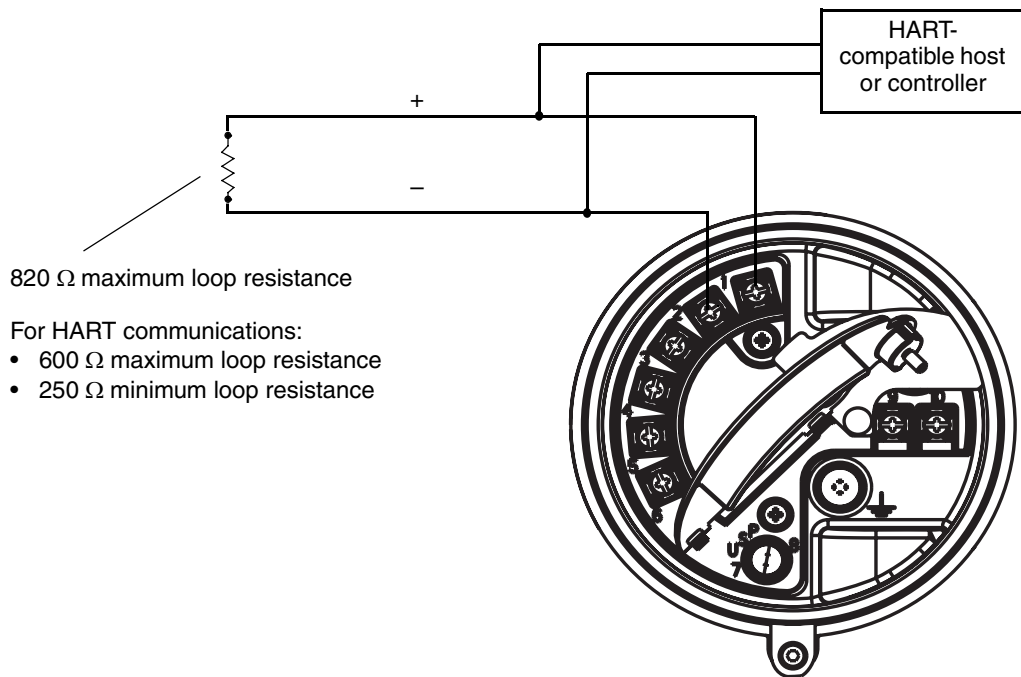
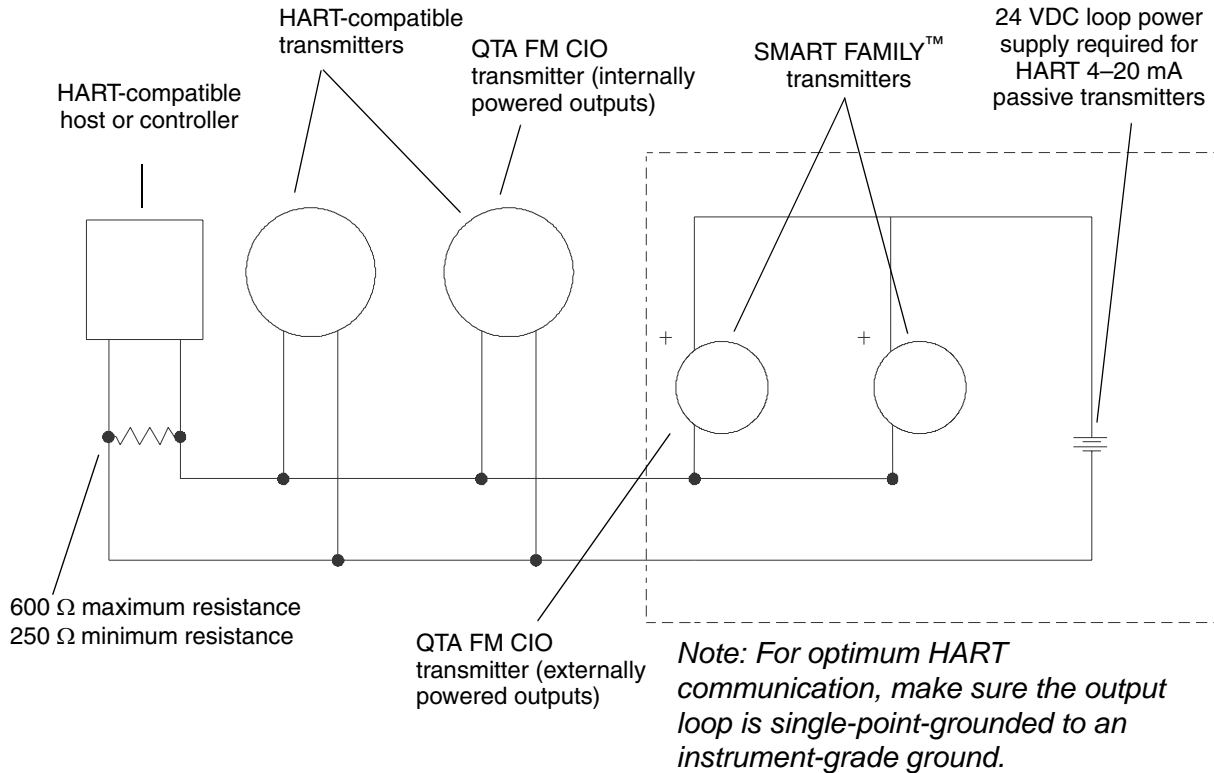


Figure 7-3 HART/Analog Single-Loop Wiring



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Figure 7-4 HART Multidrop Wiring with SMART FAMILY™ Transmitters and a Configuration Tool



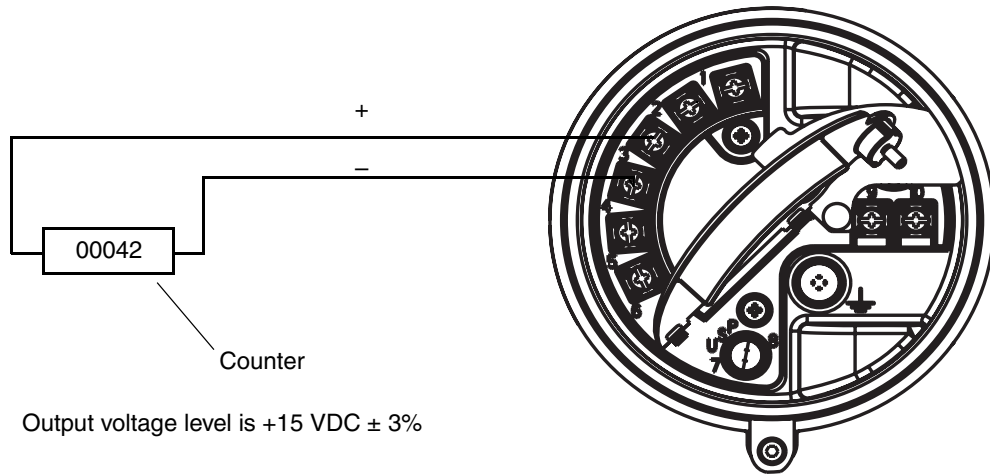
7.4 Frequency Output Wiring

Frequency output wiring depends on whether you are wiring terminals 3 and 4 (Channel B) or terminals 5 and 6 (Channel C), and also on whether you have configured the terminals for internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Channel B, internal power – Figure 7-5
- Channel B, external power – Figure 7-6
- Channel C, internal power – Figure 7-7
- Channel C, external power – Figure 7-8

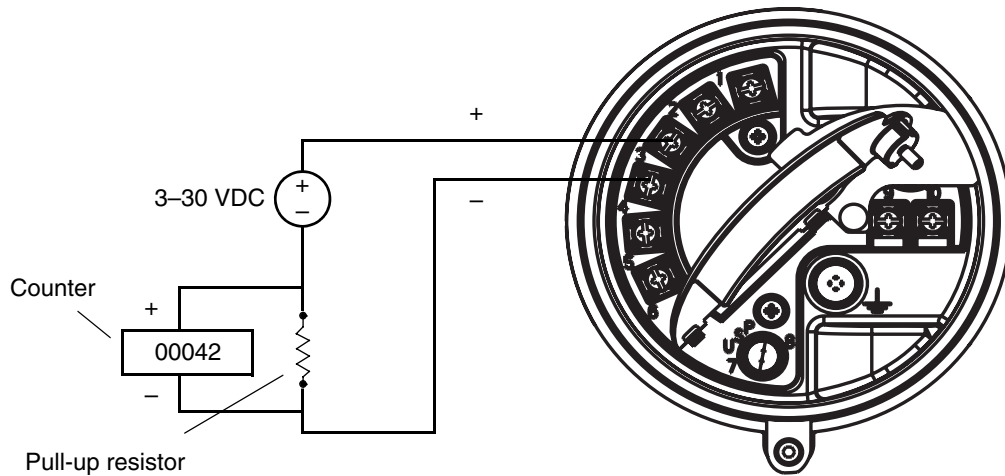
Note: If both Channel B and Channel C are configured for frequency output, the Channel C signal is generated from the Channel B signal, with a user-specified phase shift. The signals are electrically isolated but not independent. This configuration is used to support dual-pulse and quadrature modes. For more information, see the transmitter configuration manual.

Figure 7-5 Frequency Output – Terminals 3 & 4 (Channel B) – Internal Power



Note: See Figure 7-13 for output voltage versus load resistance.

Figure 7-6 Frequency Output – Terminals 3 & 4 (Channel B) – External Power

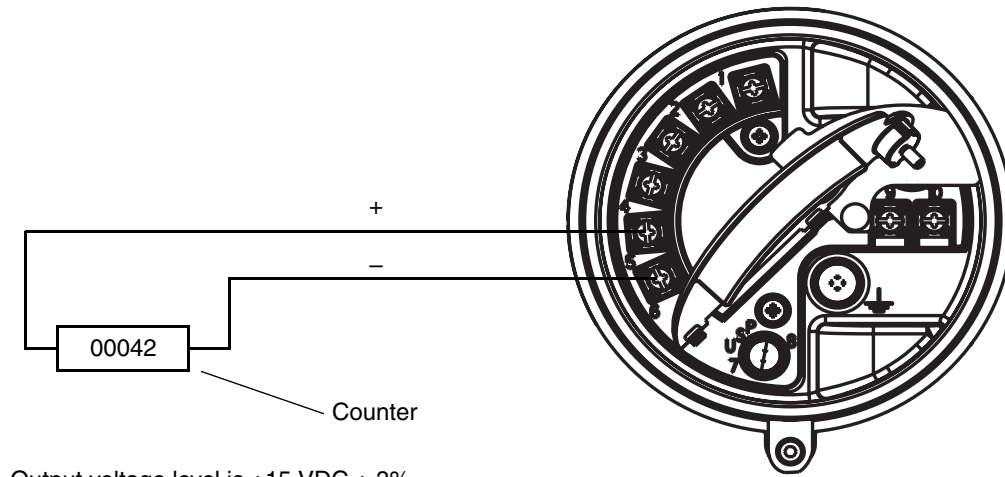


Note: See Figure 7-15 for recommended resistor versus supply voltage.

⚠ CAUTION
Excessive current will damage the transmitter.
Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

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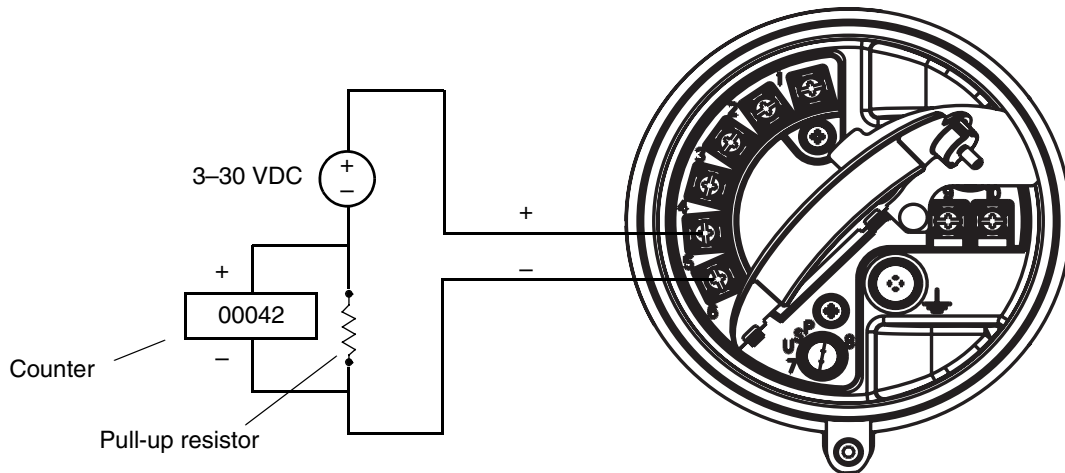
Figure 7-7 Frequency Output – Terminals 5 & 6 (Channel C) – Internal Power



Output voltage level is +15 VDC ± 3%

Note: See Figure 7-14 for output voltage versus load resistance.

Figure 7-8 Frequency Output – Terminals 5 & 6 (Channel C) – External Power



Note: Refer to Figure 7-15 for recommended resistor versus supply voltage.

⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

7.5 Discrete Output Wiring

Discrete output (DO) wiring depends on whether you are wiring terminals 3 and 4 (Channel B) or terminals 5 and 6 (Channel C), and also on whether you have configured the terminals for internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Channel B, internal power – Figure 7-9
- Channel B, external power – Figure 7-10
- Channel C, internal power – Figure 7-11
- Channel C, external power – Figure 7-12

Figure 7-9 Discrete Output 1 – Terminals 3 & 4 (Channel B) – Internal Power

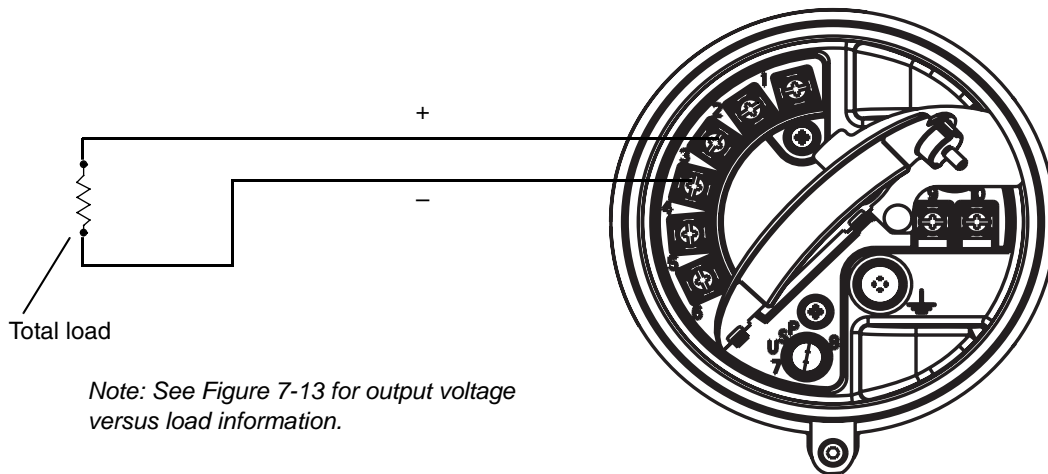
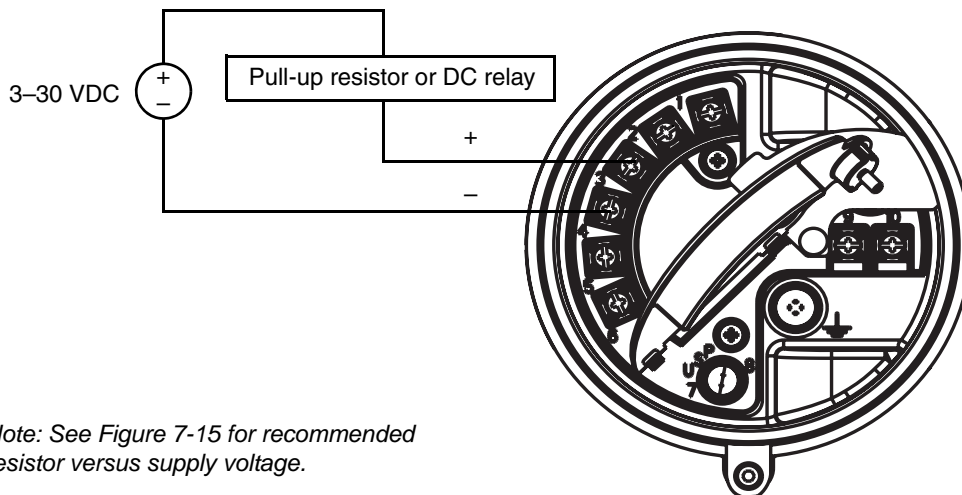


Figure 7-10 Discrete Output 1 – Terminals 3 & 4 (Channel B) – External Power



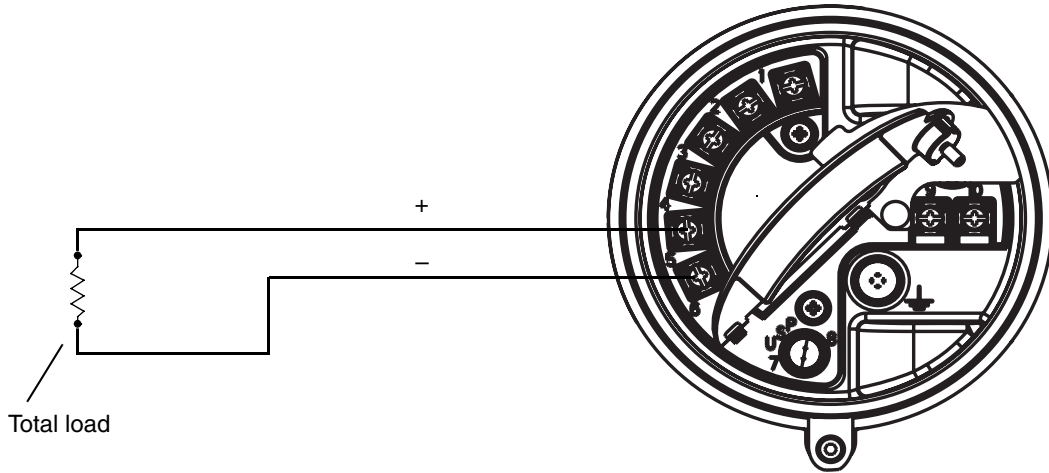
⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

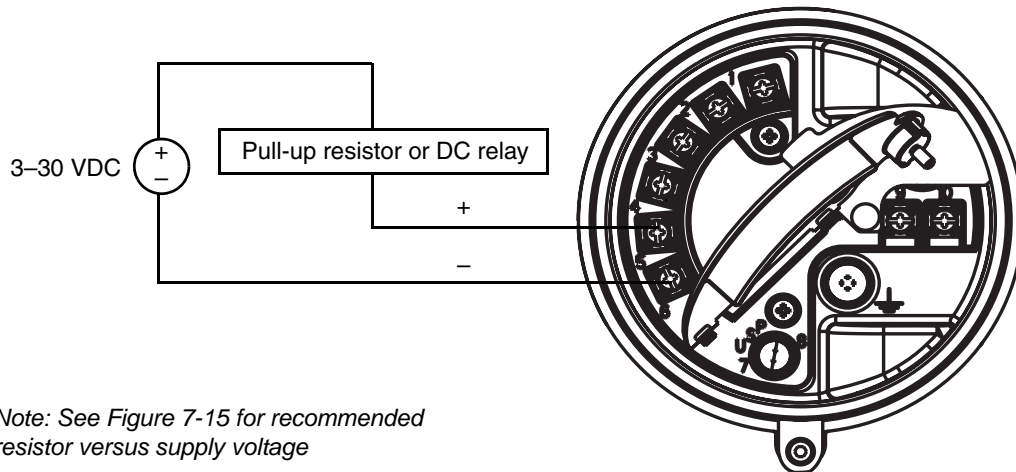
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Figure 7-11 Discrete Output 2 – Terminals 5 & 6 (Channel C) – Internal Power



Note: See Figure 7-14 for output voltage versus load.

Figure 7-12 Discrete Output 2 – Terminals 5 & 6 (Channel C) – External Power



Note: See Figure 7-15 for recommended resistor versus supply voltage

⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

Figure 7-13 Output Voltage vs. Load Resistance – Terminals 3 & 4 (Channel B) – Internal Power

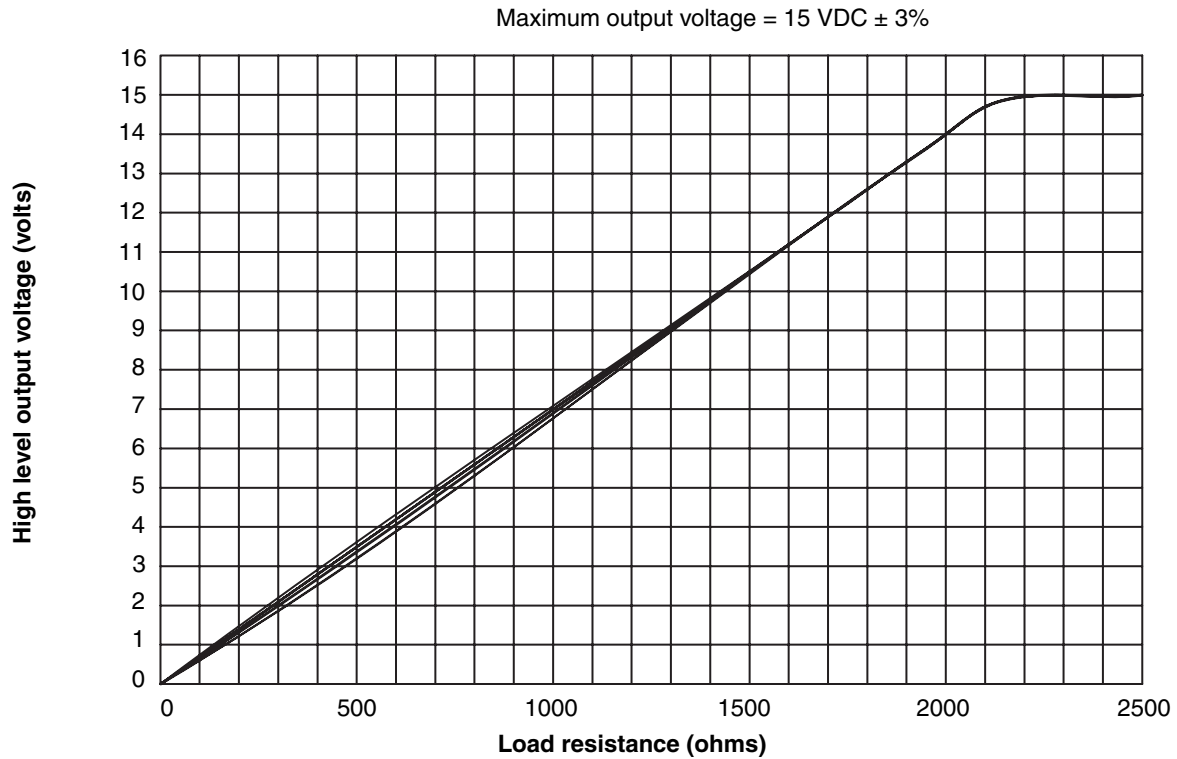
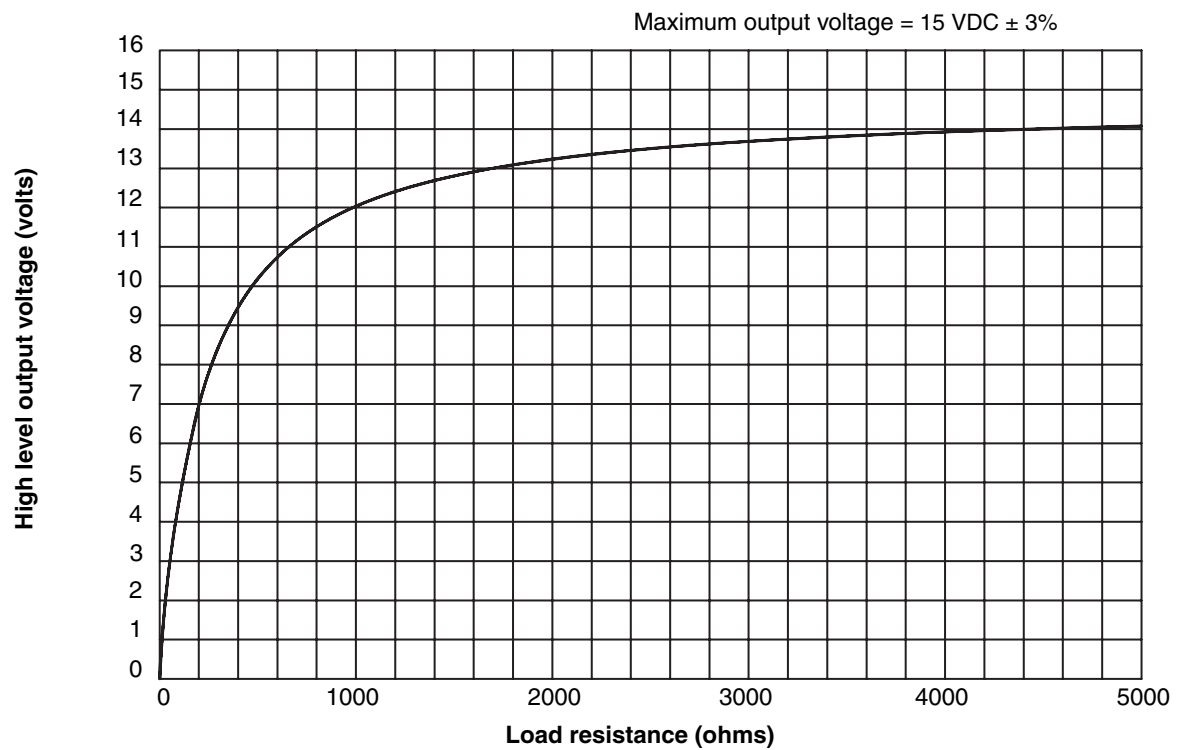
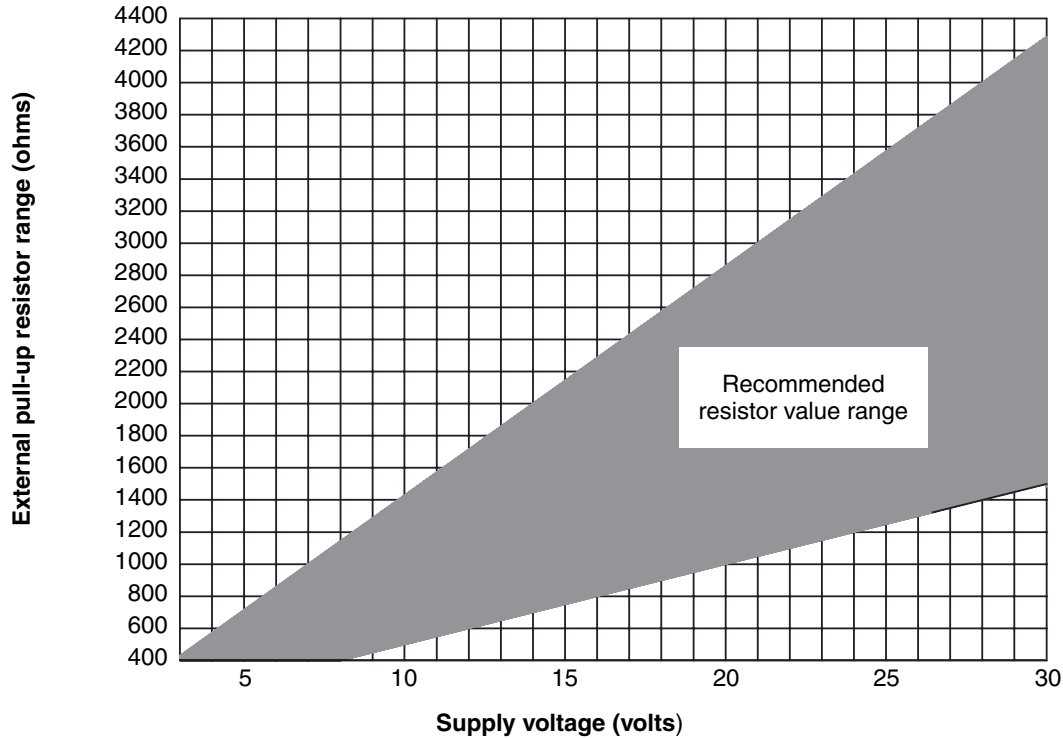


Figure 7-14 Output Voltage vs Load Resistance – Terminals 5 & 6 (Channel C) – Internal Power



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Figure 7-15 Recommended Pull-up Resistor Versus Supply Voltage – External Power



Note: When using a discrete output to drive a relay, choose external pull-up to limit current to less than 500 mA.

7.6 Discrete Input Wiring

Discrete input wiring depends on whether you have configured terminals 5 and 6 (Channel C) for internal or external power. The following diagrams are examples of proper wiring for these configurations.

If external power is configured, power may be supplied by a PLC or other device, or by direct DC input. See Table 7-2 for input voltage ranges.

Table 7-2 Input Voltage Ranges for External Power

VDC	Range
3–30	High level
0–0.8	Low level
0.8–3	Undefined

Figure 7-16 Discrete Input – Terminals 5 & 6 (Channel C) – Internal Power

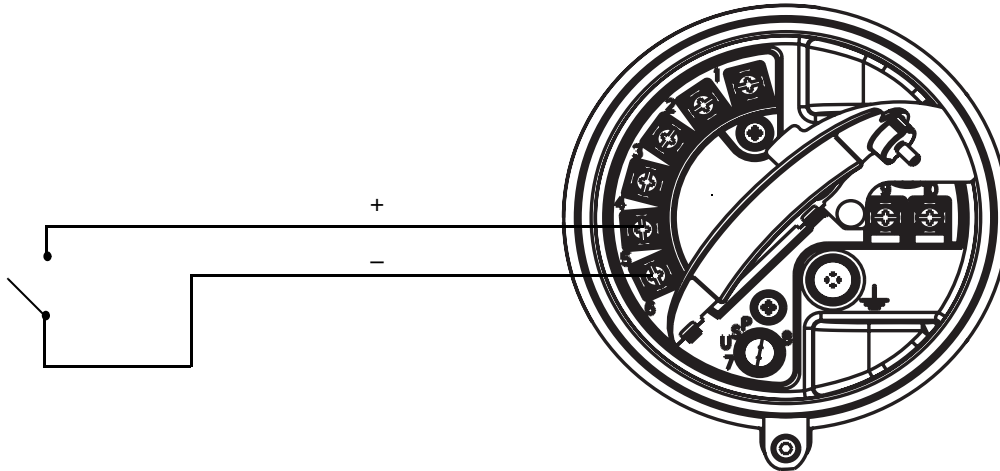
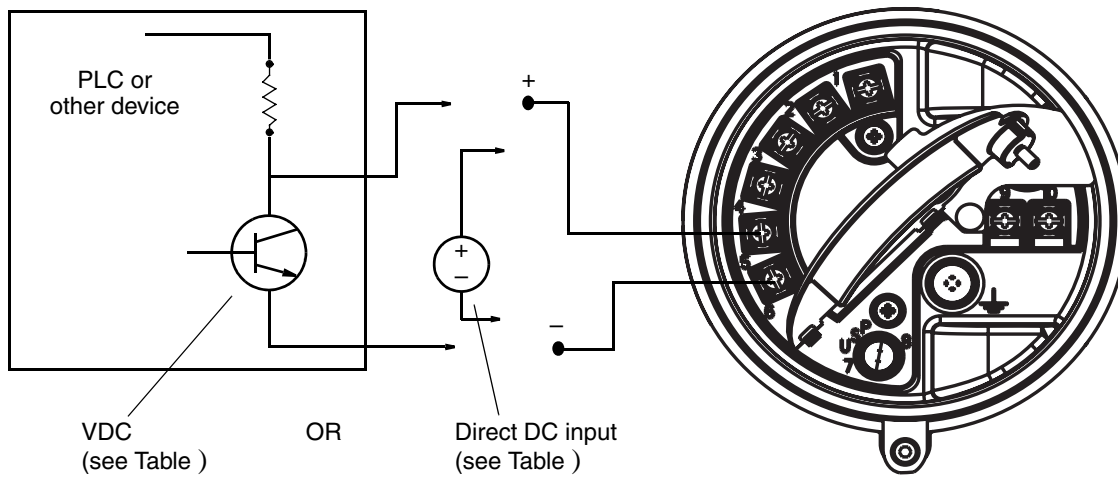


Figure 7-17 Discrete Input – Terminals 5 & 6 (Channel C) – External Power



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8.1 Overview

This section explains how to connect communication wires for QTA field-mount transmitters with the FOUNDATION fieldbus or Profibus-PA outputs option board. If you don't know your transmitter type, see Section 1.6.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

8.2 FOUNDATION Fieldbus Wiring

Connect the communication wires according to the diagram in Figure 8-1. Follow all local safety regulations.

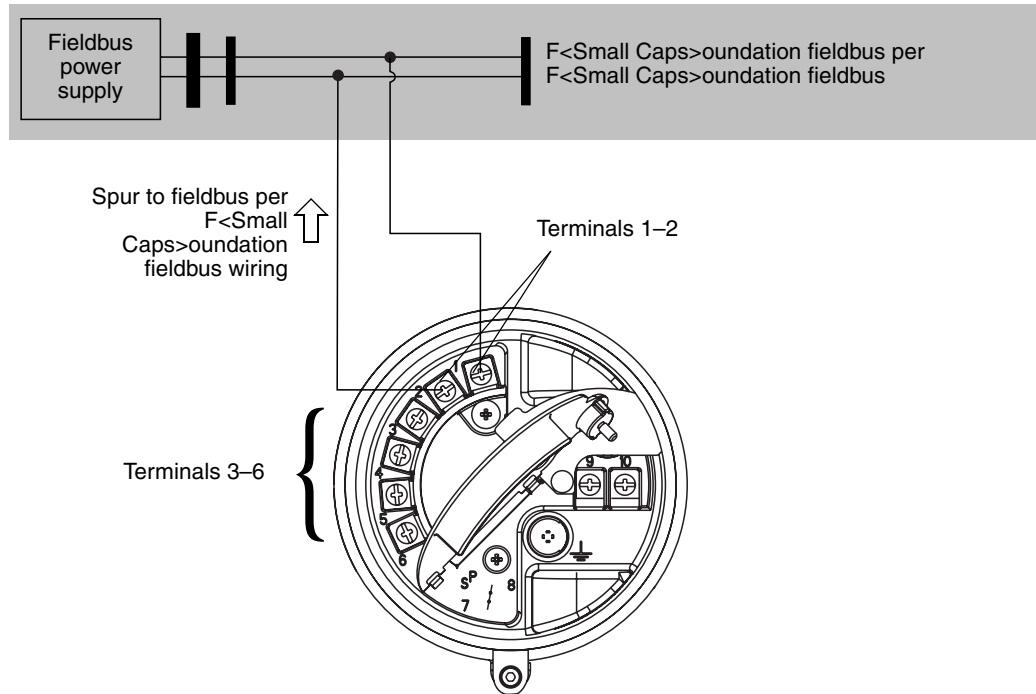
WARNING

A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the hazardous area approval tag on the transmitter. See Appendix A.

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Figure 8-1 Connecting the Fieldbus Communication Wires



Note: Terminals 3 through 6 are not used.

Note: The fieldbus communication terminals (1 and 2) are polarity-insensitive.

8.3 Profibus-PA Wiring

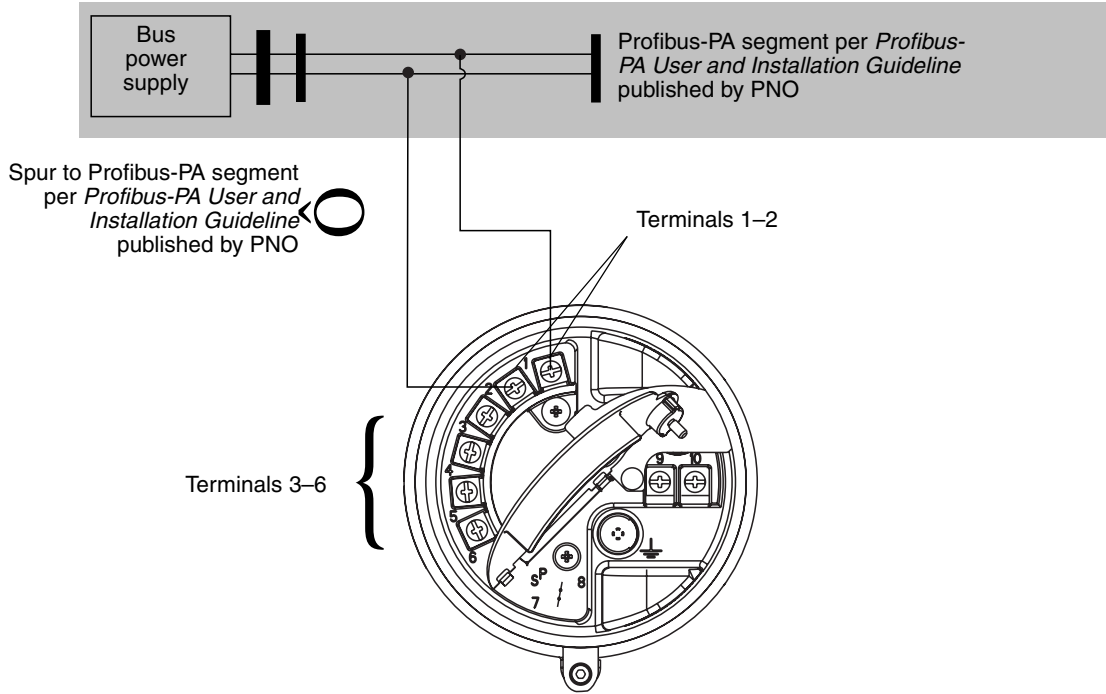
Wire the transmitter to the Profibus-PA segment according to the diagram in Figure 8-2. Follow all local safety regulations.

⚠ WARNING

A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the hazardous area approval tag on the transmitter. See Appendix A.

Figure 8-2 Connecting the Profibus-PA Communication Wires



Note: Terminals 3 through 6 are not used.

Note: The Profibus communication terminals (1 and 2) are polarity-insensitive.

Note: If you want intrinsically safe wiring, please see the Profibus-PA User manual.

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9.1 Overview

This section describes how to wire the outputs for QTA DIN AN transmitters. If you don't know your transmitter type, see Section 1.6.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

9.2 Transmitter Outputs

Table 9-1 describes the outputs and communication protocols available for the QTA DIN rail mount AN transmitter.

Note: The term "channel" is used to refer to the output terminal pairs.

Table 9-1 Terminals, Channels, and Output Types

Terminals	Channel	Output type	Communication
21 & 22	A	Milliamp	HART/Bell202
23 & 24	B	Not used	None
31 & 32	C	Frequency	None
33 & 34	N/A	Digital	Modbus/RS-485

9.2.1 mA Output Wiring

The following wiring diagrams are examples of proper wiring for the mA output on the QTA DIN rail mount AN transmitter. The following options are shown:

- Basic mA output wiring – Figure 9-1
- HART/analog single-loop wiring – Figure 9-2
- HART multidrop wiring – Figure 9-3

QmBS Sensor / QTA Transmitters

Figure 9-1 Basic mA Output Wiring

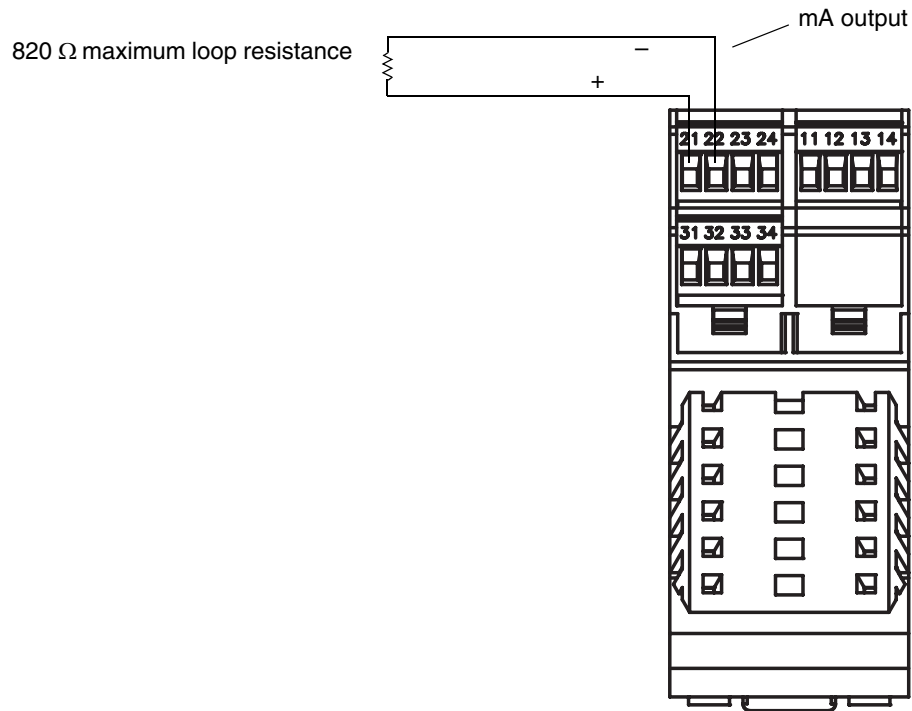


Figure 9-2 HART/Analog Single-Loop Wiring

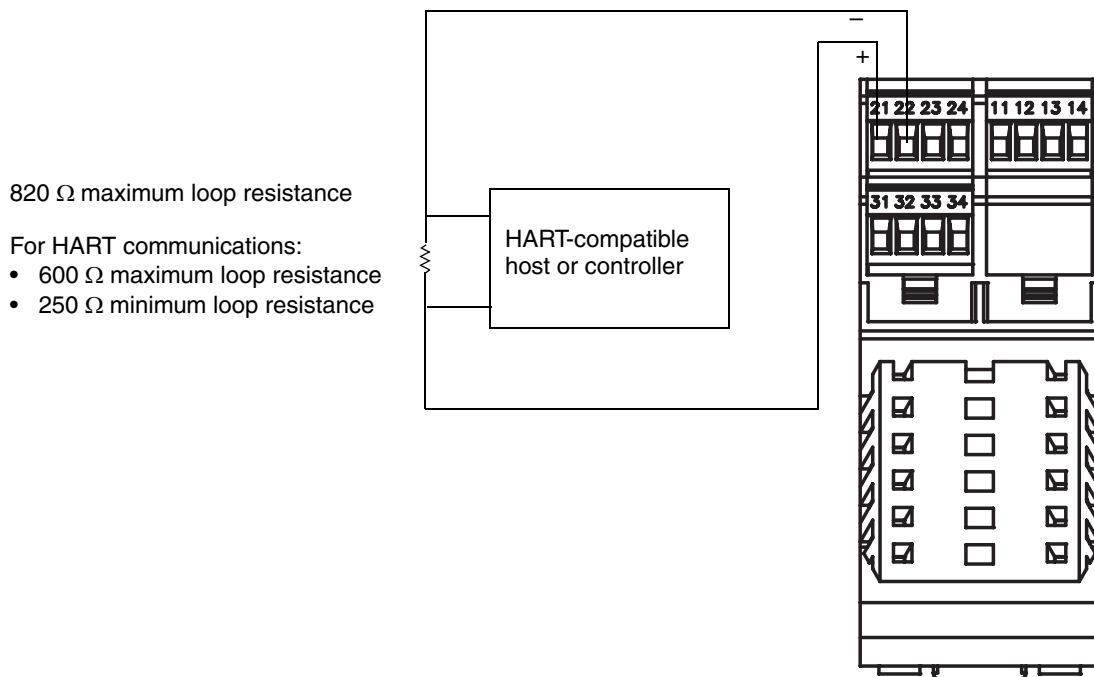
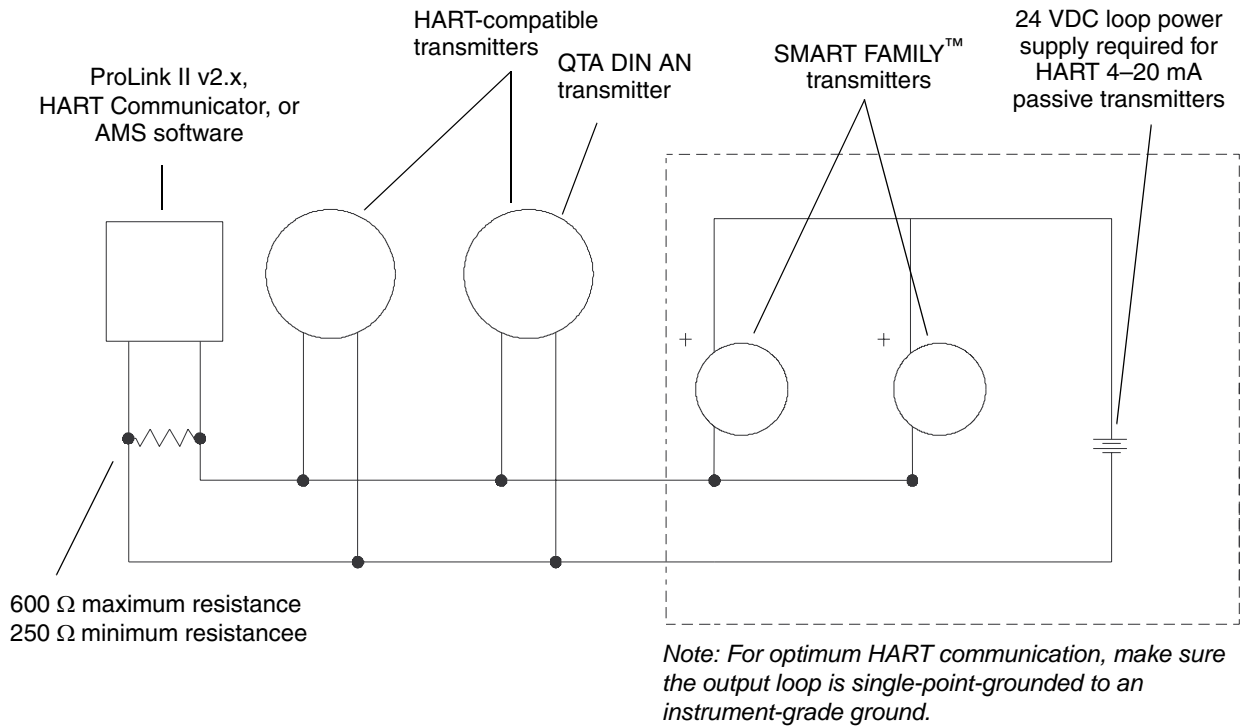


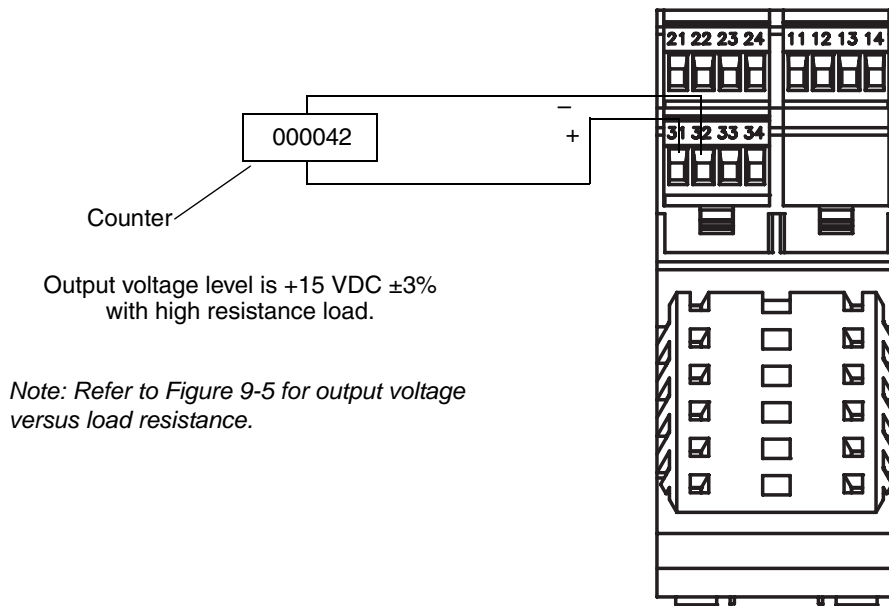
Figure 9-3 HART Multidrop Wiring with SMART FAMILY™ Transmitters and a Configuration Tool



9.2.2 Frequency Output Wiring

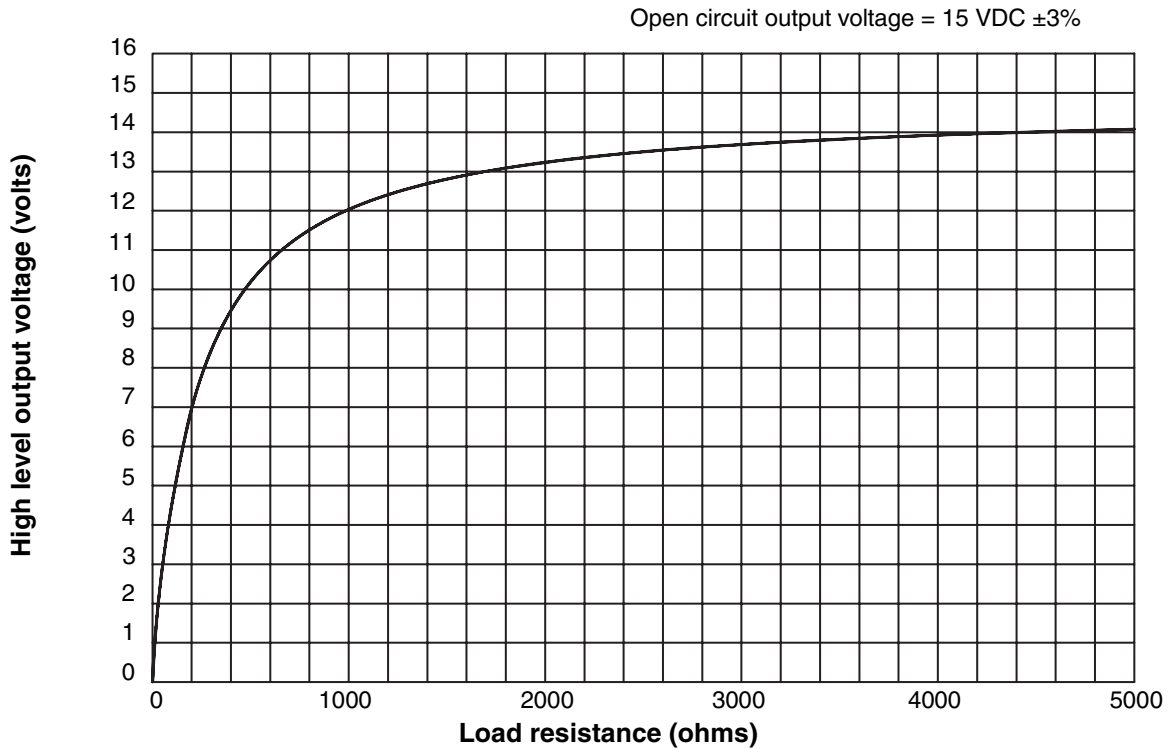
Figure 9-4 shows an example of proper wiring for the frequency output on the QTA DIN AN transmitter.

Figure 9-4 Basic Frequency Output Wiring



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Figure 9-5 Frequency Output Wiring – Output Voltage Versus Load Resistance



9.2.3 Wiring to a Remote Host

Terminals 33 and 34 support Modbus/RS-485 communication with a remote host. For an example of wiring, see Figure 9-6. For terminal information, see Table 9-2.

Figure 9-6 Wiring to a Remote Host

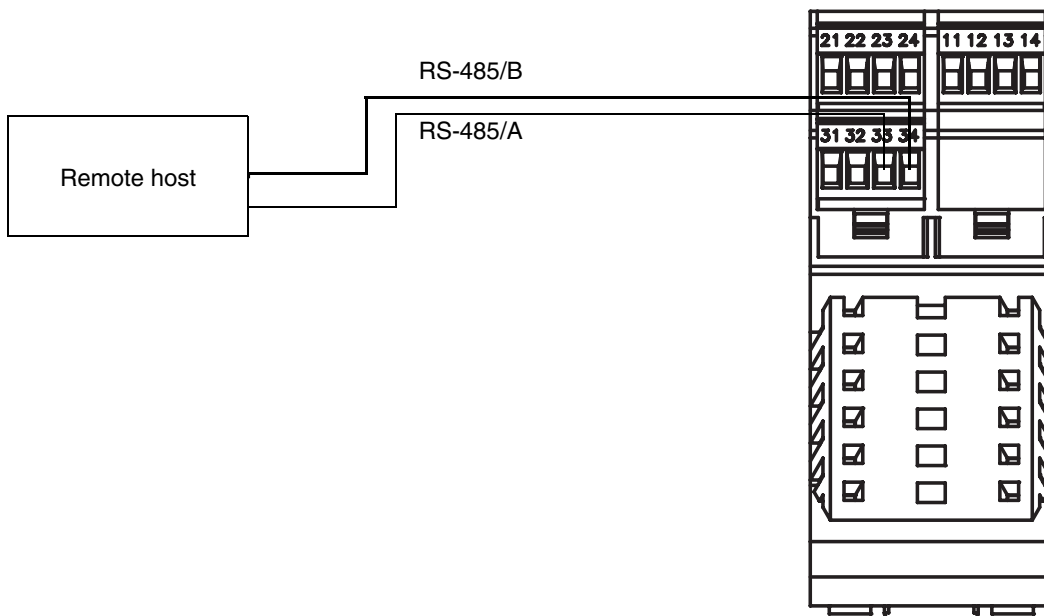


Table 9-2 Wire Terminal Assignments for Modbus/RS-485

RS-485 signal	Transmitter terminal
A	33
B	34

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10.1 Overview

This section describes how to wire the inputs and outputs for QTA DIN CIO transmitters. If you don't know your transmitter type, see Section 1.6.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

10.2 Channel Configuration

The six output terminals are divided into three pairs. The pairs are called Channels A, B, and C. Channel A is terminals 21 and 22; Channel B is terminals 23 and 24; and Channel C is terminals 31 and 32. Variable assignments are governed by channel configuration.

Output wiring requirements depend on how you will configure the transmitter terminals. The configuration options are shown in Table 10-1 and Figure 10-1. You can use ProLink II software to configure the channels. See the transmitter configuration manual for more information.

If Channel B is configured as a frequency output or discrete output, it can also be configured to use either internal or external power. Channel C can be configured to use either internal or external power, independent of its output configuration.

- "Internal power" means that the terminals are powered automatically by the transmitter. The output wiring instructions do not include power setup and power wiring.
- "External power" means that the terminals must be connected to an independent power supply. The output wiring instructions include power setup and power wiring.

Note: The terms "active" and "passive" are sometimes used to describe internally and externally powered outputs.

Note: You cannot configure the following combination: Channel B = discrete output, Channel C = frequency output. If you need both a frequency output and a discrete output, use the following: Channel B = frequency output, Channel C = discrete output. For more information, see the transmitter configuration manual.

Note:

Table 10-1 Channel Configuration

Channel	Terminals	Configuration options	Power
A	21 & 22	mA output with HART/Bell 202 ^a	Internal
B	23 & 24	• mA output (default)	Internal
		• Frequency output ^b	Internal or external ^c
		• Discrete output ^d	Internal or external ^c
C	31 & 32	• Frequency output (default) ^e	Internal or external ^c
		• Discrete output	Internal or external ^c
		• Discrete input	Internal or external ^c
D	33 & 34	Modbus/RS-485	Internal

a. The Bell 202 signal is superimposed on the mA output.

b. Can be configured for active high or active low polarity. Default is active high.

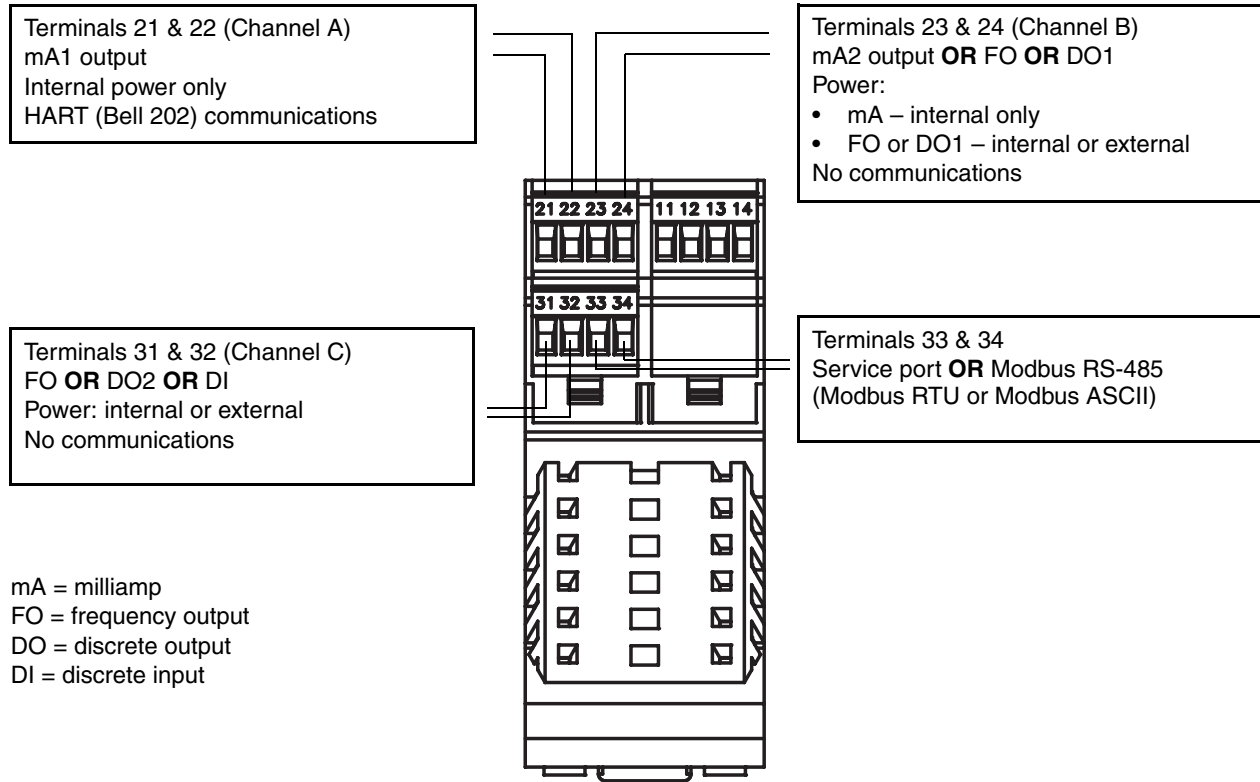
c. You must provide power to the outputs when a channel is set to external power.

d. Because discrete output 1 uses the same circuitry as the frequency output, it is not possible to configure both a frequency output and discrete output 1. If both a frequency output and a discrete output are required, configure Channel B as the frequency output and Channel C as the discrete output (discrete output 2).

e. When configured for two frequency outputs (dual pulse), frequency output 2 is generated from the same signal that is sent to the first frequency output. Frequency output 2 is electrically isolated but not independent.

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Figure 10-1 Configuration of Configurable I/O Terminals



10.3 mA Output Wiring

The wiring diagrams in this section are examples of proper wiring for the QTA DIN CIO transmitter's primary and secondary mA outputs. The following options are shown:

- Basic mA output wiring – Figure 10-2
- HART/analog single-loop wiring – Figure 10-3
- HART multidrop wiring – Figure 10-4

Figure 10-2 Basic mA Output Wiring

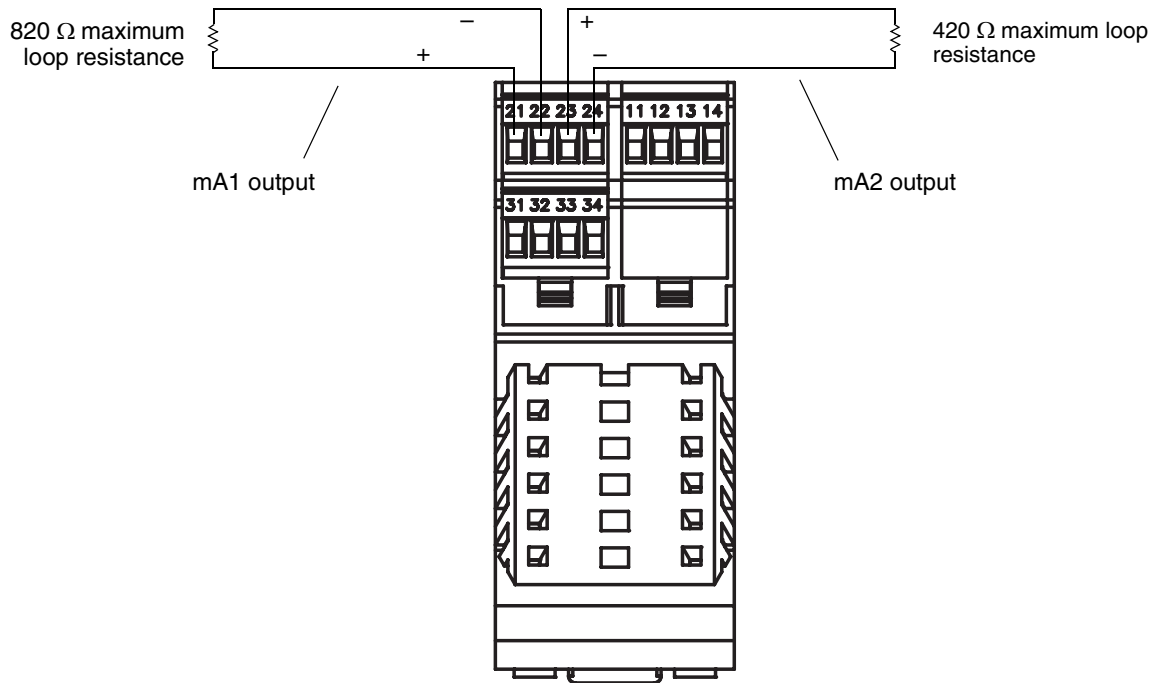
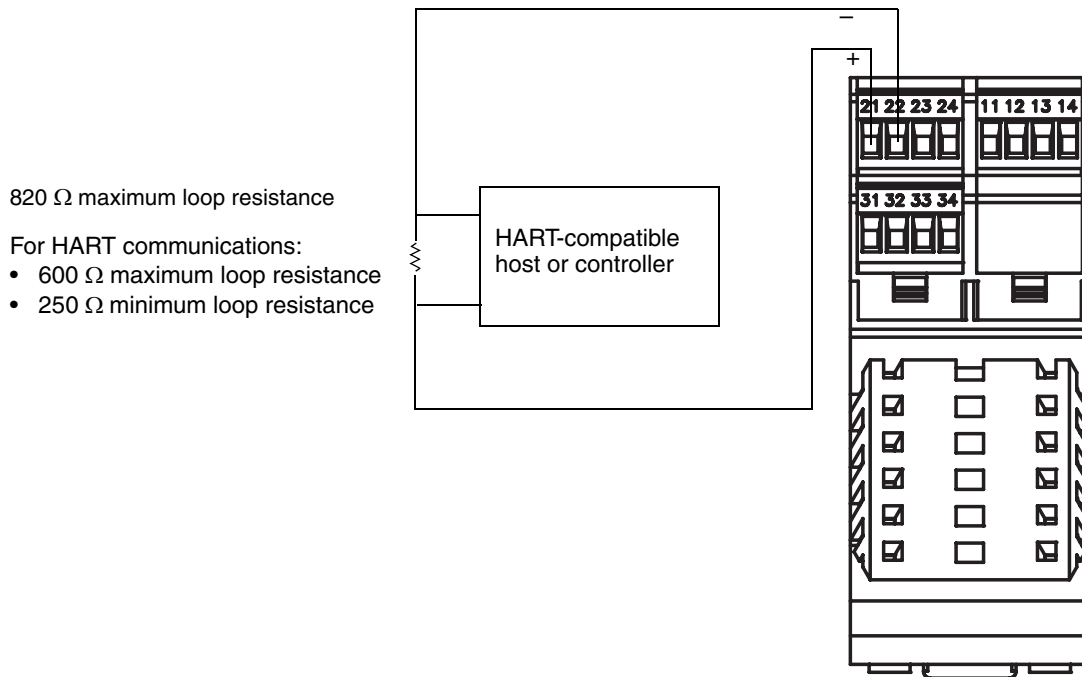
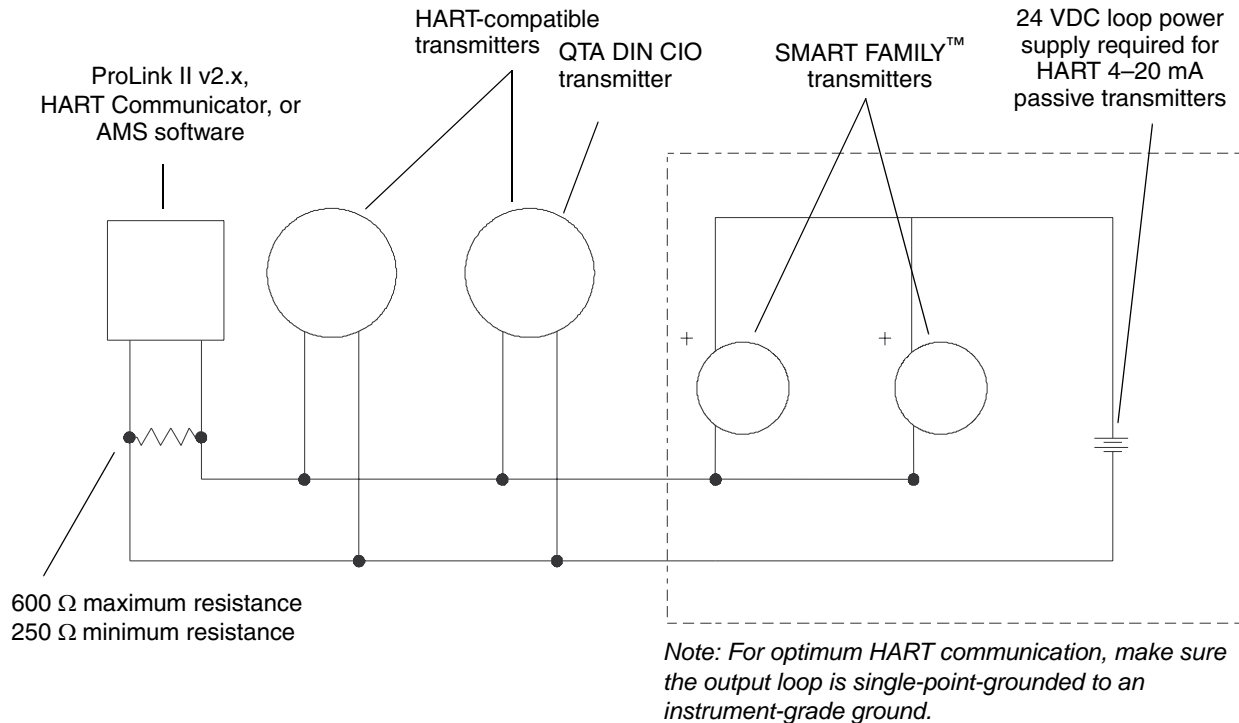


Figure 10-3 HART/Analog Single-loop Wiring



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Figure 10-4 HART Multidrop Wiring with SMART FAMILY™ Transmitters and a Configuration Tool



10.4 Frequency Output Wiring

Frequency output wiring depends on whether you are wiring terminals 23 and 24 (Channel B) or terminals 31 and 32 (Channel C), and also on whether you have configured the terminals for internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Channel B, internal power – Figure 10-5
- Channel B, external power – Figure 10-6
- Channel C, internal power – Figure 10-7
- Channel C, external power – Figure 10-8

Note: If both Channel B and Channel C are configured for frequency output, the Channel C signal is generated from the Channel B signal, with a user-specified phase shift. The signals are electrically isolated but not independent. This configuration is used to support dual-pulse and quadrature modes. See the transmitter configuration manual.

Figure 10-5 Frequency Output Wiring – Terminals 23 & 24 (Channel B) – Internal Power

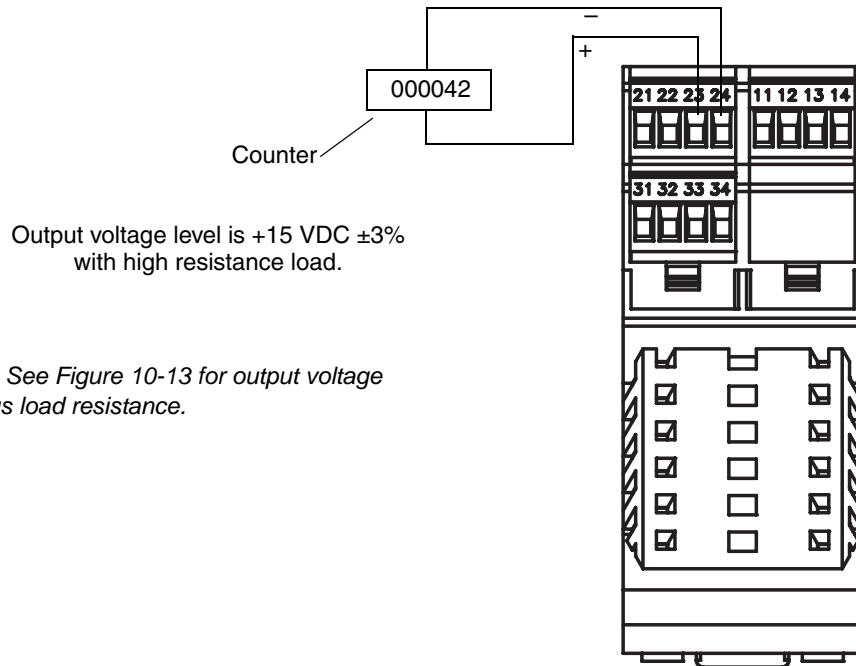
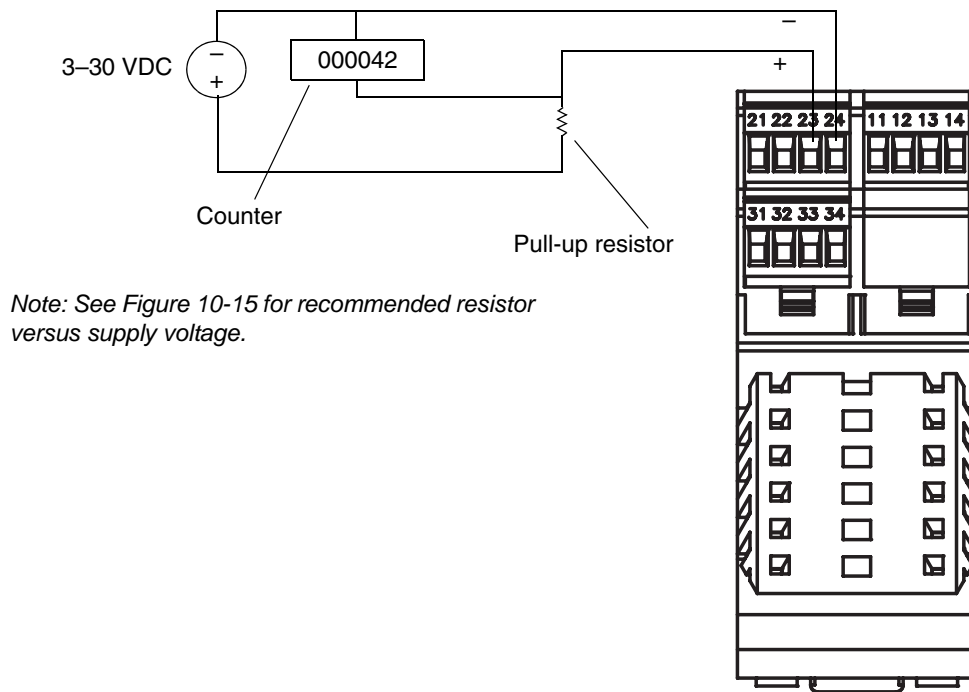


Figure 10-6 Frequency Output Wiring – Terminals 23 & 24 (Channel B) – External Power



⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

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Figure 10-7 Frequency Output Wiring – Terminals 31 & 32 (Channel C) – Internal Power

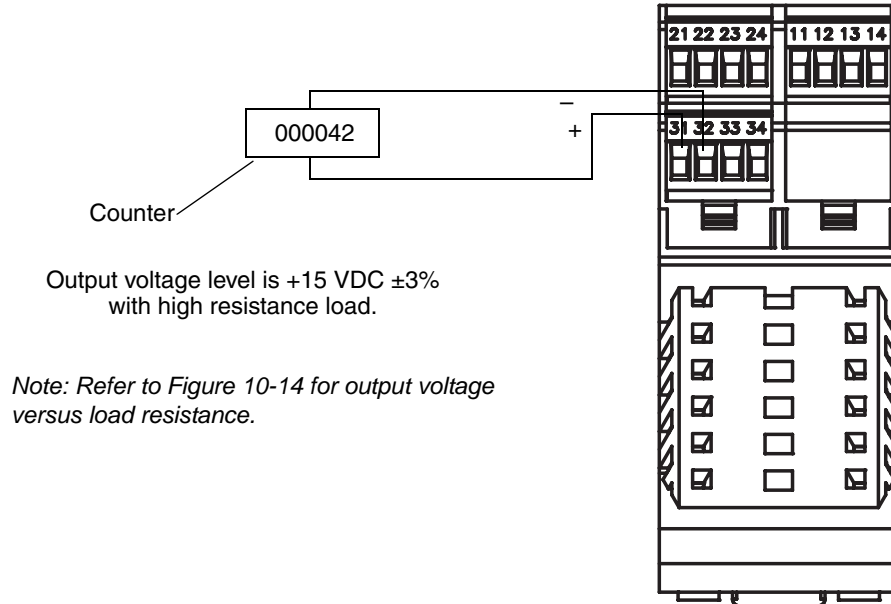
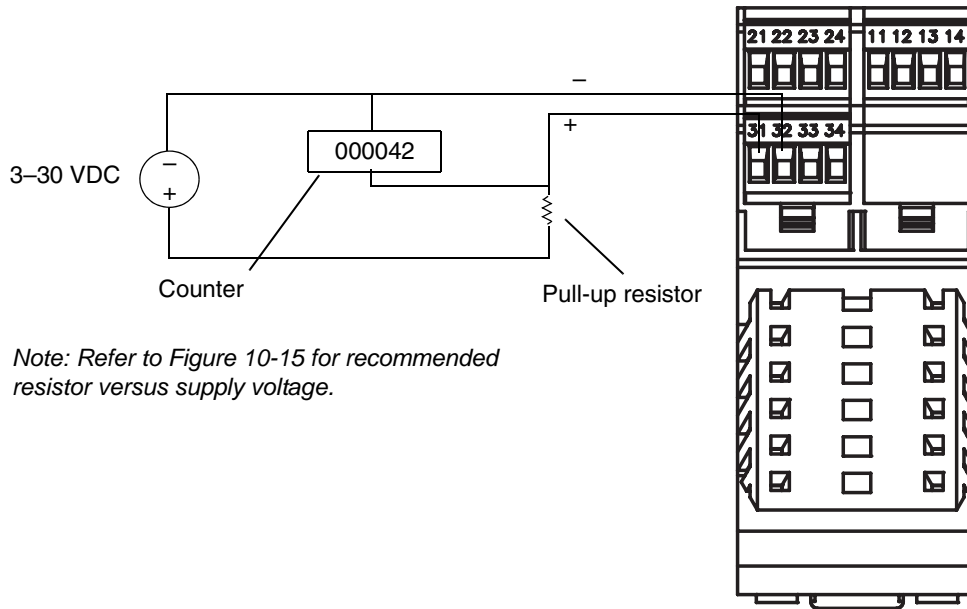


Figure 10-8 Frequency Output Wiring – Terminals 31 & 32 (Channel C) – External Power



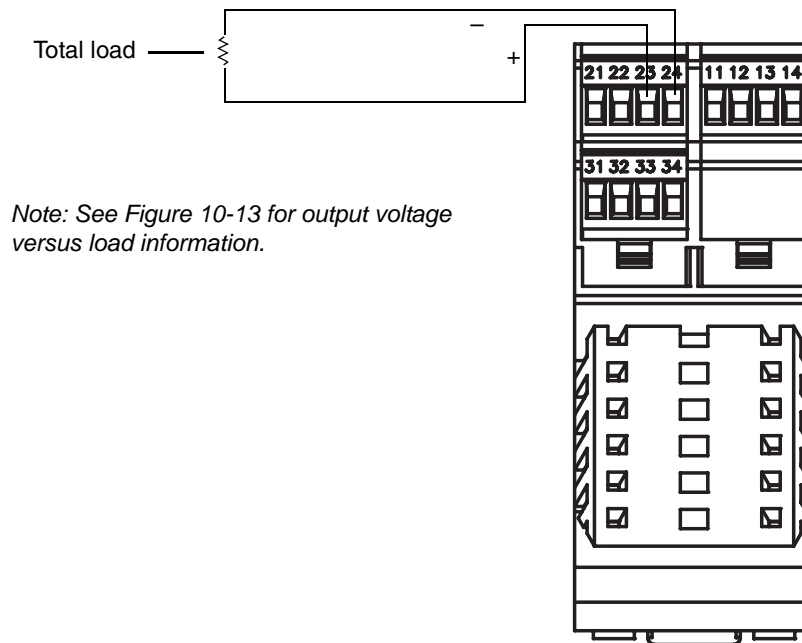
⚠ CAUTION
 Excessive current will damage the transmitter.
 Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

10.5 Discrete Output Wiring

Discrete output wiring depends on whether you are wiring terminals 23 and 24 (Channel B) or terminals 31 and 32 (Channel C), and also on whether you have configured the terminals for internal or external power. The following diagrams are examples of proper wiring for these configurations:

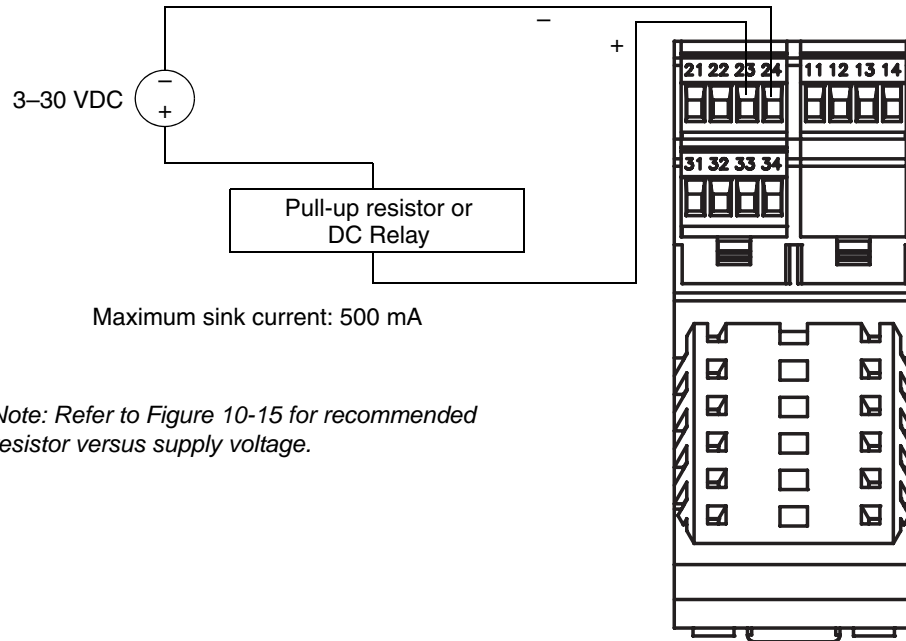
- Channel B (DO1), internal power – Figure 10-9
- Channel B (DO1), external power – Figure 10-10
- Channel C (DO2), internal power – Figure 10-11
- Channel C (DO2), external power – Figure 10-12

Figure 10-9 Discrete Output 1 Wiring – Terminals 23 & 24 (Channel B) – Internal Power



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Figure 10-10 Discrete Output 1 Wiring – Terminals 23 & 24 (Channel B) – External Power



⚠ CAUTION
Excessive current will damage the transmitter.
 Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

Figure 10-11 Discrete Output 2 Wiring – Terminals 31 & 32 (Channel C) – Internal Power

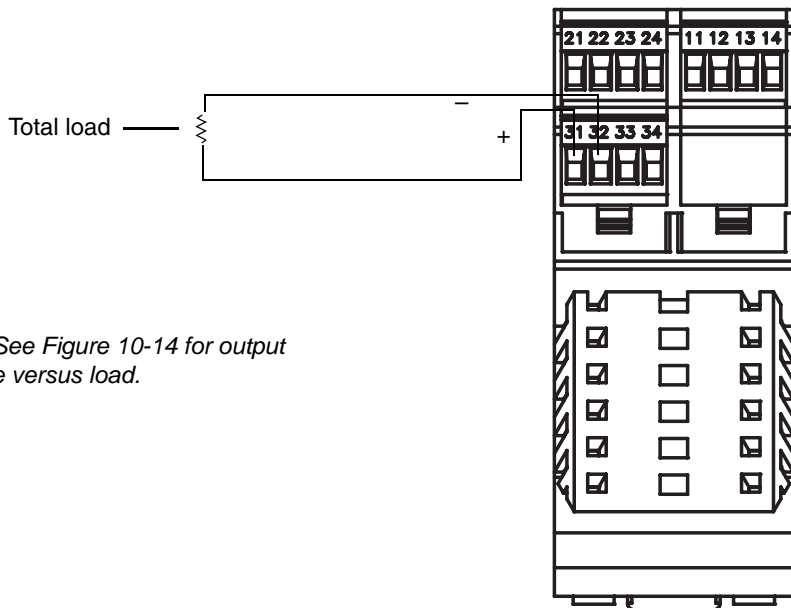
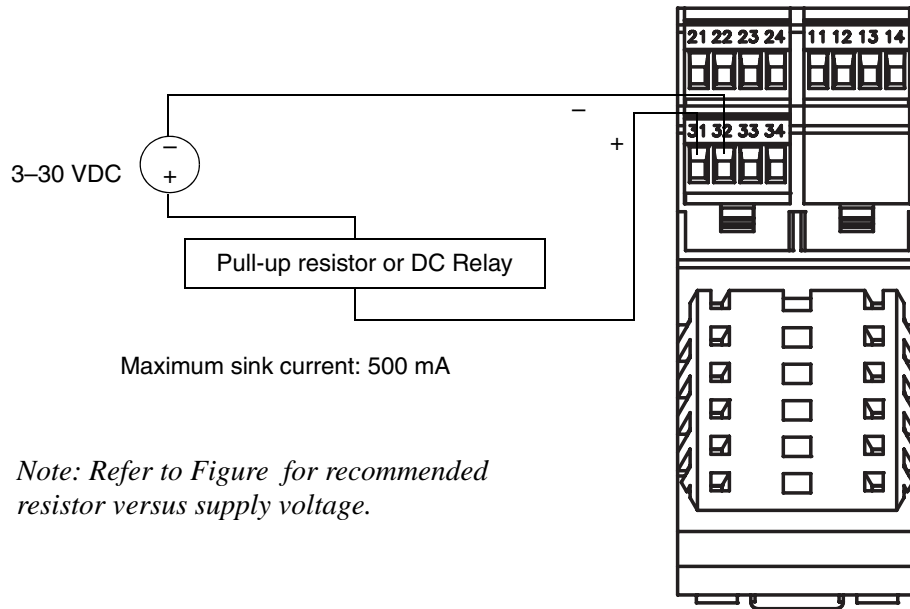


Figure 10-12 Discrete Output 2 Wiring – Terminals 31 & 32 (Channel C) – External Power



⚠ CAUTION
Excessive current will damage the transmitter.
Do not exceed 30 VDC input. Terminal current must be less than 500 mA.

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Figure 10-13 Output Voltage vs. Load Resistance – Terminals 23 & 24 (Channel B) – Internal Power

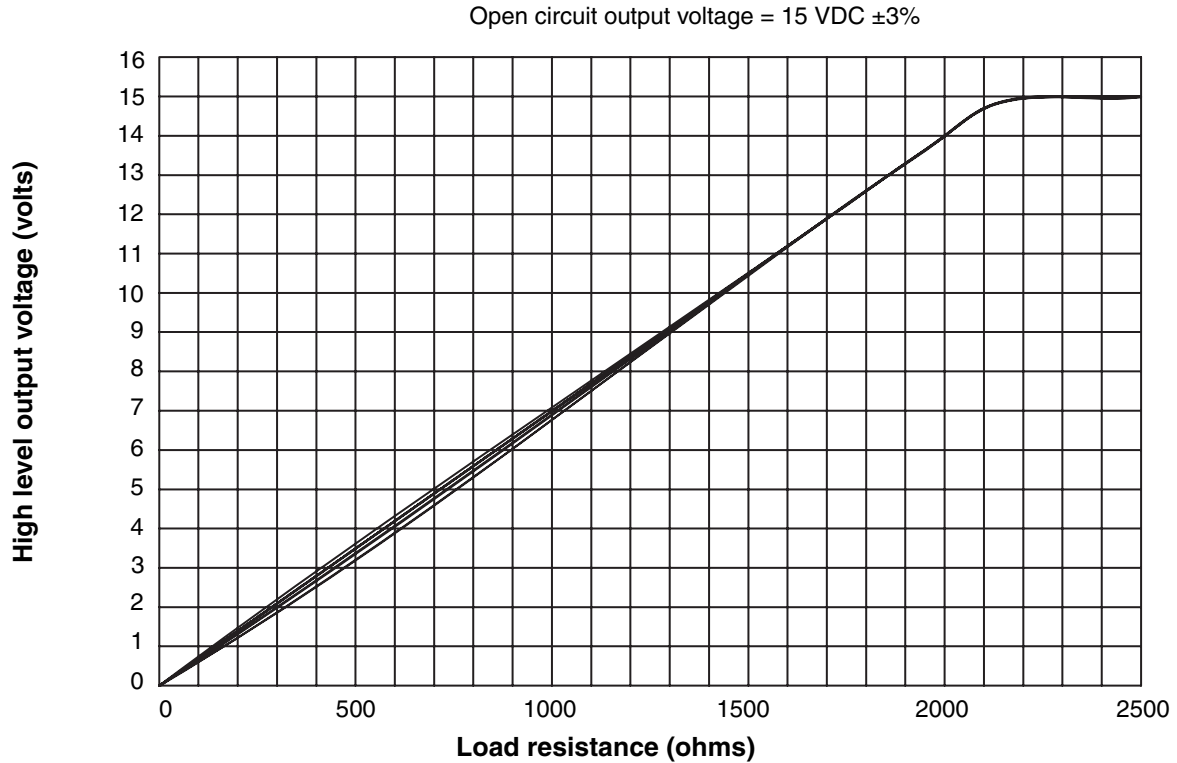


Figure 10-14 Output Voltage vs Load Resistance – Terminals 31 & 32 (Channel C) – Internal Power

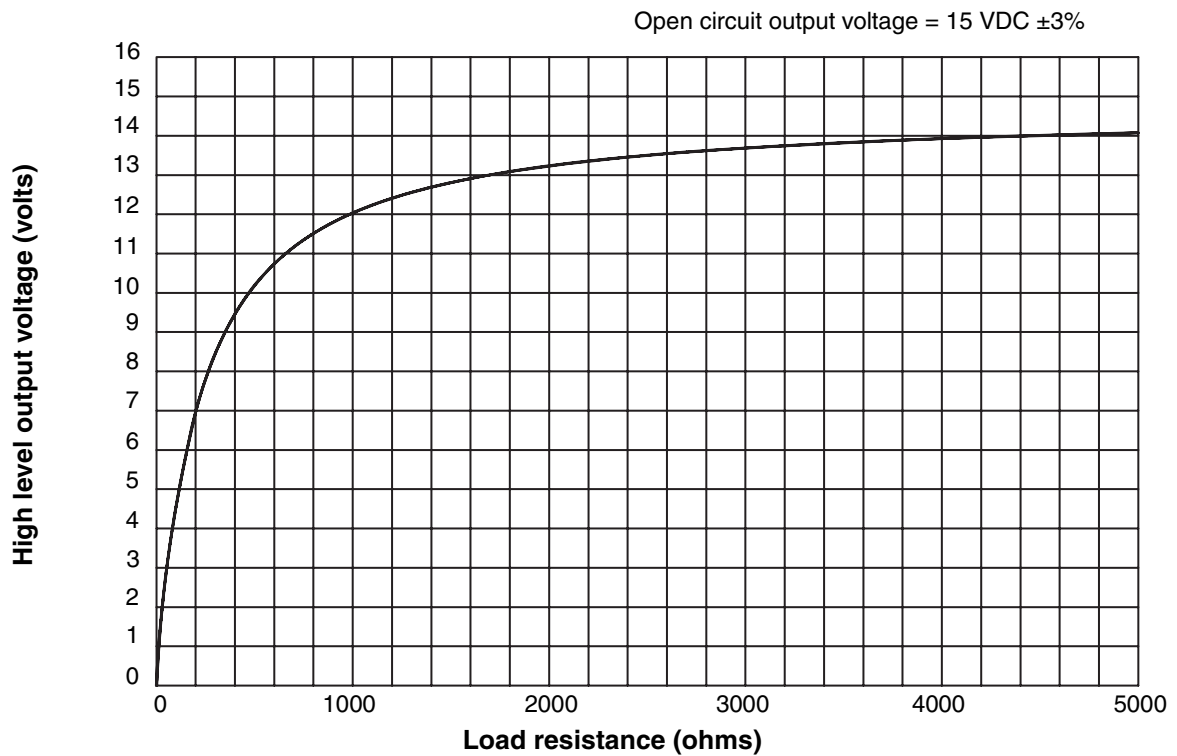
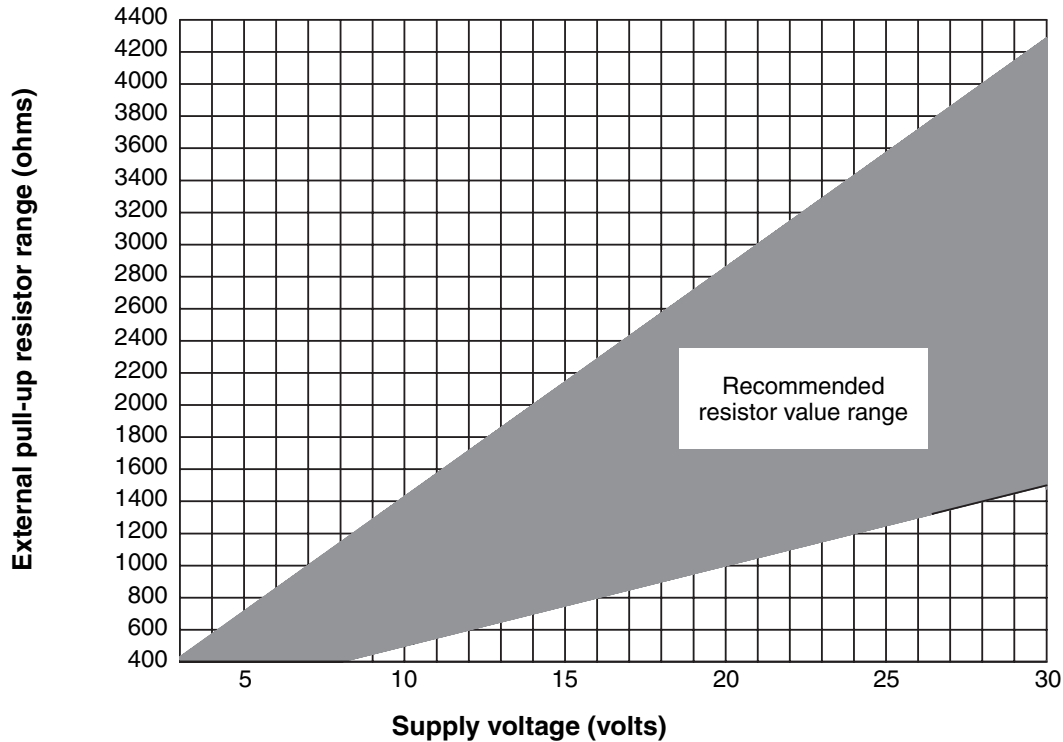


Figure 10-15 Recommended Pull-up Resistor Versus Supply Voltage – External Power



Note: When using a discrete output to drive a relay, choose external pull-up to limit current to less than 500 mA.

10.6 Discrete Input Wiring

Discrete input wiring depends on whether you have configured terminals 31 and 32 (Channel C) for internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Internal power – Figure 10-16
- External power – Figure 10-17

If external power is configured, power may be supplied by a PLC or other device, or by direct DC input. See Table 10-2 for input voltage ranges.

Table 10-2 Input Voltage Ranges for External Power

VDC	Range
3–30	High level
0–0.8	Low level
0.8–3	Undefined

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Figure 10-16 Discrete Input – Terminals 31 & 32 (Channel C) – Internal Power

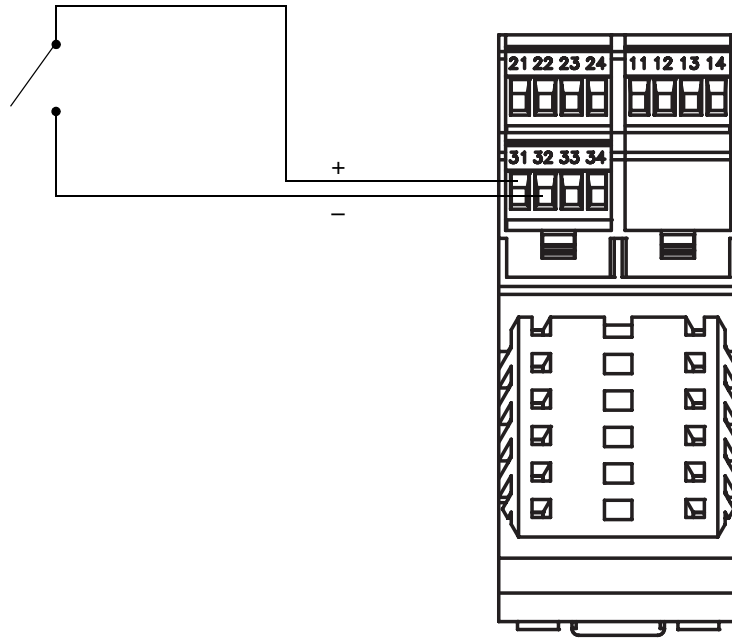
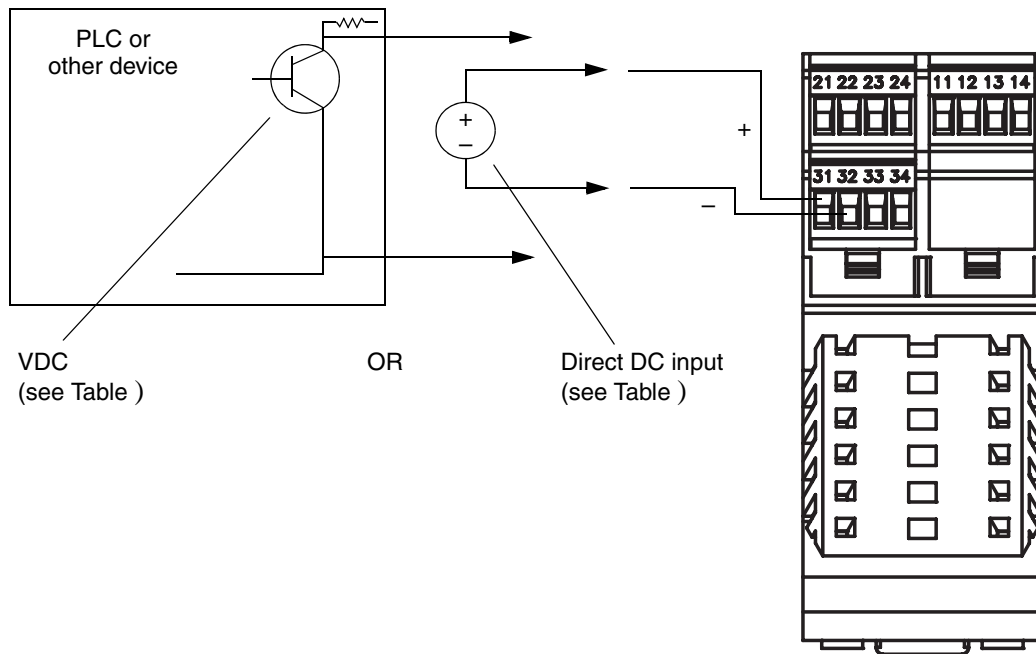


Figure 10-17 Discrete Input – Terminals 31 & 32 (Channel C) – External Power



10.7 Wiring to a Remote Host

Terminals 33 and 34 support Modbus/RS-485 communication with a remote host. For an example of wiring, see Figure . For terminal information, see Table .

Figure 10-18 Wiring to a Remote Host

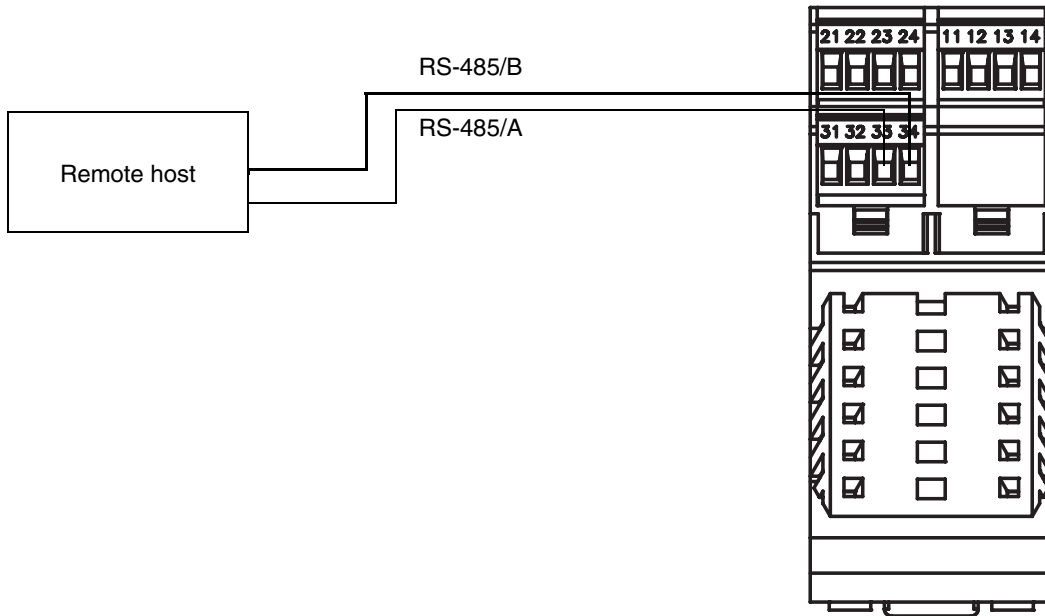


Table 10-3 Terminal assignments for Modbus/RS-485

RS-485 signal	Transmitter terminal
A	33
B	34

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A.1 Dimensions for Transmitters & Sensor

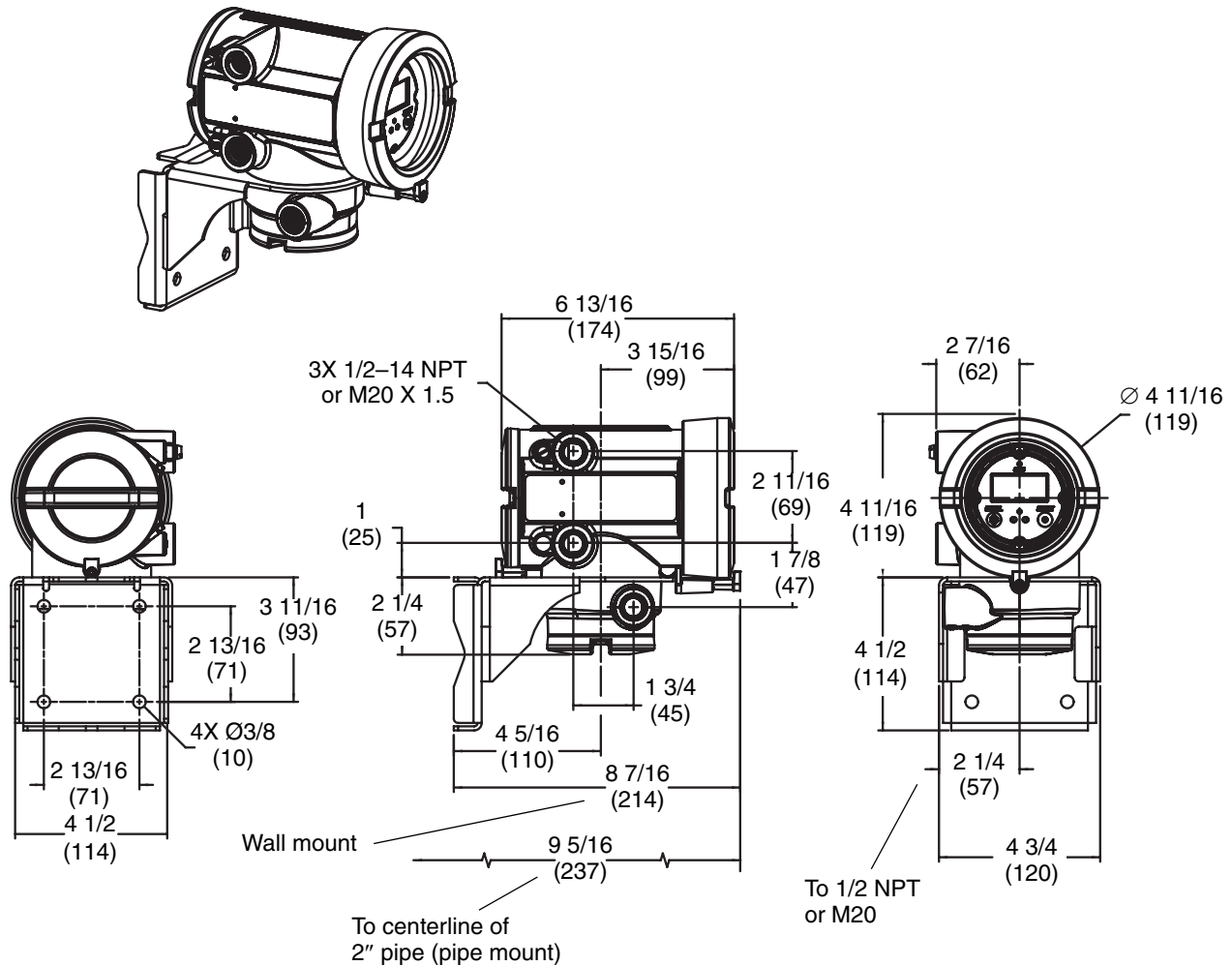
Figure A-1 shows the dimensions of the QTA FM transmitter with a display.

Figure A-2 shows the dimensions of the QTA FM transmitter without a display.

Figure A-3 shows the dimensions of the QTA DIN transmitter.

Figure A-1 QTA FM Transmitter with Display

Dimensions in inches
(mm)



QmBS Sensor / QTA Transmitters

Figure A-2 QTA FM Transmitter Without Display

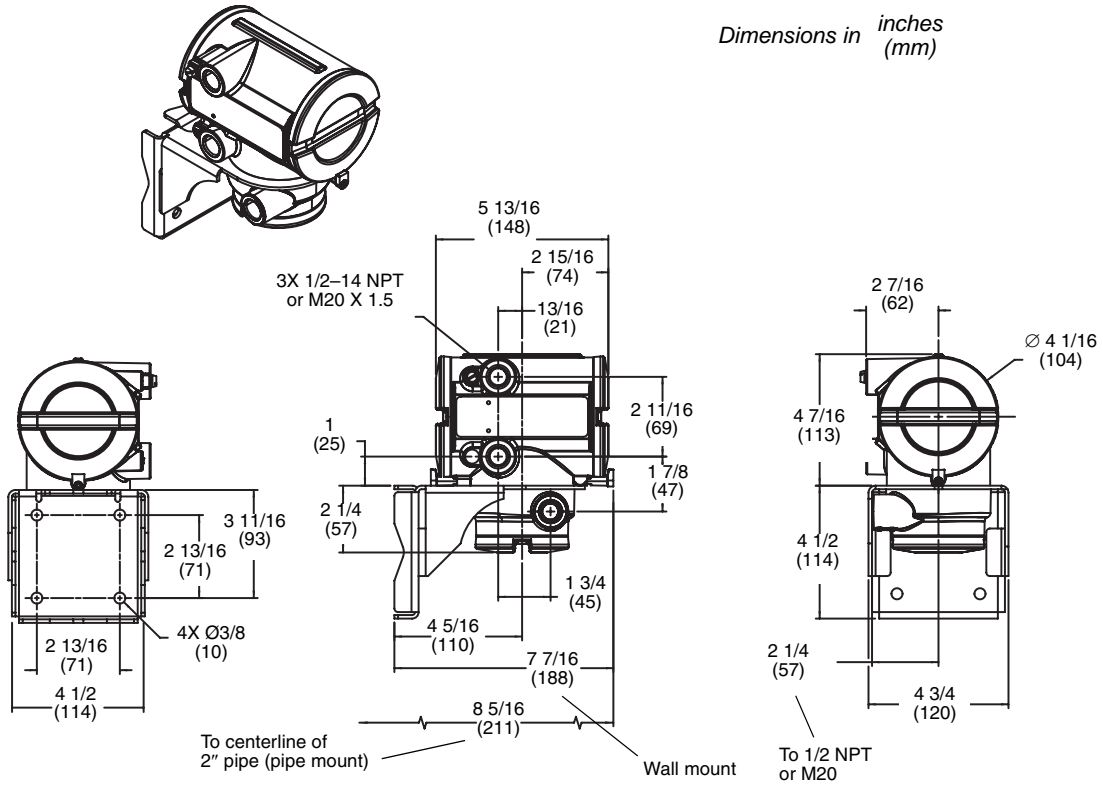


Figure A-3 QTA DIN Transmitter

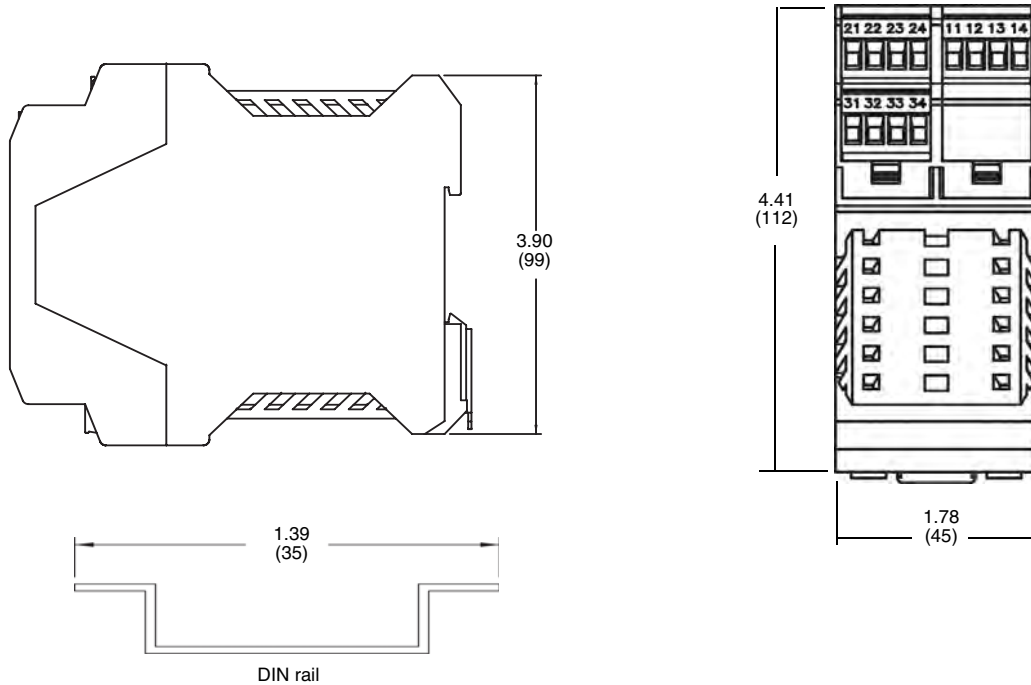
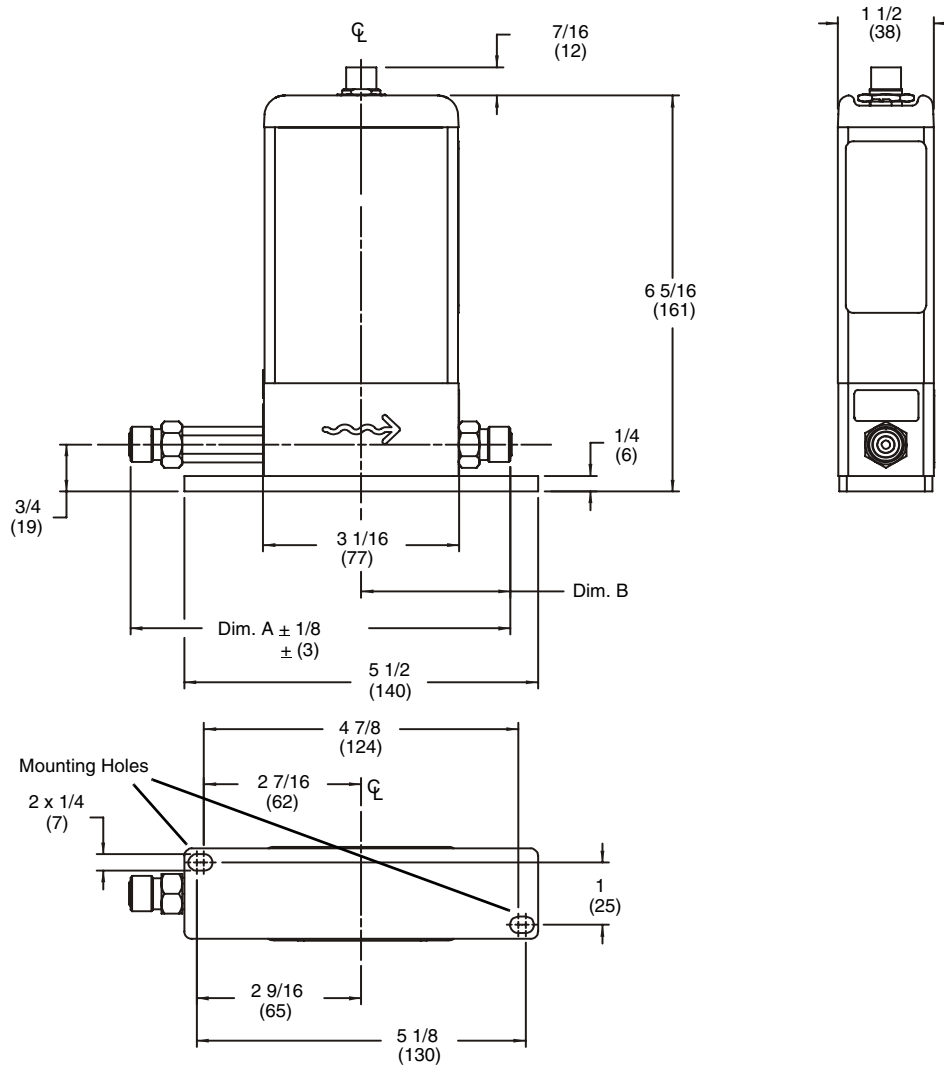


Figure A-4 QmBS Sensor Dimensions



A.2 QmBS Sensor Specifications

Table A-1 Liquid Flow Rates

		Mass		Volume ^a	
		lb/hr	kg/hr	gal/hr	l/hr
Nominal flow range^b	QmBS2	0.474	0.215	0.057	0.215
	QmBS3	3.020	1.37	0.362	1.37
	QmBS4	30.422	13.8	3.646	13.8
Maximum flow rate	QmBS2	0.948	0.43	0.114	0.43
	QmBS3	3.307	1.5	0.396	1.5
	QmBS4	60.845	27.6	7.291	27.6

a. Volume measurement is based on a process-fluid density of 1 g/cm³ (1000 kg/cm³). For fluids with a density other than 1 g/cm³, the volumetric flow rate equals the maximum mass flow rate divided by the fluid's density.

b. Brooks has adopted the terminology "nominal flow range." The upper limit of this range is the flow rate at which water at reference conditions causes approximately 15 psid (1bar) of pressure drop.

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Table A-2 Gas Flow Rates^a

		Mass		Volume	
		lb/hr	kg/hr	SCFH	SCCM
Typical flow rate	QmBS2	0.225	0.102	2.99	1408.0
	QmBS3	0.881	0.400	11.7	5521.8
	QmBS4	8.343	3.78	110.82	52300


a. Flow rates that produce approximately 14.5 psid (1.0 bar) pressure drop on air at 70 °F (21.1 °C) and 500 psi (35 bar)

Table A-3 Liquid and Gas Performance

Accuracy^a	Standard	$\pm 1.0\%$ of rate or $\pm \left[\left(\frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater	
	Optional	$\pm 0.5\%$ of rate or $\pm \left[\left(\frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater	
Repeatability	$\pm 0.05\%$ of rate or $\pm \frac{1}{2} \left[\left(\frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater		
Reproducibility	$\pm 0.05\%$ of rate or $\pm \frac{1}{2} \left[\left(\frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater		
Zero stability		lb/hr	kg/hr
	QmBS2	0.0004	0.0002
	QmBS3	0.0022	0.001
	QmBS4	0.1264	0.012
Liquid density	Range	0.01 to 0.3 g/cm ³	
	Accuracy	± 0.005 g/cm ³	
	Repeatability	± 0.002 g/cm ³	
Temperature	Ambient and process	0 to 65 °C (32 to 149 °F)	
	Accuracy	± 0.5 °C (± 1.0 °F)	
Maximum operating pressure	Standard	35 bar (500 psi)	
	Optional	100 bar (1500 psi)	

a. Stated flow accuracy includes the combined effects of repeatability, linearity, and hysteresis. All specifications for liquids are based on reference conditions of water at 70 °F (21.1 °C). At temperatures other than 70 °F (21.1 °C), you can expect an additional density error of approximately 0.0005 g/cm³ per °C.

Table A-4 Hazardous Area Classifications

Approvals agency	Classification
CSA ^a	Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F and G Class III Division 2
ATEX ^b	 II 3 G EEx nA II T4 II 2 D T135°C

- a. CSA is a Canadian approvals agency that provides approvals accepted both in the U.S.A. and in Canada.
b. ATEX is a European directive.

Table A-5 Materials of Construction

Component	Material
Wetted parts	316L stainless steel, 316L VAR and high alloy ferritic stainless steel 17-7PH
Process seals	Viton [®] fluoroelastomer, Buna, Kalrez, or EPDM
Housing	IP65; Polyurethane-painted aluminum

Table A-6 Physical Specifications

Weight	3.5 lb (1.6 kg)
Fittings	See product data sheet

A.3 QTA Transmitter Specifications

A.3.1 Output Options and Output Option Codes

Table A-7 Transmitter Output Options and Output Option Codes

Outputs	FM transmitters	DIN transmitters
1 mA output, 1 frequency/pulse output	Output option codes 1 and 3 (FM AN)	Output option code 2 (DIN AN)
2 mA outputs, 1 frequency/pulse output (configurable)	Output option code 4 (FM CIO)	Output option code 5 (DIN CIO)
FOUNDATION fieldbus	Output option code 6 (FM FB)	(Not available)
Profibus-PA	Output option code 7 (FM PB)	(Not available)

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Table A-8 Transmitter Output Options and Output Option Codes with Configurable I/O

Channel	Terminals		Configuration option	Default process variable assignment	Power
	FM	DIN			
A	1 & 2	21 & 22	mA output 1 (with Bell 202 HART)	Mass flow	Internal (active)
B	3 & 4	23 & 24	mA output 2 (default)	Density	Internal (active)
			Frequency output (FO) ^a	Mass flow	Internal (active) or external (passive)
			Discrete output 1 (DO1)	Fwd/Rev	
C	5 & 6	31 & 32	FO (default)<Superscript>(a)	Mass flow	Internal (active) or external (passive)
			Discrete output 2 (DO2)	Flow switch	
			Discrete input (DI)	None	

a. When configured for two FOs (dual pulse), FO2 is generated from the same FO signal sent to the first FO. FO2 is electrically isolated but not independent.

A.3.2 QTA FM Transmitters Physical Specifications

Table A-9 QTA FM Transmitter Physical Specifications

Weight	With display: 8 lb (3, 6 kg) Without display: 7 lb (3.2 kg)
Mounting and cabling	Transmitters include a mounting bracket and 6.5 ft (2 m) of 4-wire twisted-pair shielded signal cable. Additional lengths up to 1000 ft (300 m) can be purchased. Hardware for installing the transmitter on the mounting bracket is included. The transmitter can be rotated on the mounting bracket, 360° in 90° increments.
Interface/Display (optional)	Segmented 2-line display with LCD screen with optical controls and flowmeter-status LED is standard. <ul style="list-style-type: none"> • LCD line 1 lists the process variable. • LCD line 2 lists engineering unit of measure. Non-glare tempered glass lens. Available in both backlit and non-backlit versions. Display is suitable for hazardous area installation. To facilitate various mounting orientations, the display can be rotated on the transmitter, 360° in 90° increments. Display controls feature optical switches that are operated through the glass with a red LED for visual feedback to confirm when a "button" is pressed. Display functions: <ul style="list-style-type: none"> • View process variables • Start, stop and reset totalizers • View and acknowledge alarms • Off-line (where applicable): <ul style="list-style-type: none"> • Zero flowmeter • Simulate outputs • Change measurement units • Configure outputs • Set RS-485 communications options
Status light	Three-color LED status light on display panel indicates flowmeter condition at a glance.

Table A-10 FM Transmitter Electrical Connections

Input and output connections	One (output option codes 6 and 7), two (output option codes 1 and 3), or three (output option code 4) pairs of wiring terminals for transmitter outputs Screw terminals accept one or two solid conductors, 14 to 12 AWG (2.0 to 3.5 mm ²); or one or two stranded conductors, 22 to 14 AWG (0.34 to 2.5 mm ²)
Power connections	One pair of wiring terminals accepts AC or DC power One internal ground lug for power-supply ground wiring Screw terminals accept one or two solid conductors, 14 to 12 AWG (2.0 to 3.5 mm ²); or one or two stranded conductors, 22 to 14 AWG (0.34 to 2.5 mm ²)
Service port connection	Two clips for temporary connection to the service port
Sensor connection	Two pairs of terminals for the 4-wire connection to the sensor • One pair is used for the RS-485 connection to the sensor • One pair is used to supply power to the sensor Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 2.5 mm ²)

Table A-11 FM transmitter Input/output Signals

All transmitters	One 4-wire sensor signal input connection with ground
Output option code 1 or 3 (1 mA, 1 FO)	<p>One active 4–20mA output</p> <ul style="list-style-type: none"> • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: 600 ohms • Flow-only transmitter can report mass flow or volume flow • Multivariable transmitter can report mass flow, volume flow, density, temperature, or drive gain • Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994) <hr/> <p>One active or passive frequency/pulse output</p> <ul style="list-style-type: none"> • Not intrinsically safe • Can report mass flow or volume flow, which can be used to indicate flow rate or total • Flow-only transmitter: frequency output reports the same flow variable as the mA output • Multivariable transmitter: frequency output is independent of the mA output • Scalable to 10,000 Hz • Maximum output of +24 VDC ±3% with a 2.2 kohm internal pull-up resistor <p>Output is linear with flow rate to 12,500 Hz</p>
Output option code 4 (2 mA, 1 FO configurable, multivariable transmitter only)	<p>One or two active 4–20 mA outputs</p> <ul style="list-style-type: none"> • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: <ul style="list-style-type: none"> - mA1: 820 ohms - mA2: 420 ohms • Can report mass flow, volume flow, density, temperature, or drive gain • Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994) <hr/> <p>One active or passive frequency/pulse output</p> <ul style="list-style-type: none"> • Not intrinsically safe • Can report mass flow or volume flow, which can be used to indicate flow rate or total • Scalable to 10,000 Hz • Power: <ul style="list-style-type: none"> - Internal (active): +15 VDC ±3% with a 2.2 kohm internal pull-up resistor - External (passive): +30 VDC maximum, +24 VDC typical • Output is linear with flow rate to 12,500 Hz

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Table A-11 FM transmitter Input/output Signals (Continued)

All transmitters	One 4-wire sensor signal input connection with ground
	<p>One or two active or passive discrete outputs</p> <ul style="list-style-type: none"> • Not intrinsically safe • Can report event 1, event 2, event 1 and event 2, flow switch, forward/reverse flow, calibration in progress, or fault • Power: <ul style="list-style-type: none"> - Internal (active): +15 VDC \pm3% with a 2.2 kohm internal pull-up resistor - External (passive): +30 VDC maximum, +24 VDC typical • Maximum sink capability: 500 mA
	<p>One discrete input</p> <ul style="list-style-type: none"> • Can be configured for internal or external power • Not intrinsically safe • Power: <ul style="list-style-type: none"> - Internal (active): +15 VDC, 7 mA maximum source current - External (passive): +3 to 30 VDC maximum • Can report reset all totals, reset mass total, reset volume total, or start sensor zero
Output option code 6 (FOUNDATION fieldbus)	One FOUNDATION fieldbus H1 output Manchester-encoded digital signal conforms to IEC 1158-2
Output option code 7 (Profibus-PA)	One Profibus-PA output Manchester-encoded digital signal conforms to IEC 1158-2

Table A-12 FM Transmitter Digital Communications

All transmitters	One service port can be used for temporary connection only Uses RS-485 Modbus signal, 38.4 kilobaud, one stop bit, no parity
Output option code 1, 3, or 4	<p>HART Bell 202 signal is superimposed on the primary milliamp output, and is available for host system interface:</p> <ul style="list-style-type: none"> • Frequency: 1.2 and 2.2 kHz • Amplitude: to 0.8 V peak-to-peak • 1200 baud • Requires 250 to 600 ohms resistance
Output option code 1 or 3	<p>One RS-485 output can be used for direct connection to a HART or Modbus host system.</p> <p>Modbus communications supports 7-bit or 8-bit protocol (default: 8-bit), 1200 to 38,400 baud (default: 9600), one or two stop bits (default: one), and odd, even, or no parity (default: odd). Configuration can be changed using ProLink II software or the display (if applicable).</p>
Output option code 6 (FOUNDATION fieldbus)	<p>Transmitters are registered with the Fieldbus Foundation, and conform to the FOUNDATION fieldbus H1 protocol specification.</p> <p>Input frequency from sensor:</p> <ul style="list-style-type: none"> • Mass flow: 20 Hz • Volume flow: 20 Hz • Density: 20 Hz • Temperature: 1Hz <p>Analog input function blocks:</p> <ul style="list-style-type: none"> • Cycle time: Host dependent • Update rate: 50 milliseconds • Refresh rate: Host dependent

Table A-12 FM Transmitter Digital Communications

Output option code 7 (Profibus-PA)	<p>Transmitters are registered with the Profibus Organization, and fulfill the requirements of the Profibus-PA Profile for Process Control Devices.</p> <p>Input frequency from sensor:</p> <ul style="list-style-type: none"> • Mass flow: 20 Hz • Volume flow: 20 Hz • Density: 20 Hz • Temperature: 1Hz <p>Analog input function blocks:</p> <ul style="list-style-type: none"> • Cycle time: Host dependent • Update rate: 50 milliseconds • Refresh rate: Host dependent <p>Siemens Simatic PDM required for configuration.</p>
---------------------------------------	---

Table A-13 FM Transmitter Power Supply

Self-switching AC/DC input, automatically recognizes supply voltage.
 Complies with low voltage directive 73/23/EEC per IEC 61010-1
 Installation (Overvoltage) Category II, Pollution Degree 2.
 The transmitter fieldbus circuit is passive, and draws its power from the fieldbus segment. Current draw from the fieldbus segment is 11.5 mA.

AC power	85 to 265 VAC, 50/60 Hz, 6 watts typical, 11 watts maximum
DC power	<p>18 to 100 VDC, 6 watts typical, 11 watts maximum</p> <p>At startup, transmitter power source must provide a minimum of 1.5 amperes of short-term current at a minimum of 18 volts at the transmitter's power input terminals.</p> <p>Minimum 22 VDC with 1000 feet of 18 AWG (300 meters of 0.8 mm²) power supply cable</p>
Fuse	IEC 127-1.25 fuse, slowblow

Table A-14 FM Transmitter Environmental Limits





Ambient temperature limits	<p>Operating and storage: -40 to +140 °F (-40 to +60 °C)</p> <p>Display responsiveness decreases and display may become difficult to read below -4 °F (-20 °C). Above 131 °F (55 °C), some darkening of the display might occur. ATEX requires limiting ambient temperature to below 131 °F (55 °C).</p>
Humidity limits	5 to 95% relative humidity, non-condensing at 140 °F (60 °C)
Vibration limits	Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g.

QmBS Sensor / QTA Transmitters

Table A-15 FM Transmitter Environmental Effects

EMI effects	Meets EMC directive 89/336/EEC per EN 61326 Industrial
Ambient temperature effect	On analog outputs $\pm 0.005\%$ of span per °C

Table A-16 FM transmitter Hazardous Area Classifications

Approvals agency	Classification
CSA ^a	Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F and G Class III Division 2
ATEX ^b	With display:   II 3 G EEx nC [L] IIB+H2 T6 II 3 D IP66/IP67 T65°C
	Without display or with optional display cover:   II 3 G EEx nC [L] IIC T6 II 3 D IP66/IP67 T65°C

a. CSA is a Canadian approvals agency that provides approvals accepted both in the U.S.A. and in Canada.

b. ATEX is a European directive.

A.3.3 QTA DIN Transmitters

Table A-17 DIN transmitter Physical Specifications

Housing	Polyamide PA 6.6
Weight	0.52 lbs (0.24 kg)
Mounting and cabling	DIN rail transmitters are mounted on a 35 mm rail. The rail must be grounded. Transmitters include a mounting bracket and 6.5 ft (2 m) of 4-wire twisted-pair shielded signal cable. Additional lengths up to 1000 ft (300 m) can be purchased.
Status LED	Three-color LED status light on face of transmitter indicates flowmeter condition at a glance, using a solid green, yellow or red light. Zero in progress is indicated by a flashing yellow light.
Zero button	A zero button on the face of the transmitter can be used to start the transmitter zero process.

Table A-18 DIN Transmitter Electrical Connections

Input and output connections	<p>Three pairs of wiring terminals for transmitter outputs</p> <p>One pair of terminals for digital communications (Modbus/RS-485)</p> <p>Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0,2 to 3,5 mm²)</p>
Power connections	<p>Two pairs of terminals</p> <ul style="list-style-type: none"> • Either pair accepts DC power • The remaining pair is used for making a jumper connection to a second transmitter <p>Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 3.5 mm²)</p>
Sensor connection	<p>The transmitter has two pairs for the 4-wire connection to the sensor</p> <ul style="list-style-type: none"> • One pair is used for the RS-485 connection to the sensor • One pair is used to supply power to the sensor <p>Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 3.5 mm²)</p>

Table A-19 DIN Transmitter Input/output Signals

All transmitters	One 4-wire sensor signal input connection with ground
Output option code 2 (1 mA, 1 FO)	<p>One active 4–20mA output</p> <ul style="list-style-type: none"> • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: 600 ohms • Can report mass flow or volume flow • Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994) <p>One active or passive frequency/pulse output</p> <ul style="list-style-type: none"> • Not intrinsically safe • Can report mass flow or volume flow, which can be used to indicate flow rate or total • Frequency output reports the same flow variable as the mA output • Scalable to 10,000 Hz • Maximum output of +24 VDC ±3% with 2.2 kohm internal pull-up resistor • Output is linear with flow rate to 12,500 Hz
Output option code 5 (2 mA, 1 FO configurable, multivariable transmitter only)	<p>One or two active 4–20 mA outputs</p> <ul style="list-style-type: none"> • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: <ul style="list-style-type: none"> - mA1: 820 ohms - mA2: 420 ohms • Can report mass flow, volume flow, density, temperature, or drive gain <p>Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)</p>

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Table A-19 DIN Transmitter Input/output Signals (Continued)

One active or passive frequency/pulse output

- Not intrinsically safe
- Can report mass flow or volume flow, which can be used to indicate flow rate or total
- Scalable to 10,000 Hz
- Power:
 - Internal (active): +15 VDC \pm 3% with 2.2 kohm internal pull-up resistor
 - External (passive): +30 VDC maximum, 24 VDC typical, sinking up to 500 mA at 30 VDC

Output is linear with flow rate to 12,500 Hz

One or two active or passive discrete outputs

- Not intrinsically safe
- Can report event 1, event 2, event 1 and event 2, flow switch, forward/reverse flow, calibration in progress, or fault
- Power:
 - Internal (active): +15 VDC \pm 3% with 2.2 kohm internal pull-up resistor
 - External (passive): +30 VDC maximum, +24 VDC typical, sinking up to 500 mA at 30 VDC

Maximum sink capability: 500 mA

One discrete input

- Can be configured for internal or external power
- Not intrinsically safe
- Power:
 - Internal: +15 VDC, 7 mA maximum source current
 - External: +3 to 30 VDC maximum

Can reset all totals, reset mass total, reset volume total, or start sensor zero

Table A-20 DIN Transmitter Digital Communications

All transmitters	One pair of terminals supports Modbus/RS-485 signal or SP (service port) mode. HART/Bell 202 signal is superimposed on the primary mA output, and is available for host system interface <ul style="list-style-type: none"> • Frequency: 1.2 and 2.2 kHz • Amplitude: 0.8 V peak-to-peak • 1200 baud • Requires 250 to 600 ohms load resistance
------------------	--

Table A-21 DIN Transmitter Power Supply

Requires DC power Meets Installation (Overvoltage) Category II, Pollution Degree 2 requirements Contains an IEC 1.6A slowblow fuse	
Power requirements	19.2 to 28.8 VDC, 6.3 watts maximum At startup, transmitter power source must provide a minimum of 1.0 amperes of short-term current per transmitter Length and conductor diameter of the power cable must be sized to provide 19.2 VDC minimum at the power terminals, at a load current of 330 mA



Table A-22 DIN Transmitter Environmental Limits

Ambient temperature limits	Operating: -40 to +131 °F (-40 to +55 °C) Storage: -40 to +185 °F (-40 to +85 °C) If temperature is above 113 °F (45 °C) and you are mounting multiple transmitters, they must be mounted at least 8.5 mm apart.
Humidity limits	5 to 95% relative humidity, non-condensing at 140 °F (60 °C)
Vibration limits	Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g

Table A-23 DIN Transmitter Environmental Effects

EMI effects	Meets EMC directive 89/336/EEC per EN 61326 Industrial
Ambient temperature effect	On analog outputs ±0.005% of span per °C

Table A-24 DIN Transmitter Hazardous Area Classifications

Approvals agency	Classification
CSA ^a	Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F and G Class III Division 2
ATEX ^b	  II (3) G [Ex nL] IIB/IIC T6

a. CSA is a Canadian approvals agency that provides approvals accepted both in the U.S.A. and in Canada.

b. ATEX is a European directive.

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B.1 Receipt of Equipment

When the instrument is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to your nearest Product Service Department.

Brooks Instrument

407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554-FLOW (3569)
Tel (215) 362-3700
Fax (215) 362-3745
E-mail: BrooksAm@EmersonProcess.com
<http://www.brooksinstrument.com>

Brooks Instrument

Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel 31-318-549-300
Fax 31-318-549-309
E-mail: BrooksEu@EmersonProcess.com

Brooks Instrument

1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel 011-81-3-5633-7100
Fax 011-81-3-5633-7101
Email: BrooksAs@EmersonProcess.com

Remove the envelope containing the packing list. Carefully remove the instrument from the packing case. Make sure spare parts are not discarded with the packing materials. Inspect for damaged or missing parts.

B.2 Recommended Storage Practice

If intermediate or long-term storage of equipment is required, it is recommended that the equipment be stored in accordance with the following:

- a. Within the original shipping container.
- b. Stored in a sheltered area, preferably a warm, dry, heated warehouse.
- c. 32°C (90°F) maximum, 45°F (7°C) minimum.
- d. Relative humidity 45% nominal, 60% maximum, 25% minimum.
Upon removal from storage a visual inspection should be conducted to verify the condition of equipment is "as received".

QmBS Sensor / QTA Transmitters

B.3 Return Shipment

Prior to returning any instrument to the factory, contact your nearest Brooks location for a Return Materials Authorization Number (RMA#). This can be obtained from one of the following locations:

Brooks Instrument

407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554-FLOW (3569)
Tel (215) 362-3700
Fax (215) 362-3745
E-mail: BrooksAm@EmersonProcess.com
<http://www.brooksinstrument.com>

Brooks Instrument

Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel 31-318-549-300
Fax 31-318-549-309
E-mail: BrooksEu@EmersonProcess.com

Brooks Instrument

1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel 011-81-3-5633-7100
Fax 011-81-3-5633-7101
Email: BrooksAs@EmersonProcess.com

Any instrument returned to Brooks requires completion of Form RPR003-1, Brooks Instrument Decontamination Statement, as well as, a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. This is required before any Brooks Personnel can begin processing. Copies of the form can be obtained from any Brooks Instrument location listed above.

B.4 Transit Precautions

To safeguard against damage during transit, transport the instrument to the installation site in the same container used for transportation from the factory if circumstances permit.

C.1 Overview

This appendix contains information related to compliance with Electro Magnetic Compatibility (EMC) directive 89/336/EEC, Low Voltage Directive 73/23/EEC, and ATEX directive 94/9/EC.

C.2 CE Compliance Information

Brooks equipment bearing the CE mark has been successfully tested to the regulations of Electro Magnetic Compatibility (EMC) directive 89/336/EEC, Low Voltage Directive 73/23/EEC, and ATEX directive 94/9/EC. This section contains a brief overview of the installation requirements. For complete information, refer to Sections 2, 3, 4 and 5 Installing Instructions in this manual.

Table C-1 Compliance Requirements

Directive	Applies to	Requirement
Electro Magnetic Compatibility (EMC) Directive 89/336/EEC	All QmBS Sensors	<ul style="list-style-type: none"> • The sensor mounting plate must be grounded to earth. • The transmitter must be grounded to earth. • For the cable used between the sensor and the transmitter: <ul style="list-style-type: none"> - Brooks supplies high-quality cable that meets the specifications for CE certification. - If you provide your own signal cable, you should use a cable which is overall completely shielded with a 100% shield. - If “Circular” type connectors are used, they should be shielded with a metal shield. If applicable, metal cable glands providing cable shield clamping must be used. - The cable shield should be terminated to earth ground.
Low Voltage Directive 73/23/EEC	All QTA transmitters that use AC power	<ul style="list-style-type: none"> • A user-supplied switch must be installed in the power supply line in close proximity to the transmitter.
ATEX Directive 94/9/EC	Transmitter models QTA(1/3/4/6/7)**L****	<ul style="list-style-type: none"> • When cable entries are used, they shall conform to clause 7.2.6 of EN 50021. • In an ambient temperature of less than –20 °C, suitable cable and cable entries or conduit entries for this condition shall be used. • A type of protection of at least IP 54 according to EN 60529 will be achieved only when cable and conduit entries providing IP 54 according to EN 60529 are used.
	Transmitter models QTA(6/7)**L****	<ul style="list-style-type: none"> • The cover of the terminal compartment containing terminals 1–6 may be removed for short periods when the apparatus is in service to permit checking or adjustment of energized energy-limited circuits.
	Transmitter models QTA(2/5)**L****	<ul style="list-style-type: none"> • When multiple transmitters are stacked on a single DIN rail and the ambient temperature is above 45 °C, the units must be spaced at least 10 mm apart.
	Sensor models QmBS(2/3/4)*****L**** (all sensors)	<ul style="list-style-type: none"> • When the temperature under rated conditions is higher than 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature rating of the cable used between the sensor and the transmitter shall be higher than the actually measured temperature values. • Provisions shall be made to prevent the rated voltage being exceeded by transient disturbances of more than 40%.

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Installation and Operation Manual

X-CM-QmBS-eng

Part Number: 541B052AHG

June, 2008

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QmBS Sensor / QTA Transmitters

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.

All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS LOCAL AND WORLDWIDE SUPPORT

Brooks Instrument provides sales and service facilities around the world, ensuring quick delivery from local stock, timely repairs and local based sales and service facilities.

Our dedicated flow experts provide consultation and support, assuring successful applications of the Brooks flow measurement and control products.

Calibration facilities are available in local sales and service offices. The primary standard calibration equipment to calibrate our flow products is certified by our local Weights and Measures Authorities and traceable to the relevant international standards.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required.

For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons. Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance:

- Americas 1-888-554-FLOW
Europe +(31) 318 549 290 Within Netherlands 0318 549 290
Asia +011-81-3-5633-7100

Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

- Brooks Brooks Instrument, LLC
Kalrez DuPont Dow Elastomers
HART HART Communications Foundation
Profibus Profibus International
Viton DuPont Performance Elastomers



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